

Prevalence of Incisal Trauma in Class II Division 1 Malocclusion Compared to Class I Control Group – A Retrospective Study

Punati Nithin¹, Adrij Dutta², Kiran Kumar HC³, K. Sadashiva Shetty⁴, Sapna B⁵

ABSTRACT

Introduction: Dental trauma is the most common and important dental public health problem. The most prevalent dental injury among growing individuals is incisal trauma. Maxillary incisors are the most frequently affected teeth by trauma. The aim of this study was to assess the prevalence of incisal trauma in Class II division 1 malocclusion and compare the prevalence of incisal trauma in patients with Class II division 1 malocclusion to Class I control group.

Material and methods: Case records of 180 patients between 10-25 years age who had visited to the Department of Orthodontics and Dentofacial Orthopedics, Bapuji Dental College and Hospital, Davangere were analyzed. Information regarding the etiology of trauma, number of teeth affected, type of tooth involved, type of dentition and overjet were collected. The collected data was subjected to statistical analysis.

Results: Prevalence of incisal trauma was higher in class II division 1 [65.6%] than in class I control group [34.4%]. Prevalence rate was higher in males [55.6%] than in females [44.4%]. Patients from urban area belonging to upper middle class showed higher prevalence for incisal trauma [52.8%]. The most common cause for incisal trauma was found to be falls [61.1%]. Patients of 13-17 years age group showed higher frequency of incisal trauma as compared to other ages [49.4%]. Maxillary central incisors were found to be more affected by incisal trauma [78.6%].

Conclusion: Overall the study results showed a greater prevalence of incisal trauma in Class II division 1 patients affecting the maxillary central incisors. As the combination of trauma with orthodontic treatment seems to render the teeth more susceptible to complications, knowledge of the prevalence of previous dental trauma in patients referred for orthodontic treatment is of paramount importance for early treatment planning and success of any individual orthodontic treatment.

Keywords: Incisal Trauma, Prevalence, Class II Division 1 Malocclusion, Class I Malocclusion

MeSH terms: Malocclusion, Angle Class II, Tooth Fractures

in children as well as in adolescents.² The combined impact of violence, traffic accidents and sporting activities has contributed to the establishment of traumatic dental injuries as a dental public health problem. Anterior permanent teeth have significant effect on the individual facial profile. Facial trauma that results in fractured, displaced or lost teeth can have significant negative functional, esthetic and psychological effect on children.^{3,7}

In both primary and permanent dentition, maxillary incisors are the most frequently affected teeth by trauma.⁴ Previous investigations suggest that increased overjet and inadequate lip coverage form significant predisposing factors to traumatic injuries of upper incisors. The common causes for incisal trauma include falls, collisions, sporting activities, traffic accidents, increased overjet, incompetent lip coverage of upper anteriors and class II division 1 malocclusion along with lack of awareness about preventive and interceptive orthodontics. The combination of trauma with orthodontic treatment seems to render the teeth more susceptible to complications. Knowledge of the prevalence of previous dental trauma in patients referred for orthodontic treatment is of paramount importance to the planning and success of any individual orthodontic treatment.⁵ Early orthodontic treatment of increased overjet to prevent incisor trauma has been recommended by various authors.⁶

Factors such as age, sex, socioeconomic status and behavioral problems might also influence the frequency of incisal trauma.¹ Previous studies have also proved a positive correlation between the frequency of occurrence of incisor trauma with increased proclination. Class II Division 1 malocclusion is characterized by proclined maxillary anteriors with an increased overjet and deep overbite. In such patients the upper lip is hypotonic, short and fails to achieve

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competent lip seal.

The aim of this study is to assess and compare the prevalence of incisal trauma in Class II division 1 malocclusion compared to Class I control group.

MATERIAL AND METHODS

This descriptive, cross-sectional study was approved by the institutional ethical review board (BDC/Exam/209/2019-20). Based on the retrospective investigation of clinical data, study models, photographs and radiographic data of all patients with incisal trauma who attended the Department of Orthodontics and Dentofacial Orthopedics, Bapuji dental college and hospital, Davangere, between May 1988 to May 2019 were considered to include in the study. Taking the prevalence of incisal trauma from the previous study⁴, the sample size was determined as 180. Cases with incomplete documentation and records of substandard value or patients with underlying systemic diseases and endocrine disorders, patients on routine systemic medication, craniofacial abnormalities, physical and mental disabilities and patients who had previously undergone orthodontic treatment were excluded. Total of 180 patient records were included in the study for analysis. One investigator was trained and calibrated from a clinical expert in the department of orthodontics for scrutinization and collection of related data from the patient’s records. The following information were collected from each patient’s files: Etiology of trauma, number of teeth affected/involved, time /date of injury/accident, type of tooth involved (maxillary/ mandibular, central incisor/lateral incisor), type of dentition (mixed/permanent), any soft tissue injury associated and overjet of more than 3.5mm.

The causes of incisal trauma were classified in 4 categories: Fall, Collisions, Sporting activities and Traffic accidents. The grading of incisal trauma was classified, according to Ellis classification of trauma.²²

STATISTICAL ANALYSIS

Data collected through records were entered in Microsoft excel spread sheet, and a master table was prepared. Data was analyzed using SPSS for Windows version 20.0 statistical software. Frequency distribution tables were prepared and interpreted.

RESULTS

The results were analyzed based on impact of incisal trauma on age, gender, socioeconomic status, demography, cause of incisal trauma, number of teeth involved and frequency of incisal trauma in primary and permanent teeth.

Highest frequency of trauma was seen between 13-17 years (49.4%) followed by 18-25 years age group [30.5%]. [Table 1] [Figure 1]

The distribution of patients by gender showed that males were affected more (55.6%) than females (44.4%).

Among the patients included in the study, prevalence of trauma was found to be high among the patients from urban area (52.8%) than rural area (47.2%). [Table 2]

Majority of the patients belonging to upper middle class (class II) showed the highest evidence of trauma (33.3%)

		Frequency	Percent
Age in years	9 -12	36	20
	13-17	89	49.4
	18-25	55	30.5
Gender	Male	100	55.6
	Female	80	44.4

Table-1: Prevalence of trauma according to age and gender

		Frequency	Percent
Socioeconomic status	Class I	43	23.9
	Class II	60	33.3
	Class III	44	24.5
	Class IV	31	17.2
	Class V	2	1.1
Geographical area	Rural	85	47.2
	Urban	95	52.8

Table-2: Prevalence of trauma by demography

	Frequency	Percent
Fall	110	61.1
Collisions	19	10.6
Sporting activities	38	21.1
Traffic accidents	13	7.2
Total	180	100.0

Table-3: Cause of trauma

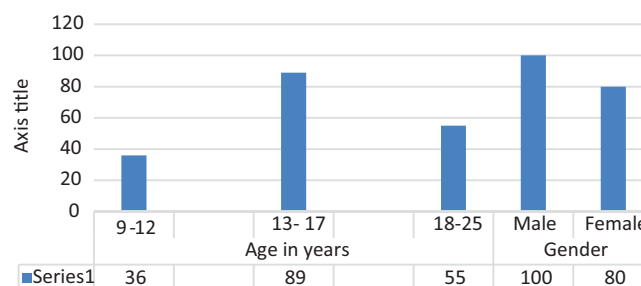


Figure-1: Age and genderwise distribution of trauma patients

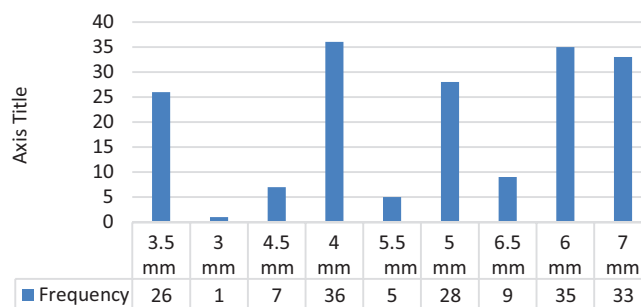


Figure-2: Prevalence of trauma according to varying degree of overjet

followed by class III (24.5%), class I (23.9%), class IV (17.2%) and class V (1.1%) respectively as classified by Kuppuswamy SES Scale-2019²¹ [Table 2].

When the cause for Trauma was analyzed, 61.1% of trauma were caused by falls, 21.1% by sporting activities, 10.6% by collisions and 7.2% were due to traffic accidents respectively. [Table 3]

		Frequency	Percent
Type of malocclusion	Class I	62	34.4
	Class II Division I	118	65.6
Location of trauma	Maxillary	165	91.7
	Mandibular	12	6.7
	Both	3	1.7
Type of tooth affected	Maxillary central incisors	202	78.6
	Maxillary lateral incisors	32	12.4
	Mandibular central incisors	15	5.8
	Mandibular lateral incisors	08	3.2
Number of teeth affected	One tooth	122	67.8
	More than one tooth	58	32.2
Type of dentition	Permanent	163	90.6
	Mixed	17	9.4

Table-4: Prevalence of trauma according to type of occlusion, location, type of tooth affected number of teeth affected and type of dentition

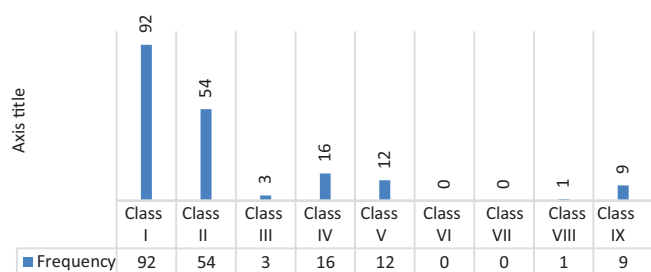


Figure-3: Grading of trauma according ellis and davey classification

Patients with class II division I had highest prevalence of trauma (65.6%) compared to class I controls (34.4%). [Table 4]

From a total of 180 traumatically injured teeth, maxillary arch was more frequently involved (91.7%) than the mandibular arch (6.7%). Only 1.7% of the dental trauma was noticed involving both the arches.

The most affected teeth were the maxillary central incisors (78.6%), followed by the maxillary lateral incisors (12.4%), mandibular central incisors (5.8%) and mandibular lateral incisors (3.2%). [Table 4]

A total of 122 (67.8%) patients suffered trauma to one tooth, while 58 patients (32.2%) suffered trauma to more than one tooth. [Table 4]

Highest frequency of trauma was seen in permanent dentition (90.6%) than compare to mixed dentition (9.4%).

Patients having overjet of 4mm, had higher predilection of trauma (20.0%) followed by 6mm (19.4%) and 7mm (18.3%). [Figure 2]

The most common type of injury was simple crown fracture with little or no dentin affected (51.1%), followed by extensive crown fracture with considerable loss of dentin without pulp affected (30.0%), tooth devitalized by trauma (8.9%) and complete loss of tooth as a result of trauma (6.7%) as assessed by Ellis & Davey’s classification. [Figure 3]

DISCUSSION

Dental injuries are particularly important as they are critical

for sensory, communicative and psychosocial functions of the teeth and mouth.

The present study was done to compare the prevalence of incisal trauma in Class II division I and Class I malocclusions. A total of around 2000 case files were analyzed from the file section of Department of Orthodontics & Dentofacial Orthopedics at Bapuji Dental College & Hospital, Davangere, Karnataka for the required sample. Case files between 1988-2019 were analyzed for the same.

The results showed that patients with class II division I malocclusion had more chance of incisal trauma than compared to those with class I malocclusion. This was in accordance with previous study by Korlouk et al¹², Rai S.B.¹³ and Dostdogru E.Y.⁹, which showed that an increase in overjet seen in class II division 1 malocclusion has an effect on increased chance of incisal trauma.

In the present study overall prevalence of incisal trauma was found to be more in boys (55.6%) compare to girls (44.4%). Boys were found to have significantly higher number of fractures than girls in all the age groups. This data is similar to the study done by Marcenés W et al (67.2% and 50.2%)¹⁰ and Atabek et al [64.7% and 35.3%].¹⁴ This can be attributed to the fact that boys are more inclined towards vigorous physical activities, competitive athletics and engaged in rough outdoor activities than girls. Other studies done by Rocha et al (2001)¹⁵, showed an increasing trend of traumatic dental injuries among girls, because of their increasing participation in sports or activities formerly practiced by boys only.

The age at which children are most prone to the traumatic injuries should be identified so that preventive measures can be taken to protect the risk to a considerable extent. In this study, the peak age group to sustain injury was found to be 13-17 years [49.4%]. This is in accordance to the study done by Zaleckiene et al¹⁶ who found that the peak age of traumatic injuries in permanent dentition to be between 10-12 years. Study done by Bauss et al.⁵ had also seen a high

prevalence in age group of 11-15 years which supports the findings of this study.

It was found that most common cause for incisal trauma to be fall [61.1%]. This is in accordance with the study done by Atabek et al.¹⁴ from Turkey who observed that falls [70.1%] were the most frequent cause for incisal trauma. This finding was followed by sport accidents [21.1%] and collisions [10.6%].

The present study found that around 52.8% were from urban region. Around 33.3% belonged to Class II [upper middle class] of socioeconomic scale. A study conducted by Mercenes and Murray¹¹ showed an increased prevalence of incisal trauma in social deprivation. However, the current results can be attributed to increased sporting activities and lifestyle changes. Also, the patients who reported to the hospital should also be considered as the lower class might not have found the orthodontic treatment feasible.

It was seen that maxillary central incisors [78.6%] are the most frequently injured teeth. 67.8% of the injuries involved only one tooth. Årtun et al.¹⁷ concluded that maxillary central incisors were most commonly traumatized teeth and most of the patients had only one injured tooth. Schatz et al.¹⁸ reported that most injuries involved one incisor tooth (74.6%). Bauss et al.⁵ also reported that maxillary central incisors are the most commonly injured teeth [79.6%] and most of the trauma cases involved only one tooth [53.9%]. The results of the present study were consistent with the previous reports. It is likely that the susceptibility of teeth to trauma is related to their position in the dental arch. Maxillary incisors are usually the most anteriorly positioned teeth; therefore, it is to be expected that they will have the highest frequency of trauma. It was seen that maxillary left central incisor was the most frequently injured tooth.

In the present study, it is seen that 1.7% of the patients had injuries affecting both maxillary and mandibular arches. Schatz et al.¹⁸ showed that only 2.6% of the patients had injuries that affect incisors of both arches at the same time. In a study by Dosdogru et al.⁹ 7.9% had both maxillary and mandibular incisor teeth injuries.

One of the most common types of dental trauma is enamel fracture or enamel-dentin fracture without pulp exposure. The present study also has shown that Ellis class I fracture is the most frequent [51.1%] followed by class II [30%]. Schatz et al.¹⁸ observed that 39.4% of the patients had enamel fractures while 48.1% had enamel-dentin fractures without pulp exposure. According to study by Dosdogru et al.⁹ enamel fracture was the most common (51.06%) type of incisal trauma in patients with Class II division 1 dental malocclusion which is followed by enamel-dentin fracture without pulp exposure (23.40%). Chen et al¹ found that most frequent incisal trauma was of enamel fractures and only 19% of the injuries involved dentin.

In this study, it was seen that the highest prevalence of incisal trauma was found in patients with an overjet of 4mm [20.0%] followed by 6mm [19.4%] and 7mm [18.3%]. According to Järvinen⁸, the amount of injuries increased in relation to the larger overjet (>6mm). Burden observed increased overjet

and lip incompetence as risk factors to traumatic injury. Bauss et al⁵ found a higher prevalence of incisal trauma in subjects with overjet more than 3 mm. Borzabadi-Farahani et al.¹⁹ in their study reported that, in children with OJ>3.5 mm, the odds of incisal trauma was more compared to children who have normal overjet (OJ≤3.5 mm). Previous literature has shown a 3.5-fold increased risk to sustain trauma to anterior teeth in children having overjet greater than 3.5 mm. Children having an overjet of more than 3.5 mm (3–4mm) are definitely more prone to injuries in accordance with many other previous studies.

The current study shows that prevalence of incisal trauma in class II division 1 malocclusion is higher than that in class I malocclusion. Orthodontic treatment for young children can reduce the incidence of incisal trauma significantly. Early treatment is necessary to be initiated at the eruption of the permanent incisors to determine its effectiveness in preventing dental trauma.

CONCLUSION

Following conclusions can be drawn from the results of present study:

The prevalence of incisal trauma was greater in class II division 1 malocclusions [65.6%] than in class I malocclusions [34.4%].

Maxillary central incisors are the most frequently injured teeth. Most injuries before and during treatment were minor and consisted of enamel fractures [Ellis class I].

Patients belonging to urban region and of upper middle-class socioeconomic status have a higher risk of incisal trauma than other groups.

Children having an increased overjet of more than 4mm show higher prevalence to incisal trauma.

Implications

To educate the parents and patients regarding the ill effects of proclined anterior malocclusions and their prevention and interception at correct age.

Orthodontic prevention to reduce and/or prevent incisal trauma in class II division 1 malocclusion patients.⁶

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