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

Associação entre violência doméstica e problemas de saúde bucal em crianças e adolescentes: revisão sistemática
Asociación entre violencia doméstica y problemas de salud bucal en niños y adolescentes: revisión sistemática

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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.

Resumo

A violência doméstica tem um impacto negativo no desenvolvimento, saúde geral e qualidade de vida de crianças e adolescentes. Este estudo teve como objetivo revisar o conhecimento sobre as consequências na saúde bucal e seus desfechos em crianças e adolescentes expostos à violência doméstica. Conduzimos esta revisão sistemática de acordo com a declaração de itens de relatório preferidos para revisão sistemática e meta-análises (PRISMA), aderindo a um protocolo publicado no PROSPERO. Esta revisão buscou sistematicamente a literatura nas bases de dados MEDLINE, PsycINFO, LILACS, SciELO e Grey Literature, para artigos publicados nos idiomas inglês, português e espanhol, sem limite de data de publicação. A qualidade dos estudos foi avaliada usando a escala de New Castle Ottawa e sua versão modificada. Todo o processo foi realizado de forma independente por dois pesquisadores. Quatorze estudos foram incluídos. Nove estudos eram transversais, quatro eram de caso-controle e um era uma coorte retrospectiva. Todos os estudos incluídos nesta revisão encontraram maior risco de ter algum problema de saúde bucal e ficar exposto a algum tipo de violência doméstica. Os principais problemas de saúde bucal associados a algum tipo de violência foram experiência de cárie (dentes cariados, perdidos e obturados), autopercepção de saúde bucal precária, má oclusão, pior qualidade de vida relacionada à saúde bucal, higiene bucal precária e experiência de cárie na primeira infância. Avanços metodológicos importantes são necessários para entender melhor os moderadores em potencial.

Descritores: Criança; Adolescente; Saúde Bucal; Violência Doméstica; Maus-Tratos Infantis.

Resumen

La violencia doméstica tiene un impacto negativo en el desarrollo, la salud general y la calidad de vida de los niños y adolescentes. Este estudio tuvo como objetivo revisar el conocimiento sobre las consecuencias sobre la salud bucal y sus resultados relacionados de los niños y adolescentes expuestos a la violencia doméstica. Realizamos esta revisión sistemática de acuerdo con la declaración Preferred Reporting Items for Systematic Review and Meta-Analyzes (PRISMA), siguiendo un protocolo publicado en PROSPERO. Esta revisión buscó sistemáticamente la literatura utilizando las bases de datos MEDLINE, PsycINFO, LILACS, SciELO y Grey Literature, para artículos publicados en inglés, portugués y español, sin límites de fecha de publicación. La calidad de los estudios se evaluó mediante la escala de New Castle Ottawa y su versión modificada. Todo el proceso fue realizado de forma independiente por dos investigadores. Se incluyeron catorce estudios. Nueve estudios fueron transversales, cuatro fueron de casos y controles y uno fue una cohorte retrospectiva. Todos los estudios incluidos en esta revisión encontraron un mayor riesgo de tener algún problema de salud bucal y estar expuesto a algún tipo de violencia doméstica. Los principales problemas de salud bucal asociados con algún tipo de violencia fueron la experiencia de caries (dientes cariados, perdidos y obturados), mala salud bucal autopercibida, maloclusión, peor calidad de vida relacionada con la salud bucal, peor higiene bucal y experiencia de caries en la primera infancia. Se necesitan avances metodológicos importantes para comprender mejor a los posibles moderadores.

Descriptores: Niño; Adolescente; Salud Bucal; Violencia Doméstica; Maltrato a los Niños.

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[1-3]. 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[4].

Undeniably, a diversity of oral health problems may occur among children and adolescents, some of them may initiate during childhood and persist into adulthood[1,5]. 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[1,6,7]. Adverse experiences, such as abuse and neglect, physical and psychological violence, are identified as situations harmful to the victim's health[8-10]. 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[8,11].

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[12]. Some physical evidences generated by domestic violence are more easily observed in the orofacial complex, becoming eventually detected by dentists[13]. 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.

MATHERIAL AND METHOD

o *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)[14], 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?".

o *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.

o *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.

o *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 "intimate partner violence"[All Fields]) OR ("domestic violence"[MeSH Terms] OR ("domestic"[All Fields] AND "violence"[All Fields]) OR "domestic violence"[All Fields])) AND (("adolescent"[MeSH Terms] OR "adolescent"[All Fields]) OR ("child"[MeSH Terms] OR "child"[All Fields]))) AND ("oral health"[MeSH Terms] OR ("oral"[All Fields] AND "health"[All Fields]) OR "oral health"[All Fields]). Following full-text review, reference and citation lists of included articles hand searched for further relevant studies.

o *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.

o *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 representativity, sample size, non-respondent 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.

o *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

o *Study selection*

Figure 1[14] 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[5,8,10,15-24 22-24].
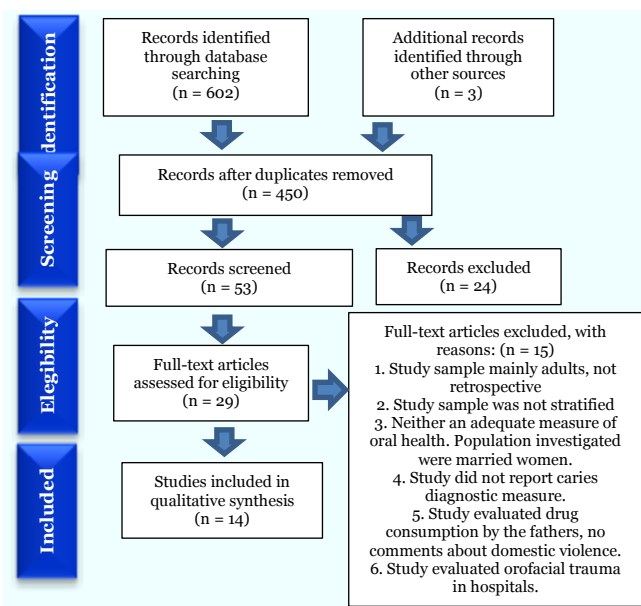

Figure 1. PRISMA flowchart of studies selection.

o *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[8,15,25-27] three in Brazil[5,19,21] two in Sweden[18,22]; one in India[20]; one in Canada[23]; one in the UK[16] and one in Netherlands[10]. Most studies were cross-sectional[5,8,10,18-20,22,23,27], investigated domestic violence in children and/or adolescents, some[8,10,22,23] of them retrospectively. Only one study[25] was a prospective cohort, using a sample of adults exposed to violence.

Table 1. Summary of studies included

	Cases/ Controls	Case Control Studies
Study/year	Greene et al. (1994)[19]	
Origin	USA	
Sample (N)	30/ 873	
Age group (years)	5-13	
Type of violence assessed	Abuse/ Neglect	
Assessment of oral health	DMFS	
Main Outcomes	The odds that abused/neglected children have untreated, decayed teeth are 8.0 times greater.	
Study/year	Greene et al. (1995)[18]	
Origin	USA	
Sample (N)	42/822	
Age group (years)	3-11	
Type of violence assessed	Abuse/Neglect	
Assessment of oral health	dmft	
Main Outcomes	Abused/neglected children from military families with non-combatant sponsors were 5.2 times more likely to have untreated decayed primary teeth than children from other military households.	
Study/year	Duda et al. (2017)[26]	
Origin	Brazil	
Sample (N)	122/240	
Age group (years)	3– 15	
Type of violence assessed	Abuse	
Assessment of oral health	DMFT, dmft and malocclusion	
Main Outcomes	The number of missing teeth was significantly higher in the case group than in the control group (P = 0.04) A significant difference was found in the mean DMFT between groups (P < 0.001), in which the case group had a higher mean DMFT than controls. The case group also had more untreated decayed teeth than the control group.	
Study/year	Keene et al. (2015)[20]	
Origin	UK	
Sample (N)	79/79	
Age group (years)	2 – 11	
Type of violence assessed	Physical abuse, emotional abuse, sexual abuse, or neglect.	
Assessment of oral health	DMFT, dmft	
Main Outcomes	Children with child protection plans had statistically higher levels of primary tooth decay than controls (P = 0.002). 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).	
	Retrospective Cohort Study	
Study/year	Widom et al. (2012)[27]	
Origin	USA	
Sample (N)	908 cases from 1967 to 1971/667 controls	
Age group (years)	Average 41.2	
Type of violence assessed	Physical abuse, sexual abuse, and neglect	
Assessment of oral health	Suspicious gums problems or diseases	
Main Outcomes	Neglect increased risk for oral health problems (OR = 1.55; 95% CI = 1.10, 2.18).	
	Cross-Sectional Studies	
Study/year	Valencia-Rojas et al. (2008)[17]	
Origin	Canada	
Sample (N)	66	
Age group (years)	2-6	
Type of violence assessed	Children suffering maltreatment (abuse, neglect)	
Assessment of oral health	ECC	
Main Outcomes	Neglect increased risk for oral health problems (OR = 1.55; 95% CI = 1.10, 2.18).	
	ECC was observed in 58 percent of the abused children. Logistic regression revealed that children in permanent CAST (OR: 0.16) care and those in its care (OR: 0.14) more than once were significantly less likely to have experienced caries. (p=0.03)	
Study/year	Kvist et al. (2013)[22]	
Origin	Sweden	
Sample (N)	5,890	
Age group (years)	15-17	
Type of violence assessed	Child physical abuse, intimate partner violence forced sex and bullying.	
Assessment of oral health	Poor self-perceived oral health	
Main Outcomes	Poor self-perceived oral health was associated with self-reported experience of physical abuse, intimate partner violence, forced sex, and bullying (adjusted OR = 2.3–14.7). The likelihood of reporting poor oral health increased from an adjusted OR of 2.1 for a single incident of abuse to an adjusted OR of 23.3 for multiple abuses.	

DMFt /dmft: index or decayed, missing, and filled teeth/same for deciduous; DMFS: decayed, missing, and filling surfaces; ECC: early childhood caries; ACEs: adverse childhood experiences.

Table 1 (Continuation). Summary of studies included

Cross-Sectional Studies	
Study/year	Lourenço et al. (2013)[24]
Origin	Brazil
Sample (N)	149
Age group (years)	5
Type of violence assessed	Physical neglect
Assessment of oral health	dmf-t
Main Outcomes	Associations were found between caries experience and reason of the last consultation (P = 0.011), 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 = 0.083), and caries experience and number of times brushes the teeth (P = 0.086).
Study/year	Bright et al. (2014)[4]
Origin	USA
Sample (N)	90,555
Age group (years)	0-17
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)
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 1.35–1.65 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.
Study/year	Gurunathan et al. (2016)[25]
Origin	India
Sample (N)	478
Age group (years)	3-12
Type of violence assessed	Dental neglect
Assessment of oral health	Oral hygiene index, DMFT, PUFA (pulp, ulcers, fistula, abscess)
Main Outcomes	A significant higher dental neglect score was reported among the people who reside in the suburban location (P < 0.001), parents whose educational qualification was secondary (P < 0.001), and those people who have not availed any dental service for >3 years (P = 0.001).
Study/year	Smitt et al. (2017)[6]
Origin	Netherlands
Sample (N)	376 children (202 males; 54%)
Age group (years)	2-17
Type of violence assessed	Domestic violence and child abuse from database of a Social Service.
Assessment of oral health	Child who underwent multiple tooth extractions under general anesthesia
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).
Study/year	Kabani et al. (2018)[29]
Origin	USA
Sample (N)	61.530
Age group (years)	1-17
Type of violence assessed	ACEs, including exposure to a parental divorce, parental death, domestic violence, parental drugs/alcohol exposure, parental mental illnesses, parental incarceration, neighborhood violence, household financial hardship, racial/ ethnic discrimination, and unfair treatment.
Assessment of oral health	Question about oral related quality of life
Main Outcomes	Overall, 18.3 percent of the sample experienced untreated oral health-care needs morbidity. The sample's exposure to our refined eight key independent variables, ACEs, ranged from 3% - 50%.
Study/year	Kvist et al. (2018)[16]
Origin	Sweden
Sample (N)	86 children in the study population and 172 matched controls.
Age group (years)	mean age 8.9 ± 4.3
Type of violence assessed	Physical abuse, psychological abuse, intimate partner violence, sexual abuse, and neglect.
Assessment of oral health	Oral hygiene, dietary habits, decayed teeth (DMFT, dmft, early childhood caries)
Main Outcomes	Four factors indicated a high probability of being investigated because of suspected CAN: prevalence of dental caries in primary teeth (OR= 3.92), fillings in permanent teeth (OR= 2.88), dental health service avoidance (OR=12.37), and referral to specialist pediatric dentistry clinics (OR= 6.13).
Study/year	Silva-Júnior et al. (2018)[23]
Origin	Brazil
Sample (N)	48 child abuse victims and 144 public and private school students.
Age group (years)	8-10
Type of violence assessed	Sexual abuse, physical abuse, psychological abuse, and neglect
Assessment of oral health	Oral health related quality of life
Main Outcomes	After adjustment for confounding variables, multiple linear regression showed that child abuse victims exhibited higher scores on the CPQ overall scale (P=0,029) and on the oral symptoms and functional limitations (P=0,003) subscales with statistical significance.

DMFt /dmft: index or decayed, missing, and filled teeth/same for deciduous; DMFS: decayed, missing, and filling surfaces; ECC: 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[15,16,16,19-23,28]. Moreover, two studies evaluated oral health conditions through self-perceived oral health[8,18]. Oral health related quality of life was measured in two studies[5,27]. In one study, oral health was evaluated by means of teeth with suspicious areas and gums diseases[25].

Finally, another study evaluated children who underwent multiple extractions under general anesthesia[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 according to types of violence reported and additional findings.

ORAL HEALTH PROBLEMS	TYPES OF VIOLENCE ASSOCIATED	COVARIATES
CARIES EXPERIENCE[4,18-20]	ABUSE/NEGLECT	Age, rank, family size, and abuse status had direct relationship with caries experience.
	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 parent-reported teeth in fair or poor condition.
	PHYSICAL ABUSE, EMOTIONAL ABUSE, SEXUAL ABUSE, OR NEGLECT	Children subject to child protection plans had significantly higher levels of dental caries in the primary dentition.
POOR ORAL (GLOBAL) AND GENERAL HEALTH[27]	PHYSICAL ABUSE, SEXUAL ABUSE AND NEGLECT	Neglected children were also at increased risk for diabetes, poorer lung functioning, and vision problems. Childhood social class in part explained increases in the risk for malnutrition, peak airflow, oral health, and vision problems in adulthood.
POOR ORAL HEALTH RELATED QUALITY OF LIFE[29]	ADVERSE CHILDHOOD EXPERIENCES	Nearly half of the participants reported their family was experiencing financial hardship. Roughly, 20 percent of the population reported exposure to parental divorce during their pediatric developmental years.

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

ORAL HEALTH PROBLEMS	TYPES OF VIOLENCE ASSOCIATED	COVARIATES
POOR SELF-PERCEIVED ORAL HEALTH[4,22,23]	CHILD PHYSICAL ABUSE, INTIMATE PARTNER VIOLENCE FORCED SEX AND BULLYING.	Parents separated, both parents foreign born and one parent 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 symptoms and functional limitations subscales) with statistical significance.
	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 parent-reported teeth in fair or poor condition.
TOOTH DECAY[6,24-26]	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 brushes the teeth.
	NEGLECT	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 >3 years.
	ABUSED CHILDREN	Number of missing teeth was also significantly higher in abused children
	DOMESTIC VIOLENCE AND CHILD ABUSE	In 13% of the children, multiple tooth extraction took place before they were reported to social service.
POOR ORAL HEALTH AND RISKY RELATED BEHAVIOR[16]	PHYSICAL ABUSE, PSYCHOLOGICAL ABUSE, INTIMATE PARTNER VIOLENCE, SEXUAL ABUSE AND NEGLECT.	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 records, more treatment under general anesthesia and more sedation.
MALOCCLUSION[26]	ABUSED CHILDREN	Victims 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.
EARLY CHILDHOOD CARIES (ECC)[17]	CHILD MALTREATMENT (ABUSE, NEGLECT)	The proportion of the children with severe ECC tended to be higher in physically/sexually abused children than in neglected children. The age distribution was similar in cases of neglect occurred among 4 to 6-year-old children. Only four children had clinical evidence of dental injury, recorded in the dental

o *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[20]. No study reached the maximum score.

Study/ Year	Selection	Comparability	Exposure	Total
Case-control studies				
Greene et al. (1994)[19]	3	1	1	5
Greene et al. (1995)[18]	4	1	1	6
Duda et al. (2017)[26]	4	1	1	6
Keene et al. (2015)[20]	2	1	1	4
Cohort studies				
Widom et al. (2012)[27]	3	1	2	6
Cross-sectional studies				
Valencia-Rojas et al. (2008)[17]	2	2	2	6
Kvist, et al. (2013)[22]	4	2	2	8
Lourenço et al. (2013)[24]	2	2	1	5
Bright et al. (2015)[4]	3	1	3	7
Gurunathan et al. (2016)[25]	3	1	2	6
Smitt et al. (2017)[6]	3	0	1	4
Kabani et al. (2018)[29]	2	1	2	5
Kvist, et al. (2018)[16]	3	2	2	7
Silva-Júnior et al. (2018)[23]	3	2	2	7

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

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[16], financial hardship/parental divorce[25,27], low parental education[20], poorer general health[19] and poorer oral hygiene were[22] 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[29]. One study identified that family size is a risk factor the presence of untreated, decayed teeth[15].

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[30]. 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[25], 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. Most of dentists receives little or no education about violence during the under graduation in dentistry[31].

Widom et al.[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[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[27].

Dental neglect is willful failure of parent or guardian to seek and follow through with treatment necessary to ensure a level of oral heath essential for adequate function and freedom from pain and infection[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[8].

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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