

Review Article**Dental Trauma as a Sentinel Marker for Post-Traumatic Stress and Psychological Sequelae in Children and Adolescents: A Narrative Review with Implications for Indian Practice**Khushi Yadav¹, Vrinda Saxena², Naveen S Yadav³¹ Undergraduate Student, Bachelors in Psychology, University of British Columbia, Canada.² Professor and Head, Department of Public Health Dentistry, Government College of Dentistry, Indore, Madhya Pradesh, India³ Professor & Head of Department, Department of Prosthodontics, People's Dental Academy, Bhopal, Madhya Pradesh, India

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ABSTRACT

Traumatic dental injuries (TDIs) are among the commonest unintentional childhood injuries, yet their mental health dimension remains under-recognised in child and adolescent psychiatry. This narrative review synthesises evidence on the psychological and psychiatric sequelae of dental trauma in children and adolescents and outlines an agenda for Indian research and practice. Pooled international data suggest that roughly one in five children and adolescents experiences a TDI at some point, with wide variation across settings and study designs. Indian school-based surveys from Goa, Hyderabad and Faridabad converge with this global picture, additionally showing that most affected children never receive treatment and are frequently unaware they require it. Emerging evidence reframes psychosocial status as more than an outcome of dental trauma: poorer psychosocial functioning independently predicts the subsequent occurrence of TDIs, establishing a bidirectional relationship that merits mental health attention rather than dental attention alone. Beyond the physical injury, TDIs and their treatment are associated with impaired oral health-related quality of life, heightened dental and re-injury anxiety, and social withdrawal, particularly after anterior tooth injuries visible during smiling and speech. Purpose-built instruments now exist to quantify oral re-injury anxiety and general paediatric post-traumatic stress, but they have rarely been applied together in the same child, and no Indian study has yet screened a dental trauma cohort for post-traumatic stress disorder using a validated instrument. We propose that dental trauma be treated as a sentinel event warranting brief psychological screening in trauma dental clinics, and describe a feasible, low-resource, integrated dental-mental-health pathway suited to Indian schools and primary care. Future Indian research should prioritise prospective studies combining dental and psychiatric assessment after TDI, validated screening embedded within dental trauma services, and evaluation of trauma-informed first-aid education as a joint prevention strategy.

Introduction

Traumatic dental injuries (TDIs) fractures, luxations and avulsions of the teeth and supporting structures are a leading cause of unplanned dental attendance in children and adolescents worldwide. A recent systematic review and meta-analysis pooling data from 151,205 patients across 30 studies estimated an overall pooled prevalence of 19.5%, with individual study estimates ranging from under

2% to nearly 87% depending on setting, age group and diagnostic criteria.¹ A related meta-analysis of 34,382 traumatised permanent teeth from 20 countries found that 14% presented with more than one injury pattern affecting the same tooth, most often an enamel-dentin fracture combined with subluxation, underscoring that many TDIs are not simple,

* Corresponding author: Dr Vrinda Saxena, Professor and Head, Department of Public Health Dentistry, Government College of Dentistry, Indore 452001, India. Email: dr.vrinda@gmail.com .Tel: +91 9981175126

isolated events but complex injuries with a correspondingly complex recovery trajectory.² In India, three recent cross-sectional school surveys illustrate both the scale of the problem and the gap in its recognition. Among 2,732 schoolchildren aged 8–12 years in Goa, 7.4% had sustained a TDI, predominantly single-tooth enamel fractures of the maxillary central incisors; strikingly, 39.6% of affected children were unaware that they had experienced dental trauma at all, and only 12.4% had ever sought treatment.³ A Hyderabad survey of 2,046 children aged 8–13 years reported an 8.5% prevalence, again concentrated in younger boys with increased overjet and incompetent lip seal.⁴ In Faridabad, Haryana, children with visible maxillary incisor trauma showed the greatest impact on the ability to smile 80% of affected children reported this as their most disrupted daily performance well ahead of any functional or speech-related impact.⁵ Together these Indian data show a consistent pattern: dental trauma in children is common, concentrated in the most socially visible teeth, frequently invisible to the child or family as a health event, and rarely followed by professional dental or psychological evaluation. Child and adolescent mental health professionals are well placed to recognise a pattern that dental epidemiology alone cannot

fully capture: an injury to the face and mouth is not merely a cosmetic or functional problem. The mouth is central to smiling, speaking, eating and social signalling, and an injury there particularly one that is visible, painful, or the result of an accident, fall, assault or road traffic event carries the same ingredients (sudden onset, threat, loss of control, visible bodily change) that predispose to acute stress reactions and post-traumatic stress disorder (PTSD) after other paediatric injuries.^{6,7} Yet the psychiatric literature on paediatric PTSD after injury rarely mentions dentofacial trauma specifically, and the dental literature on TDI rarely uses validated psychiatric instruments. This review aims to bridge that gap: to summarise what is currently known about the psychological and psychiatric sequelae of dental trauma in children and adolescents, to identify Indian-specific gaps, and to propose a practical, low-resource pathway for joint dental-mental-health attention to this common but under-recognised injury.

Methods

This is a narrative review rather than a systematic review. Relevant literature was identified through targeted searches of PubMed/MEDLINE using combinations of the terms "traumatic dental injury", "dental trauma", "tooth avulsion", "tooth fracture",

"post-traumatic stress disorder", "anxiety", "quality of life" and "child" or "adolescent", supplemented by review of the reference lists and related-article suggestions of retrieved papers. Priority was given to systematic reviews and meta-analyses where available, to Indian data where available, and to studies published within the last decade, though seminal or uniquely relevant older studies were retained. Given the narrative design, no formal risk-of-bias or PRISMA assessment was undertaken; this is a limitation acknowledged later in the review.

Epidemiology of Traumatic Dental Injuries in Children and Adolescents

TDIs peak during two developmental windows: early childhood, when falls during the acquisition of walking and running predominate, and later childhood/early adolescence (roughly 8–12 years), when the permanent maxillary incisors are erupting, often still proclined, and children are most active in unsupervised play and contact sport.^{3,4}

Across settings, boys consistently outnumber girls, and the maxillary central incisors are overwhelmingly the most affected teeth, with enamel-only or enamel-dentin fractures being the commonest injury type; this pattern was replicated in Goa, Hyderabad and Faridabad alike.^{3,4,5} A systematic review and meta-

analysis of 17 studies found that children of lower socioeconomic status had 17% greater odds of TDI than their higher-status peers, an effect that was strongest when socioeconomic status was measured by household income and in upper-middle-income countries a category that includes India.⁸ Two well-established anatomical risk factors, increased overjet and incompetent lip seal, have each been confirmed by dedicated meta-analyses: an overjet of 3 mm or more in the primary dentition and of 5 mm or more in the mixed and permanent dentition roughly doubles to triples the odds of TDI,⁹ while lip incompetence increases the odds by a factor of roughly 2.4 to 3.8 depending on the dentition stage.¹⁰ Both risk factors are readily identifiable during a routine dental or orthodontic examination, offering a practical entry point for anticipatory guidance.

The Psychological Sequelae of Dental Trauma: Beyond the Tooth

Acute distress and a post-traumatic stress framework

Dental trauma shares core features with other paediatric injuries known to precipitate PTSD: it is typically sudden, unanticipated, painful, and often accompanied by visible blood, disfigurement or a frightening fall or collision. In the general paediatric injury literature, a study of children and parents following traffic

accidents in Japan found that 10.1% of children and 22.1% of parents met criteria for being at high risk of PTSD, with children's and parents' stress scores significantly and positively correlated with one another a reminder that a child's psychological recovery from an injury is entangled with the caregiver's own distress.⁶ Comparable rates have been documented after other sudden, unanticipated childhood traumas: 51% of children in Kathmandu showed moderate-to-severe PTSD symptoms fifteen months after the 2015 Nepal earthquake, with younger children, greater exposure severity, and poorer baseline psychosocial functioning acting as independent predictors.⁷ No published Indian study has yet applied an equivalent validated PTSD instrument specifically to a cohort of children following dental trauma, representing one of the clearest gaps this review identifies.

A validated, cross-culturally tested instrument well suited to fill this gap already exists: the UCLA PTSD Reaction Index for DSM-5 (PTSD-RI-5), a self-report screening tool whose four-factor structure matching DSM-5 re-experiencing, avoidance, negative cognition/mood, and arousal criteria was confirmed in a sample of 4,201 adolescents drawn from eleven countries, with excellent internal consistency (Cronbach's alpha 0.90–

0.94 across countries).¹¹ Its brevity and self-report format make it a realistic candidate for use in a busy dental trauma clinic, either as a stand-alone screen after significant TDIs or embedded within a broader dental-trauma follow-up protocol.

Dental anxiety and re-injury fear

A more dentistry-specific psychological sequela is the fear of re-injury, distinct from generalised dental anxiety, which has recently been operationalised for the first time in a validated instrument. Working with an Indian sample of young boxers aged 10–16 years a population at particularly high and repeated risk of orofacial trauma Ravi and colleagues developed and psychometrically validated a ten-item Oral Re-injury Anxiety Scale for Young Boxers (ORAS-YB), demonstrating a five-factor structure explaining 56.4% of variance and acceptable internal consistency (Cronbach's alpha 0.74).¹² This Indian-led tool is directly transferable, with adaptation, to any child or adolescent returning to contact sport, physical play, or even routine activity after a TDI, and represents exactly the kind of joint dental-psychological instrument this review argues is needed more broadly.

Oral health-related quality of life: emotional and social domains

The most extensively studied psychological outcome after paediatric TDI is oral health-related quality of life (OHRQoL), typically measured using validated child- or parent-report instruments such as the Child Perceptions Questionnaire (CPQ) or the Pediatric Oral Health-Related Quality of Life (POQL) scale. A systematic review of 25 studies concluded that TDI of permanent teeth strongly influences children's and adolescents' OHRQoL, with sociodemographic status, parental education, gender, age and schooling type all modifying the size of the impact, and confirmed that timely treatment mitigates the biological and socio-psychological consequences.¹³ Notably, however, a meta-analysis restricted specifically to uncomplicated TDIs enamel or enamel-dentin fractures and discolouration, which make up roughly two-thirds of all TDIs found no significant overall effect on OHRQoL (pooled odds ratio 0.96, 95% CI 0.85–1.10), suggesting that psychological impact is not automatic but scales with injury severity, visibility and treatment complexity.¹⁴

Complicated and avulsion-type injuries tell a different story. In a Turkish case-control study, children with a history of dental avulsion scored significantly worse than healthy peers on the social and total POQL domains, with

girls more affected than boys in both emotional and social subscales; the loss of a replanted tooth over time produced a borderline-significant worsening of emotional scores.¹⁵ In Ibadan, Nigeria, dental treatment of previously identified TDI cases produced a large improvement in the emotional well-being domain of the Child Perception Questionnaire (68.6% adversely affected before treatment falling to 19.6% after) and in social well-being (66.7% falling to 43.1%), even though functional-limitation scores paradoxically worsened, illustrating that treatment relieves emotional distress even when some functional trade-offs remain.¹⁶ A qualitative study of children, adolescents and families in New Zealand following dental avulsion identified emotional and psychological impact as one of five major themes emerging from semi-structured interviews, with the degree of distress shaped by how quickly emergency care was accessed and by parental or caregiver awareness of appropriate first aid.¹⁷ Even in the primary dentition, a four-year case-report follow-up of a TDI sustained at age four documented negative OHRQoL effects that persisted into the successor permanent tooth, improving only once treatment for the sequela was completed evidence that psychological and quality-of-life consequences of early dental

trauma can echo forward across the transition to permanent teeth.^{10,18} In preschool children specifically, parental psychological factors sense of coherence, self-efficacy, and health locus of control independently predicted the child's OHRQoL after TDI, showing that the caregiver's own psychological resources shape the young child's recovery just as they do after traffic-accident trauma.^{6,19}

Self-esteem, social visibility, and the primacy of the smile

A recurring and clinically important finding across the reviewed studies is that the social and emotional domains of quality of life are consistently more affected than physical or functional domains, and that this effect concentrates in visible anterior teeth. In Faridabad, the ability to smile was the single most impacted daily performance (80% of affected children), far ahead of speaking (4.4%).⁵ In the New Zealand qualitative interviews, children described self-consciousness about smiling and being seen, alongside more concrete practical burdens.¹⁷ This pattern is consistent with a broader developmental literature in which visible facial and dental difference is linked to teasing, self-consciousness and social withdrawal in school-aged children, even though this specific link has been better established for conditions such

as malocclusion than for acute TDI, and represents a promising area for dedicated Indian research given the strong emphasis placed on smiling and appearance in Indian school social life.

Risk Factors and Vulnerable Subgroups

Beyond the anatomical and socioeconomic risk factors already described, several subgroups of children and adolescents merit particular mental health attention because either their baseline vulnerability increases TDI risk, or a TDI carries disproportionate psychological weight for them.

Neurodevelopmental comorbidity

In a Turkish study of 88 children undergoing orthodontic treatment for malocclusion, parent-reported attention-deficit hyperactivity disorder (ADHD) symptoms were present in 15.9% of subjects — appreciably higher than general-population estimates and the most affected quality-of-life domain was psychological discomfort; children with malocclusion, a known TDI risk factor, thus overlap substantially with a population already carrying elevated psychiatric burden.²⁰ Because impulsivity and inattention are themselves independent risk factors for unintentional injury broadly, children presenting with recurrent or multiple TDIs may warrant screening for underlying neurodevelopmental

conditions rather than being treated as isolated dental accidents.

Contact sport and repeated trauma

Adolescents in contact sports such as boxing face a fundamentally different psychological task after TDI: not simply recovering from a single injury, but returning to an activity with a known, elevated risk of re-injury. The development of the ORAS-YB specifically for this population reflects a recognition that reinjury anxiety can hamper both psychological wellbeing and athletic performance, an issue previously studied in general sports medicine but only recently extended to orofacial trauma.¹²

Refugee, displaced and socioeconomically disadvantaged children

Among refugee preschool children in Germany, 30% screened positive for PTSD symptoms using the Child and Adolescent Trauma Screening instrument, and while child PTSD status was not itself significantly associated with dental health (measured by decayed-missing-filled-teeth index) in this small sample of 44 children, parental mental health screening scores were significantly and positively associated with the child's dental health, again highlighting the caregiver as a key mediating variable.²¹ Combined with the independent finding that lower socioeconomic status raises

TDI risk by 17%,⁸ this suggests that the most psychologically and socially vulnerable children may also be the most likely to sustain dental trauma and the least likely to receive coordinated dental and mental health follow-up a pattern with direct relevance to underserved rural and peri-urban Indian populations.

Temporomandibular and chronic pain sequelae

A minority of orofacial and dental trauma cases progress to chronic temporomandibular joint (TMJ) dysfunction or facial pain syndromes, in which psychological factors (alongside structural and neurogenic ones) are recognised contributors to symptom chronicity and require distinguishing during evaluation.²² A Portuguese forensic case series of orofacial trauma similarly emphasised a biopsychosocial model, noting that TMJ involvement and psychosocial repercussions frequently co-occurred and that dental medico-legal evaluation should account for psychological sequelae alongside physical injury.²³ These findings argue for periodic reassessment of children with persistent facial or jaw pain after TDI, rather than assuming resolution once acute treatment is complete.

A Bidirectional Relationship: Psychosocial Status as a Predictor, Not Only a Consequence, of Dental Trauma

Perhaps the most conceptually important finding for child and adolescent mental health professionals comes from a Brazilian cohort study using confirmatory factor analysis and structural equation modelling, which found that psychosocial status was the main predictor of new TDI incidence in schoolchildren, with better psychosocial status exerting a direct protective effect.²⁴ In this model, known anatomical risk factors such as increased overjet and lower parental education influenced TDI risk indirectly, mediated through the child's psychosocial status, and children in areas with poorer contextual socioeconomic indicators faced higher risk through the same psychosocial pathway. This reframes the relationship between mental health and dental trauma from a simple one-way consequence (trauma causes distress) to a bidirectional cycle in which pre-existing psychosocial vulnerability increases injury risk, and the resulting injury and its social visibility can, in turn, further affect mental wellbeing a cycle with practical implications for both prevention and follow-up care.

The Indian Context: Gaps and Opportunities

India's own school-based dental surveys are methodologically strong on epidemiology and consistently document that most TDIs go

untreated,^{3,4,5} but none of the reviewed Indian studies incorporated a validated psychiatric outcome measure, and no Indian study has combined a paediatric PTSD screen with a dental trauma register. The one Indian instrument-development study identified in this review, the ORAS-YB, was purpose-built for young boxers and has not yet been tested in general-population children after everyday falls, road-traffic incidents or playground injuries the far larger share of Indian paediatric TDIs.¹² Given that India already has an established network of pediatric and public health dentistry departments conducting large school-based epidemiological surveys, embedding a brief, validated psychological screen (such as an adapted PTSD-RI-5 or a locally validated re-injury/dental anxiety measure) into existing survey and follow-up protocols would be a low-cost, high-yield first step. Equally, the finding that psychosocial status independently predicts TDI incidence²⁴ argues for testing school-based psychosocial support or resilience programmes as a dental trauma prevention strategy in Indian schools, alongside the more familiar mouthguard and anticipatory-guidance approaches already validated for reducing injury severity.²⁵

Toward an Integrated Dental-Mental-Health Pathway: Clinical and Policy Implications

Table 1. A proposed low-resource integrated dental-mental-health pathway for paediatric traumatic dental injury

Step	Action	Responsible team
1. Triage	Record injury type, tooth visibility, and whether the child/family sought care promptly	Dentist / school health worker
2. Brief screen	Ask about smiling/speaking avoidance, sleep disturbance, re-injury fear, and re-enactment or avoidance behaviours	Dentist, with 5-minute structured checklist
3. Caregiver check-in	Briefly assess caregiver distress and first-aid knowledge; caregiver distress predicts child recovery	Dentist / school counsellor
4. Referral threshold	Persistent avoidance, sleep disturbance, or distress beyond 4 weeks, or any injury from assault/road-traffic trauma	Refer to child & adolescent mental health service
5. Follow-up	Reassess OHRQoL and psychological symptoms at treatment completion, not only tooth survival	Joint dental-psychology review

Table 1 outlines a proposed, low-resource pathway for joint dental and mental health attention to paediatric TDI, feasible within existing Indian pediatric dentistry, public health

dentistry and school health infrastructure. Four principles underpin it. First, treat visible anterior tooth injuries as a marker of likely emotional impact even when the physical injury is minor, since severity of injury and severity of distress do not always correspond.^{14,16} Second, ask about the child's willingness to smile, speak and socialise at school as a simple, low-burden proxy for the emotional and social OHRQoL domains most consistently affected.^{5,17} Third, assess the parent or caregiver alongside the child, since caregiver distress and psychological resources repeatedly emerged as predictors of the child's own recovery trajectory across multiple studies in this review.^{6,19,21} Fourth, treat recurrent TDI, and TDI in children with known malocclusion or lip incompetence, as an opportunity to screen for underlying neurodevelopmental or psychosocial vulnerability rather than as a purely restorative dental problem.^{10,20}

Limitations of the Current Evidence

Most reviewed OHRQoL studies are cross-sectional, limiting causal inference, and heterogeneity in instruments (POQL, CPQ and its variants) and in injury classification restricts direct comparison across studies.^{13,14} Genuinely psychiatric outcome measures (validated PTSD or anxiety-disorder instruments administered by or in consultation with mental health

professionals) are almost entirely absent from the dental trauma literature reviewed here, with the ORAS-YB and PTSD-RI-5 representing rare exceptions developed for narrow or unrelated populations.^{11,12} As this is a narrative rather than a systematic review, publication bias and selective emphasis cannot be excluded, and the search was not exhaustive; the conclusions should be read as a synthesis for hypothesis generation and clinical sensitisation rather than as pooled quantitative evidence.

Conclusion

Traumatic dental injuries are common, frequently invisible as a health event to the families who experience them, and carry a psychological burden that is real but inconsistently measured, particularly using genuinely psychiatric instruments. The evidence reviewed here supports three concrete steps for Indian child and adolescent mental health practice: routinely asking about recent dental trauma when assessing childhood injury or distress, given its established links to anxiety, avoidance and impaired quality of life; collaborating with pediatric and public health dentistry colleagues to embed brief, validated psychological screening into existing school dental survey and dental trauma follow-up systems; and prioritising Indian research that

combines dental and psychiatric assessment prospectively, since psychosocial status appears to be not only a consequence but also an independent predictor of dental trauma itself. Positioning dental trauma as a sentinel event for psychological vulnerability, rather than a purely restorative dental problem, offers a low-cost opportunity to identify and support at-risk children earlier than current practice allows.

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