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Methodological assessment and overall confidence in the results of systematic reviews with meta-analyses focusing on traumatic dental injuries: a cross-sectional study.

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Methodological assessment and overall confidence in the results of systematic reviews with meta-analyses focusing on traumatic dental injuries: a cross-sectional study.

Abstract

Background/Aims: High methodological quality is required to interpret results of systematic reviews in a reliable and accurate manner. The primary aim of this study was to appraise the methodologic quality of systematic reviews (SRs) with meta-analysis within the field of traumatic dental injuries using the A MeaSurement Tool to Assess systematic Reviews (AMSTAR) 2 tool and assess overall confidence in their results. A secondary aim was to identify potential predictive factors associated with methodological quality.

Study Design and Setting: SRs with meta-analyses published in English in the field of traumatic dental injuries from inception to March 2023 were identified. The methodological quality of the included reviews was assessed using the AMSTAR 2 checklist. Two independent evaluators scored each AMSTAR 2 item as "yes" if it was adequately addressed, "partial yes" if it was partially addressed, and "no" if it was not addressed. The overall confidence in the results of each review was classified as "High," "Moderate," "Low," or "Critically low". Using multiple regression, the relationship between five predictor variables (journal impact factor, year of publication, number of authors, journal adherence to Preferred Reporting Items for Systematic reviews and Meta-analyses (PRISMA) guidelines and *a priori* protocol registration) and the total AMSTAR 2 scores were analyzed. The p-value was 5%.

Results: Forty-one systematic reviews were included. The overall confidence in the results of 13 reviews was categorized as 'Critically low', 18 as 'Low', 3 as 'Moderate' and 7 as 'High'. Among the five predictor variables analyzed statistically, impact factor of the journal and year of publication significantly influenced the total AMSTAR 2 scores. The number of authors, adherence to PRISMA guidelines, and *a priori* protocol registration had no significant impact on AMSTAR 2 scores.

Conclusion: The overall confidence in the results of SRs with meta-analysis within the field of traumatic dental injuries was 'Low' or 'Critically Low' in the vast majority of studies (31 out of 41). SRs with meta-analyses published in journals with higher Impact factors and more recent publications had significantly higher methodological quality.

1.   INTRODUCTION

Systematic reviews (SRs) with meta-analyses are primarily used to develop clinical practice guidelines, identify deficiencies in knowledge, and select topics for further investigation, with the findings increasingly accepted by healthcare providers wishing to provide the most recent evidence-based care.[1-3] It is good practice to investigate the methodological quality of SRs periodically in order to assess the confidence that stakeholders can have in the findings of reviews. Understanding the degree of confidence is essential when judging the overall strength of evidence on a given research question and is considered by evaluating the methodological quality of the design and implementation of the SR rather than the actual effect of an intervention.[4] In a similar way to other types of study designs such as randomized trials, the quality of SRs can vary .[5] As a result of this, assessing the quality of SRs is important for researchers, clinicians, and policy developers to judge whether the results of a SR can be responsibly used to influence clinical practice.

Various studies have appraised the methodological quality of SRs using the AMSTAR tool in several health care settings including traditional Chinese medical nursing interventions,[6] nursing interventions,[4] paediatric surgery[7] and telerehabilitation.[8] Similarly, the methodological quality of SRs in some specialty subjects in dentistry has been analysed.[9-13] The majority of these studies identified deficiencies in the conduct of SRs,[10-13] which should stimulate researchers in future to produce higher quality SRs in their specialty for the benefit not only of readers and researchers, but ultimately clinicians and their patients.

Traumatic Dental injuries are an important field in dentistry, and include damage to the teeth, the periodontium and the surrounding soft and bony tissues as well as their management. Due to an increase in the number of SRs related to traumatic dental injuries, it is important to assess the methodological quality of those SRs and accompanying meta-analyses in order to inform researchers and clinicians on the improvements necessary to produce high-quality SRs related to dental traumatology.

The primary aim of the current study was to appraise the methodologic quality of SRs with meta-analysis on traumatic dental injuries using the A MeaSurement Tool to Assess systematic Reviews (AMSTAR) 2 tool and to evaluate the overall confidence in their results, while the secondary outcome was to identify the potential predictive factors associated with methodological quality.

2. METHODS

Literature search

SRs with meta-analysis were retrieved from the PubMed and EbBSCOhost electronic databases from inception to March 2023. The following search strategy (((((((((((((((("dental trauma") OR ("dental traumatism")) OR ("dental traumatic injuries")) OR ("traumatic dental injuries")) OR ("crown fracture")) OR ("root fracture")) OR ("tooth fracture")) OR ("alveolar fracture")) OR ("crown-root fractures")) OR ("tooth injury")) OR ("avulsion")) OR ("intrusion")) OR ("extrusion")) OR ("luxation")) OR ("tooth exarticulation")) OR ("traumatic pulp exposure")) AND (("systematic review") OR ("qualitative synthesis"))) AND (((("meta-analysis") OR ("meta-analyses")) OR ("meta-syntheses")) OR ("quantitative synthesis")) was used to identify the reviews. The OpenGrey (https://opengrey.eu) database was used to search the grey literature. Additionally, the reference lists of included SRs were searched to identify missing publications.

Inclusion criteria

1. SRs with meta-analyses in the field of traumatic dental injuries published in English
2. SRs with meta-analysis where the primary studies included were related only to traumatic dental injuries

Exclusion criteria

1. SRs with meta-analyses involving dentofacial trauma with or without associated dental (tooth) injuries
2. SRs without meta-analyses

Data extraction

The following items were included on the data extraction forms: Name of the first author, country of the corresponding author, total number of authors, name of the Journal, JCR impact factor for the year in which the review was published, name of the database where the protocol of the review was registered, and year of publication.

Methodological quality

The methodological quality of the included reviews was appraised using the A MeaSurement Tool to Assess systematic Reviews (AMSTAR) 2 checklist, which contains 16 items.[14] Two reviewers independently assessed each item as "yes" if it was adequately addressed, "partial yes" if it was partially addressed, or "no" if it was not addressed at all. If information was unclear or missing, the corresponding authors of each review were contacted and asked to provide additional data. To prevent any potential misinterpretation and to verify the scores awarded, the AMSTAR 2 scores awarded for each item were shared with the corresponding author of the included reviews. The AMSTAR 2 scores were emailed to the corresponding authors along with a request for a response within ten days. If no response was received from the author after the deadline, it was assumed that the scores were acceptable.[15]

Overall confidence rating

Firstly, the research team used the critical domains suggested by the developers of AMSTAR 2 (Appendix Table 1), and then two reviewers independently applied the criteria to rate the overall confidence in the results of each review.[14] The AMSTAR 2 developers have described how the overall confidence in the results of a SR could be categorized as "High," "Moderate," "Low," or "Critically low" .[14] A greater number of non-critical and critical weaknesses that were identified resulted in reduced confidence in the results of a review.

Assessment approach

Two independent evaluators conducted the literature search, study selection, data extraction, methodological quality assessment, and overall rating of confidence. Disagreements were handled through reviewer discussion in order to reach consensus. If conflicts remained, the final judgment was determined by a third reviewer.

Potential predictors of methodological quality

The association between the following predetermined predictors and the methodological quality of SRs was investigated:

1. *A priori* protocol published (Yes vs. No)
2. JCR impact factor of the journal in the year of publication
3. Publication year
4. Continent of corresponding author
5. Number of authors
6. Adherence of the journal to the Preferred Reporting Items for Systematic reviews and Meta-analyses (PRISMA) guidelines (Yes vs. No)

Data analysis

The data were entered in an Excel sheet and overall score for each SR was calculated. If the item was adequately addressed, a score of "1" was awarded, "0.5" if it was partially addressed, or "0" if it was not addressed. The AMSTAR 2 checklist has 16 items. The total score for each review was calculated by adding all the scores awarded for each item. The maximum score awarded per SR was 16 if all 16 AMSTAR-2 items were scored "1".

A multiple linear regression analysis was conducted to examine the relationship between the five predictor variables (*a priori* protocol published, impact factor of the journal, year of publication, number of authors, journal adherence to the PRISMA guidelines) and the total AMSTAR 2 scores of each review. One factor (continent of corresponding author) was not included in the model due to insufficient number of observations within each subcategory. The three continuous predictor variables included in the model were journal impact factor, year of publication, and number of authors; the two categorical predictor variables included were journal adherence to PRISMA guidelines and protocol registration status. The reference category (in regression models, the reference category for a categorical variable is the category that is used as a baseline or reference point against which other categories are compared) used for the categorical variables were non-adherence to PRISMA guidelines and lack of protocol registration. One SR was excluded from the analysis because it was published prior to the publication of the PRISMA guidelines in 1999.[16] The assumptions underlying multiple linear

regression were checked to ensure the validity of the analysis. The p-value was set at 5%. The data were analysed statistically using SPSS software (Version 28, IBM Corp, USA).

3. RESULTS

Literature search

The results of the literature search are presented in Figure 1. The initial database search resulted in 1216 publications; however, following a screening of the titles and/or abstracts, 1172 of the publications were excluded because they did not meet the inclusion criteria. After reading the complete texts, three SRs with meta-analyses were excluded because they were not related to traumatic dental injuries. [17-19] Finally, 41 SRs with meta-analyses were included (Appendix Table 2).

Characteristics of the included reviews

The characteristics of the included SRs are provided in Table 1. The number of authors for each review ranged from 2 to 9. Amongst the 41 reviews, 29 were registered in the PROSPERO database, while 2 were registered in the Open Science Framework; the other 10 reviews were not registered. From the total number of journals (n=20), 11 required that authors adhere to the PRISMA guidelines.

Methodological quality and *overall confidence*

Table 2 presents a summary of the methodological quality assessment for each AMSTAR 2 item. All the reviews adequately reported items 1 and 8 while less than 35% of reviews adequately addressed items 4, 7 and 10. The overall AMSTAR 2 scores and overall confidence in the results for each SR are presented in Appendix Table 2. The overall confidence in the results was categorized as "Critically low" in 13 (32%) reviews, "Low" in 18 (44%) reviews, "Moderate" in 3 (7%) reviews, and "High" in 7 (17%) reviews.

Predictors of methodological quality

Overall, the regression model demonstrated moderate fit measures, with an R-squared value of 0.5, indicating that approximately 50% of the variability in the total score was accounted by the five predictor variables (protocol published *a priori*, impact factor of the journal, year of publication, number of authors, journal adherence to the PRISMA

guidelines) included in the model. Assumption tests revealed that there was no evidence of multicollinearity as assessed by tolerance values greater than 0.1. There were no Cook's distance values above 1 indicating no influential outliers significantly affecting the model. The assumption of normality was met, as assessed by a Q-Q Plot. The multiple linear regression model statistically significantly predicted the total score [$F_{(5, 34)}$ = 6.784, $p < 0.001$], and the adjusted R^2 was 0.43. Among the five predictor variables, impact factor and year of publication had a significant influence on the total AMSTAR 2 scores ($p < .05$). Higher journal impact factor was associated with a higher total AMSTAR 2 score. Similarly, more recent years of publication were associated with an increase in the total score. The number of authors, adherence of the journal to the PRISMA guidelines and protocol registration status did not have a significant effect on the total score. The regression coefficients (95% CI), their standard errors and collinearity statistics are presented in Table 3.

4. DISCUSSION

High methodological quality is essential to enable stakeholders to make valid, correct and responsible interpretations of the results of SRs.[20] Despite the systematic approach and other rigorous strategies employed when conducting SRs, not all are carried out and reported to a high standard and as a consequence, the quality of SRs is likely to vary.[10-13] With the observed variation in the quality of reporting and the subsequent concerns over the validity of results and conclusions, it has become necessary to evaluate the methodological quality of SRs in all fields within dentistry, including dental traumatology. Publications on the appraisal of SRs in dental traumatology are scarce. One study evaluated the risk of bias using the ROBIS tool and the reporting quality using the PRISMA checklist for SRs in the field of dental traumatology.[21] However, since risk of bias and methodological quality are different entities,[22] making a direct comparison is difficult. In addition, the SR appraisal by Tewari et al., did not provide a detailed report of the risk of bias assessment,[21] which hinders potential future comparisons between their findings and the present study.

Authors of SRs must provide the rationale for the inclusion of different study designs, which should not be arbitrary.[14] It is worth noting that AMSTAR 2 is a critical appraisal tool for SRs that include randomized or non-randomized studies of healthcare

interventions or both. In the current study most of the included SRs were reports on observational studies. Hence, for those SRs studying the prevalence or association or non-intervention studies, a score of "YES" was awarded (adequately addressed) for item 3 ("Did the review authors explain their selection of the study designs for inclusion in the review?").

Only a few of the included reviews on traumatic dental injuries described or conducted a literature search within the relevant clinical trial registry. Similar to the present results, in Cochrane SRs published between 2008 and 2010, only 38% included trial registry searches.[23] Jones et al., reported that searches of clinical trials registries are not usually included in SRs published in leading medical journals.[24] Clinical trial registry searches can identify unpublished trials as well as allow for a more precise characterization of publishing and outcome reporting bias. They can also improve the validity of the estimated medical therapy effects.[24]

The authors of a SR must provide a comprehensive list of excluded primary studies and the rationale for their exclusion according to the described criteria [14]. The excluded studies should be thoroughly accounted by authors otherwise there is a possibility that they remain undetected, with the effects of their exclusion being unknown.[14] To ensure repeatability of all steps of a SR, excluded primary studies and their reasons for exclusion should be detailed.[25]

In the present study only 15% of the SRs adequately reported the sources of funding for the included primary studies. Commercially funded studies have been shown to be more likely to favour a sponsor's product than studies independent of industry funding.[26,27] The authors of a review should identify the funding sources for each included study or highlight the absence of funding in the manuscript. This information will then permit a separate analysis of commercially and independently funded studies and allow a judgement to be made regarding potential bias.[14] The AMSTAR 2 tool was developed to evaluate the quality of SRs of interventions. The source of funding might impact the quality of SRs based on prevalence studies. However, the authors of SRs based on prevalence studies should explicitly state that the source of funding had not influenced the study.

During peer review and before publication, the reviewers and assessors of each SR should carry out an assessment of deficiencies in both AMSTAR 2 critical and non-critical domains.[14] The AMSTAR 2 developers have indicated that authors of SRs should determine the importance of the items based on the specific research conducted.[14] In the present study, confidence in the results of 32% and 44% of the SRs was categorized as "Critically low" and "Low" respectively. It is interesting to note that confidence in the results of SRs on the COVID-19 pandemic,[28] asthma treatments,[29] pharmacological or psychological interventions for major depression in adults,[30] and surgical robotics[31] was reported to be "Critically low". Hasuike et al., reported that most SRs of treatments for peri-implantitis were of "Critically low" methodological quality.[32] The overall confidence in the results of most SRs with network meta-analyses in the dental specialty of endodontics was "Critically low".[33] This emphasizes the necessity to improve the conduct and methodological rigour of SRs in the future.

In the present study, higher methodological quality reviews were associated with journals with higher impact factors. This is likely due to the stricter and more comprehensive review procedures employed by such journals.[34] Recently, Nagendrababu et al., evaluated the reporting quality of case reports in dental traumatology using the PRICE 2020 checklist and concluded that journals with impact factors publish higher-quality reports than journals without an impact factor.[35] In the present study, more recent publications were associated with higher methodological quality scores. The most likely explanation for this positive association is that authors and reviewers are becoming more knowledgeable about SR methodologies.[36] There was no significant difference between the methodological quality scores and following parameters: i) journal adherence to the PRISMA guidelines, ii) SRs that published an *a priori* protocol and iii) number of authors. These negative findings could have occurred because the majority of the SRs included in the present study were published in journals with impact factors. In the statistical analysis, although the p-value of 0.158 for the number of authors suggests a lack of statistical significance, it is worth noting that a larger sample size could potentially yield different results. With a small sample size (n=41), the ability to detect smaller effects may be limited.

Notably, AMSTAR 2 was designed for SRs including randomized and non-randomized studies. In the present study, most of the reviews included observational studies or a mixture of observational and randomized studies. The current study had to used AMSTAR 2 tool to assess the methodological quality of reviews that included observational studies because a standard and validated tool is not available. However, recent data suggests that some of the AMSTAR 2 items can also be applied to the SRs of non-interventional studies, although some adaptation to the other items might be necessary.

Limitations of this study include the fact that only English-language reviews were evaluated, which may introduce bias as potentially relevant non-English publications were not considered. Secondly, the current study included reviews published between 1999 and 2023. It must be emphasized that the AMSTAR 2 tool was only published in 2017. Therefore, reviews published prior to 2018 were unable to use the AMSTAR 2 tool in order to self-evaluate and improve their work prior to submission.

In general, this study was undertaken from the perspective of a reader and the analysis was based on the information provided in the included manuscripts. It is always possible that the authors of the SRs with meta-analyses used the correct methodology but failed to report it in the manuscript or that the peer-review processes and/or word count limits imposed by the journals may have resulted in the exclusion of key information. Hence, the scores were shared with the authors of SRs to confirm the scores in an attempt to reduce potential discrepancies.[15]

AMSTAR 2 includes several items that apply exclusively to SRs with meta-analyses. To standardize the current study, only SRs with meta-analyses were included. This highlights the need to assess the methodologically quality of SRs without meta-analyses in the future. It is well-known that poorly reported SRs reduce the usefulness of their findings for clinicians and other stakeholders.[37] Also, for standardization purposes, the current study excluded SRs with meta-analyses that involved more severe dentofacial trauma with or without dental (tooth) injuries. Therefore, further research is required to evaluate the validity of SRs and meta-analyses involving dentofacial trauma.

5. CONCLUSION

The overall confidence in the results of SRs with meta-analysis within the field of traumatic dental injuries was 'Low' or 'Critically Low' in the vast majority of studies (31 out of 41). SRs with meta-analyses published in journals with higher Impact factors and more recent publications had significantly higher methodological quality. When performing SRs, authors should consider using the AMSTAR 2 tool, which has the potential to increase the validity, quality and clinical application of future SRs regarding traumatic dental injuries and their management.

CONFLICT OF INTEREST

The authors declare there are no competing interests for the current manuscript. No funding was received for the current work.

ETHICAL STATEMENT

No ethics approval was required for this manuscript.

LEGENDS

Table 1: Characteristics of the systematic reviews with meta-analyses included in the study

Table 2: Summary of the assessment of methodological quality

Table 3: Multiple Linear regression results for variables influencing total AMSTAR 2 scores

Appendix Table 1: Critical domains suggested by the developers of AMSTAR 2 (Shea et al., 2017)

Appendix Table 2: List of the included systematic reviews with meta-analysis (n=41)

Figure 1: 1: Literature search process

References

1. Gopalakrishnan S, Ganeshkumar P. Systematic Reviews and Meta-analysis: Understanding the Best Evidence in Primary Healthcare. J Family Med Prim Care. 2013;2:9-14.

2. Uman LS. Systematic reviews and meta-analyses. J Can Acad Child Adolesc Psychiatry. 2011;20:57-9.

3. Murad MH, Asi N, Alsawas M, Alahdab F. New evidence pyramid. Evid Based Med. 2016; 21:125-7.

4. Seo HJ, Kim KU. Quality assessment of systematic reviews or meta-analyses of nursing interventions conducted by Korean reviewers. BMC Med Res Methodol. 2012;12:129.

5. Wasiak J, Shen AY, Tan HB, Mahar R, Kan G, Khoo WR, et al. Methodological quality assessment of paper-based systematic reviews published in oral health. Clin Oral Investig. 2016;20:399-431.

6. Jin YH, Wang GH, Sun YR, Li Q, Zhao C, Li G, et al. A critical appraisal of the methodology and quality of evidence of systematic reviews and meta-analyses of traditional Chinese medical nursing interventions: a systematic review of reviews. BMJ Open. 2016;6:e011514.

7. Cullis PS, Gudlaugsdottir K, Andrews J. A systematic review of the quality of conduct and reporting of systematic reviews and meta-analyses in paediatric surgery. PLoS One. 2017;12:e0175213.

8. Rogante M, Kairy D, Giacomozzi C, Grigioni M. A quality assessment of systematic reviews on telerehabilitation: what does the evidence tell us? Ann Ist Super Sanita. 2015;51:11-8.

9. Suebnukarn S, Ngamboonsirisingh S, Rattanabanlang A. A systematic evaluation of the quality of meta-analyses in endodontics. J Endod. 2010;36:602–8.

10. Kattan S, Lee SM, Kohli MR, Setzer FC, Karabucak B. Methodological Quality Assessment of Meta-analyses in Endodontics. J Endod. 2018;44:22-31.

11. Nagendrababu V, Pulikkotil SJ, Sultan OS, Jayaraman J, Peters OA. Methodological and reporting quality of systematic reviews and meta-analyses in endodontics. J Endod. 2018;44:903-13.

12. Jayaraman J, Nagendrababu V, Pulikkotil SJ, Innes NP. Critical appraisal of methodological quality of Systematic Reviews and Meta-analysis in Paediatric Dentistry journals. Int J Paediatr Dent. 2018;28:548-60.

13. Papageorgiou SN, Papadopoulos MA, Athanasiou AE. Evaluation of methodology and quality characteristics of systematic reviews in orthodontics. Orthod Craniofac Res. 2011;14:116-37.

14. Shea BJ, Reeves BC, Wells G, Thuku M, Hamel C, Moran J, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ. 2017;358:j4008.

15. Faggion CM Jr, Nagendrababu V, Dummer PM. Should authors of overviews of systematic reviews invite the authors of the systematic reviews they analysed to attempt to replicate or validate their methodological analysis? J Clin Epidemiol. 2023:S0895-4356(23)00072-0.

16. Nguyen Q V., Bezemer PD, Habets L, Prahl-Andersen B. A systematic review of the relationship between overjet size and traumatic dental injuries. Eur J Orthod. 1999;21:503–15.

17. Long H, Zhou Y, Ye N, Liao L, Jian F, Wang Y, et al. Diagnostic accuracy of CBCT for tooth fractures: a meta-analysis. J Dent. 2014;42:240-8.

18. Ma RH, Ge ZP, Li G. Detection accuracy of root fractures in cone-beam computed tomography images: a systematic review and meta-analysis. Int Endod J. 2016;49:646-54.

19. Salineiro FCS, Kobayashi-Velasco S, Braga MM, Cavalcanti MGP. Radiographic diagnosis of root fractures: a systematic review, meta-analyses and sources of heterogeneity. Dentomaxillofac Radiol. 2017;46:20170400.

20. Shea BJ, Hamel C, Wells GA, Bouter LM, Kristjansson E, Grimshaw J, et al. AMSTAR is a reliable and valid measurement tool to assess the methodological quality of systematic reviews. J Clin Epidemiol. 2009;62:1013-20.

21. Tewari N, Mathur VP, Kaur A, Sardana D, Rahul M, Tamchos R, et al. Evidence mapping and quality assessment of systematic reviews in dental traumatology. Dental Traumatol. 2021;37:17-36.

22. Furuya-Kanamori L, Xu C, Hasan SS, Doi SA. Quality versus risk-of-bias assessment in clinical research. J Clin Epidemiol. 2021;129:172-5.

23. van Enst WA, Scholten RJ, Hooft L. Identification of additional trials in prospective trial registers for Cochrane systematic reviews. PLoS One. 2012;7:e42812.

24. Jones CW, Keil LG, Weaver MA, Platts-Mills TF. Clinical trials registries are under-utilized in the conduct of systematic reviews: a cross-sectional analysis. Syst Rev. 2014;3:126.

25. Faggion CM. Critical appraisal of AMSTAR: challenges, limitations, and potential solutions from the perspective of an assessor. BMC Med Res Methodol. 2015;15:63.

26. Lexchin J, Bero LA, Djulbegovic B, Clark O. Pharmaceutical industry sponsorship and research outcome and quality: systematic review. BMJ. 2003;326:1167-70.

27. Yaphe J, Edman R, Knishkowy B, Herman J. The association between funding by commercial interests and study outcome in randomized controlled drug trials. Fam Pract. 2001;18:565-8.

28. Li Y, Cao L, Zhang Z, Hou L, Qin Y, Hui X, et al. Reporting and methodological quality of COVID-19 systematic reviews needs to be improved: an evidence mapping. J Clin Epidemiol. 2021;135:17-28.

29. Wu IX, Deng Y, Wang H, Chen Y, Wong CH, Chung VC. Methodological quality of systematic reviews and meta-analysis on asthma treatments. a cross-sectional study. Ann Am Thorac Soc. 2020;17:949-57.

30. Matthias K, Rissling O, Pieper D, Morche J, Nocon M, Jacobs A, et al. The methodological quality of systematic reviews on the treatment of adult major depression needs improvement according to AMSTAR 2: A cross-sectional study. Heliyon. 2020;6:e04776.

31. Yan P, Yao L, Li H, Zhang M, Xun Y, Li M, et al. The methodological quality of robotic surgical meta-analyses needed to be improved: a cross-sectional study. J Clin Epidemiol. 2019;109:20-9.

32. Hasuike A, Ueno D, Nagashima H, Kubota T, Tsukune N, Watanabe N, et al. Methodological quality and risk-of-bias assessments in systematic reviews of treatments for peri-implantitis. J Periodontal Res. 2019;54:374-87.

33. Nagendrababu V, Faggion Jr CM, Pulikkotil SJ, Alatta A, Dummer PM. Methodological assessment and overall confidence in the results of systematic reviews with network meta-analyses in Endodontics. Int Endod J. 2022;55:393-404.

34. Nagendrababu V, Jakovljevic A, Jacimovic J, Duncan HF, Jayaraman J, Dummer PM. Critical analysis of the reporting quality of randomized trials within Endodontics using the Preferred Reporting Items for RAndomized Trials in Endodontics (PRIRATE) 2020 quality standard checklist. Int Endod J. 2021;54:1083-104.

35. Nagendrababu V, Sarao SK, Berlin-Broner Y, Gopinath VK, Shetty NY, Duncan HF, et al. Critical analysis of the reporting quality of case reports focusing on dental traumatology using the Preferred Reporting Items for Case reports in Endodontics 2020 checklist: A baseline evaluation prior to checklist publication. Dent Traumatol. 2023;00:1-12.

36. Abushouk AI, Yunusa I, Elmehrath AO, Elmatboly AM, Fayek SH, Abdelfattah OM, et al. Quality Assessment of Published Systematic Reviews in High Impact Cardiology Journals: Revisiting the Evidence Pyramid. Front Cardiovasc Med. 2021;8:671569.

37. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JP, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. J Clin Epidemiol. 2009;62:e1-34.

Table 1: Characteristics of the systematic reviews with meta-analyses included in the study

No	Name of the first author	Name of the Journal	JCR impact factor for the year in which the review is published	Name of the database where the protocol of the review was registered	Year of publication	Corresponding author's country	Total number of authors
1	Nguyen et al., (1999)	*European Journal of Orthodontics*	0.607	Not Reported	1999	Netherlands	4
2	Aldrigui et al., (2014)	*Community Dental Oral Epidemiology*	2.025	Not Reported	2014	Brazil	5
3	Azami-Aghdash et al., (2015)	*Medical Journal of the Islamic Republic of Iran*	-	Not Reported	2015	Iran	7
4	Corrêa-Faria et al., (2015)	*Dental Traumatology*	1.327	PROSPERO	2015	Brazil	6
5	Corrêa-Faria and Petti (2015)	*Dental Traumatology*	1.327	Not Reported	2015	Italy	2
6	Corrêa-Faria et al., (2016)	*Dental Traumatology*	1.413	PROSPERO	2016	Brazil	6
7	Martins et al. (2016)	*Archives of Health Investigation*	-	PROSPERO	2016	Brazil	6
8	Costa et al., (2017)	*International Journal of Oral Maxillofacial Surgery*	2.164	PROSPERO	2017	Brazil	6
9	Borges et al., (2017	*Plos One*	2.766	PROSPERO	2017	Brazil	4
10	Soares et al. (2017)	*Dental Traumatology*	1.414	PROSPERO	2017	Brazil	7
11	Zaror et al., (2018)	*Community Dent Oral Epidemiology*	2.278	Not Reported	2018	Chile	7
12	Petti et al., (2018)	*Dental Traumatology*	1.494	Not Reported	2018	Italy	3
13	Fagundes et al. (2018)	*Plos One*	2.74	PROSPERO	2018	Brazil	6
14	Moccelini et al., (2018)	*International Journal of Pediatric Dentistry*	2.057	PROSPERO	2018	Brazil	6
15	Souza et al. (2018)	*Journal of Endodontics*	2.833	PROSPERO	2018	Brazil	9
16	Fernandes et al., (2019a)	*Dental Traumatology*	1.53	PROSPERO	2019	Brazil	7
17	Magno, de França Leite et al., (2019a)	*Drug and Alcohol Dependence*	3.951	PROSPERO	2019	Brazil	4
18	Magno, Neves et al., (2019b)	*Dental Traumatology*	1.53	PROSPERO	2019	Brazil	5
19	Arraj et al., (2019)	*Dental Traumatology*	1.53	PROSPERO	2019	Australia	3
20	Lopez et al., (2019)	*BMC Oral Health*	1.911	PROSPERO	2019	Australia	4
21	Trabelsi et al. (2019)	*Education Sciences*	0.94	Not Reported	2019	Canada	9

22	Silveira et al., (2020)	*Dental Traumatology*	3.333	PROSPERO	2020	Brazil	3
23	Antunes et al., (2020)	*International Journal of Dental Hygiene*	2.477	PROSPERO	2020	Brazil	6
24	Tewari, Goel et al., (2020a)	*Dental Traumatology*	3.333	PROSPERO	2020	India	8
25	Tewari, Mathur et al., (2020b)	*Indian Journal of Dental Research*	-	Open Science Frame work	2020	India	6
26	De Brier et al. (2020)	*Dental Traumatology*	3.333	PROSPERO	2020	Belgium	6
27	Darely et al. (2020)	*Dental Traumatology*	3.333	PROSPERO	2020	Brazil	5
28	Tewari, Sultan et al., (2021a)	*Dental Traumatology*	3.328	PROSPERO	2021	India	9
29	Tewari, Jonna et al., (2021b)	*Injury*	2.687	PROSPERO	2021	India	9
30	Milani et al., (2021)	*Dental Traumatology*	3.328	PROSPERO	2021	Brazil	5
31	Patnana et al., (2021)	*Dental Traumatology*	3.328	PROSPERO	2021	India	6
32	Vieira et al., (2021)	*Cadernos de Saude Publica*	3.371	PROSPERO	2021	Brazil	9
33	Narayanan et al., (2021)	*The Journal of Contemporary Dental Practice*	-	Not Reported	2021	India	5
34	Tzanetakis et al., (2022)	*Journal of Endodontics*	4.422	Open Science Frame work	2022	Greece	4
35	Moccelini et al., (2022)	*Dental Traumatology*	3.328	PROSPERO	2022	Brazil	7
36	Wig et al., (2022)	*Evidence-based dentistry*	-	PROSPERO	2022	India	5
37	Bourgeois et al. (2022)	*Journal of Evidence-Based Dental Practice*	5.1	Not Registered	2022	Belgium	6
38	Madhumitha et al. 2022	*Indian Journal of Dental Research*	-	PROSPERO	2022	India	5
39	Andonovski et al., (2022)	*Journal of stomatology, oral and maxillofacial surgery*	-	Not Registered	2022	Switzerland	2
40	Vieira et al., (2022)	*Dental Traumatology*	3.328	PROSPERO	2022	Brazil	10
41	Lima et al., (2023)	*Community Dent Oral Epidemiology*	2.489	PROSPERO	2023	Brazil	9

Table 2: Summary of the assessment of methodological quality

Item #	Checklist item	Adequately reported (%)	Partially reported (%)	Not reported (%)
1	Did the research questions and inclusion criteria for the review include the components of PICO?	100	-	0
2	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?	76	7	17
3	Did the review authors explain their selection of the study designs for inclusion in the review?	76	-	24
4	Did the review authors use a comprehensive literature search strategy?	27	68	5
5	Did the review authors perform study selection in duplicate?	90	-	10
6	Did the review authors perform data extraction in duplicate?	61	-	39
7	Did the review authors provide a list of excluded studies and justify the exclusions?	34	-	66
8	Did the review authors describe the included studies in adequate detail?	100	-	0
9	Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	93	-	7
10	Did the review authors report on the sources of funding for the studies included in the review?	15	-	85
11	If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	95	-	5
12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	61	-	39
13	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	85	-	15
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	85	-	15
15	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	78	-	22
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	88	-	12

Table 3: Multiple Linear regression results for variables influencing total AMSTAR 2 scores*									
		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Collinearity Statistics
Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	-788.970	272.989		-2.890	.007	-1343.750	-234.189		
	Journal impact factor for the year published	.637	.240	.353	2.651	**.012**	.149	1.124	.831	1.204
	Journal's adherence to the PRISMA guidelines (Reference – Non adherence)	-.546	.609	-.110	-.897	.376	-1.784	.691	.976	1.025
	PROTOCOL REGISTERED (Reference – Not registered)	.436	.747	.076	.584	.563	-1.081	1.954	.872	1.147
	Year of publication	.395	.135	.381	2.921	**.006**	.120	.670	.867	1.154
	Number of authors	.221	.152	.184	1.455	.155	-.088	.529	.918	1.090
Dependent Variable: Total AMSTAR 2 scores										

*In the current study, the literature search was performed in March 2023. Lima et al. (2023) was published in April 2023, however, it was available online in 2022. Therefore, during the statistical analysis the study was included .

Appendix Table 1: Critical domains suggested by the developers of AMSTAR 2 (Shea et al., 2017)

1. *"Protocol registered before commencement of the review (item 2);*

2. *Adequacy of the literature search (item 4);*

3. *Justification for excluding individual studies (item 7);*

4. *Risk of bias from individual studies being included in the review (item 9);*

5. *Appropriateness of meta-analytical methods (item 11);*

6. *Consideration of risk of bias when interpreting the results of the review (item 13);*

7. *Assessment of presence and likely impact of publication bias (item 15)"*

Appendix Table 2: List of the included systematic reviews with meta-analysis (n=41)

No	Included systematic reviews with meta-analysis	Overall Methodological score	Overall confidence
1	Nguyen Q V., Bezemer PD, Habets L, Prahl-Andersen B. A systematic review of the relationship between overjet size and traumatic dental injuries. Eur J Orthod.1999;21:503–15.	8	Critically Low
2	Aldrigui JM, Jabbar NS, Bonecker M, Braga MM, Wanderley MT. Trends and associated factors in prevalence of dental trauma in Latin America and Caribbean: A systematic review and meta-analysis. Community Dent Oral Epidemiol. 2014;42:30–42.	5	Critically Low
3	Azami-Aghdash S, Ebadifard Azar F, Pournaghi Azar F, Rezapour A, Moradi-Joo M, Moosavi A, Ghertasi Oskouei S. Prevalence, etiology, and types of dental trauma in children and adolescents: systematic review and meta-analysis. Med J Islam Repub Iran. 2015;29:234.	6.5	Critically Low
4	Corrêa-Faria P, Martins CC, Bönecker M, Paiva SM, Ramos-Jorge ML, Pordeus IA. Absence of an association between socioeconomic indicators and traumatic dental injury: a systematic review and meta-analysis. Dent Traumatol. 2015;31:255-66.	10.5	Low
5	Corrêa-Faria P, Petti S. Are overweight/obese children at risk of traumatic dental injuries? A meta-analysis of observational studies. Dent Traumatol. 2015;31:274-82.	11.5	Low
6	Corrêa-Faria P, Martins CC, Bönecker M, Paiva SM, Ramos-Jorge ML, Pordeus IA. Clinical factors and socio-demographic characteristics associated with dental trauma in children: a systematic review and meta-analysis. Dental Traumatol. 2016;32:367–78.	10.5	Low
7	Martins CM, Batista VE de S, Verri ACG, Verri FR, Gomes Filho JE, Panzarini SR. Orthodontic approach in dental trauma: systematic review and meta-analysis. Arch Health Invest. 2016;5: 336-41.	8.5	Critically Low
8	Costa LA, Ribeiro CC, Cantanhede LM, Santiago Júnior JF, de Mendonça MR, Pereira AL. Treatments for intrusive luxation in permanent teeth: a systematic review and meta-analysis. Int J Oral Maxillofac Surg. 2017;46:214-29.	10	Critically Low
9	Borges TS, Vargas-Ferreira F, Kramer PF, Feldens CA. Impact of traumatic dental injuries on oral health-related quality of life of preschool children: A systematic review and meta-analysis. PLoS One. 2017;12:e0172235.	11.5	Critically Low
10	Soares TR, Fidalgo TK, Quirino AS, Ferreira DM, Chianca TK, Risso PA, MaiaLC. Is caries a risk factor for dental trauma? A systematic review and meta-analysis. Dent Traumatol. 2017;33:4-12.	12.5	Low
11	Zaror C, Martínez-Zapata MJ, Abarca J, Díaz J, Pardo Y, Pont À, Ferrer M. Impact of traumatic dental injuries on quality of life in preschoolers and	13.5	Low

	schoolchildren: A systematic review and meta-analysis. Community Dent Oral Epidemiol. 2018;46:88-101.		
12	Petti S, Glendor U, Andersson L. World traumatic dental injury prevalence and incidence, a meta-analysis-One billion living people have had traumatic dental injuries. Dent Traumatol. 2018;34:71-86.	11.5	Critically Low
13	Fagundes NCF, Bittencourt LO, Magno MB, Marques MM, Maia LC, Lima RR. Efficacy of Hank's balanced salt solution compared to other solutions in thepreservation of the periodontal ligament. A systematic review and meta-analysis. PLoS One. 2018;13:e0200467.	11.5	Low
14	Moccelini BS, de Alencar NA, Bolan M, Magno MB, Maia LC, Cardoso M. Pulp necrosis and crown discoloration: a systematic review and meta-analysis. Int J Paediatr Dent. 2018;28-432-42.	14.5	Low
15	Souza BDM, Dutra KL, Kuntze MM, Bortoluzzi EA, Flores-Mir C, Reyes-Carmona J, et al. Incidence of Root Resorption after the Replantation of Avulsed Teeth: A Meta-analysis. J Endod. 2018;44:1216-27.	13.5	Moderate
16	Fernandes LM, Neto JCL, Lima TFR, Magno MB, Santiago BM, Cavalcanti YW, et al. The use of mouthguards and prevalence of dento-alveolar trauma among athletes: A systematic review and meta-analysis. Dent Traumatol. 2019;35:54-72.	12.5	Low
17	Baraúna Magno M, de França Leite KL, Melo Pithon M, Maia LC. Are traumatic dental injuries greater in alcohol or illicit drugs consumers? A systematic review and meta-analysis. Drug Alcohol Depend. 2019;197:236-49.	12.5	Low
18	Magno MB, Neves AB, Ferreira DM, Pithon MM, Maia LC. The relationship of previous dental trauma with new cases of dental trauma. A systematic review and meta-analysis. Dent Traumatol. 2019;35:3-14.	12.5	Low
19	Arraj GP, Rossi-Fedele G, Doğramacı EJ. The association of overjet size and traumatic dental injuries-A systematic review and meta-analysis. Dent Traumatol. 2019;35:217-32.	13	Critically Low
20	Lopez D, Waidyatillake N, Zaror C, Mariño R. Impact of uncomplicated traumatic dental injuries on the quality of life of children and adolescents: a systematic review and meta-analysis. BMC Oral Health. 2019;19:224.	12.5	Low
21	Trabelsi K. Shephard RJ, Zlitni S, Boukhris O, Ammar A, Khacharem A, et al. Khanfir, S.; Bragazzi, N.L.; Chtourou, H. Dental Trauma First-Aid Knowledge and Attitudes of Physical Education Teachers: A Systematic Review and Meta-Analysis of the Literature with Meta-Regressions. *Educ Sci. 2019; 9: 251.*	12	Critically Low
22	Silveira ALN de M e. S, Magno MB, Soares TRC. The relationship between special needs and dental trauma. A systematic review and meta-analysis. Dent Traumatol 2020;36:218–36.	12.5	Low
23	Antunes LAA, Lemos HM, Milani AJ, Guimarães LS, Küchler EC, Antunes LS. Does traumatic dental injury impact oral health-related to quality of life of children and adolescents? Systematic review and meta-analysis. Int J Dent Hyg. 2020;18:142-62.	12	Low
24	Tewari N, Goel S, Rahul M, Mathur VP, Ritwik P, Haldar P, et al. Global status of knowledge for prevention and emergency management of traumatic dental injuries among school teachers: A systematic review and meta-analysis. Dent Traumatol. 2020;36:568-83.	12	Low
25	Tewari N, Mathur VP, Siddiqui I, Morankar R, Verma AR, Pandey RM. Prevalence of traumatic dental injuries in India: A systematic review and meta-analysis. Indian J Dent Res 2020;31:601-14.	13	Low
26	De Brier N, O D, Borra V, Singletary EM, Zideman DA, De Buck E; International Liaison Committee on Resuscitation First Aid Task Force. Storage of an avulsed tooth prior to replantation: A systematic review and meta-analysis. Dent Traumatol. 2020;36:453-76.	11.5	Low
27	Darley RM, Fernandes E Silva C, Costa FDS, Xavier CB, Demarco FF. Complications and sequelae of concussion and subluxation in permanent teeth: A systematic review and meta-analysis. Dent Traumatol. 2020;36:557-67.	11.5	Critically Low

28	Tewari N, Sultan F, Mathur VP, Rahul M, Goel S, Bansal K, et al. Global status of knowledge for prevention and emergency management of traumatic dental injuries in dental professionals: Systematic review and meta-analysis. Dent Traumatol. 202;37:161-76.	15	High
29	Tewari N, Jonna I, Mathur VP, Goel S, Ritwik P, Rahul M, et al. Global status of knowledge for the prevention and emergency management of traumatic dental injuries among non-dental healthcare professionals: A systematic review and meta-analysis. Injury. 2021;52:2025-37.	14.5	High
30	Milani AJ, Castilho T, Assaf AV, Antunes LS, Antunes LAA. Impact of traumatic dental injury treatment on the Oral Health-Related Quality of Life of children, adolescents, and their family: Systematic review and meta-analysis. Dent Traumatol. 2021;37:735-48.	14	Moderate
31	Patnana AK, Chugh A, Chugh VK, Kumar P, Vanga NRV, Singh S. The prevalence of traumatic dental injuries in primary teeth: A systematic review and meta-analysis. Dent Traumatol. 2021;37:383-99.	14	Moderate
32	Vieira WA, Pecorari VGA, Figueiredo-de-Almeida R, Carvas Junior N, Vargas-Neto J, Santos ECA, et al. Prevalence of dental trauma in Brazilian children and adolescents: a systematic review and meta-analysis. Cad Saude Publica. 2021;37:e00015920.	14.5	High
33	Narayanan SP, Rath H, Panda A, Mahapatra S, Kader RH. Prevalence, Trends, and Associated Risk Factors of Traumatic Dental Injury among Children and Adolescents in India: A Systematic Review and Meta-analysis. J Contemp Dent Pract. 2021;22:1206-24.	14	Low
34	Tzanetakis GN, Tsiouma O, Mougiou E, Koletsi D. Factors Related to Pulp Survival After Complicated Crown Fracture Following Vital Pulp Therapy: A Systematic Review and Meta-analysis. J Endod. 2022;48:457-78.e4.	14	Low
35	Moccelini BS, Santos PS, Barasuol JC, Magno MB, Bolan M, Maia LC, et al. Prevalence of sequelae after traumatic dental injuries to anterior primary teeth: A systematic review and meta-analysis. Dent Traumatol. 2022;38:286-98.	16	High
36	Wig M, Kumar A, Chaluvaiah MB, Yadav V, Shyam R. Lip incompetence and traumatic dental injuries: a systematic review and meta-analysis. Evid Based Dent. 2022. doi.org/10.1038/s41432-022-0258-7	11.5	Critically Low
37	Bourgeois J, Carvalho JC, De Bruyne M, Declerck D, Eloot A, Leroy R. Antibiotics at replantation of avulsed permanent teeth? A systematic review. J Evid Based Dent Pract. 2022;22:101706.	14.5	High
38	Madhumita S, Chakravarthy D, Vijayaraja S, Kumar SA, Kavimalar DS. The outcome of partial pulpotomy in traumatized permanent anterior teeth – A systematic review and meta-analysis. Indian J Dent Res. 2022;33:203-08.	6.5	Critically Low
39	Andonovski ME, Antonarakis GS. Autism spectrum disorder and dentoalveolar trauma: A systematic review and meta-analysis. J Stomatol Oral Maxillofac Surg. 2022;123:e858-64.	8.5	Critically Low
40	Vieira WA, Pecorari VGA, Gabriel PH, Vargas-Neto J, Santos ECA, Gomes BPFA, et al. The association of inadequate lip coverage and malocclusion with dental trauma in Brazilian children and adolescents - A systematic review and meta-analysis. Dent Traumatol. 2022;38:4-19.	14.5	High
41	Lima TCDS, Coste SC, Fernandes MIAP, Barbato-Ferreira DA, Colosimo EA, Del Fabbro M, et al. Prevalence of traumatic dental injuries in emergency dental services: A systematic review and meta- analysis. Community Dent Oral Epidemiol. 2023;51:247-55.	14.5	High

Figure 1: Literature search process