

SYSTEMATIC REVIEW

Orofacial signs of child or adolescent maltreatment identified by dentists and dental hygienists: A scoping review

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Funding information

Research Council of Norway;

Abstract

Background: Child maltreatment, the abuse or neglect of children aged 0–18 years, is a severe and underreported global problem. Compared with other body parts, the orofacial region displays more signs of child maltreatment. Dentists and dental hygienists are therefore well situated to identify orofacial signs of child maltreatment.

Aim: To map the current literature on orofacial signs of child maltreatment identified by dentists or dental hygienists.

Design: A scoping review was conducted based on systematic searches of Medline (Ovid), Embase (Ovid), and CINAHL (EBSCOhost) for primary qualitative and quantitative studies through June 6, 2022.

Results: Twenty-nine studies were included in this scoping review. Though all child maltreatment types were identified in dental settings, physical abuse and dental neglect were most commonly identified. Reports of caries dominated the orofacial signs, followed by bruises (intra- and extraoral), poor oral hygiene, dental trauma, and lacerations (intra- and extraoral). Case reports were used most commonly to describe orofacial signs of child maltreatment.

Conclusion: Dental clinicians identify orofacial signs of all child maltreatment types intraorally. Dentists identify the same extraoral signs as do other healthcare professionals, with bruising being the most common.

KEYWORDS

abuse, child maltreatment, dental hygienist, dentist, neglect, orofacial, scoping review

1 | INTRODUCTION

Child maltreatment—the abuse or neglect of children younger than age 18 years—is defined by the World Health Organization (WHO) as “all forms of physical and/or emotional ill-treatment, sexual abuse, neglect or

negligent treatment, or commercial or other exploitation of children that results in actual or potential harm to a child’s health, survival, development, or dignity in the context of a relationship of responsibility, trust, or power.”¹ The term “child maltreatment” is used to describe child abuse and neglect (CAN),² within which

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four maltreatment types are generally recognized: physical abuse, sexual abuse, emotional/psychological abuse, and neglect. CAN types can be identified separately or in any combination³ (Figure 1).

Child maltreatment is widespread and of an endemic magnitude.⁴ Global estimates reveal rates of more than 1 billion children aged 2–17 years being exposed to past-year violence.⁵ The WHO has reported that one in five women and one in 13 men report having been sexually abused as a child.⁶ Annual prevalence rates of physical abuse range from 4% to 16%, and approximately 10% of children are neglected or emotionally abused in high-income countries.⁴ Community surveys from Europe suggest that 18 million children suffer from sexual abuse, 44 million from physical abuse, and 55 million from psychological abuse.⁷ Child maltreatment is a serious public health and human rights issue, causing profound short- and long-term consequences^{4,8} ranging from immediate physical injuries to lifelong adverse effects on emotional and cognitive development, behavior, physical and mental health, and quality of life.⁹

1.1 | Physical abuse

Deliberate, aggressive, or violent nonaccidental behavior from one person toward another person comprises 60%–75% of bodily injuries to the orofacial region (facial, neck, ears, lips, and intraoral).^{10–17} Because of its exposed placement and complex anatomical structures, the orofacial region is more vulnerable to traumatic injury than other body parts.¹⁵ In their systematic review, Sarkar et al. comprehensively reviewed orofacial signs in children who are physically abused, reporting that there are no pathognomonic signature patterns of child physical abuse to the exposed orofacial region.¹⁷ Infancy is a time of high risk for exposure to severe physical abuse¹⁸ and includes a range of orofacial signs, that is, bruises, oral injuries, or subconjunctival hemorrhages.¹⁹ Furthermore, a torn labial frenum in a young infant or nonambulatory infant may highly indicate physical abuse and is described as sentinel injuries.^{19,20}

1.2 | Sexual abuse

Sexual abuse has been defined as “sexual activity with a child by an adult, adolescent or older child.”²¹ Reports about orofacial signs of sexual abuse are rare,²² although the oral cavity is often involved in cases of child sexual abuse.²³ Nevertheless, some soft oral tissues may display typical, recognizable signs of sexual abuse²⁴; these include erythema, bruises (petechiae), ulcer, pseudomembranous

Why this paper is important to paediatric dentists

- Children exposed to maltreatment often display intraoral signs.
- Dental clinicians may identify intraoral signs characteristic of all child maltreatment types.
- Case reports are the main method of reporting on orofacial signs of child maltreatment.

and condylomatous lesions of the lips, palate, tongue, and nasopharynx.^{23,24}

1.3 | Emotional (psychological) abuse

This includes any act by a primary caregiver that endangers a child's basic psychological development by expressing that the child is worthless, defective, unlovable, and/or unimportant.²⁵ These nonphysical types of rejection or hostility may stress and harm the child's physical and mental health, as well as their cognitive and emotional development.⁸ Emotional abuse is mostly identified in combination with other CAN types.²⁵ Despite the fact that emotional abuse is a universal problem, often conferring more negative psychological outcomes than other abuse types, it has received less attention in scientific research than physical or sexual abuse.²⁶

1.4 | Neglect

The repeated failure of caregivers to provide a child's basic physical and emotional requirements is a significant problem impacting many children.²⁷ Neglect is by far the most common type of child maltreatment.²⁸ Regardless, child neglect remains an underaddressed maltreatment type in scientific research.^{29,30} From a dental perspective, a significant type of neglect is dental neglect.³¹

1.5 | Dental neglect

This is the deliberate failure of a parent or guardian to seek and complete the treatment necessary to ensure the oral health and absence of pain and infection of a child.²³ Dental caries, untreated decay, poor oral hygiene, and missed appointments are all parameters of dental neglect.^{31,32} Left untreated, dental caries, and other oral health issues can cause pain, infection, and loss of

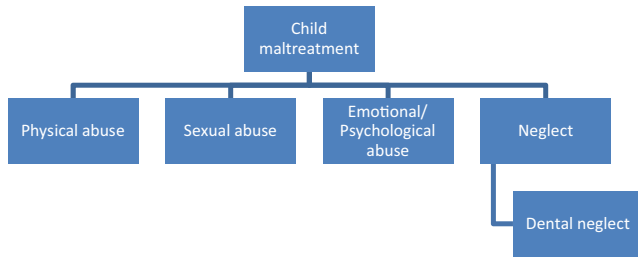


FIGURE 1 Child maltreatment types.

function.³³ These outcomes can negatively impact learning, communication, nutrition, and other activities necessary for normal growth and development.³¹

Child maltreatment is associated with poor oral health, including a higher incidence of untreated tooth decay, low priority for oral hygiene, and more missed dental appointments that occur within the general population.³⁴ Furthermore, the orofacial region is a common injury site, both accidental and nonaccidental.

Dentists and dental hygienists examine the orofacial region on a regular basis and thus have a good understanding of recent and healing injuries, as well as other orofacial signs of maltreatment.¹⁰ Dentists and dental hygienists, with their specialized professional knowledge, can contribute to early detection of child maltreatment.^{10,34,35} In their literature review, Singh et al. summarized the role of dentists in child maltreatment identification as prevention and protection,³⁵ and Abo-Hamar's editorial³⁶ on child abuse and the role of dentistry confirmed the scarcity of literature on this topic.^{17,36}

There is a clear need for more research in the field. Our scoping review differs from previous reviews^{17,34,35} by including all forms of child maltreatment and their associated orofacial signs and by applying an extensive eligibility process. This study reviewed the current literature on orofacial signs of maltreatment in children and adolescents, identified by dentists or dental hygienists. A systematic literature review was conducted to address the following research questions:

1. What child maltreatment types are identified by dentists and dental hygienists?
2. What orofacial signs identified by dentists and dental hygienists are indicative of specific child maltreatment types?
3. What study designs have been used to investigate the orofacial signs of child maltreatment?

2 | MATERIALS AND METHODS

This scoping review was designed to map the orofacial signs of child maltreatment, identify research gaps, and

make future recommendations. To this end, we chartered the scoping process using the methodological guidance for conducting systematic scoping reviews by Peters and colleagues³⁷ and the PRISMA Extension reporting system for Scoping Reviews (PRISMA-ScR),³⁸ safeguarded by a PRISMA-ScR checklist.³⁸

2.1 | Search strategy

2.1.1 | Selection criteria

Reviews assessing prevalence data must adhere to the PCC structure (ie, population, concept/exposure, and context). The research questions' main concepts were identified using the PICO formulation³⁹ where: population = dentists and dental hygienists identifying children and adolescents (MESH: 0–18 years) exposed to child maltreatment; phenomenon of interest = orofacial signs of child maltreatment; and context = dental settings. The search traced published reports from 1964 to June 6, 2022.

2.1.2 | Search methods

Three electronic databases, Medline (Ovid), Embase (Ovid), and CINAHL (EBSCOhost), were systematically searched through June 6, 2022. The searches were executed based on a building block search strategy using the following keywords: “child maltreatment,” “abuse and neglect,” “dental,” “dentist,” “mouth,” “teeth,” and “orofacial,” supervised by a research librarian (Appendix S1). We also manually searched all included publications' reference lists and forwarded citations in Google Scholar and PubMed for additional relevant citations (ie, berrypicking). Combining formal search strategy methods with berrypicking as an alternative to comprehensive keyword-based approaches is a way to uncover contextually or theoretically nearby publications.³⁹ One additional study⁴⁰ was retrieved by berrypicking after the search process ended in June 2022.

2.2 | Inclusion criteria

All primary studies reporting on dental examinations that disclosed orofacial signs of maltreatment in children or adolescents were included. Reports were included regardless of whether child maltreatment status was known to the dental clinician prior to the clinical examination. Only English language studies, irrespective of research design, were included. There was no lower time limit for this study, owing to limited research in the field. The database

records dated back to 1946 for Ovid Medline, 1980 for Embase, and 1981 for CINAHL.

The exclusion criteria were as follows: studies on ritualistic or war abuse; studies without a clear or defined description of the profession; and those evaluating signs registered in medical records. Furthermore, we only included domestic violence studies when they were defined as a combination of child physical abuse and emotional/psychological abuse. "Witness to violence" studies were excluded.

2.3 | Abstraction of papers and level of evidence

Four reviewers (Håkstad, Fegran, Hovden and Köpp) independently screened articles for study inclusion. Articles were first screened based on their title and abstract. One reviewer (Håkstad) read all abstracts and full texts; the three other reviewers each read one third of the abstracts independently and double-blinded to determine eligibility. Any disagreements between the reviewers regarding the inclusion of specific studies were resolved through consensus. Reports that did not meet the inclusion criteria were excluded with reason (Appendix S2). The PRISMA 2020 flow diagram (Figure 2) outlines the inclusion process for eligible studies according to Page et al.⁴¹ Based on the methodological guidance for systematic scoping reviews,³⁷ no critical appraisal of the quality of the included studies was performed.

2.4 | Study synthesis

Data relevant to this scoping review were extracted from the included studies using a data extraction sheet (Excel),⁴² in accordance with the research questions. Child maltreatment types reported in the included studies are described in Figure 1.

3 | RESULTS

Among the 4620 records initially identified, 2094 duplicates were removed. There were 2526 unique hits screened by title and abstract in the Rayyan citation manager.⁴³ This identified 128 reports, among which four could not be retrieved in full text. Thus, 124 reports were read in full text, among which 29 were selected for inclusion. The exclusion reasons for 95 reports are provided in Appendix S2.

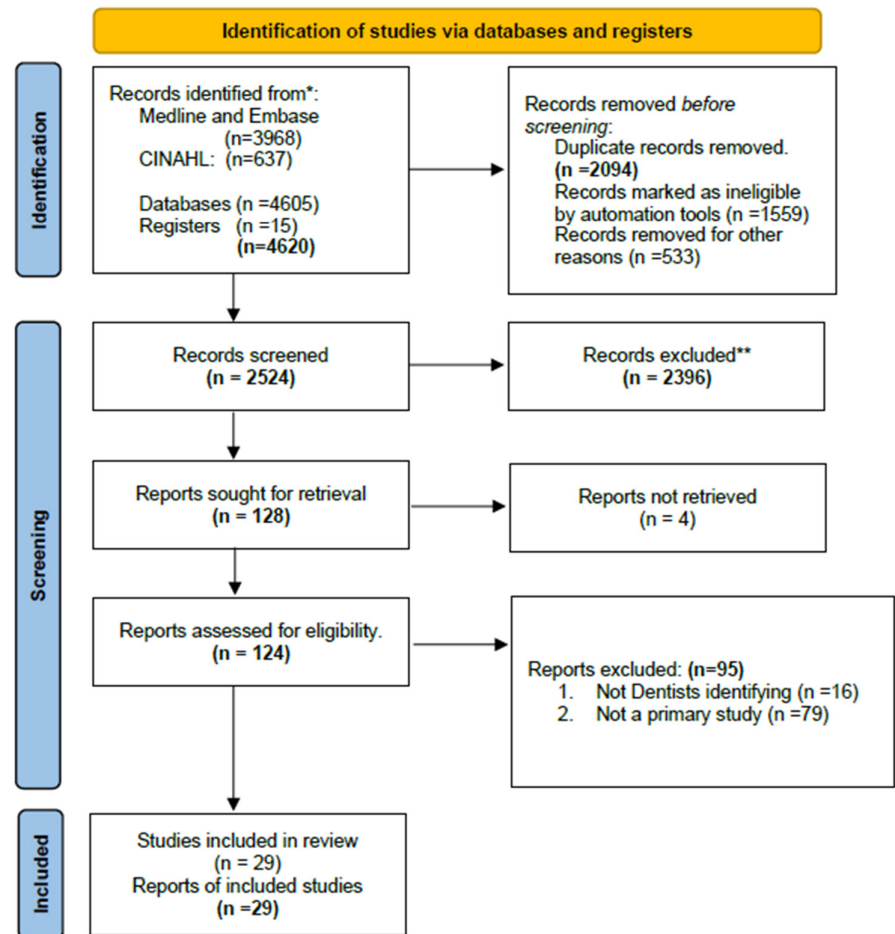
The included studies represented all continents. Most were conducted in North ($n=8$) and South ($n=6$) America, Europe ($n=11$), and Asia ($n=2$). Only one study was conducted in Africa and Australia. Paper publication years ranged from 1981 to 2022, and the volume of research on the topic increased over time, with most ($n=20$) conducted during the past two decades.

The reports included a total of 1837 children who had been exposed to child maltreatment. They ranged in age from 0 to 18 years. Boys were overrepresented in studies in which physical abuse was the only reported maltreatment type, whereas girls were slightly overrepresented among sexual abuse cases (246 females in seven reports; 238 males in six reports). Dentists (including pedodontists) performed all dental examinations. Only one study also included dental hygienists.⁴⁴ Excepting three studies conducted outdoors or in a classroom with natural light,^{45–47} all dental examinations were conducted in a clinical dental setting. Most studies reported that caries used the caries detection system for decayed, missed, filled teeth index for primary (dmft) and permanent (DMFT) dentition. One study described the systematic use of plaque and gingival indexes.⁴⁸ The two studies describing dental fractures used different classification indexes, and one used a standardized tooth wear index. Five studies reported using dental X-rays, whereas only Stavrianos et al.^{49,50} reported using orthopantomography, computed tomography, or clinical photographs in the identification and documentation of child maltreatment signs. Table 1 gives an overview of the included studies' key information.

3.1 | Child maltreatment types identified by dentists or dental hygienists

All child maltreatment types are represented in the included studies. Most papers described physical abuse ($n=17$), followed by those on dental neglect ($n=14$), sexual abuse ($n=10$), emotional abuse ($n=6$), and neglect ($n=6$; Table 2).

Child maltreatment types often co-occurred in these studies ($n=17$), indicating clusters of orofacial signs. In these dental settings, physical abuse was identified by a wide variety of orofacial signs in all orofacial regions, whereas sexual abuse was identified exclusively in the mouth and on the lips.⁵¹ Emotional abuse and general neglect were only identified in combination with other forms of child maltreatment. Dental neglect was described within the largest cumulative sample ($n=1296$). In addition, dental neglect (eg, untreated tooth decay, dental trauma, missing dental appointments, and poor oral hygiene) was also reported as an indication of broader neglect^{27,52–54} (Table 2).

FIGURE 2 PRISMA 2020 flow diagram.³⁹

3.2 | Orofacial signs identified by dentists or dental hygienists

Orofacial signs were classified into two categories: extraoral and intraoral signs. Five studies^{49,54–57} reported both extra- and intraoral findings. A single orofacial sign at a single location was rare and only described in two reports.^{51,52}

In terms of sex distribution among victims with orofacial signs, females were slightly overrepresented. Four studies, however, did not categorize abuse signs based on the sex of the victims.^{45,46,58,59}

3.2.1 | Extraoral signs

Extraoral signs were reported in nine studies and included soft tissue injuries, including bruises/ecchymosis,^{49–52,54–57,60} abrasions,^{49,54,55} edemas,^{49,54} lacerations,^{54–56} scarring,⁵⁵ and burns to the face and lip area.⁴⁹ Bruising was included in all reports of extraoral signs and was the predominant soft tissue injury. Only three studies also reported hard tissue injuries; facial fractures included

bones of the frontal sinus, lower ocular wall, nose, and zygomatic arch^{49,50,54} (Table 3).

Extraoral signs were frequently localized to the upper temporal and periorbital regions, followed by the cheeks and lips. Bruises were found in all orofacial regions. Lacerations and scars were mostly found on the lips. Edemas were on the upper and lower eyelids (Figure 3).

3.2.2 | Intraoral signs

Intraoral signs were identified in 25 of the included studies and were divided into hard and soft tissue signs and poor oral hygiene. Intraoral signs were reported among all child maltreatment types. Physical abuse and dental neglect caused both hard and soft tissue injuries, sexual abuse caused soft tissue injuries (in the mouth and on the lips), and emotional abuse caused hard tissue injuries (Table 4).

Caries was the most significant intraoral sign, identified in 21 of the reports. Except for three reports only describing caries,^{13,58,59} they were found in combination with other intraoral signs. Croll et al. (1981), Sobel

TABLE 1 Key characteristics of included studies and overview of their results (*n* = 29).

Author (year)	Country	Study design	Context	Measures	Clinical tools	Sample size (N)	Participant ages (years)
Croll et al. (1981)	USA	Case report	Private pedodontics office	Clinical examination	ND	1 M	2.8
Sobel et al. (1986)	USA	Case report	Hospital dental clinic	Clinical examination	X-rays	1 M	4
Symons, et al. (1987)	Australia	Case report	Dental clinic/office	Clinical examination	X-rays	3 M = 2 F = 1	1.9 3 8
Wandera et al. (1989)	Kenya	Case report	Dental clinic/office	Clinical examination	X-rays	2 M = 1, F = 1	7 12
Carrotte (1990)	UK	Case report	Dental clinic/office	Clinical examination	ND	1 M	13
Jessee et al. (1993)	USA	Case report	Dental clinic/office	Clinical examination	ND	1 M	9
Heitzler et al. (1994)	USA	Case report	Dental clinic/office	Clinical examination	ND	1 F	
Greene et al. (1994)	USA	Case-control study	Major medical military center	ND	DMFT index No X-rays	30 Both genders	5-13
Greene et al.* (1995)	USA	Case-control study	Major medical military center	ND	dfs index No X-rays	42 Both genders	3-11
Babich et al. (2003)	USA	Case report	Specialist clinic	Clinical examination	ND	1 M	4
Santos et al. (2007)	Brazil	Case report	Educational clinic	Clinical examination	ND	1 M	9
Valencia-Rojas et al. (2008)	Canada	Retrospective prevalence study	Private paediatric dental practice	ND	dmft index	66 M = 37 F = 29	2-6
Montecchi et al. (2009)	Italy	Case-control study	Paediatric hospital	ND	Plaque index Gingival index Dental decay	237 M = 83 F = 154	10.5

TABLE 1 (Continued)

Author (year)	Country	Study design	Context	Measures	Clinical tools	Sample size (N)	Participant ages (years)
Balmer et al. (2010)	UK	Case report	Dental clinic	Clinical examination	ND	3 M=1 F=2	3 9 7
Louloudiadiset al. (2010)	Greece	Case report	Dental clinic	Clinical examination	Clinical photographs	1 M	2,5
Stavrianos et al. (2010)	Greece	Case report	Dental clinic	Clinical examination	X-rays CT	1 M	12
Stavrianos et al. (2011)	Greece	Case report	Dental clinic	Clinical examination	X-rays Clinical OPG	1 M	11
Lourenco et al. (2013)	Brazil	Two-stage quantitative study	Dental examination in a nondental environment	Examination in natural light	dmft index after prophylaxis	149 Both genders	5
Percinoto et al. (83)	Brazil	Case report	Educational clinic	Clinical examination	ND	1 M	5
Garrocho-Rangel (2015)	Mexico	Case report	Paediatric dentistry department	Clinical examination	Tinanoft dental caries risk scale	1 F	5,67
Pawlaczyk-Kamienska et al. (2016)	Poland	Case report	Educational clinic	Clinical examination	ND	1 F	5
Duda et al. (2016)	Brazil	Case-control study	Dental examination in a nondental environment	Examination in natural light	dmft/DMFT indexes	122 Both genders	8,56 (3–15)
Nogami et al. (2017)	Japan	Case-control study	Dental examination in a nondental environment	Examination in natural light	dmft/DMFT indexes	166 M=95 F=71	11,6
Schlabe et al. (2018)	UK	Retrospective audit	Dental hospital/office or ED*	Oral and maxillofacial surgery	ND	17 M=8 F=9	8,3
Hartung (2019)	Germany	Mixed methods	Dental clinic/offices	Focus group interview	dmft/DMFT indexes	102 M=56 F=46	3–14

TABLE 1 (Continued)

Author (year)	Country	Study design	Context	Measures	Clinical tools	Sample size (N)	Participant ages (years)
Silva-Júnior et al. (2019)	Brazil	Cross-sectional study	Public dental service/ public faculty of dentistry	Clinical examination	dmft/DMFT indexes O'Brien index**	68 M = 30 F = 38	8 and 12
Pantelewicz et al. (2020)	Poland	Mixed methods	Paediatric dentistry department	Clinical examination	Parafunctional habits: TWI TW: visual examination DT: Anderson's classification***	404 M = 173 F = 231	2–17
Barbi et al. (2021)	India	Cohort study	Outpatient department of dentistry	Clinical intraoral and perioral examination	ND	250 M = 131 F = 119	5–16
Toft et al. (2022)	Norway	Retrospective cohort study	Public dental clinics/child advocacy center	Clinical examination	ND	163 M = 68 F = 95	3–16

Abbreviations: dfs, decayed, filled surfaces; DMFT, decayed, missed, filled permanent teeth; dmft, decayed, missed, filled primary teeth; DT, dental trauma; ECC, early childhood caries; F, female; M, male; ND, Not described; TW, tooth wear; TWI, tooth wear index.

*ED = Emergency department; ED results not included in this scoping review because of the uncertainty of participants being dentists. **O'Brien Index: "enamel fracture only," "enamel-dentin fracture," "any fracture with signs/symptom of pulp involvement," "signs/symptom of pulp involvement without signs of fracture," "missing tooth due to trauma," or "other." ***Anderson's classification: enamel infractions, enamel fracture, enamel-dentin fracture, complicated crown fracture, subluxation, lateral luxation, intrusion, avulsions, soft tissue injuries and abrasion of mucosa, and gingiva.

TABLE 2 Child maltreatment and orofacial signs ($n = 29$).

Author (year)	Child maltreatment type	Intraoral signs ($n = 25$)		Extraoral signs ($n = 9$)
		Dental caries and Oral hygiene	Other intraoral signs	Extraoral signs
Croll et al. (1981)	Physical abuse	Dental caries: Class I carious lesions of primary and second molars	ND	Bruises/ecchymosis
Sobel et al. (1986)	Physical abuse	Dental caries Poor oral hygiene	Dental trauma Mucosal lesions Fracture Tooth wear/ parafunction	Bruises/ecchymosis Abrasions Lacerations Scars
Symons et al. (1987)	Physical abuse Psychological abuse General neglect	Dental caries Poor oral hygiene including plaque deposits General chronic gingivitis	Dental trauma Mucosal lesion Tooth wear/ parafunction	Bruises/ecchymosis Abrasions Lacerations Contusion/edema Fracture
Wandera et al. (1989)	Physical abuse Psychological abuse Dental neglect	Dental caries: Interproximal caries, pulpal involvement Poor oral hygiene Halitosis	Dental trauma Mucosal lesions	Bruises/ecchymosis Lacerations
Carrotte (1990)	Physical abuse Psychological abuse	ND	Dental trauma	ND
Jessee et al. (1993)	Dental neglect	Dental caries: in all first permanent molars, severe caries in the primary dentition	Jaw infection	ND
Heitzler et al. (1994)	Sexual abuse	Dental caries: several carious teeth Poor oral hygiene	Mucosal lesions	ND
Greene et al. (1994)	Physical abuse Sexual abuse Dental neglect	Dental caries: 8.0 times more likely to have untreated, decayed permanent teeth vs. control group	ND	ND
Greene et al. (1995)	Physical abuse Sexual abuse Dental neglect	Dental caries: 5.2 times more likely to have untreated, decayed primary teeth vs. control group	ND	ND
Babich et al. (2003)	Sexual abuse	Dental caries: several carious teeth Poor oral hygiene	Mucosal lesions	ND
Santos et al. (2007)	Physical abuse	ND	ND	Bruises/ecchymosis
Valencia-Rojas et al. (2008)	Physical abuse Sexual abuse Dental neglect	Dental caries: ECC/dt = 5.63 ($n = 66$, 58%) DN: 57% ($n = 53$) PA/SA: 62% ($n = 13$)	Dental trauma	ND
Montecchi et al. (2009)	Dental neglect General neglect	Poor oral hygiene: dental plaque index ($p = .02$) Gingival inflammation score ($p = .2$)	ND	ND
Louloudiadis et al. (2010)	Physical abuse Psychological abuse	ND	ND	Bruises/ecchymosis
Balmer et al. (2010)	Dental neglect General neglect	Dental caries: severe carious dentition and black front teeth Acute pulpitis Poor oral hygiene	ND	ND
Stavrianos et al. (2010)	Physical abuse	ND	ND	Bruises/ecchymosis Fracture

TABLE 2 (Continued)

Author (year)	Child maltreatment type	Intraoral signs (<i>n</i> = 25)		Extraoral signs (<i>n</i> = 9)
		Dental caries and Oral hygiene	Other intraoral signs	Extraoral signs
Stavrianos et al. (2011)	Physical abuse Psychological abuse	ND	Dental trauma Jaw fracture	Bruises/ecchymosis Abrasions Contusion/edema Fracture Cigarette burns
Lourenco et al. (2013)	Dental neglect General neglect	Dental caries: dmft = 2.75 (<i>n</i> = 16, dmft ≥ 7), (<i>n</i> = 85, ≤ 1 dmft ≥ 6) Poor oral hygiene 32%	ND	ND
Percinoto et al. (83)	Sexual abuse	ND	Mucosal lesions	ND
Garrocho-Rangel (2015)	Physical abuse Sexual abuse	Dental caries: poor oral hygiene including heavy plaque deposits	ND	ND
Pawlaczyk-Kamienska et al. (2016)	Sexual abuse	ND	ND	Bruises/ecchymosis
Duda et al. (2016)	Physical abuse	Dental caries: OR 6.48 (95% CI: 3.52–11.95)	Tooth wear/ parafunction; children exposed to maltreatment have a 2.11 times higher chance of developing anterior open bite	ND
Nogami et al. (2017)	Dental neglect	Dental caries: dmft/DMFT: 4.76 (neglected group) vs. 2.59 (control group)	ND	ND
Schlabe et al. (2018)	Dental neglect General neglect	Odontogenic infections due to dental neglect (average 3.2 teeth)	ND	ND
Hartung (2019)	Dental neglect General neglect	Dental caries: dmft/DMFT score = 9.7 quantitative; GN: 12.7% (<i>n</i> = 13)	ND	ND
Silva-Júnior et al. (2019)	Dental neglect	Dental caries: 81.3% (<i>n</i> = 13) intervention vs. Control: 60.7% (<i>n</i> = 17)	Dental trauma	ND
Pantelewicz et al. (2020)	Physical abuse Psychological abuse	ND	Dental trauma, tooth wear/parafunction; exposed children had a 44.6% higher prevalence of erosive tooth wear and 67.8% presence of parafunctional habits than the general population	ND
Barbi et al. (2021)	Physical abuse Sexual abuse Dental neglect	Dental caries: 41.6% (<i>n</i> = 106) Poor oral hygiene including plaque deposits (100% [<i>n</i> = 205])	Dental trauma Mucosal lesions Jaw fracture	ND
Toft et al. (2022)	Physical abuse Sexual abuse Dental neglect	Dental caries: sexually abused were (23%) four times more likely to have caries than physically abused children (59%)	Dental trauma	ND

Note: Studies assessing child maltreatment type are described based on the abuse or neglect type they describe.

Abbreviations: CI, confidence interval; DMFT, decayed, missed, filled permanent teeth; dmft, decayed, missed, filled primary teeth; ECC, early childhood caries; ND, Not described.

et al. (1986), Symons, et al. (1987), and Wandera et al. (1989) reported caries in combination with extraoral signs (Table 2). Poor oral hygiene was described in 10 reports^{27,46,48,54–56,61–64} as present in all child maltreatment types, though it was overrepresented in neglect cases (Table 2). Reported poor oral hygiene parameters included heavy plaque deposits^{46,48,54,56,61,62} and plaque index measurements,^{48,61,62,65} acute or chronic gingivitis,^{48,65} and halitosis.⁶⁶ Other reported dental neglect signs were odontogenic infections^{27,53,56,67} and dentoalveolar infections.^{13,61}

Intraoral signs of physical abuse were described in 17 studies, comprising bruising/ecchymosis^{55–57} and lacerations.^{54–56,61} Only two reports described frenum tearing^{54,61} and one described scars from previous abuse.⁵⁴ Hard tissue injuries of the teeth and jaw were described as caries dental trauma,^{40,44,61,68,69} including subluxations^{49,55,56,70} and tooth fractures,⁵⁶ dentoalveolar fractures,^{13,49,55,61} and malocclusions due to previous fractures.⁵⁵ Enamel infractions were reported as the most common trauma injury.⁶⁸

The most commonly described intraoral signs of sexual abuse were warts (condyloma acuminata), in three studies,^{24,63,64} typically located in the labial mucosa, interproximal gingiva at the dorsal surfaces of the posterior tongue, and palate. Two studies^{51,64} reported bruises of the oral mucosa or lips because of child sexual assault.

Intraoral manifestations of emotional abuse were reported as hard tissue injuries like erosive tooth wear,^{54,69} parafunctional habits,^{45,54,69} malocclusions like cross-bite,^{54,55} and anterior open bite.⁴⁵ Figure 4 displays the location and prevalence of the intraoral signs from the included studies.

3.3 | Study designs used to investigate child maltreatment in dental care settings

All the included studies used a quantitative design, and two also included a qualitative design element.^{67,69} The most frequently used study design was the case report ($n=16$). Among the remaining studies, five were case-control studies, two were retrospective studies, two were cohort studies, two were mixed methods studies, one was a cross-sectional study, and one was a quantitative study conducted in two stages. Green et al. conducted two case-control studies using the same data material, but with different dental measures and age groups (ie, primary vs. permanent dentition and 5–13 vs. 3–11 years.^{58,59} As such, we included both publications, as separate reports.

Dental researchers used different observational study types to describe child maltreatment types. Case reports were the only study design type used to report all child

TABLE 3 Number of studies reporting on types of extraoral sign.

Type of extraoral signs		N
Hard tissue injuries	Facial fractures	3
Soft tissue injuries	Bruises	9
	Abrasion	3
	Lacerations	3
	Edema	2
	Burns	1
	Scars	1
	Bite marks	0

maltreatment types, and dental neglect was the only child

TABLE 4 Number of studies reporting on types of intraoral sign.

Type of intraoral signs		N
Hard tissue injuries	Dental caries	21
	Dental trauma	10
	Odontogenic infections	4
	Dentoalveolar fractures	4
	Tooth wear/parafunction	3
	Malocclusion	3
	Dentoalveolar infections	2
Soft tissue injuries	Bruises	5
	Lacerations	4
	Warts	3
	Frenulum tearing	2
Scars	1	
Poor oral hygiene		10

maltreatment type reported in all included study designs.

For reports of physical abuse, the most frequent study design was a case report. Furthermore, dental researchers described physical abuse in case-control studies, a prevalence study, two mixed methods studies, and cohort studies. Half of the studies reporting sexual abuse were case reports; the rest were cohort and prevalence studies. Emotional (psychological) abuse was mainly reported in case reports, excepting one mixed methods study, and general neglect was reported in all study designs except for cross-sectional studies (Table 1).

Altogether, the included case reports identified a wide variety of orofacial signs compared with other study designs and comprised all sign types revealed in this scoping review. Caries was addressed in all study design types, excepting one retrospective audit addressing

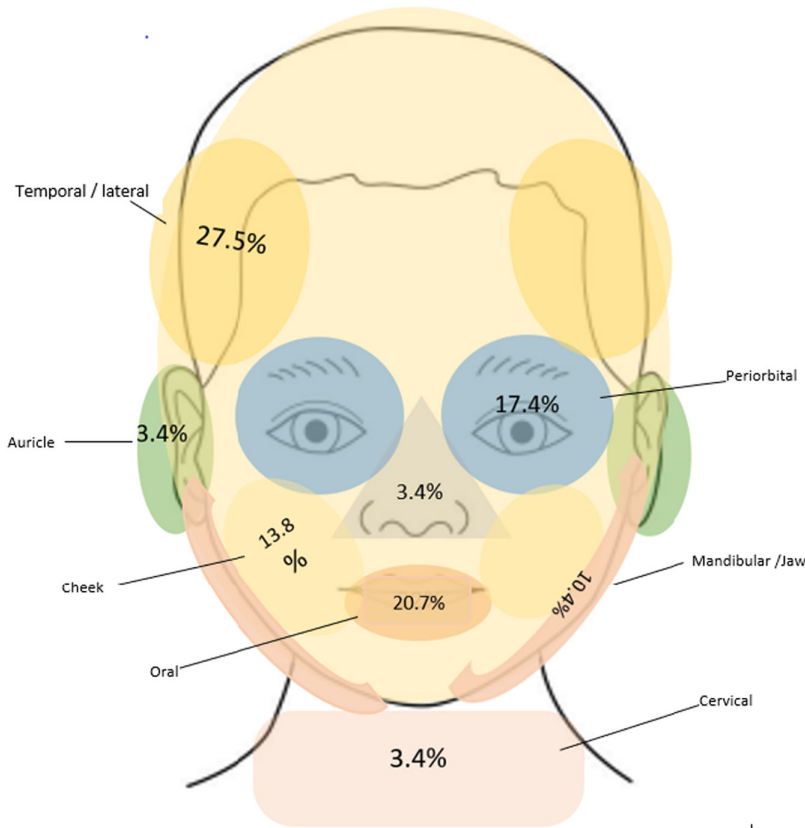


FIGURE 3 Regions of extraoral signs of the neck, lateral, cheeks, jaw, lips, eyes, ears, and nose. Percentages represent the proportion of studies reporting signs in each region.

Table 3. Number of studies reporting on types of extra oral sign.

Type of extra oral signs		N
Hard tissue injuries	Facial fractures	3
	Bruises	9
Soft tissue injuries	Abrasion	3
	Lacerations	3
	Oedema	2
	Burns	1
	Scars	1
	Bite-marks	0

Signs are registered as one regardless of times reported in a study.

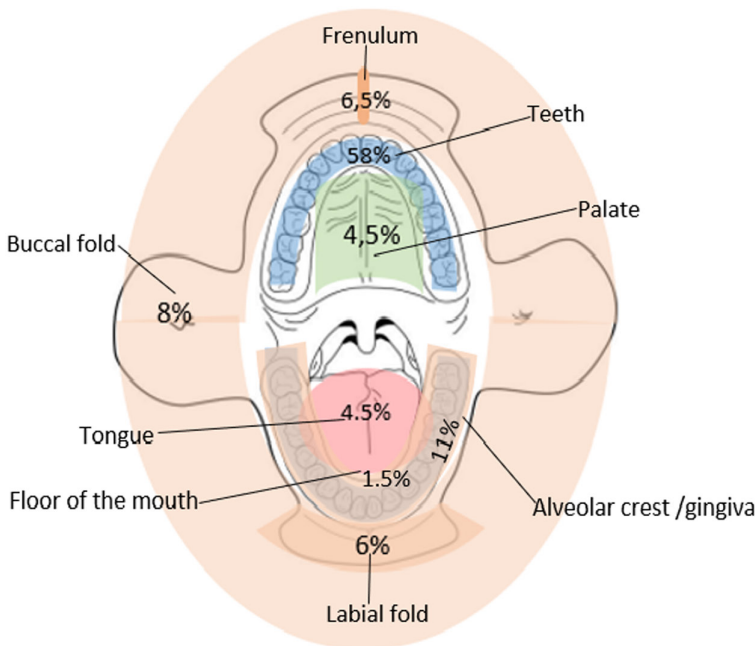


FIGURE 4 Locations of intraoral signs (n=25). Percentages represent the proportions of studies reporting signs in each region.

Table 4. Number of studies reporting on types of intraoral signs.

Type of intra oral signs		N
Hard tissue injuries	Dental caries	21
	Dental trauma	10
	Odontogenic infections	4
	Dento-alveolar fractures	4
	Tooth wear/ parafunctions	3
	malocclusion	3
	Dento-alveolar infections	2
Soft tissue injuries	Bruises	5
	lacerations	4
	Warts	3
	Frenulum tearing	2
Poor oral hygiene	Scars	1
		10

Signs are registered as one regardless of number reported in a study.

odontogenic infections. There was also one case-control study and a cohort study on poor oral hygiene. The mixed methods reports mainly addressed tooth wear/

parafunction, though one also described dental trauma, and one cross-sectional study also reported on dental trauma (Table 2).

4 | DISCUSSION

This systematic literature review aimed to map the orofacial signs of child maltreatment types, their associated orofacial signs, and the study designs used to report research on these issues. The scientific literature suggests that dentists have an important role in child maltreatment identification.^{10,11,34,35} The current findings confirmed that orofacial signs can be used to identify all child maltreatment types from 0 to 18 years. Physical abuse and dental neglect were present in most of the included studies. Dentists identified signs of physical and sexual abuse based on both intra- and extraoral signs, whereas emotional abuse and dental neglect were identified only by intraoral signs. Our analyses also indicate that dentists can identify the same extraoral signs of physical abuse as do other health professionals and that dentists are situated to identify child maltreatment based on bruising as the most prominent sign.^{10-15,22,71,72} General healthcare professionals, however, identify far fewer intraoral signs than do dentists, mainly finding soft tissue injuries like bruises and lacerations,^{10,12,17,22,72,73} if they examine the intraoral region at all.¹⁰

Bhatia et al. reported that healthcare professionals, outside of dental teams, seem to hesitate to look inside children's mouths.³¹ According to Sarkar et al. (2021), intraoral signs serve as markers of subsequent child abuse, providing an opportunity for early child maltreatment identification and intervention.¹⁷ Our analyses also show that dentists are able to identify all child maltreatment types, as intraoral findings in the teeth and/or oral cavity may most obviously be signs of dental neglect and physical abuse. Other intraoral signs, identified to a lesser extent, revealed condylomas and scars in and around the mouth in sexual abuse cases and stress-related tooth wear in relation to emotional abuse. Our findings also suggest that boys are at a slightly higher risk of exposure to physical abuse, which is in line with Sarkar et al. (56.7%).¹⁷ Furthermore, our findings support the contention that dentists should be aware of intraoral signs like bruises and lacerations, tooth fractures, dental trauma, jaw fractures, and malocclusion injuries as potential physical abuse signs. Furthermore, dental personnel have a legal obligation to disclose child maltreatment⁷⁴ and should ask their child patients about injury origins, even if doing so is difficult.

Maltreated children generally display more orofacial signs than do those in the general population.^{10,17,22,71,75} In our analyses, dentists identify orofacial signs most prominently on the lateral forehead/temporal region, around the eyes, cheeks, mouth, and intraoral regions, consistent with previous findings.^{12,22,72,73} Stavrianos et al. reported that orofacial signs occur at twice the rate of injuries found

on other parts of the body.⁴⁹ Consistent with other studies on intra- and extraoral signs in abused and neglected children,^{13,75,76} we found an almost equal distribution of orofacial signs between the two genders. Our findings are in line with the general scientific literature when indicating that dentists identify a wide variety of orofacial signs of child maltreatment.¹⁰ We also recognized similarities between the extraoral signs identified by dentists and other healthcare practitioners, suggesting consistency among clinicians.

Dental caries is the most common disease in children.³² Nevertheless, to regard caries as dental neglect is complicated and there exists no unified threshold level for caries being considered dental neglect.^{31,32} Several of our included studies found that neglected children display more caries. Furthermore, they show a link pattern between caries and risk factors associated with dental neglect.^{45-48,53} One study even defined poor oral hygiene as 4.5 decayed teeth based on dmft/DMFT score and further suggested a threshold level for dental neglect to be more than five decayed teeth.⁶⁷ Children suffering from neglect are potentially less likely to visit the dentist and are therefore more likely to have untreated caries.³¹ Diagnosing dental neglect is challenging, and dental clinicians must consider multiple factors, like cultural, ethnic, and socioeconomic status, before diagnosing dental neglect.³¹ In addition, it is important to be aware that there are significant inequalities in accessing dental care and poverty, and such cases have to be distinguished from neglect. Nevertheless, when there is adequate access to oral healthcare services and the parent or the guardian persistently fails to ensure appropriate medical care or treatment for his/her child, the possibility of dental neglect has to be seriously considered.⁷⁷ The caries findings in this study are based on already established diagnoses of dental neglect or abuse in the various included studies. There is, however, reason to believe that different diagnostic assessments were made to define caries as dental neglect, given the different underlying assessments described in the literature for diagnosing dental neglect.⁷⁷⁻⁷⁹ It is also important that they distinguish between parental lack of knowledge and neglectful behavior⁸⁰ and consider that neglected children are unaware of the neglect.⁸¹ It is also reasonable to suppose that when dentists do not participate in the identification process, intraoral findings are not revealed as thoroughly, and that losing this information may ultimately cause vulnerable children to remain "under the radar." Therefore, dentists and dental professionals, with their specialized knowledge of the orofacial region, are well equipped to identify CAN and should remain alert to its detection. Furthermore, dental neglect intervention is not solely dentists' responsibility; rather, it represents a shared public challenge.⁸¹

Case reports are generally not considered high-quality scientific evidence and are often excluded from the evaluation process because their results cannot be generalized.¹⁷ The results of this scoping review, however, show that case reports identifying the clinical signs of child maltreatment are highly valuable, as they provide the most evidence regarding extraoral signs. Furthermore, to address these especially vulnerable children, study designs must be compatible with the ethical concerns that arise with investigating child maltreatment. Finally, there are significant advantages to the quantitative method; it generally provides consistent, reliable, objective data³⁹ and can help eliminate research bias and produce more accurate results.³⁹

Dentists and dental hygienists examine children's oral health, and, in many countries, the latter is often the first clinician a child meets in the dental setting. Thus, it is unfortunate that dental hygienists have participated in only one study included herein.⁴⁴ Furthermore, Becker et al. found that oral surgeons and pedodontists generally report more orofacial injuries and are more aware of their responsibilities than general dental clinicians.²² Despite evidence that the international dental community is making a concerted effort to identify child maltreatment, when all professions are considered, there is a significant research gap in child maltreatment identification.^{9,17,34,82} Increased recent focus on this issue may soon lead to dentists and dental hygienists making greater contributions to the early identification of child maltreatment, and increased research in this field may provide additional evidence that will enable clinicians in the child maltreatment identification process. Further research on recognizing and identifying orofacial signs is needed, including sentinel events and physical abuse in nonambulatory infants so that health professionals become more successful in identifying child maltreatment. Ultimately, greater knowledge of the characteristics of child maltreatment types and orofacial injury patterns may be the first step toward establishing unified methods and tools to identify child maltreatment.

4.1 | Strengths and limitations

This study's comprehensive approach to developing search terms and identifying relevant published literature without time constraints is a major asset. Furthermore, this scoping review used rigid and transparent methods throughout the evaluation process. Another strength is that data selection and extractions were performed blindly and independently. The search strategy also included three electronic databases, screening the reference

lists of all included reports and forwarding citations to ensure comprehensive inclusion. Finally, four independent reviewers reviewed each title and abstract, and each full-text article was discussed and resolved and assisted by the systematic screening tool Rayyan; this process ensured that all citations and articles were correctly accounted for during the process.

One study limitation may have been including only English language studies; relevant reports may have been published in other languages. Second, reports were excluded if the title or abstract did not mention, or was unclear about, a child maltreatment investigation in a dental setting or by dental professionals. Third, that different index systems were used to determine when caries indicates dental neglect was a challenge³¹; whereas caries is usually reported with the dmft/DMFT system, defining dental neglect is complex.^{27,31,32} Several factors should be assessed and considered before suspecting or diagnosing dental neglect (eg, the impacts of carious lesions; dental record history; and parental awareness, knowledge, and willingness to follow up on dental treatments).³¹ Finally, cultural, ethnic, and socioeconomic issues must also be considered before diagnosing dental neglect.³²

This scoping review emphasizes the important role of dentists and dental hygienists in identifying child maltreatment. Dentists are situated to identify the same extraoral signs of child maltreatment as do other health-care practitioners. Dentists and dental hygienists can also identify all child maltreatment types based on signs in the mouth and teeth. Intraoral findings are first and foremost identified by dentists. Therefore, dental professionals have an important role in uncovering child maltreatment and preventing children from escaping detection.

AUTHOR CONTRIBUTIONS

The paper was co-authored by Liv Fegran, Ewa Hovden, and Unni Mette Stamnes Köpp. All authors contributed to data conception, design, collection, and interpretation. Fegran contributed significantly to the methodological design. The co-authors read one-third of the abstracts and actively participated with guidance during the process. The first author read all abstracts, full texts, and the writing. All authors have read and approved the final manuscript.

ACKNOWLEDGMENTS

The authors wish to thank Sonja May Amundsen Sorlandet, Hospital Medical Library, and Ellen Sejersted, University of Agder, library for competent contribution.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest in relation to this study.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

As this is a review study, no ethics approval nor patient consent is required.

CONSENT FOR PUBLICATION

Not applicable.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Håkstad K, Fegran L, Hovden E, Köpp UMS. Orofacial signs of child or adolescent maltreatment identified by dentists and dental hygienists: A scoping review. *Int J Paediatr Dent*. 2023;00:1-17. doi:[10.1111/ipd.13139](https://doi.org/10.1111/ipd.13139)