



ORIGINAL RESEARCH PAPER

Dentistry

CRACKED SMILES: THE PREVALENCE AND GENDER DISPARITIES OF DENTAL FRACTURES IN ANTERIOR AND POSTERIOR TEETH AMONG THE RESIDENTS OF HYDERABAD - A COMPREHENSIVE CROSS-SECTIONAL STUDY

KEY WORDS: Tooth fracture, Gender, Prevalence, Intraoral Camera, Hyderabad

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ABSTRACT

Background: Dental fractures, a common and significant issue, often lead to pain, functional impairment, and aesthetic concerns. These fractures can occur in both anterior and posterior teeth, with potential differences in prevalence and severity based on a range of factors, including gender. **Objective:** To determine the prevalence of fracture in anterior and posterior teeth in the male and female population of Hyderabad. **Materials And Methods:** This study was conducted by OroGlee Solutions Private Limited, Hyderabad. A total of 3662 subjects aged 11 - 50 years were examined. The oral examination was done using an intraoral camera. **Results:** The prevalence of anterior teeth fracture in males and females was 13.72% and 9.13% respectively. The prevalence of posterior teeth fracture in males and females was 8.99% and 4.17% respectively. Chi square test was used to determine the significance of the difference between the prevalence of anterior and posterior teeth fracture in males and females. p-value for both anterior and posterior fractures was <0.05 which is significant, thus showing higher prevalence of these fractures in males than in females. **Conclusion:** Males exhibit a greater frequency of anterior and posterior fractures compared to women. Potential lifestyle and behavioural factors contribute to this disparity. By understanding these patterns, dental health professionals can better design and implement effective strategies to reduce the incidence of dental fractures, ultimately improving the oral health and quality of life of the patients.

INTRODUCTION

Traumatic dental injuries (TDIs) are injuries to teeth or oral cavity caused by an external force on the teeth and surrounding tissues. They are known to occur promptly and abruptly necessitating immediate medical attention.^[1] TDIs are a serious concern that can affect one's oral health and quality of life. It is anticipated that TDIs will rank as the fifth most prevalent dental condition worldwide.^[2]

The incidence of fracture is influenced by tooth anatomy and the functional force delivered to cusps.^[3] Most dental injuries affect the maxillary anterior teeth. The leading causes of these injuries are falls, sports, bicycling and traffic accidents. Predisposing variables for dental trauma may include anatomical traits such as greater overjet and poor lip coverage of upper anterior teeth.^[4] Studies have shown that greater the overjet, the higher the risk of severe injury to the anterior teeth.^[5]

Males have shown higher prevalence of anterior tooth fracture when compared to females due to trauma that could be attributed to occupational accidents, road traffic accidents, sports injuries and violence.^[6]

In contrast, posterior teeth, especially non-carious, non-endodontically treated, and unrestored ones, may occasionally shatter due to repetitive high occlusal stresses.^[7] Functional cusps (lingual cusps for upper teeth and buccal cusps for lower teeth) are more prone to fractures since they are responsible for food crushing and grinding.^[8] The prevalence of teeth fracture among posterior teeth, has been found to be higher in molars, particularly in the mandibular arch, due to their susceptibility to caries and thus the frequent need for restoration. Tooth morphology also affects the incidence of tooth fracture in posterior teeth.^[9]

Some studies have explored fractures of posterior teeth and reported various incidence rates ranging from 20.5 per 1000 people/year to 69.9 per 1000 people/year. These incidence estimates, although variable, suggest that posterior teeth fractures are a significant concern.^[8]

However extensive research on the prevalence of fracture of anterior and posterior teeth are scarce, despite these differences.

The aim of this article is to provide a comprehensive examination and comparative analysis of anterior and posterior tooth fractures among the male and female population of Hyderabad. By stating the differences between each form of dental fracture, this article seeks to empower dental practitioners with the knowledge and insights necessary for delivering patient-centered care, that caters to the unique needs of the people presenting with anterior or posterior tooth fractures.

MATERIALS AND METHODS:

A cross-sectional survey was conducted by OroGlee Solutions Private Limited among the students from different schools and employees of various corporate offices in the city of Hyderabad. A total of 3662 children & adults were examined at their respective schools and places of work. A survey questionnaire was prepared to acquire personal details such as age, gender, occupation, hometown, relevant dental and medical history.

Approval from the respective school administration was taken to examine their students. In corporate offices, informed oral consent of the participants was obtained before examination. Oral examination was done using an intraoral camera which consisted of a handheld camera unit equipped with a high-resolution sensor and built-in illumination, connected to a computer workstation for image capture and storage. Standardized intraoral images of each quadrant of the mouth were captured, including the occlusal, buccal and lingual surfaces.

Inclusion Criteria:

Participants from the age group of 11 to 50 years were included in the study.

Exclusion Criteria:

1. Participants below the age of 11 years and those above the age of 50 years were excluded from the study.
2. The third molars were excluded from the study.

Data analysis was done using SPSS version 29. Chi-square test was used to determine the significance of difference between the prevalence of anterior teeth fracture and posterior teeth fracture in males and females. $p \leq 0.05$ was considered statistically significant.

RESULTS:

A total of 3662 subjects, aged between 11 to 50 years participated in the study. Out of these, 712 participants had teeth fracture which accounts for 19.44%. Among 3662 participants, 2391 were males and 1271 were females. Among 2391 males, 543 (22.71%) have teeth fracture and among 1271 females, 169 (13.30%) have teeth fracture. (Table 1)

Table 1: Prevalence of fracture of teeth in males and females

Gender	Total number of participants	Number of participants with fracture (n)	Percentage of participants with fracture (%)
Males	2391	543	22.71%
Female	1271	169	13.30%

Number of males with anterior teeth fracture was 328 (13.72%) and number of males without anterior teeth fracture was 2063 (86.28%). Number of females with anterior teeth fracture was 116 (9.13%) and number of females without anterior teeth fracture was 1155 (90.87%). Chi-square test was conducted to determine the significance of difference between prevalence of anterior teeth fracture in males and females. The Chi-square test result was 16.42 which is higher than the value 3.84 for the significance level of 0.05. The result is significant at $p < 0.05$. The p-value for our study is < 0.000051 . This result shows a higher prevalence of fracture of anterior teeth in males when compared to females. (Table 2)

Table 2: Prevalence of fracture of anterior teeth in males and females

Gender	Number of people with anterior tooth fracture	Percentage of people with anterior tooth fracture	Number of people without anterior tooth fracture	Percentage of people without anterior tooth fracture	Total
Male	328	13.72%	2063	86.28%	2391
Female	116	9.13%	1155	90.87%	1271
Total	444		3218		3662

Number of males with posterior teeth fracture was 215 (8.99%) and number of males without posterior teeth fracture was 2176 (91.01%). Number of females with posterior teeth fracture was 53 (4.17%) and number of females without posterior teeth fracture was 1218 (95.83%).

Gender	Number of people with posterior tooth fracture	Percentage of people with posterior tooth fracture	Number of people without posterior tooth fracture	Percentage of people without posterior tooth fracture	Total
Male	215	8.99%	2176	91.01%	2391
Female	53	4.17%	1218	95.83%	1271
Total	268		3394		3662

Chi-square test was conducted to determine the significance of difference between prevalence of posterior teeth fracture in males and females. The Chi-square test result is 28.45 which is higher than the value 3.84 for the significance level of 0.05. The result is significant at $p < 0.05$. The p-value for our study is < 0.00001 . This result shows a higher prevalence of fracture of

posterior teeth in males when compared to females. (Table 3)

DISCUSSION:

Dental trauma is a major health concern in many nations, with greater occurrence rates among children and adolescents.^[10] The prevalence of traumatic dental injuries worldwide ranges from 6 to 37%.^[11] Traumatic dental injuries are more prevalent in permanent (58.6%) than in primary dentition where they constitute 36.8%.^[4] Effective interventional strategies are critical because of the detrimental effects of dental trauma on the quality of life of the patients, psychological and social issues and the direct and indirect expenses of the treatment.^[10]

Prevalence of Tooth Fracture:

Oral traumatic injuries account for 5% of all body injuries across all age groups. They are more common in men than in women.^[12] This could be explained by the fact that males tend to participate in more intense games and high-impact sports. In contrast, females are less likely to sustain traumatic dental injuries due to social structures and cultural norms that discourage them from engaging in rigorous outdoor activities.^[13]

More than 75% of tooth fractures occur in the upper jaw, primarily affecting central incisors, followed by lateral incisors and canines due to their anatomical position in the oral cavity and increased overjet.^[12,14] Patients with proclined maxillary incisors and canines had a 3.5-fold increased risk of dental damage.^[5]

The prevalence of TDIs to permanent anterior teeth ranges from 4.1% to 58.6% worldwide.^[15]

Among posterior teeth, mandibular second molars are the most affected, followed by mandibular first molars and maxillary premolars. Mandibular premolars are the least affected.^[16] Mandibular molars are more prone to fracture than maxillary molars because of their unique crown structure, intercusp interactions, and exposure to higher masticatory stresses.^[17]

Etiology:

Traumatic dental injuries are caused by either a direct or indirect impact. The severity of the damage depends on the energy, direction, and shape of the impacting object and the response of the tissues surrounding the tooth.^[12]

The patient's home has frequently been identified as the leading location for sustaining dental trauma in both the primary and permanent dentition. This was followed by school-related injuries.^[2]

According to a study done by the Susham Gojanur et al., the etiology of traumatic injuries was largely due to falls (71.1%), followed by bicycle accidents (11.1%), collisions (8.9%), aggression (6.7%), and bike accidents (2.2%).^[11]

Furthermore, it is estimated that restorative work can weaken a tooth and increase the chance of fracture by up to 29 times when compared to a tooth that is healthy and undamaged.^[18]

Classification of Tooth Fracture:

Dental injuries are classified based on various aspects, including causation, anatomy, and treatment options. Most commonly used classification of tooth fracture is Ellis & Davey classification, proposed in 1970. This classification has divided tooth fracture into 9 Classes (Class I – IX) based on the extent of the damage to the tooth structure.^[19]

Some other classification of tooth fracture which are used include:^[20]

- Bennette's Classification (1963)
- Classification Of Traumatic Injuries by Johnson (1981)

- Classification based upon system adopted by the WHO in its "Application of International Classification of Diseases to Dentistry and Stomatology" (1992)
- Classification by Hamilton et al. (1997)
- Classification by McDonald (2004)

Diagnostic considerations:

The diagnosis of fractured tooth can be done by using various methods, which include:^[21]

1. **Visual Inspection:** The dentist examines the tooth for visible signs of cracks, chips or other damage.
2. **Palpation & Percussion:** Assessment of the tenderness or sensitivity of the fractured tooth and surrounding structures is done.
3. **Transillumination:** It uses a bright light or fiber-optic device to highlight cracks and fractures by illuminating the tooth.
4. **Radiographic Imaging:** It helps in diagnosing tooth fractures by providing detailed images of the tooth and surrounding structures.
5. **Thermal and electrical stimuli:** It helps in assessing the vitality of the tooth's pulp to determine if the nerve is affected.

Treatment Options:

The classic procedures for restoring damaged teeth include partial coverage crowns, full coverage crowns, composite resin restorations, and laminate veneers.^[22]

The present study was conducted to find the prevalence of the anterior and posterior teeth fracture in males and females in the population of Hyderabad. A total of 3662 participants between 11 to 50 years of age were screened using an intraoral camera. Out of these, 712 participants had teeth fracture which accounts for 19.44%. Out of 3662 participants, 2391 were males and 1271 were females.

Number of males with anterior teeth fracture was 328 (13.72%) and number of females with anterior teeth fracture was 116 (9.13%). Chi-square test was done to determine the significance of difference in the prevalence of anterior teeth fracture in male and female participants. The Chi-square test result was 16.42 which is higher than the value 3.84 for the significance level of 0.05. The result is significant at $p < 0.05$. The p-value for our study is < 0.000051 . This result shows a higher prevalence of fracture of anterior teeth in males when compared to females.

Number of males with posterior teeth fracture was 215 (8.99%) and number of females with posterior teeth fracture was 53 (4.17%). Chi-square test was done to determine the significance of difference in the prevalence of posterior teeth fracture in male and female participants. The Chi-square test result is 28.45 which is higher than the value 3.84 for the significance level of 0.05. The result is significant at $p < 0.05$. The p-value for our study is < 0.00001 . This result shows a higher prevalence of fracture of posterior teeth in males when compared to females.

Hence, our study results have shown that males are more susceptible to both anterior tooth fracture and posterior tooth fracture when compared to females.

A cross-sectional study was conducted by Hegde MN et al. in the Department of Conservative Dentistry and Endodontics, A B Shetty Memorial Institute of Dental Sciences, Mangalore, Karnataka. A total of 2000 patients were examined among whom the prevalence of anterior teeth fracture was 14.85%. The prevalence of anterior tooth fracture was highest in the age group of 15 to 30 years at 53.9%. This age group was followed by the group of ≤ 15 years old at 20.2%. Anterior tooth fracture was seen in 53.9% of males and 46.1% of females ($p < 0.001$), indicating a statistically significant difference.^[6]

A cross-sectional study was conducted by Baldava P et al. in the Udupi district of Karnataka. The participants were 370 male high school students in the age group of 14-16 years. 55 had TDI to anterior teeth, with prevalence rate at 14.9%.^[23]

A cross-sectional study was conducted by Juneja et al. among 4000 children of 60 schools in the age group of 8-15 years in Indore. The sample included 2058 boys and 1534 girls. The incidence of TDI of permanent anterior teeth was 10.2%, involving 408 school children. Out of 408 affected children, 279 (68.38%) were boys, whereas 129 (31.62%) were girls. The ratio between prevalence of tooth fracture in boys and girls was 2:1.^[24]

A cross-sectional study was done by Ogundare et al. over a one-year period (May 2016-April 2017) on patients aged 18 to 92 years, who visited the Oral diagnosis and Restorative Clinics. A total of 3345 patients were examined, among whom 1642 were males and 1703 were females. Among these patients, 152 were found to have fractured posterior teeth with a prevalence rate of 4.54%.^[25]

A systemic and meta-analysis review was done by Saber Azami-Aghdash et al. The study included 44 totally relevant articles out of a total of 3197 relevant articles. This included 69,502 children and adolescents aged 0 to 18. The result showed that the prevalence of dental trauma was variable based on geographical area and was estimated to be 17.5%, with higher prevalence in males.^[10]

CONCLUSION:

Fractures are more common in anterior teeth when compared to posterior teeth, likely due to their position and functional role in the dental arch. Additionally, higher incidence of tooth fractures among males is potentially attributed to differences in lifestyle, occupational hazards, and anatomical factors.

The frequency of these injuries can be decreased by adopting a proactive approach that combines prevention (eg: wearing mouthguards during sports), patient education and personalized treatment. Dentists play a crucial role in effectively mitigating the consequences of tooth fractures, thereby enhancing their patients' long-term dental health and overall well-being. The formulation of personalized treatment programs, including restorative treatments and aesthetic considerations, is vital for restoring function and aesthetics while meeting patients' particular needs and preferences.

Conflict Of Interest:

There is no conflict of interest.

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