Association between domestic violence and oral health problems in children and adolescents: a systematic review

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Abstract
Domestic violence has a negative impact on development, general health, and quality of life of children and adolescents. This study aimed to revise knowledge regarding the consequences on oral health and its related outcomes of children and adolescents exposed to domestic violence. We conducted this systematic review in line with Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement, adhering to a published protocol in PROSPERO. This review systematically searched the literature using the MEDLINE, PsyCINFO, LILACS, SciELO databases and Grey Literature, for articles published in English, Portuguese, and Spanish, with no publication date limits. Quality of studies was assessed using New Castle Ottawa scale and its modified version. All process was carried out independently by two researchers. Fourteen studies were included. Nine studies were cross-sectional, four were case-control, and one was a retrospective cohort. All studies included in this review found a higher risk of having some oral health problem and being exposed to some type of domestic violence. The main oral health problems associated with some type of violence were caries experience (decayed, missing and filled teeth), poor self-perceived oral health, malocclusion, poorer oral health related quality of life, poorer oral hygiene, and early childhood caries experience. Important methodological advancements are needed to better understand potential moderators.

Descriptors: Child; Adolescent; Oral Health; Domestic Violence; Child Abuse.

INTRODUCTION

Oral health is an important part of general health and contributes to children’s and adolescents’ quality of life. Neglecting oral health produces negative consequences for children’s development, self-perceived oral and general health, and quality of nutrition. Oral diseases, particularly dental caries, have a complex and interconnected etiology with common, primarily behavioral based risk factors. The main individual key factors are a sugar-rich diet in combination with an insufficient oral hygiene and inappropriate fluoride exposure.

Undeniably, a diversity of oral health problems may occur among children and adolescents, some of them may initiate during childhood and persist into adulthood. Studies on children’s oral health report malocclusion as a worldwide dental problem that influences the
affected individuals in several degrees. Dental caries, pulpal and periapical lesions, dental trauma, abnormality of development, and oral habits are the most common dental diseases in children. Adverse experiences, such as abuse and neglect, physical and psychological violence, are identified as situations harmful to the victim’s health. Children and adolescents exposed to such experiences are more likely to have toothache, cavities, among other dental problems, compared to those who are not exposed.

The World Health Organization defines violence as the use of physical power against another individual, who may cause some type of injury or damage, physical or psychological. Physical, sexual, emotional abuse and neglect are recognized as domestic violence. Some physical evidences generated by domestic violence are more easily observed in the orofacial complex, becoming eventually detected by dentists. Therefore, this review aims to investigate if there is an association between exposure to domestic violence during childhood and/or adolescence and its impact on oral health.

MATERIAL AND METHOD

- Registration and protocol
  We conducted this systematic review in line with Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement (Moher et al. 2009), adhering to a published protocol in PROSPERO (ref. CRD42015029874). The PECO methodology was utilized to formulate the research question: “Is there an association between exposure to domestic violence and detrimental outcomes on oral health in children and adolescents?”.

- Search method and selection procedure
  Is exposure to domestic violence a risk or associated factor for direct and indirect consequences on oral health of children and adolescents? Does exposure to different types of domestic violence during childhood and adolescent years (0-19) affects oral health status, oral health related quality of life and self-perceived oral health? PECO: Population: children and adolescents, from birth to 19 years of age; Exposure: domestic violence; Comparator: non-applicable; Outcomes: primary - oral health status secondary: oral health related quality of life and self-perceived oral health.

- Eligibility criteria
  We included the following: observational studies (cohort, cross-sectional, or case-control studies), children and adolescents up to 19 years of age, or adults followed retrospectively; investigating factors mediating or moderating the association between exposure to DV and oral health status in children and adolescents; validated measures or data extracted from databases assessing different oral health conditions (caries, malocclusion, periodontal diseases); published in English, Portuguese or Spanish. We excluded review studies (narrative or systematic), letters to the editor, case reports, laboratory studies in animals, studies that did not discriminate the age of the patients, samples with special patients and/or specific group, and studies in which they did not correlate violence and oral health in the age group selected.

- Search strategy
  This review systematically searched the literature using the MEDLINE, PsycINFO, LILACS, SciELO databases and Grey Literature by date of inception to August 2019. There no limits on publication date. The PubMed MEDLINE search strategy is included as an example: (((“intimate partner violence”[MeSH Terms] OR (“intimate”[All Fields] AND “partner”[All Fields] AND “violence”[All Fields])) OR ”adolescent”[All Fields]) OR ”domestic violence”[All Fields]) OR (“domestic”[All Fields] AND “violence”[All Fields]) OR (“adolescent”[MeSH Terms] OR ”adolescent”[All Fields]) OR (“child”[MeSH Terms] OR “child”[All Fields])) AND (“oral health”[MeSH Terms] OR ”oral health”[All Fields]) OR ”oral health”[All Fields]).

- Data extraction (selection and coding)
  Initially, records screened based on titles and abstracts against the eligibility criteria by two reviewers (MN and NC). Remaining records full-text review (MN and NC), and a Cohen’s kappa were computed to assess the level of agreement between reviewers. Two independent reviewers (MN and NC) performed data extraction. Studies data were typed in an excel template. Data extracted: first author; year of publication; country; study design; sampling approach; sample size; sample characteristics (age mean and SD or range, %female/male); Type of domestic violence assessed; measure(s) of exposure to childhood adverse experiences (OR, RR or PR); statistical method used; covariates included in analysis; results.

- Quality assessment
  Two reviewers performed a search strategy and did a risk for a bias and a quality assessment of case-control studies using the
Newcastle-Ottawa quality scale. For cohort and cross-sectional studies, the reviewers applied the Modified Newcastle-Ottawa. In case of doubt a third reviewer assessed as well. The following criteria were used: sample representativeness, sample size, non-responder rate, exposure determination, control of exposure confounding factors, outcome assessment, and statistical test used. Each item could mark up to 1 point. Studies’ quality was rated on a scale from 0 (high risk of bias) to 9 (low risk of bias). Disagreements between the reviewers in relation to quality assessment were resolved by consensus.

- **Strategy for data synthesis**
  
  A narrative synthesis was planned in the first instance – summaries of sample characteristics, study design, methods used, and the type of childhood adversity experienced presented results of the included studies. Data synthesis were carried out by two reviewers (NC and MN), with disagreements resolved through consensus with a third reviewer (VC).

### RESULTS

- **Study selection**
  
  Figure 1 describes the results of the search and the study selection process. Following the removal of duplicates, we identified a total of 53 articles. After initial screening based on titles and abstracts, 29 articles remained for further evaluation of eligibility. After inspection of these articles, 15 were excluded because violence was studied mostly in an adult population. This resulted in 14 studies included for the review.

Figure 1. PRISMA flowchart of studies selection.

- **Characteristics of the included studies**
  
  A description of the 14 included studies is provided in Table 1. The country with the largest number of studies was the USA, three in Brazil, two in Sweden, one in India, one in Canada, one in the UK, and one in Netherlands. Most studies were cross-sectional- and investigated domestic violence in children and/or adolescents, some of them retrospectively. Only one study was a prospective cohort, using a sample of adults exposed to violence.

| Study/year | Origin | Sample (N) | Age group (years) | Type of violence assessed | Assessment of oral health | Main Outcomes |
|------------|--------|------------|-------------------|--------------------------|--------------------------|--------------|
| 1995 | USA | 30/373 | 5-13 | Abuse/Neglect | DMFT | The odds that abused/neglected children have untreated, decayed teeth are 8.0 times greater. |
| 2021 | Brazil | 42/822 | 5-13 | Abuse/Neglect | DMFT | The outcomes that abused/neglected children have untreated primary teeth than children from other military households. |
| 2017 | USA | 322/420 | 3-13 | Abuse | DMFT, dmft | The number of missing teeth was significantly higher in the case group than in the control group (P = 0.042). In this model, the incidence rate ratio (IRR) for the occurrence of dental caries in primary teeth in children with a child protection plan was 1.76 (95% CI: 1.44-2.15). |
| 2015 | Canada | 30/873 | 5-18 | Abuse/Neglect | DMFT, dmft | The odds that abused/neglected children have untreated, decayed primary teeth in in hospitals. |
| 2012 | Canada | 93/60 | 2-6 | Abuse/Neglect | DMFT, dmft | The outcomes that abused/neglected children have untreated primary teeth than children from other military households. |
| 2008 | India | 97/36 | 5-15 | Abuse | DMFT, dmft | The outcomes that abused/neglected children have untreated primary teeth than children from other military households. |
| 2017 | USA | 39/416 | 5-15 | Abuse | DMFT, dmft | The outcomes that abused/neglected children have untreated primary teeth than children from other military households. |

**Table 1. Summary of studies included**

DMFT: dmft: index of decayed, missing, and filled teeth/same for deciduous; DMFS: decayed, missing, and filling surfaces; EEC: early childhood caries; ACEs: adverse childhood experiences.
The type of violence mostly assessed was child physical abuse (CPA), physical neglect, sexual abuse, intimate partner violence (IPV) and childhood adverse experiences (ACE), which included exposure to parental divorce, death, parental use of drugs/alcohol, parental incarceration or mental health. Oral health assessments varied across studies. DMFT/dmft indexes were the most common form of evaluation, identified in eight of them\textsuperscript{15,16,19-23,28}. Moreover, two studies evaluated oral health conditions through self-perceived oral health\textsuperscript{6,18}. Oral health related quality of life was measured in two studies\textsuperscript{27}. In one study, oral health was evaluated by means of teeth with suspicious areas and gums diseases\textsuperscript{25}.

Finally, another study evaluated children who underwent multiple extractions under general anesthesia\textsuperscript{10}. Regarding the association between exposure to violence in childhood/adolescence and poor oral health conditions, all studies found that the odds of having oral health problems, poor self-perceived oral health or poor oral health related quality was higher among children who suffered some type of abuse, neglect or suffered some adverse childhood experience (Table 1).

We grouped studies according to oral health outcomes, type of violence participants were exposure and additional findings to identify covariables possibly mediating the associations found in selected studies. Sociodemographic variables (financial hardship, parents’ education, gender), type of abuse, number of ACEs, general health, reason of the last consultation, parents’ health condition, treatment under general anesthesia influenced some associations found between cases and controls. These results are presented in Chart 1.

Chart 1. Oral health problems and findings according to types of violence reported and additional findings.

| ORAL HEALTH PROBLEMS | TYPES OF VIOLENCE ASSOCIATED | COVARIATES |
|----------------------|-----------------------------|------------|
| CAREGIVERS’ EXPERIENCES\textsuperscript{14,15,22} ** | ABUSE/NEGLECT | Age, rank, family size, and abuse status had direct relationship with cases experience. |
| PHYSICAL ABUSE, EMOTIONAL ABUSE, SEXUAL ABUSE, OR NEGLECT | ADVERSE CHILDHOOD EXPERIENCES (ACEs) | There was a graded association between number of ACEs and likelihood of caregiver report of having teeth in fair or poor condition. Children whose parents reported more than one ACE were more likely to have reported teeth in fair or poor condition. |
| POOR ORAL (GLOBAL) AND GENERAL HEALTH\textsuperscript{6} | PHYSICAL ABUSE, SEXUAL ABUSE AND NEGLECT | Children subject to child protection plans had significantly higher levels of dental caries in the primary dentition. |
| POOR ORAL HEALTH-RELATED QUALITY OF LIFE\textsuperscript{6} | ADVERSE CHILDHOOD EXPERIENCES | Neglected children were also at increased risk for diabetes, poorer lung functioning, and vision problems. Children in the childhood social class in part explained increases in the risk for malnutrition, peak airflow, oral health, and vision problems in adulthood. |

The dataset included 12 studies: six cross-sectional\textsuperscript{12,13,16,19-21} and five prospective\textsuperscript{23,25,26}; the sex distribution was 8,180 females and 8,178 males. The mean age was\textsuperscript{2} 9.0 ± 4.3 years; the median age was\textsuperscript{11} 9 years. The summary of studies included can be seen in Table 1.

** Table 1 (Continuation). Summary of studies included **

| Study/year | Lourenço et al. (2003)\textsuperscript{14} | Brazil |
| Sample (N) | 875 |
| Age group (years) | Physical neglect |
| Type of violence assessed | Physical neglect |
| Main Outcomes | Associations were found between caries experience and reason of the last consultation (P<0.001), decayed teeth and child’s oral health perception (P=0.001). There was a trend towards a significant association between general health and decayed teeth (P=0.079), general hygiene and caries experience (P=0.085), and caries experience and number of times brushes the teeth (P=0.086). |
| Non-dental variables | | |
| Assessment of oral health | dmft |
| Main Outcomes | | |
| Study/year | Bright et al. (2014)\textsuperscript{26} | USA |
| Sample (N) | 90,555 |
| Age group (years) | 0-47 |
| Type of violence assessed | ACEs (Child’s exposure to the divorce of a parent, parental incarceration, domestic violence, neighborhood violence, drug and alcohol abuse, mental illness, and financial hardship). |
| Main Outcomes | | |
| Assessment of oral health | Questions to parents measuring child’s oral health |
| Main Outcomes | There was a graded association between number of ACEs and likelihood of caregiver report of having teeth in fair or poor condition. Children whose parents reported more than one ACE were 1.38-2.11 times more likely to have parent-reported teeth in fair or poor condition. Children who experienced more than one ACE were 1.38-2.11 times more likely to have parent reported teeth in fair or poor condition. |
| Type of violence assessed | | |
| Study/year | Smillie et al. (2007)\textsuperscript{25} | Netherlands |
| Sample (N) | 376 children (202 males; 54%) |
| Age group (years) | 2-17 |
| Type of violence assessed | | |
| Main Outcomes | | |
| Assessment of oral health | Oral hygiene index, DMFT, PUPA (gum, ulcer, fistula, abscess) |
| Main Outcomes | In 13% of the children multiple tooth extraction took place before they were reported to a social service. Additionally, the average time interval between tooth extraction and reporting was 36 months (6-91 months). |
| Type of violence assessed | | |
| Study/year | Kabani et al. (2010)\textsuperscript{30} | USA |
| Sample (N) | 61,360 |
| Age group (years) | 1-7 |
| Type of violence assessed | | |
| Main Outcomes | | |
| Assessment of oral health | | |
| Study/year | Kvist et al. (2010)\textsuperscript{31} | Sweden |
| Sample (N) | 86 children in the study population and 172 matched controls. |
| Age group (years) | | |
| Type of violence assessed | | |
| Main Outcomes | | |
| Assessment of oral health | | |
| Study/year | Silva-Junior et al. (2010)\textsuperscript{32} | Brazil |
| Sample (N) | 478 children and 444 public and private school students. |
| Age group (years) | 8-16 |
| Type of violence assessed | | |
| Main Outcomes | | |
| Assessment of oral health | | |
| Study/year | Sousa et al. (2014)\textsuperscript{33} | Brazil |
| Sample (N) | 149 |
| Age group (years) | 0-90,555 |
| Type of violence assessed | | |
| Main Outcomes | | |
| Assessment of oral health | | |
| Summary of studies included | | |
| Chart 1. Oral health problems and findings according to types of violence reported and additional findings. | | |


**DISCUSSION**

All studies included in this review found a higher risk or likelihood of some oral health problem associated with domestic violence exposure, comprising physical abuse, emotional abuse, sexual abuse, neglect, or adverse childhood experiences. The main oral health problems reported were caries experience (decayed, missing and filled teeth), poor self-perceived oral health, decayed teeth, malocclusion, poorer oral health related quality of life, poorer oral hygiene, and early childhood caries experience. These results are despite variations in the types of settings included, the study duration, type of study and the measures employed.

Among factors cited, having been subjected to a protection plan, financial hardship/parental divorce, low parental education, poorer general health, and poorer oral hygiene were cited as potential contributors. In fact, social factors linking adverse experiences to poor dental health can include family routines and functioning and parental attitudes toward oral health. Chronic stress is often associated with socially disadvantaged families and can be an underlying mechanism regarding the prevalence of health concerns, including dental caries, in these children. One study identified that family size is a risk factor the presence of untreated, decayed teeth.

A recent systematic review demonstrated that socioeconomic status (SES), parental education, oral health knowledge, and attitudes were associated with early childhood caries in children. To date, most of studies in developing countries have reported distal parental factors such as income and education being significant risk factors in caries development compared to proximal risk factors in low-income groups. There is great difficulty in studying the theme of neglect because it does not easily separate attitudes of abuse and precarious living conditions.

In one prospective longitudinal study, the authors investigated a cohort of people born in sixties and seventies, who suffered from physical abuse, sexual abuse, and neglect. The domestic violence against children interferes in the psychological development leading to sequels that manifest and persist up to the adulthood. The physical evidences of domestic violence are more easily observed in the orofacial complex, becoming eventually detected by dentists. A topic of interest in a recent systematic review was the knowledge of dentists about clinical cases of domestic violence against children.

**Quality of individual studies**

The results of the NOS for the quality of the included studies are presented in Figure 2. Cross-sectional studies were of slightly better quality than case-control studies (median [range] NOS, 6 [4-8] vs. 5 [4-6], respectively). Only four studies evaluated the outcome of interest. No study reached the maximum score.

![Figure 2. Quality of individual studies (modified version of the Newcastle–Ottawa Scale)](http://dx.doi.org/10.21270/archi.v10i8.5364)

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**Chart 1 (Continuation).** Oral health problems according to types of violence reported and additional findings.

| ORAL HEALTH PROBLEMS | TYPES OF VIOLENCE ASSOCIATED | COVARIATES |
|-----------------------|-------------------------------|------------|
| CHILD PHYSICAL ABUSE, INTEIMATE PARTNER VIOLENCE FORCED SEX, AND BULLYING | Parents separated, both parents foreign born, one or both unemployed or on sick leave were significantly associated. Boys rated their oral health as poor, or very poor significantly more often than did girls. | |
| SEXUAL ABUSE, PHYSICAL ABUSE, PSYCHOLOGICAL ABUSE, AND NEGLECT | Child abuse victims exhibited higher scores on negative self-perception (oral symmetry and functional limitations subscales) with statistical significance. | |
| ADVERSE CHILDHOOD EXPERIENCES (ACEs) | There was a graded association between individual ACEs and likelihood of caregiver report of having teeth in fair or poor condition. Children whose parents reported more than one ACE were more likely to have parent-reported teeth in fair or poor condition. | |
| TOOTH DECAY**<sup>a</sup> vs. NEGLECT | Significant associations were found between caries experience and reason of the last consultation, decayed teeth and child's oral health perception. There was a trend towards a significant association between general health and decayed teeth, general hygiene and caries experience, and caries experience and number of times the child brushed the teeth. | |
| POOR ORAL HEALTH AND RISKY RELATED BEHAVIOR* | There was no significant difference in dental neglect with respect to sex, age, and income. With respect to dental neglect, a significant higher dental neglect score was reported among the people who reside in the suburban location, parents whose educational qualification was secondary, and those people who have not availed any dental service for >2 yrs. | |
| PHYSICAL ABUSE, PSYCHOLOGICAL ABUSE, INTIMATE PARTNER VIOLENCE, SEXUAL ABUSE, AND NEGLECT | Number of missing teeth was also significantly higher in abused children. | |
| MALOCCLUSION**<sup>b</sup> vs. ABUSED CHILDREN | Children under investigation for suspected CAN had poorer oral hygiene with more dental plaque as well as more gingivitis and more irregular dietary habits than controls. The study group also had significantly more descriptions of dental behavior management problems in their reports, more treatment under general anesthesia and more sedation. | |
| EARLY CHILDHOOD CARIES (ECC)**<sup>c</sup> | Violations of child abuse had worse oral health reflected by a higher incidence of decayed teeth, missing primary teeth, filled permanent teeth, DMFT index, and anterior open bite. | |

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**Study/ Year**

- Greene et al. (1993)<sup>a</sup>
- Greene et al. (1995)<sup>a</sup>
- Duda et al. (2015)<sup>d</sup>
- Kvan et al. (2015)<sup>e</sup>
- Keene et al. (2013)<sup>f</sup>
- Widom et al. (2012)<sup>g</sup>
- Laureno et al. (2013)<sup>h</sup>
- Bright et al. (2015)<sup>i</sup>
- Gurnaney et al. (2016)<sup>j</sup>
- Swift et al. (2017)<sup>k</sup>
- Kuban et al. (2015)<sup>m</sup>
- Kraft et al. (2018)<sup>n</sup>

**Selection**

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**Comparability**

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**Exposure**

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**Total**

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**Figure 2. Quality of individual studies (modified version of the Newcastle–Ottawa Scale)**

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children. Most of dentists receives little or no education about violence during the under graduation in dentistry.\textsuperscript{31}

Widom et al.\textsuperscript{25} also reported that neglected children were at increased risk for diabetes, poorer lung functioning, and vision problems. Physical abuse increased risk for diabetes and malnutrition. Sexual abuse showed non-significant trends for hepatitis C, HIV, and oral health. In his study, childhood social class in part explained increases in the risk for malnutrition, peak airflow, and oral health and vision problems in adulthood. Nonetheless, it is likely that behaviors, lifestyle factors, access to health care, and neighborhood characteristics (e.g., environmental toxins) may act as mediators between childhood abuse and neglect and long-term physical health consequences.

In another study, the authors hypothesized that those children who underwent multiple tooth extractions for caries under general anesthesia were abused, in comparison to the normal population. They found a strong association between severe dental caries and child abuse. Furthermore, in some children, the multiple tooth extraction was performed before child abuse and neglect was established.\textsuperscript{10}

The results of one study identified ACEs having a statistically significant negative impact on oral health related quality of life (OHRQoL). In comparison to other research, this exploratory study further supports the inverse association between ACEs and OHRQoL. In addition, this study contributed to original evidence on financial hardship being the leading, and practically significant, ACE that public health professions should address when prioritizing interventions.\textsuperscript{27}

Dental neglect is willful failure of parent or guardian to seek and follow through with treatment necessary to ensure a level of oral health essential for adequate function and freedom from pain and infection.\textsuperscript{32} While failure/delay in seeking care with adverse dental consequences is highlighted, differentiating dental caries from dental neglect is difficult, and there is a paucity of data on precise clinical features to aid in this distinction. Domestic violence is a difficult issue to investigate, so studies look after social services databases to retrieve information.

To the best of our knowledge, this is the first review to investigate the relationship between domestic violence perpetrated against children and adolescents and oral health problems. Our results indicate that all types of domestic violence have some negative impact on oral health, despite the type of abuse perpetrated. While we have attempted to follow a rigorous protocol in the conduct of this review, it is still subject to several limitations. It may be prone to indexing bias, publication bias and reporting bias. Our ability to assess quality of the studies that we identified was limited by the methodological information provided in the published articles, some of which was incomplete.

The findings from this review represents the experiences of children and adolescents aged 0 to 18 years from different countries. Understanding the mechanisms that place abused and neglected children at higher risk for these adult physical health outcomes will help focus these efforts. Having only one ACE was associated with a slight increase in likelihood of having poor dental health; the combination of three or more ACEs, however, more than doubled the likelihood.\textsuperscript{4}

**CONCLUSION**

Exposure to domestic violence can pose children to an increased risk of having poor oral health. The main oral health problems and negative behaviors associated are caries experience (decayed, missing and filled teeth), poor self-perceived oral health, malocclusion, poorer oral health related quality of life, poorer oral hygiene, and early childhood caries experience. Methodological advancements in determining exposure to violence, selection of control groups, and neglect definitions are needed to improve comprehension on this theme.

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CONFLICTS OF INTERESTS
The authors declare no conflicts of interests.

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Received 08/03/2021
Accepted 16/07/2021