

Prevalence Traumatic Dental Injuries in Spain: A Systematic Review and Meta-Analysis

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ADMINISTRATIVE INFORMATION**Support** - This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.**Review Stage at time of this submission** - Preliminary searches.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202480076**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 15 August 2024 and was last updated on 15 August 2024.**INTRODUCTION**

Review question / Objective Traumatic Dental Injuries (TDIs) constitute a significant public health concern with substantial global prevalence. Despite this, TDIs are often overlooked in broader discussions of oral health. The World Health Organization, in their oral health status reports, reports annual expenditures for oral diseases in Europe reaching approximately \$113 billion, positioning the region as having the second highest costs globally. Notably, TDIs are not specifically included in these figures, despite their prevalence. This omission suggests that TDIs may be undervalued by health policymakers, potentially hindering the allocation of necessary resources and the development of targeted prevention programs. A comprehensive understanding of TDI trends, presentation patterns, and risk factors within individual countries is essential for effective cross-country comparisons, the formulation of informed health policies, and the optimization of emergency care protocols. Ultimately, such efforts can contribute to reducing the long-term costs

associated with TDIs. Therefore, this systematic review aims to address the following question: What is the prevalence of TDIs in Spain?

Condition being studied TDIs are the second most common oral disease after dental caries, affecting between 900 million and 1.2 billion people worldwide, of which approximately 180 million are children under 6 years of age.

According to a meta-analysis conducted by Petti et al., it ranks fifth among the most prevalent traumatic diseases or injuries globally with a prevalence of 15.2%, followed by dental caries, tension headaches, iron-deficiency anemia, and hearing loss.

The prevalence of TDIs varies significantly across regions, with a prevalence of 14% in Europe. However, it varies from country to country and even within countries because of socioeconomic and cultural diversity, customs and lifestyles of each society along with the absence of a standardized system for its registration and classification. This is due to a large variety of classification systems, namely: Andreasen,

O'Brien, Ellis; and the fact that many researchers create their own classification systems or modify existing ones. These limitations are expected to decrease following WHO's approval in 2022 of the NAOD classification for TDIs (injury to teeth or supporting structures) based on Andreasen's classification.

TDIs have a high incidence in preschool-aged children between 2-3 years old, with no sex differences due to the development of motor coordination at this stage [5], and between 8-10 years old, with a male predominance due to their tendency towards riskier and more aggressive behaviors, high involvement in physical activities, and active participation in sports.

The upper anterior teeth are the most affected by TDIs in both primary and permanent dentition, predominantly in the upper incisor group, due to their anatomical position protruding in front of the lower incisors and the direction of impacts, which generally occur head-on. Additionally, the presence of malocclusions and deforming oral habits (digital sucking and mouth breathing) are associated with a significantly higher frequency of traumatic dental injuries. Studies conducted by Gupta et al. and Basha et al. concluded that in children with increased overjet (>3 mm), TDIs are 4-5 times more frequent, whereas in those with inadequate lip coverage, the risk is 2-3 times higher.

Dental trauma has a negative impact on quality of life related to oral health in children, adolescents, and adults. The repercussions not only encompass the physical-inflammatory alterations inherent to the injury, such as pain and functional impotence, but also bring about aesthetic alterations, highly costly treatments for both the individual and national health system, as well as a significant psychological burden with a negative impact on quality of life. A very important aspect is the repercussions they have on the development of successive permanent teeth, with possible sequelae such as crown, root, and enamel defects, root dilacerations, pulp obliterations, necrosis, and delays in dental development and eruption.

METHODS

Search strategy Embase: ('traumatic dental injury'/exp OR 'traumatic dental injury' OR 'tooth injury'/exp OR 'tooth injury' OR 'dentoalveolar fracture'/exp OR 'dentoalveolar fracture' OR 'tooth avulsion'/exp OR 'tooth avulsion' OR 'tooth fracture'/exp OR 'tooth fracture' OR 'tooth luxation'/exp OR 'tooth luxation' OR 'root fracture'/exp OR 'root fracture') AND ('spain'/exp OR 'spain') AND ([embase]/lim OR [medline]/lim OR [preprint]/lim OR [pubmed-not-medline]/lim).

Ovid Medline: (Tooth Injuries/ or Tooth Avulsion/ or Tooth Fractures/) and spain/ep.

CINAHL: dental injuries OR traumatic dental injuries OR dental trauma OR tooth injuries AND spain.

Participant or population Spanish children and adults, or long-term residents in Spain.

Intervention Not applicable.

Comparator Not applicable.

Study designs to be included Cross-sectional or cohort design.

Eligibility criteria This systematic review will include observational studies examining the prevalence of dentoalveolar trauma in Spanish populations. To be included, studies will need to meet the following criteria: cross-sectional or cohort design; participants who are Spanish children and adults, or long-term residents of Spain; evaluation of the prevalence of dental trauma, specifically fractures, luxations, and avulsions; publication in Spanish or English; and a clear definition of the criteria used to classify the types of dental trauma. The clinical context in which the study is conducted will also be considered, as research conducted in emergency services may tend to overestimate the prevalence of TDIs. Studies analyzing trauma in the context of craniofacial anomalies, neurological disorders, or systemic diseases, as well as those focusing exclusively on sports-related trauma, will be excluded. Case-control studies will also be excluded.

Information sources We will conduct an exhaustive search of the Embase, Ovid Medline, and CINAHL databases. The search strategy will utilize keywords related to "dentoalveolar trauma," "dental fracture," "dental avulsion," "dental luxation," and "Spain." To ensure a comprehensive search, preprint registries and the reference lists of selected articles will also be reviewed. Additionally, gray literature will be searched in Google Scholar and within the repositories of final degree projects, master's theses, and doctoral dissertations from Spanish universities.

Main outcome(s) The primary variable will be the prevalence of dentoalveolar trauma in the Spanish population, expressed as a percentage. All diagnostic criteria identified by Feliciano and Franca Caldas will be considered valid. To reduce the number of groups for subsequent analysis, the five most frequent criteria identified by these

authors will be used: Andreasen, Ellis, García-Godoy, O'Brien, Oikarinen, and Others. The results to be evaluated will be adapted from those reported in another meta-analysis: TDI in permanent dentition; TDI in primary dentition; TDI in children, adolescents, and adults; TDI in any tooth and at any age; and TDI for both biological sexes.

Data management Search results will be uploaded to Rayyan software to facilitate collaboration, remove duplicate articles, and conduct an initial screening based on inclusion and exclusion criteria. Next, a two-phase selection process will be implemented. Two independent reviewers will screen titles and abstracts in the first phase, then proceed to full-text review for eligible studies in the second phase. Disagreements between reviewers will be resolved through consensus or by consulting a third reviewer. The selection process will be documented using a PRISMA flow diagram. A standardized form will be used to extract relevant data from the selected studies, including: author, year of publication, study design, sample size, participant demographics, prevalence of dentoalveolar trauma (overall and by type), and classification criteria used. Study authors will be contacted for any missing or unclear data.

Quality assessment / Risk of bias analysis The methodological quality of the included studies will be assessed using the JBI Critical Appraisal Checklist for Prevalence Studies, which evaluates aspects such as sample representativeness, sample size, data collection methods, and statistical analysis. This tool includes 11 evaluation items, each of which can be rated as yes, no, unclear, or not applicable. Two reviewers will independently assess the quality of each study and any disagreements will be resolved by consensus or with the involvement of a third reviewer.

Strategy of data synthesis If the studies are sufficiently homogeneous in terms of design, population, clinical context, definition of TDI types, and diagnostic criteria, an aggregated statistical analysis will be performed using meta-analysis with a random-effects model. The overall and specific prevalence for each type of TDI, with their corresponding 95% confidence intervals, will be calculated.

If information related to a specific subgroup of interest cannot be retrieved, the authors will be contacted, and if no response is received, the data will be imputed using the multiple imputation method. Sensitivity analyses will be performed to

assess the effects of imputation on the estimated effect size.

To assess heterogeneity among studies, statistical tests such as the I² statistic, Cochran's Q test, tau-squared, and prediction interval will be used.

Selective publication and reporting bias will be evaluated through visual inspection of funnel plots and statistical tests, such as Egger's test.

Subgroup analysis In the case of significant heterogeneity, potential sources of variability will be explored through subgroup analyses and meta-regression if the number of studies permits. Subgroup analyses will be performed for the following variables, if data are available: Age group (children, adolescents and adults); Tooth type (primary, permanent); Sex (male, female); and Source of data (emergency department, dental clinic).

Sensitivity analysis As a sensitivity analysis, studies with high risk of bias will be excluded to assess the impact on the overall results.

Language restriction The search strategy will not be limited by language, but only studies published in Spanish or English will be included in the final analysis.

Country(ies) involved Spain.

Keywords dental trauma, dentoalveolar injury, tooth fracture, tooth avulsion, tooth luxation, prevalence, systematic review, meta-analysis, Spain.

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