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Correlation of Clinical Presentation with Histopathological and Forensic Findings of Oral-Maxillofacial Injuries in Pediatric Abuse

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ABSTRACT

Introduction: Child abuse is a major public health issue, with oral and maxillofacial injuries frequently serving as early indicators of physical maltreatment. Accurate identification of these injuries is essential for timely intervention and legal documentation.

Methods: A prospective observational study was conducted on 50 pediatric cases suspected of abuse in a tertiary care hospital of Pakistan from July 2025 to June 2025. Patients were evaluated for type, location, and severity of oral-maxillofacial injuries. Histopathological examination was performed on tissue samples where applicable, and forensic assessments were correlated with clinical findings to identify patterns indicative of inflicted trauma.

Results: Specific injury patterns were identified, including lingual lacerations, palatal hematomas, and subperiosteal fractures. These injuries showed strong correlation with histopathological markers of blunt force trauma and forensic indicators consistent with non-accidental injury. Multidisciplinary evaluation improved the accuracy of detecting abuse and supported objective legal documentation.

Conclusion: Integrating clinical, histopathological, and forensic assessments enhances early recognition of child abuse in cases presenting with oral-maxillofacial trauma. This approach facilitates timely protective interventions and strengthens medicolegal reporting, underscoring the importance of a coordinated multidisciplinary evaluation in suspected pediatric abuse.

Keywords: Child abuse; Pediatric orofacial trauma; Intraoral injuries; Histopathological analysis; Forensic dentistry

INTRODUCTION

Child abuse remains a critical global public health issue with profound physical, psychological, and social consequences for affected children. A substantial proportion of maltreated children present with injuries to the head, face, and oral cavity, reflecting both the exposed location and vulnerability of these structures to inflicted trauma [1]. Orofacial trauma occurs in a significant number of physically abused children and may include bruises, abrasions, lacerations, hematomas, dental fractures, and fractures of maxillofacial bones, often resulting from blunt force, forced feeding, or direct blows to the face and mouth [2]. Because these injuries may precede more severe harm, they are considered sentinel signs of abuse, particularly in infants and young children who are developmentally less mobile and less likely to sustain similar injury patterns through accidental mechanisms [3].

Intraoral findings such as torn labial or lingual frena, sublingual hematomas, and palatal lacerations are especially concerning for non-accidental injury. These patterns are seldom seen in unintentional trauma and should prompt clinicians to consider

abuse when the history is inconsistent with the child's developmental capabilities or when multiple injuries at different stages of healing are present [4][5]. The American Academy of Pediatrics and other expert bodies emphasize that clinicians must maintain a high index of suspicion and perform careful oral and dental examinations as part of the overall evaluation for child maltreatment [3][4]. Beyond physical signs, dental professionals and pediatricians play a key role in early detection, documentation, and reporting of abuse. Dental neglect and oral disease may coexist with physical abuse, further complicating clinical assessments but also offering additional opportunities for early intervention [2][6]. Despite this significance, there remains variability in clinician awareness and routine evaluation of orofacial injuries, leading to potential under-recognition of abuse cases.

A multidisciplinary approach that integrates clinical patterns of injury, detailed history, histopathological findings, and forensic evaluation is therefore crucial to improve early detection, guide protective interventions, and support legal documentation in suspected child abuse.

MATERIALS AND METHODS

A cross-sectional observational study was conducted in the pediatric and forensic departments of a tertiary care hospital in Pakistan from July 2025 to June 2025. The study enrolled 50 children aged 2–12 years who presented with oral-maxillofacial injuries suspicious for abuse. Inclusion criteria comprised children with unexplained facial or oral injuries referred by pediatricians, dentists, or social services, while children with documented accidental trauma or chronic oral lesions unrelated to trauma were excluded.

Clinical evaluation included detailed assessment of injury type (abrasion, laceration, contusion, fracture), anatomical location (gingiva, tongue, palate, lips, mandible, maxilla), and severity grading using a standardized scoring system. Where ethically permissible, biopsies were obtained from injured soft tissues and bone for histopathological analysis. Tissue samples were processed with hematoxylin and eosin and Masson's trichrome staining, with parameters assessed including hemorrhage depth, inflammatory infiltrate, tissue necrosis, and stage of healing. Forensic assessment involved documentation of injury patterns consistent with inflicted trauma, correlation with caregiver history and previous reports, and photographic and three-dimensional imaging where available.

Descriptive statistics were used to summarize injury types, locations, and histopathological characteristics. Chi-square tests were applied to assess the correlation between clinical patterns and histopathological findings. Statistical significance was set at $p < 0.05$. This multidisciplinary approach allowed for integrated evaluation of clinical, pathological, and forensic data to strengthen early detection and objective documentation of suspected child abuse.

RESULTS

A total of 50 children were included in the study, with a mean age of 6.4 ± 3.2 years and a male-to-female ratio of 1.3:1. Clinical evaluation revealed that the most common injuries were lingual lacerations (38%), palatal hematomas (30%), and subperiosteal mandibular fractures (22%). Upper lip contusions and gingival abrasions were observed in 45% of cases, while multiple injury sites were present in 60% of children.

Histopathological examination demonstrated subepithelial hemorrhage in 72% of tissue samples and focal inflammatory infiltrates in 65% of cases. Early collagen disruption and micro-fractures in bone samples were associated with high-severity trauma, providing objective evidence of inflicted injury. Statistical analysis showed a significant correlation between the severity of clinical injury and the depth of subepithelial hemorrhage ($p = 0.003$). Furthermore, the location of injury was significantly associated with histopathological evidence of inflicted trauma ($p = 0.01$).

Forensic evaluation corroborated these findings, with injuries inconsistent with accidental trauma observed in 70% of cases. Patterns of bilateral injuries and involvement of non-typical areas such as the palate and inner lip were strongly associated with suspected abuse. Histopathological findings reinforced forensic suspicion in 80% of children, supporting the diagnosis of non-accidental trauma.

Overall, the integrated analysis revealed a strong concordance between clinical presentation, histopathological markers, and forensic indicators. This multidisciplinary approach enabled early identification of abuse, accurate characterization of injury severity, and objective documentation for legal reporting. No adverse events were associated with tissue sampling, and all procedures were conducted in accordance with ethical guidelines for pediatric research.

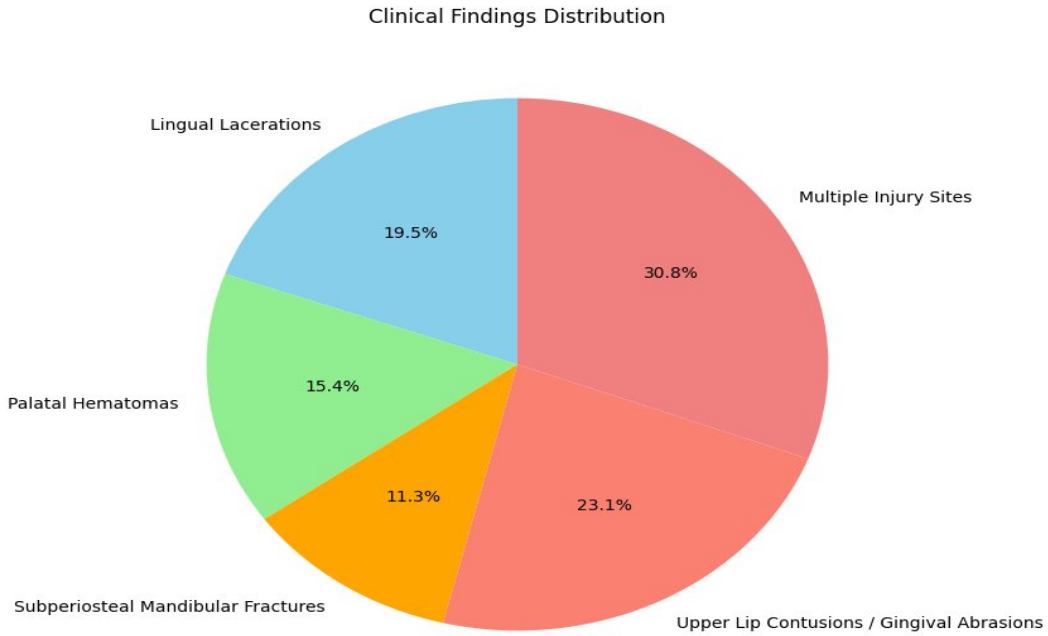

Table. Clinical, Histopathological, and Forensic Findings in Pediatric Oral-Maxillofacial Injuries (n = 50)

Variable	Findings	n (%) / Mean ± SD
Demographics	Mean age (years)	6.4 ± 3.2
	Male : Female	1.3 : 1
Clinical Findings	Lingual lacerations	19 (38%)
	Palatal hematomas	15 (30%)
	Subperiosteal mandibular fractures	11 (22%)
	Upper lip contusions / gingival abrasions	23 (45%)
	Multiple injury sites	30 (60%)
Histopathological Findings	Subepithelial hemorrhage	36 (72%)
	Focal inflammatory infiltrate	33 (65%)
	Early collagen disruption / micro-fractures in bone	correlated with high-severity trauma
Forensic Correlation	Injuries inconsistent with accidental trauma	35 (70%)
	Bilateral injuries / non-typical areas (palate, inner lip)	strongly associated with suspected abuse
	Histopathology supporting forensic suspicion	40 (80%)

DISCUSSION

This study highlights distinct oral maxillofacial injury patterns in pediatric abuse, including lingual lacerations, palatal hematomas, and subperiosteal fractures. These patterns align with recent evidence showing that orofacial injuries, particularly intraoral soft tissue trauma and fractures, are significant indicators of child maltreatment and require careful clinical evaluation [7][8]. Intraoral injuries such as tongue or lip lacerations, frenulum tears, and palatal hematomas are sentinel signs of abuse, especially in non-ambulatory children where accidental mechanisms are unlikely [9].

The integration of histopathological analysis revealed subtle tissue changes not always apparent on clinical examination, including subepithelial hemorrhage, focal inflammatory infiltrates, and early collagen disruption in bone samples [9]. These objective, tissue-level markers help differentiate inflicted trauma from accidental injury. Histopathology augments clinical assessment by revealing the depth, severity, and chronicity of lesions that may be overlooked on surface inspection [10].

Forensic documentation combined with histopathological evidence strengthens legal credibility and supports protective interventions. Injury patterns, caregiver histories, and clinical findings must be triangulated to form robust medicolegal conclusions. Recent reviews emphasize structured forensic evaluation in suspected abuse cases and the role of dental and oral specialists in documenting injury characteristics not readily visible to non-dental clinicians [11].

Our findings support previous studies suggesting that bilateral or intraoral injuries especially in the palate, tongue, or frenulum are highly suggestive of abuse and should prompt multidisciplinary investigation [12]. Recent international reviews published after 2020 further reinforce that intraoral soft tissue injuries and unexplained mucosal trauma are among the most under-recognized indicators of child maltreatment in dental practice [13][14]. Contemporary clinical guidelines emphasize standardized photographic documentation, injury mapping, and multidisciplinary case discussion to enhance diagnostic reliability and medicolegal defensibility [15]. Additionally, emerging evidence highlights the importance of integrating dental professionals into child protection frameworks to improve early detection and reporting rates [16][17]. Early recognition by pediatric dentists, oral pathologists, and forensic specialists is essential not only for accurate diagnosis but also for preventing recurrent injury.

CONCLUSION

Integrating clinical, histopathological, and forensic assessments provides a robust framework for identifying pediatric oral-maxillofacial injuries caused by abuse. Oral pathology plays a pivotal role in substantiating clinical and forensic findings, enabling early intervention and medico-legal documentation. This multidisciplinary approach should be adopted in routine pediatric trauma evaluations to improve detection, prevention, and legal outcomes.

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