

**PREVALENCE OF TRAUMATIC DENTAL INJURIES AND
THEIR CORRELATION WITH ASSOCIATED FACTORS IN
CHILDREN AND ADOLESCENTS.**

BABU BANARASI DAS UNIVERSITY, LUCKNOW

**Thesis submitted in partial fulfilment of the requirements for
degree of**

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**In the subject of
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**DEPARTMENT OF PEDIATRIC AND PREVENTIVE DENTISTRY
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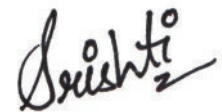
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I hereby declare that this dissertation entitled “**PREVALENCE OF TRAUMATIC DENTAL INJURIES AND THEIR CORRELATION WITH ASSOCIATED FACTORS IN CHILDREN AND ADOLESCENTS**” is a bonafide and genuine research work carried out by me under the guidance of **Dr. Neerja Singh, Professor and Head**, Department of Pediatric and Preventive Dentistry, Babu Banarasi Das College of Dental Sciences, Babu Banarasi Das University, Lucknow, Uttar Pradesh.

Date: 7/7/2021

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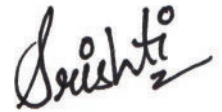
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LIST OF ABBREVIATIONS

S.NO	ABBREVIATIONS	FULL FORM
1.	TDI	Traumatic dental injuries
2.	i.e.	That is
3.	OJ	Overjet
4.	Div	Division
5.	BMI	Body mass index

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ABSTRACT

Background: Traumatic dental injuries [TDI] are one of the most common dental problems in pediatric dentistry that may influence the child's quality of life and can change their future dental health. Therefore, it is important to study its prevalence which can aid in effective prevention, intervention and management.

Aim: To evaluate the prevalence of traumatic dental injuries and its association with various parameters in children and adolescents.

Material and Method:

A total of 1400 children aged 2-18 years, were clinically screened for presence of trauma. The children were divided into 3 groups: GROUP A, B and C consisting of children aged 2-6 years, 7-12 years and 13-18 years respectively. A self-designed questionnaire was drafted and distributed to parents and children. Examination was performed and significant findings related to TDI were noted.

Results: The prevalence of TDI was found to be high (21.3%). The highly significant association of TDI with predisposing factors like overjet and lip closure was established. Significant relationship between age, monthly income of parents, number of children in the family, place of occurrence of trauma, cause of trauma, type of trauma, tooth number, arch and TDI was observed.

Conclusion: TDI showed a high overall prevalence with children aged 2-6 years being most affected. The type of dental trauma most prevalent was 'enamel cracks' and majority TDI's occurred at home due to an accident or by falling. Both in the primary as well as permanent dentition maxillary central incisors were the most affected teeth. Children of low socioeconomic status, those with inadequate lip closure and those having an overjet of ≥ 3 mm were found to be at a higher risk of TDI.

INTRODUCTION

Traumatic dental injuries (TDI) have been projected as the fifth most prevalent disease worldwide.¹ It poses as a challenging health problem for the public and its constant increase has made it important for oral health professionals to have thorough knowledge about it as well as to educate the public to change their attitude towards the same. Traumatic dental injuries are often associated with facial fractures in road traffic accidents whereas some dental injuries are often due to minor accidents such as fall or contact with blunt objects while playing. The latter is seen more frequently in the children during developmental stages of life.²

Children with injuries to their anterior teeth and their concerned parents present a challenge to dentist. TDI are associated with biological, socio-economic, psychological and behavioural factors.³

Trauma to a tooth can lead to pulpal hyperemia, congestion and alteration in the blood flow in the pulp which is sufficient to initiate irreversible degenerative changes, and over time can cause pulpal necrosis. In addition, the apical vessels might be severed or damaged enough to interfere with the reparative process. Thus, the prognosis of such tooth depends on the rapidity with which it is treated.⁴

Dental injuries can occur at any age starting from one year of life which tends to increase as child starts to crawl, stand or walk with peak incidence being school age. In the primary dentition TDI has a physical, aesthetic and psychological impact, not only on the child but also on his/her parents. There are few reports on the relationship between various traits and the occurrence of TDI to both the primary teeth as well as the permanent teeth.

In available literature, trauma in different age groups has been reported to be prevalent in children 2-5 years and 8-12 years of age. In children aged 2-5 years during their developmental period the child is learning to walk and run and hence have tendency to fall due to lack of properly developed co-ordination and judgment.^{5,6,7} In the children falling in the age group of 8 to 12 years trauma may

result because of increased outdoor activities and participation in sports as children go into the higher classes in the schools.^{8,9,10}

Unfortunately, people in general are not well informed about the risks of trauma to the deciduous and permanent dentitions and what can be done for their prevention and treatment. Therefore, it is of paramount importance that educational programs be conducted for common people about the importance of early treatment for dental trauma, ways of preventing these traumas and procedures for appropriate emergency management. These educational programs for the public in a country should preferably be preceded by an investigation of background information on the occurrence of oro-dental injuries in the community.¹¹

There is abundance of literature determining the prevalence of TDI globally but, scarcity of literature in the state of Uttar Pradesh. It is important to understand the global similarities along with regional variations.¹² This is essential for the formulation of effective interventions for improvement of awareness, prevention of TDI, emergency care and comprehensive management. Thus, a prevalent study of trauma to anterior teeth and its confounding factors would help the clinicians to recommend preventive measures to traumatic injuries, such as early reduction of excessive protrusion, use of car safety belts and to wear mouth guards during high-risk unsupervised athletic activities.

In Lucknow city, there is a scarcity of relevant data regarding the prevalence of TDI, therefore this study has been undertaken to assess the prevalence of TDI and their correlation with various associated factors in children and adolescents. The data obtained can be put to use in educating parents, caregivers as well as help in the formulation of preventive strategies for TDI, which in the longer run can help decrease the prevalence and help in providing a better quality of life.

AIM AND OBJECTIVES

AIM

To evaluate the prevalence of traumatic dental injuries and its association with various parameters in children and adolescents.

OBJECTIVES:

1. To determine the prevalence of traumatic dental injuries (TDI) in primary, mixed and permanent dentition.
2. To assess various factors associated with traumatic dental injuries in children and adolescents.
3. To determine correlation between various inclusive factors and the type of dentition involved with them.

REVIEW OF LITERATURE

Traumatic dental injuries provide significant therapeutic challenges for the dental profession. The risk of traumatic dental injuries in the general population has been demonstrated to be enormous. The management of these injuries has gotten a lot of attention, but the aetiology and pathophysiology have gotten less attention. Direct or indirect impact might result in traumatic dental injuries. The extent of the damage is determined by elements such as the impact's energy, the impacting object's resilience and shape, the impact's direction, and the reaction of the tooth's surrounding tissues. Unfortunately, most people are unaware of the dangers of trauma to the deciduous and permanent dentitions, as well as what can be done to avoid and treat them. As a result, it is critical to conduct teaching programmes for the general public on the necessity of early treatment for dental trauma, as well as strategies to prevent these traumas and protocols for appropriate emergency management. These public education initiatives in a country should ideally be preceded by a background investigation into the occurrence of oro-dental injuries in the community. Due to the scarcity of relevant data regarding the prevalence of TDI in Lucknow city, this study has been undertaken to assess the prevalence of TDI and their correlation with various associated factors in children and adolescents.

In a study of 1614 youngsters from the city of Lahti in southern Finland, **S Järvinen et al (1979)** evaluated the frequency of traumatic lesions to permanent incisors. The children, who were divided into 801 girls and 813 boys, ranged in age from 6 to 16. Hard dental tissue injuries and tooth exarticulations were documented. Injuries were reported by 19.8 % of girls and 25.0 % of boys. At the ages of 9-11 years, a significant increase in prevalence rates was seen with an estimated mean annual incidence of roughly 5% in girls and 7% in boys. One tooth was injured in 78.4 % of children with injured incisors. The upper central incisors were the teeth most commonly injured (81.7%), and the most common type of injury was an uncomplicated crown fracture (90.5%).¹³

F Garcia-Godoy, F Morbán-Laucer, L R Corominas, R A Franjul, and M Noyola (1985 June) conducted a study to determine the prevalence of traumatic injuries to permanent incisors and canines, and their distribution by type in schoolchildren from Santo Domingo, in the Dominican Republic's Caribbean

Archipelago, by age and sex. The study included 1200 children ages 6 to 17 years old who were enrolled in eight public and private schools. For traumatic injuries, Garcia-classification Godoy's was employed. Injuries were present in 12.2 % of the population (13.1 % in boys and 11.2 % in girls). The 14-year-olds were the ones who had the most injuries (17.4%), followed by the 13- and 12-year-olds (15.7 % and 11.7 %, respectively). With a boy-to-girl ratio of 1.1:1, more boys harmed their teeth than girls. Enamel-dentin fracture was the most common type of injury in both sexes, followed by enamel fracture.¹⁴

A study on Swiss population done by **A D Kaba et al (1989 Dec)** consisted of a sample of 262 children to determine the frequency of severe injuries to permanent teeth. Injuries were found in 10.81 % of the population. The children (106 girls and 156 boys) were between the ages of 6 and 18, with a boy/girl ratio of 1.47:1. Boys between the ages of 9 and 10 were found to have the highest number of injuries. The maxillary central incisors were the most commonly injured teeth (80%), and the most common type of injury was an enamel-dentin fracture without pulp exposure (53%). After receiving emergency treatment, 42% of the patients were followed for up to nine years for research. The prognosis was exceedingly positive for enamel fractures solely, according to the recall evaluations, while pulp necrosis developed in 11.8% of the enamel-dentin fractures. Luxation injuries accounted for 14% of all traumatic injuries, and 46% of them required endodontic treatment.¹⁵

A V Sanchez, F Garcia-Godoy (1990 Apr) determined the occurrence of traumatic injuries to primary and permanent incisors, as well as their distribution by type, by age in Monterrey, Mexico. The sample consisted of 1010 boys between the ages of 3 to 13 who were enrolled in four private schools in the city. For traumatic injuries, Garcia-classification Godoy's was employed. Injury rates were 28.4%, with 72.2% of the 4-year-olds examined showing evidence of traumatic oral injuries. A total of 37% of the 11-year-olds assessed, displayed signs of traumatic dental injury. Enamel fracture was the most common type of lesion in both primary and permanent dentitions (58.5% and 69.6%, respectively).¹⁶

C M Forsberg and G Tedestam (1993) used an epidemiological sample of 1610 children with 286 traumatic dental injuries to assess the etiological and predisposing factors associated to traumatic injuries to permanent teeth. The findings revealed that postnormal occlusion, an overjet of more than 4 mm, a short upper lip, incompetent lips, and mouth breathing all enhanced susceptibility to traumatic dental injury. The average overjet in children with enamel fracture injuries was 4.3 mm. The mean overjet was much higher, 5.0 mm, in instances with more serious injuries (dentine fracture, pulp lesion, root fracture, exarticulation). The most common causes of injury were 'falls and blows,' which were cited by 69.9% of the boys and 86.7 % of the girls as etiological factors. Boys (18.2%) were twice as likely as females to have dental injuries while participating in sports (8.2%). Traffic-related tooth injuries were rather uncommon, with 9.7% of boys and 5.5 % of girls suffering from them.¹⁷

E Josefsson and E L Karlander (1994) carried out a cross-sectional analysis of all traumatised permanent teeth in children aged 7-17 years living in a rural location of Boxholm district and to estimate the time required for each treatment. Age, sex, aetiology, organised sport activity, kind of injury, treatment, number of dental visits, and time spent on dental care were all investigated. Dental injuries were reported in 11.7 % of children (63% boys, 37% girls), with the highest occurrence in the 8-12-year-old age group (75%) for boys and the 7-9-year-old age group for girls (63%). Collisions while play and falling over were the most common etiological variables. Violence was responsible for 10% of all dental injuries in boys. The most common type of injury was simple enamel fractures of the maxillary central incisors. The occurrence of traumatic dental injuries in rural locations is lower than in metropolitan areas, according to the findings.¹⁸

A N Stokes, T Loh, C S Teo, and R A Bagramian(1995) in their study found that the occurrence of traumatic dental injuries in anterior teeth increases with increasing overjet. From a clinic population of 11,179, this study found 36 Singapore kids, ages 7 to 18, who had suffered tooth injuries while playing contact or impact sports. A case control group of 36 children, matched for age, sex, race and sporting activities, but who had not had dental trauma, was selected from the same clinic population. Both groups were examined, with overjet measured to the nearest 0.5 mm and the nature of injuries received determined. The trauma group's mean overjet was

3.42 ±1.45 mm, whereas the damaged groups was 3.42 ± 1.33 mm. These means did not differ significantly, nor did the distribution of overjet differ between the groups. These findings contradicted the bulk of research linking incisal overjet to dental trauma, implying that overjet was not a strong predictor of traumatic dental injury in Singapore schoolchildren.¹⁹

E Borssén and A K Holm (1997) investigated the prevalence and annual incidence of traumatic tooth damage in a cohort of 16-year-olds born in 1975 and living in the county of Västerbotten in northern Sweden. A total of 3007 dental records were used in the investigation. According to the statistics, 35% of the youngsters had suffered an injury to their primary or permanent dentition on one or more times. Boys (64%) had nearly twice as many as girls (32%) (36%). Twenty-five % of 16-year-olds had had tooth injury more than once, with boys making up the majority of this group. The incidence of injury episodes to primary and permanent teeth was 28 per 1000 per year. The boys had sustained trauma to their teeth most frequently when they were 4 years of age and between the ages of 8 and 11. This was also true for girls at 4 and at 9 years of age, although less evidently so. In the primary dentition, the majority of dental injuries had affected the supporting tissue of the maxillary incisors. In the permanent dentition, 75% of the traumatised teeth were upper incisors. Fractures of varying severity constituted 60% of all registered diagnoses in this dentition, followed by subluxation (19%) and concussion (11%).²⁰

A study undertaken by **S B Rai et al (1998)** assessed the prevalence and distribution of the traumatic injuries to anterior teeth among 4500 school children in the age group of 3 to 16 years from South Kanara District of Karnataka. The following data was collected: sex, age, origin of trauma, number of injured teeth, kind of teeth, lip competence, terminal plane relationship, and molar connection. In all, 238 instances (5.29 %) had incisor and canine fractures, with the males (72.27 %) being more likely than the girls (27.73 %). Undefined falls were the most common cause of damage, and the maxillary central incisors were commonly injured in both the primary and permanent dentition. The most prevalent type of injury was an enamel fracture. The number of fragmented teeth was much higher in Class 1 Type 2 and Class 2 division 1 molar relationship instances. Only 1.68% of the cases with traumatized teeth had undergone treatment.²¹

M I Cortes, W Marcenes, A Sheiham (2001) undertook a cross-sectional survey on 3702 boys and girls aged 9-14 years, attending public and private primary schools in Belo Horizonte, Brazil. The youngsters were chosen using a multi-stage sampling procedure with an equal probability strategy. The overall sample had a response rate of 97 %. One dentist was in charge of the dental examinations (MISC). Dental injuries increased from 8% at the age of 9 to 13.6% at the age of 12 and 16.1% at the age of 14. Children from high socioeconomic backgrounds were 1.4 times more likely to present with a dental injury than children from low socioeconomic backgrounds. Boys were 1.7 times more likely than girls to suffer dental injury. Finally, children with an adequate lip coverage were 0.56 times less likely to have a traumatic dental injury than those with inadequate lip coverage.²²

A study on children who presented for treatment of dental trauma at the Department of Dentistry for Children and Orthodontics in Budapest over a period of 15 years was undertaken by **K Gábris et al (2001)**. The WHO guidelines were used to classify the traumatic injuries. There were 590 children in total, with 810 teeth damaged. 88 % of the cohort was made up of children aged 7 to 14. The ratio of males to females was 58:42. The impacted teeth had a 90:10 permanent: primary ratio. The maxillary central incisors were the teeth most typically afflicted. Only one tooth was traumatised in 70 % of the instances. At the age of 10, the prevalence of dental trauma peaked. Enamel-dentin crown fracture was the most prevalent form of injury seen. Playing, sports, falls, cycling, traffic accidents, and fighting were in order of decreasing incidence of etiological causes. 65 % of the accidents happened at school or at home. Seventy-seven percent of the patients presented for medical care in the first 3 days after the accident.²³

N Altay and H C Gungör (2001) carried out a retrospective research of 150 patients to determine age and sex distribution, origin, kinds, location, and intensity of trauma, as well as seasonal fluctuations, time difference between traumatic injury and seeking dental care, and number of traumatic injuries. There were 91 boys and 59 girls in the study, with 246 dental traumas and 332 affected teeth (72 primary and 260 permanent teeth). Uncomplicated crown fracture (23.57 %), subluxation (15.85 %), avulsion (10.16 %), lateral luxation (9.75 %), complicated crown fracture, and intrusion were the most prevalent injuries (8.4 % and 8.94 %, respectively). The

occurrence of uncomplicated crown fractures was significantly higher in the 10-12 years age group than other age groups. Lateral luxation and intrusion were significantly higher in the 1-6- and 7-9-years age groups.²⁴

A cross-sectional study was performed by **B Nicolau, W Marcenes, A Sheiham (2001)** on 652 out of a total of 764 (85%) 13-year-old adolescents enrolled in private and public schools located in urban areas in Cianorte, Brazil. Anthropometric measures included height and weight. The BMI (mean=20.1; SD=3.7) was calculated. Overweight (BMI >23) was defined as having a BMI equal to or more than the 85th percentile. Traumatic injuries to the permanent incisors were found to be common in 20.4 % of the population. Falls (24.1 %) were the most common cause of permanent incisor injuries, followed by collisions with people or inanimate objects (15 %), traffic accidents (10.5 %), tooth abuse (6 %), sports (2.3 %), and violence (2.3%). Unknown causes made up 40.6 % of the total. After adjusting for family structure, BMI, sex, family income, and level of education of the parents, children from non-nuclear families, overweight children, and boys were 2.18, 1.93, and 2.19 times more likely to have dental injuries than children from nuclear families, non-overweight children, and girls. The relationship between dental injuries and socioeconomic indicators was not statistically significant. It was concluded that being from a non-nuclear family, overweight and a boy increased the risk of having traumatic dental injury, but the relationship with socio-economic indicators was not statistically significant.²⁵

A F Caldas Jr et al (2001) analysed data from the records of patients seen in the dental trauma emergency clinic in a general hospital in the city of Recife, Brazil, during the years 1997-1999, according to sex, age, cause, number of injured teeth, type of tooth and type of trauma. Altogether, 250 patients from 1 to 59 years of age presenting 403 dental injuries were examined and/or treated. The causes of dento-alveolar trauma were classified in five categories: home injuries, street injuries, school injuries, sports activities, violence. The type of trauma was classified using Andreasen's classification. The gender difference in the number of cases of trauma was statistically significant (males 63.2% vs females 36.8). Fracture in enamel only (51.6%) and fractures in dentine (40.8%) were the most commonly occurring types of injury. Injuries were most frequently diagnosed as serious among the youngest

patients (up to 15 years of age); 82.4% of intrusive luxation cases were diagnosed in the 1-5 years age group. The main causes of tooth injury were falls (72.4%), collisions with objects (9.2%), violence (8.0%), traffic accidents (6.8%) and sports (3.6%). Trauma caused by violence was found to be statistically significant in the 6-15 years age group.²⁶

Saroğlu I et al (2002) evaluated the type and prevalence of dental injuries referred to Ankara University, School of Dentistry, Department of Pedodontics, Turkey. During an 18-month period, 147 individuals with 234 injured teeth presented to the clinic. There were 85 boys and 62 girls among the 147 patients. The most common trauma occurred when the child was 11 years old. In both primary and permanent dentition traumas, the maxillary central incisors were shown to be the most impacted teeth. A higher number of trauma cases affect the maxillary arch (95.72%). Falls are the most common cause of injury (67.34%). Extrusive luxation (38.23%) is the most prevalent type of injury in the primary dentition, while fracture of enamel-dentin without pulpal involvement is the most common type of injury in the permanent dentition (50.5%). Only 82 patients out of 147 showed up at our clinic within 1 hour and 10 days after the accident. It demonstrates the importance of informing the public about what to do in the event of oral injuries and the importance of contacting a dentist right away.²⁷

Traebert J et al (2003) assessed place, activities and human intention related to Traumatic Dental Injuries (TDI) events in 11 to 13-year-old schoolchildren in Biguaçu, Brazil and to test the association between socio-economic status and TDI. The response rate was 90.6%. TDI was found to be present in 10.7% of the population. TDI was more common in boys than in girls, with 13.6 % and 7.6 %, respectively. The educational levels of fathers and mothers had no statistically significant relationship with TDI. Children with incisal overjets more than 5 mm experienced higher dental injuries than children with incisal overjets less than 5 mm. There was no link between TDI and poor lip coverage. It was revealed that maleness and incisal overjet remained statistically linked with dental injuries. Physical leisure activities (28.9%), playing with other people (18.2%), collisions (9.1%), and falls were the most common activities linked to TDI. The most common sites where a TDI happened were at home (42.6%), on the street (21.5%), and at school (9.5 %). The

activities of another individual were responsible for 29.2 % of TDI. Physical leisure activities were the most prevalent TDI occurrences, the majority of TDI occurred at home, and the acts of another person were a significant influence in the incidence of TDI.²⁸

Dental records of 1367 patients (731 females and 636 males) who came for orthodontic treatment at a private orthodontic practice between 1998 and 2002 were examined by **Oskar Bauss et al (2004)** for data relating to trauma to the permanent incisors. The findings revealed that 10.3% of these patients had experienced dental trauma prior to starting orthodontic treatment. The age group 11-15 years, which corresponds to the dental developmental stage of the late mixed dentition, had the highest prevalence of dental trauma. The maxillary central incisors were the most commonly impacted teeth (79.6%), and the most prevalent types of trauma were fracture of enamel-dentin without pulpal involvement (42.7%) and fracture of enamel-dentin with pulpal involvement (42.7%). Individuals with increased overjet and adequate lip covering or increased overjet and inadequate lip coverage had significantly greater rates of dental trauma than patients with normal overjet and appropriate lip coverage. According to the findings of this study, a considerable percentage of orthodontic treatment candidates, particularly those with an elevated overjet and insufficient lip coverage, experience trauma to their permanent incisors prior to starting orthodontic treatment. It might also be concluded that preventive orthodontic treatment of such patients should be initiated and completed before the age of 11, i.e. in the early to middle mixed dentition.²⁹

A study was carried out by **Kirzioğlu Zuhall et al (2005)** to investigate the incidence, etiologic factors and results of dental trauma and the effects of age and gender on the trauma in permanent incisors. Over a 3-year period, 514 permanent incisor teeth in 317 patients with trauma history, who applied to Suleyman Demirel University School of Dentistry, Department of Pedodontics from the southern cities of Turkey, were evaluated. Standardized trauma forms were filled for each patient. In all age groups, the most frequent cause of trauma was found to be unspecified falls (47.6%). Maxillary teeth (88.5%) and central incisors (87.5%) were the most affected teeth from dental trauma. Ellis class II crown fracture was the most frequently seen type of injury (43.8%). The percentage of the patients who applied to a dental clinic in

the first 3 days after the trauma occurred (22.8%) was less than the percentage of the patients who applied after 3 months and more time period (45.1%). It reveals that it is important to inform the public about dental trauma and the importance of time in these cases.³⁰

In a large population study **Jon Artun, Faraj Behbehani, Badreia Al-Jame and Heidi Kerosuo (2005)** reported the prevalence and severity of incisor trauma of adolescent Kuwaiti residents in the early permanent dentition, to determine the ages of and reasons for the injuries, and to test for any effects of sex, incisor occlusion, and lip coverage on the prevalence of incisor trauma. Trauma was more common in males (19.3%) than in girls (9.7%), and in the maxilla (13.6 %) than in the mandible (1.5%). The majority of the patients (77.3%) had only one injured tooth, and the majority of the traumatised teeth (83.7%) were maxillary central incisors. Unrepaired enamel or enamel/dentin fractures accounted for 90.3 % of the injuries. The most common causes of injuries were falls and blows, which occurred either indoors (48.4%) or outside (48.4%). Nearly two-thirds (63.0 %) of the traumas happened when the children were 10 years old or older. The participants with injured maxillary incisors had a greater mean overjet, and lip incompetence was more common than those without. The probabilities of maxillary incisor trauma were 2.8 times greater in participants with OJ between 6.5 and 9.0 mm, and 3.7 times higher in subjects with OJ > or = 9.5 mm than in subjects with OJ less than 3.5 mm. It was seen that the risk of maxillary incisor trauma was about 2 times higher in boys than in girls, and that the risk increased by 13% for every millimeter of increase in OJ. No associations were found between occlusion and mandibular incisor trauma.³¹

A cross sectional study carried out by **Peerasak Malikaew, Richard Geddie Watt and Aubrey Sheiham (2006)** assessed the prevalence and factors associated with Traumatic Dental Injuries (TDI) to anterior teeth of 11-13 year old Thai children. The sample included 2,725 students from 52 primary school classes in Thailand's Chiang Mai city. TDI affected 35.0 % of children. TDI levels were nearly twice as high in males (45.3%) as they were in females (25.2%), and the incidence of TDI rose with age. Children from lower-income families and those with less educated parents were more likely to have TDI. TDI was also more common in children with an overjet of more than 5mm. The majority of the youngsters (20.6 %) suffered trauma to one

tooth, 10.3 % to two teeth, and 2.6 % to three teeth. Damaged teeth accounted for 4.6 out of every 100 anterior teeth. In both the upper and lower jaws, central incisors were the most prevalent teeth with TDI. The most common kind of TDI was enamel fracture. The majority of TDI occurred at home and at school. Running was the most common activity that led to TDI. The most common cause of TDI was 'falls' (24.8 %). The most common vectors that directly impacted or damaged children were ground surfaces (22.4 % of all cases), particularly concrete surfaces (14.6 % of all cases). The most common activity that resulted in TDI was biting hard material.³²

Amir Shayegan, Viviane De Maertelaer and Astrid Vanden Abbeele (2007) assessed the prevalence of dental traumatic injuries in children referred to Queen Fabiola Children's Hospital, Free University of Brussels, Belgium. The research was based on clinical data from 457 youngsters with injured teeth. The majority of dental injuries affected two teeth (51 %). The maxillary central incisors were the teeth that were most damaged (89 %). Trauma occurred most frequently between the ages of 2 and 4. The most common cause of injury in both girls and boys was falls. Subluxation was the most common type of damage in both primary and permanent teeth. Gingival and mucosal laceration was the most common type of soft tissue lesion (61%). Only 42% of children came for dental treatment on the same day that they were injured.³³

A study conducted by **Oskar Bauss et al (2008)** assessed the influence of overjet size and lip coverage on the prevalence and severity of incisor trauma. Group 1 patients revealed a significantly lower prevalence of traumatic injuries than those in Group 2 or Group 3. Regarding the type of trauma, Group 3 patients showed a significantly higher frequency of periodontal injuries than those in Group 1 or Group 2. Furthermore, Group 3 patients had significantly more injuries to two or more teeth per person than patients in Group 1 or Group 2. It was concluded that increased overjet and inadequate lip coverage increase the risk and severity of incisor trauma. Early orthodontic treatment might prevent dental trauma in these patients.³⁴

Ozge Eyuboglu, Yucel Yilmaz, Cigdem Zehir and Hakan Sahin (2009) assessed the frequency, the effective factors and the applied treatments for dental trauma among children aged 1-15 years from Eastern Anatolia in a 6-year period. The

total frequency of trauma in this study was calculated as 4.9% during a 6-year period. The males were found to have more traumatic injury than females. Also, the permanent teeth were more vulnerable to dental trauma than the primary teeth. The highest frequency of traumas in the primary teeth was observed at the age of 5, whereas the rate for the permanent teeth was at the age of 10. The teeth mostly influenced by the traumas were the upper central incisors in both primary and permanent teeth. The most frequent source of trauma in both genders and in both primary and permanent teeth were falls. The most common type of trauma in the primary teeth was lateral luxation, while it was enamel-dentin crown fracture in the permanent ones. Soft tissue injuries were observed in 143 of 653 dental traumatized children. Therefore, it was concluded that the patients, parents and teachers living in Eastern Anatolia should be informed about the necessity of early treatment of dental traumas and the consequence of a delay.³⁵

A cross sectional study was conducted by **Sudeshni Naidoo, Aubrey Sheiham and Georgios Tsakos (2009)** to assess the prevalence and causes of TDI to anterior teeth in 11- to 13-year-old South African schoolchildren. The study population consisted of 2610 children aged 11-13 years old from 26 primary schools, 1665 children participated. The response rate was 64%. More than two-thirds (64.4%) were 12 years old. One hundred and six children had a TDI (6.4%). After adjusting for the effect of age and socio-economic status, boys had an almost 2.5 times higher probability of having a traumatic dental injury than girls. The highest prevalence was in 12-year olds and in the high socio-economic status group. Most of the children had trauma to one tooth. Enamel fracture was the main type of TDI (69.1%). The majority of the TDIs were untreated (85.4%). Homes and schools were the most common places where TDIs occurred, while only 5.7% occurred on a street, road or pavement. Falls were the main cause of TDIs. Sport was the second most common cause and the third most common cause was collision with objects. The present study indicates that the prevalence of TDIs in schoolchildren is not as high as has been reported in other countries. The prevalence of TDIs in this population was relatively low.³⁶

A cross sectional study was undertaken by **Arass Jalal Noori and Wesal Ali Al-Obaidi (2009)** to examine anterior teeth among 4015, 6- to 13-year-old children enrolled in 20 public primary schools of Sulaimani city, northern Iraq. The prevalence

and pattern of traumatized anterior teeth were studied in relation to age, gender, type of injury, dental treatment needs, place and cause of the trauma in addition to occlusal relation and upper lip position. The prevalence of children with traumatic dental injuries was found to be 6.1% (243 children) of the total sample. Age and gender were highly significantly associated with dental trauma. Males were more affected than females and the prevalence increased with age. Simple enamel fracture was the most common type of injury followed by enamel-dentine fracture and concussion. The maxillary central incisors were found to be most affected by trauma followed by mandibular central incisors and the maxillary lateral incisors. The number of injured teeth per child was 1.38 (totally 336 anterior teeth were found with dental trauma) and single tooth trauma was the most common type (69.5%). Results showed that only 7% of the traumatized anterior teeth received treatment and about half (48.7%) of the remaining traumatized teeth did not need dental treatments, while the least treatment type needed was extraction (3.5%). The highest proportions of traumatized children were found with class II division 1 malocclusion and inadequate upper lip coverage. Falls and playing were the most common causes of dental injury, while home was the most common place of trauma occurrence. The study revealed a relatively low prevalence of dental trauma, but it still represents a large number of children.³⁷

Orlando Aguirre Guedes et al (2010) evaluated the epidemiologic aspects of traumatic dental injuries (TDI) in the permanent dentition in a sample of 847 patients treated at the Dental Urgency Service of the Dental School of the Federal University of Goiás, Brazil, between May 2000 and May 2008. The results showed a higher incident among males with mean age of 6-10-year-old. Uncomplicated crown fracture (without pulp exposure), avulsion and complicated crown fracture (with pulp exposure) were the most prevalent TDI. The most affected teeth were the maxillary central incisors (65.65%), followed by the maxillary left lateral incisors (19.67%). In 311 participants (18.25%), only one tooth was involved while, in most patients (81.75%) TDI occurred in more than one tooth. Significant proportion (82.27%) of traumatized teeth presented completely formed root apex. The main etiologic factors involved in TDI were falls (51.71%), traffic accidents (22.90%) and violence (5.67%). Based on the obtained data, it was concluded that accurate policies of TDI prevention should be established, capable of stimulating the exposure of appropriate protocols for management of these lesions.³⁸

Cristiane B Bendo et al (2010) investigated the prevalence of traumatic dental injury (TDI) and associated factors in the permanent incisors of Brazilian schoolchildren. The study was carried out with 1,612 male and female children aged 11 to 14 attending public and private elementary schools in Belo Horizonte, Brazil. The prevalence of TDI was found to be 17.1%. Falls (43.6%) were the most common cause of TDI, mainly at home (41.8%). Boys were more affected than girls. There was no statistically significant association between TDI and socioeconomic status. The adjusted results revealed that TDI was significantly associated with DMFT and overjet. It was concluded that TDI was associated with dental caries and overjet and was not influenced by socioeconomic status.³⁹

Alireza Navabazam and Shokoufeh Shahrabi Farahani (2010) conducted a study to evaluate the prevalence and related factors of such trauma among 9- to 14-year-old children in Yazd. A sample of 1440 schoolchildren aged 9-14 years old, consisting of 720 boys and 720 girls, were randomly selected from 24 schools in Yazd. Ellis classification was used to record the dental injuries. The prevalence found was 27.56%. The occurrence of trauma was significantly higher in male patients; furthermore, most of the dental trauma occurred in children between 9 and 10 years of age (47.38%). The most common type of injury was the 'enamel only' fracture; falls being the main cause of trauma. The most affected tooth was the maxillary central incisor. It was concluded that the prevalence and most common causal factor of traumatic injuries to the maxillary anterior teeth in schoolchildren living in Yazd was approximately the same as that found in other countries.⁴⁰

A cross sectional study by **Jaime A Díaz, Luís Bustos, Andrea C Brandt and Belén E Fernández (2010)** was carried out in children and adolescents of both sexes, aged 1-15 years that sought dental emergency attention to the Regional Hospital between 2004 and 2007 in Temuco, Chile. The purpose was to identify the aetiology, types of traumatic dental injuries in primary and permanent dentitions, sex and age distributions, accident location; and time elapsed before emergency treatment in children and adolescents. The sample consisted of 359 patients with 145 primary teeth and 525 permanent teeth affected by dental trauma. The results showed a 2:1 male: female ratio distribution with a mean age of 8.4 years. The 7- to 12-year-old group had the highest frequency of dental injuries (66.6%). Unspecific accidental falls

were the main cause of injury to primary and permanent dentition (51.8%), followed by striking teeth against objects (15.6%) and bike accidents (13.9%). In primary dentition the most common diagnosis was subluxation (38.6%) and avulsion (16.6%), whereas in permanent dentition was uncomplicated crown fracture (32.9%). A high proportion of the patients received their first emergency attention 24 h after the accident (32.6%). This study revealed a high frequency (37.9%) in 1-15 aged population that sought emergency attention by dental trauma in the period of time study. A large proportion of children with dental trauma received delayed first emergency care, even 24 h after the accident. Considering the high frequency of traumatic dental injuries in 1-15 aged population and the high percentage of delayed emergency attention is necessary to develop effective educational campaigns in regard to causes, prevention and emergency management of traumatic dental injuries, especially in deprived areas. In conclusion, traumatic dental injury may be considered as a serious dental public health problem especially in children of deprived areas.⁴¹

Adarsh Kumar, Vikram Bansal, Koratagere Lingappa Veerasha and Girish M Sogi (2011) carried out a study to assess the prevalence of traumatic dental injuries (TDIs) among 12- to 15-year-old schoolchildren in the Ambala district of Haryana state, India. The study was carried out on 963 schoolchildren of 15 government schools in the Ambala district. The teeth involved, place of and reason for injury and other demographic details were recorded in a structured format. Out of 963 subjects, 14.4% had at least one tooth with TDI. Of these subjects, males and females accounted for 16.2% and 12.7%, respectively. Permanent maxillary central incisors were the most commonly affected teeth. Enamel fracture was the most common (80%) followed by enamel-dentin fracture (17.2%). A higher number of children with incisal overjet greater than 3 mm had TDI than those with less than 3 mm, although this difference was not statistically significant. Subjects with Class III and Class II Div II malocclusion were more likely to have TDI, 16.2% and 17.7% respectively. Lip-closure incompetence was found to be more common in subjects having a TDI. Amongst the subjects having a TDI, only 83.4% (116) were aware of their injury, and falling was the reason most commonly reported. It was concluded that traumatic dental injuries are highly prevalent among schoolchildren. Most of the TDIs involved only tooth enamel. Incompetent lip closure was significantly associated with TDIs and a fall was the major cause for TDIs in this age group.⁴²

Shipra Gupta , Sanjeev Kumar-Jindal, Mohit Bansal and Anshu Singla (2011) carried out a cross sectional study to assess the prevalence of traumatic dental injuries (TDI) in school children in Baddi- Barotiwala, Himachal Pradesh, India. The study was carried out in Government schools among 1059 government school children aged 4- 15 years. The data regarding the traumatic injuries was recorded using modified Ellis' classification. Prevalence of TDI was found to be 4.15 %. 95.45% of the injuries were to the maxillary anterior teeth. Maxillary central incisor was the most common tooth to be affected due to trauma (54.5%). Enamel with dentin fracture with pulp exposure was the main type of TDI (43.1%). The majority of TDI's were untreated (97.7 %). Falls (54.5%) were found to be the main cause. Over jet over 3 mm and inadequate lip coverage were found to be important contributing factors for TDI's. The study revealed a relatively low prevalence of dental trauma, but still the figure represents a large number of children. Therefore, it was concluded that educational programs should be initiated for the community regarding causes, prevention and treatment of traumatic dental injuries.⁴³

A cross-sectional study by **M C Patel and S G Sujan (2012)** measured the prevalence of anterior teeth fracture and their association with predisposing factors such as lip coverage, molar relationship, overjet, and variables such as age, sex, cause, and place of trauma. 3708 school children aged 8-13 years in the Vadodara city were included. A questionnaire was answered related to history of trauma to their anterior teeth after which they were examined for lip competence, Angle's molar relationship amount of overjet and nature of trauma sustained. The prevalence of traumatic injuries was 8.79% and the ratio of boys: girls was 1.28:1. Inadequate lip coverage group sustained about five times more injuries than the adequate lip coverage group. The maximum traumatic injuries were seen in children having Angle Class II Div 1 molar relationship and/or overjet greater than 5.5 mm and was statistically significant. Maximum number of injuries occurred at 9 years of age. The most predominant injuries were enamel fractures, the most common place for occurrence was home and fall against object, the most frequent cause.⁴⁴

Monika Kovacs, Mariana Pacurar, Blanka Petcu and Csilla Bukhari (2012) assessed the prevalence of dental trauma in deciduous and permanent teeth among children and teenagers who attended two dental clinics in Targu Mures,

Romania, between 2003 and 2011 and the correlation of their risk of dental trauma with factors, including gender, age, physical activities and extent of incisor overjet. The study population consisted of patients aged between 1 and 18 years who attended the Clinic of Paediatric Dentistry and Orthodontics and the Clinic of Oral and Maxillofacial Surgery, Targu Mures, in the period between January 2003 and August 2011. The parameters recorded were: gender, age, type of dentition, injury aetiology, lesion type and location, number of teeth affected, occlusion, and radiography. For patients who attended the orthodontics clinic, the degree of overjet was also determined. The overall prevalence of dental trauma was 24.5%. The frequency of traumatic injuries to deciduous teeth was approximately equal for boys and girls, and the most for those between 1 and 2 years. In the permanent dentition, a dental trauma was more frequently found boys, and the most affected age group was between 11 and 12 years, for both boys and girls. The most common causes were falls, in deciduous teeth especially during learning to walk, and in permanent teeth particularly during cycling or other sporting mishaps. The most frequent type of trauma found in the deciduous dentition was lateral luxation and in the permanent teeth it was fracture with the involvement of enamel and dentine, but without the exposure of the dental pulp. A positive relationship was noted between the presence of overjet associated with lip incompetence and the frequency of dental trauma.⁴⁵

V M Martins, R V Sousa, E S Rocha, R B Leite, S M Paiva, A F Granville-Garcia (2012) assessed the prevalence of traumatic dental injury (TDI), as well as associated factors, behaviour of affected schoolchildren and normative treatment needs. The cross-sectional study involved 590 children aged 7-14 years at state schools in Campina Grande, Brazil. The O'Brien classification [1994] was used for the diagnosis of TDI and the body mass index (BMI) was used as an indicator of overweight/obesity. The prevalence of TDI was 12.7%. The most common type of trauma was enamel fracture (67.0%), followed by enamel-dentine fracture (25.3%). TDI was 4.9-fold greater among children aged 13 and 14 years, 1.9- fold greater among males and 2.6-fold greater among those with inadequate lip seal. The majority of schoolchildren did not undergo treatment (82.6%) due to a belief that it was unnecessary (53.2%). The normative clinical evaluation revealed that adhesive restoration was the most common form of treatment (84.0%). It was noted that the prevalence of TDI was low. Age, gender and inadequate lip seal were associated with

dental trauma. A significant number of schoolchildren did not receive treatment for dental trauma.⁴⁶

Simone Scandiuzzi Francisco, Francisco José Filho, Ericka Tavares Pinheiro, Rodrigo Dutra Murrer and Adriana de Jesus Soares (2013) in a cross sectional study assessed the prevalence of traumatic dental injuries to permanent anterior teeth in 9- to 14-year-old schoolchildren attending public schools in Anápolis, Brazil, and to investigate the association between the occurrence of these injuries and the size of incisal overjet and type of lip coverage. The sample size included 765 9- to 14-year-old schoolchildren. Oral examinations dealt with the type of traumatic dental injury (TDI), the treatment received, the size of incisal overjet and the type of lip coverage. The maxillary and mandibular incisors examined had a 16.5% prevalence of dental trauma. Boys experienced double the number of girls' injuries. The maxillary central incisors were the teeth most affected, 84.8%. The most frequent type of injury found was enamel fracture (66%), followed by enamel-dentin fracture (27%) and enamel cracks (5%). Only 26% of traumatised teeth were restored. Children with an overjet size > 3 mm were 1.78 times more likely to have a dental injury than children with an overjet size ≤ 3 mm. Children with inadequate lip coverage were 2.18 times more likely to experience dental trauma than children whose lip coverage was adequate. This study concluded that the prevalence of traumatic dental injuries among schoolchildren in Anápolis, Brazil is similar to that of other regions in Brazil.⁴⁷

Jean-Paul Schatz, Magnus Hakeberg, Enrico Ostini and Stavros Kiliaridis (2013) evaluated the prevalence of traumatic dental injuries in the permanent dentition among Swiss children and its association with overjet. A sample of 1900 children aged 6-13 years were prospectively evaluated to determine the number and types of injuries, the influence of overjet on the risk of suffering trauma and the relationships between trauma, age, gender and life conditions. The observed prevalence of trauma was higher for boys, with a slight risk increase with age and a peak frequency at the age of 10 years. Most of the injuries (91.2%) involved the upper front teeth; 87.2% of all injuries were hard tissue injuries (enamel or dentin fractures), and 12.8% only subluxation and luxation injuries. Children with an overjet of 6 mm or more had a four times higher risk of suffering trauma, compared with those with

less overjet. This cross-sectional study confirmed most of the results from earlier studies dealing with epidemiological factors of dental injuries to the permanent dentition. Of all the variables analysed, overjet stood out as the most significant risk factor: an increased overjet of 6 mm or more had a major impact on the risk of trauma, which would speak in favour of early orthodontic correction of an increased overjet to reduce the prevalence of dental trauma.⁴⁸

Ana Vuković et al(2013) conducted a study to assess the frequency and analyze the factors associated with traumatic dental injuries in Serbian children. The study included children and adolescents with traumatic dental injury aged 0-19 year in four University Dental Centres in Serbia: Belgrade, Nis, Novi Sad and Kragujevac. Total of 2,194 patients (748 girls, 1,446 boys) with 3,077 injured teeth in permanent and 953 in primary dentition were observed. Most of patients were aged 7 to 12 years. The most frequent injuries in primary and permanent dentition were dislocations (87.4%) and teeth fractures (50.8%), respectively. The most frequent mechanism of injury was fall in children aged 0 to 12 years, while the collisions were most frequent in adolescents (53.9%). The most frequent injuries in adolescents were inflicted outdoor (66.8%), while the injuries in children aged 0 to 3 years occurred at home (68.2%). The most frequent injuries in girls were accidental (48.3%), and in boys these were sport injuries (20.4%) and violence (10.4%). The most frequent cause of injury in children aged 0 to 3 years was accidental (75.6%), while in adolescents it was sport (34.1%). It was concluded that dental injuries in preschool children most frequently resulted from fall at home. Schoolchildren most frequently injured teeth outdoor during play. Violence and sport injuries were most frequent cause of injury in adolescents.⁴⁹

A cross- sectional study by **Veruska M Martins et al (2014)** evaluated the association between overweight/obesity and the occurrence of traumatic dental injury among schoolchildren aged 7 to 14 years. The study involved 590 students at public schools in the city of Campina Grande, Brazil. The classification proposed by O'Brien (1994) was used for the diagnosis of traumatic dental injury. Overweight/obesity was determined based on the body mass index. Traumatic dental injury was less prevalent among the schoolchildren with overweight/obesity than those without this condition (8.7% and 13.3%, respectively). When the sample was stratified by gender and age,

traumatic dental injury was also more prevalent among schoolchildren without overweight/obesity. In the overall sample, no significant association was found between overweight/obesity and traumatic dental injury. Overweight/obesity among schoolchildren aged 7 to 14 years was not associated with traumatic dental injury in this study.⁵⁰

A systematic review was conducted by **Janaina Merli Aldrigui et al (2014)** to assess the prevalence of, and trends in, dental trauma in permanent teeth in 'Latin America and Caribbean' region and possible factors associated with this injury. All studies had been performed during adolescence, mostly in 12-year-old adolescents. The pooled prevalence of dental trauma in permanent teeth was 18.6%. Positive summary association of dental trauma with boys, inadequate lip coverage, and increased overjet (>5 mm) were observed across all meta-analysis models. Differences in estimation could be observed when different criteria were used for evaluating dental trauma. On the other hand, prevalence of dental trauma did not tend to show sudden changes over time, despite criteria used. It was concluded that approximately 15-20% of the adolescents in Latin American and Caribbean countries have shown some type of dental trauma in permanent teeth, and it seems there is a trend of decreasing prevalence of dental trauma in the studied areas of this region. Boys, adolescents presenting inadequate lip coverage, or an increased overjet greater than 5 mm are more likely to have traumatic dental injuries.⁵¹

Amandeep Chopra et al (2014) determined the prevalence of anterior tooth traumatic dental injuries in 12-15-year-old school children of Panchkula district, India, and to find any correlation with the cause, gender, extent of overbite as well as over-jet, and previous treatment. Sample of 12-15-year-old school children (n = 810) in Panchkula district, Haryana, was selected. The results showed that out of 810 children, 86 (10.2 %) had TDI. Males had higher prevalence of trauma than females. The common cause of trauma was fall (51.11%) followed by sports injuries (41.86%). Enamel-dentin fracture without pulpal involvement was the most common type of trauma and the most frequent involved teeth were maxillary central incisors. A significant association was observed between overjet and overbite and trauma. Only 3.5% of the children affected with trauma had received treatment. It was concluded that the prevalence of traumatic injuries to permanent incisors in 12-15-year-old

Panchkula school children was relatively high. TDI was associated with gender, overjet, and lip competence.⁵²

Didem Atabek, Alev Alaçam, Itr Aydintuğ and Gonca Konakoğlu (2014) examined epidemiological and dental data from traumatic injuries to primary and permanent teeth during the period from 2005 to 2010. The dental trauma records of patients with an average age of 9 years, including 120 girls (35.3%) and 220 boys (64.7%), were evaluated. The most commonly affected teeth were the maxillary central incisors (66.24%). The main cause was falls (70.1%). In primary dentition, subluxation (36.4%) was observed in the highest %age of injured teeth, and in permanent dentition, the most common observation was uncomplicated crown fractures (44.9%). Only 18 patients (2.9%) were referred to the clinic within 1 h following the injury. The most frequent treatment for primary teeth was examination and follow up (63.9%). Restoration with composite resin (26.3%) and root canal treatment (28.6%) were the most common procedures for permanent teeth. It was revealed that although the most frequent type of injury in permanent dentition was uncomplicated crown fracture, the root canal treatment was the most common treatment in permanent dentition. This finding suggests that when the check-up time after the injury was delayed, the pulp could lose vitality. This finding revealed that it is important to inform the parents about dental trauma and the importance of bringing their children fast to a dentist in trauma cases.⁵³

Mehmet E Toprak, Elif B Tuna, Figen Seymen and Koray Gençay (2014) evaluated traumatic dental injuries with regard to age, gender, etiology, classification of trauma, teeth involved, place of injury, and treatment received by patients who were referred over a 2-year period to the Istanbul University, Faculty of Dentistry, Clinics of Pedodontics, Istanbul, Turkey. The study was based on the clinical data of 154 patients (337 traumatized teeth). The following information was recorded: age, gender, etiology, localization, place, number of injured teeth, type of trauma, type of tooth, time elapsed between injury and treatment, and treatment provided. Traumatized teeth were assessed according to the classification of the World Health Organization slightly modified. A total of 154 patients aged 1-13 years presented a total of 337 traumatized teeth (255 permanent and 82 primary). 94 boys (61%) and 60 girls (39%) with a mean age of 7.91 ± 3.15 years participated in the study. Dental

injuries were frequent in the 6-12-year age group. The most common type of dental injuries recorded was luxation injuries (43.3%), uncomplicated crown fractures (20.5%), and complicated crown fractures (19.4%). The main causes were falls (55.2%) and being struck by an object (22.1%). The most frequent treatment was examination only (31.8%).⁵⁴

Thais Rodrigues Campos Soares et al (2014) analyzed the frequency of Traumatic dental injuries (TDI) and the association of gender and age with the different types of injuries in permanent teeth of patients treated at the Dental Trauma Surveillance Center, Federal University of Rio de Janeiro, Brazil. A total of 352 (34.4%) records from patients (mean age 9.29 ± 1.97) with 676 affected permanent teeth were included in the final sample. Children (55.7%) have a higher frequency of TDI than adolescents (42.9%). Falls (54.3%) was the most common cause, and the street (37.5%) was the most frequent place of occurrence. Enamel and dentin fracture without pulp exposure (69.2%) was the most common TDI for both genders. Avulsion (29.2%) was the most frequent injury to supportive tissues for both genders; however, this was more numerous in girls. Intrusive luxation was more common in boy. According to logistic regression, intrusive luxation affects girls less than boys, while girls have more chance of suffering from avulsion and avulsion was less frequent in children. Enamel and dentin fractures without pulp exposure and avulsion were the most common TDI. Gender (female) and age (adolescent) were considered risk factors for the occurrence of avulsion. However, male gender was a risk factor for the occurrence of intrusive luxation.⁵⁵

M E Sari, B Ozmen, A E Koyuturk, U Tokay, P Kasap and D Guler (2014) analyzed traumatic dental injuries in children visiting the dental hospital emergency department in Samsun of Turkey, in the period from 2007 to 2011. Of all 320 patients with traumatic dental injury, 205 were boys and 115 were girls with a boys/girls ratio 1.78:1. Traumatic dental injury was observed more frequently in the 7-12 age groups: 52.5% in girls and 67.8% in boys. Falls are the major cause of traumatic dental injury in the age group 6-12 (51.4%). Sport activities are a common cause of traumatic dental injury in the 7-12 age group (34.2%). Patients visited a dentist within approximately 2 h (57.1%). The upper anterior teeth were subjected to trauma more frequently than the lower anterior teeth. The maxillary central incisors

were the most commonly affected teeth, and the mandibular canines were the least affected teeth. In primary teeth, avulsion was the most common type of dental injury (23%); on the other hand, enamel fractures were the most common type of dental injury (30.6%) observed in permanent teeth. In the primary dentition, the most commonly performed treatments were dental examination and prescribing (70%). The most common treatment choices in permanent teeth were restoration and dental examination (49.7 and 15.8%, respectively). The results of the study showed that the emergency intervention to traumatized teeth is important for good prognosis of teeth and oral tissues. Therefore, the parents should be informed about dental trauma in schools, and dental hospital physicians should be subjected to postgraduate training.⁵⁶

Sakeenabi Basha et al (2015) investigated the association between traumatic dental injury, obesity, and socioeconomic status in 6- and 13-year-old schoolchildren in Davangere city, Karnataka, India. Data was obtained from 1,550 schoolchildren. Dental trauma was classified according to Andreasen's criteria. The medical evaluation assessed the Body Mass Index. Overjet was considered a risk factor when it presented values higher than 3 mm, whereas lip coverage was classified as adequate or inadequate. With appropriate sample weighting, relationships between traumatic dental injury and other variables were assessed using the chi-squared test and multivariable logistic regression. Overall prevalence of dental injuries was 10.52% (3.6% in 6-year-olds and 17.2% in 13-year-olds). Boys experienced more injuries than girls, 11.03% and 9.97%, respectively ($p > .05$). There was a statistically significant difference between traumatic dental injury and overjet and between traumatic dental injury and inadequate lip coverage. When adjusted for covariates, the logistic regression model showed that there was a significant association between obese children and dental trauma prevalence. Children from low socioeconomic status had an odds ratio 2.33 times higher likelihood of having dental trauma than children from medium and upper socioeconomic status. It was concluded that the results of this study support an association between traumatic dental injuries, obesity, and poverty.⁵⁷

Haroldo Neves de Paiva et al (2015) investigated the prevalence of traumatic dental injury and its association with overjet, lip protection, sex, socioeconomic status, social capital and binge drinking among 12-year-old students. The prevalence of traumatic dental injury was 29.9%. Traumatic dental injury was more prevalent

among male adolescents, those with overjet greater than 5 mm and those with inadequate lip protection. In the multiple logistic regression analysis, overjet, inadequate lip protection and binge drinking remained significantly associated with traumatic dental injury. The findings suggested that a high level of total social capital and trust are not associated with TDI in adolescents, unlike binge drinking. The effects of social and behavioral factors on TDI are not well elucidated. Therefore, further research involving other populations and a longitudinal design is recommended.⁵⁸

Sakeenabi Basha et al (2015) estimated the incidence of traumatic dental injuries (TDI), in particular crown fractures in a 3-year follow-up of obese adolescents. At baseline, 131 (17.15%) adolescents presented with TDI. The accumulated incidence of TDI during the 3-year period of study was 9.03%. Children with obesity and overweight were 2.78 times greater chance suffering TDI after adjusting for socioeconomic status, lip coverage, incisal overjet and previous history of trauma. Both at baseline and follow-up examination, most frequently affected tooth is right maxillary central incisor and most frequent type of TDI was enamel fracture (44.68%). It was concluded that adolescents with obesity and overweight were a greater chance of TDI in a 3-year follow-up.⁵⁹

A systematic review and meta-analysis published by **Saber Azami-Aghdash et al (2015)** assessed prevalence, etiology, types, and other epidemiologic aspects of dental trauma in children and adolescents (0-18 years old). The prevalence of dental trauma was variable based on geographical area and was estimated 17.5% in the population, with higher prevalence in boys. Falling was the major cause for dental trauma, and the most frequent location was home. The most frequent type of trauma was enamel fracture.⁶⁰

Anna Oldin et al (2015) conducted a study to identify individual risk factors for traumatic dental injuries (TDI) among Swedish children aged 0-17 years. The studied risk factors were temperamental reactivity of the child, family structure, parent's country of birth, and the socioeconomic status of the family represented by parental education and occupation. The study included 2363 children in four different age cohorts at 12 public dental service clinics in Sweden, representing different types

of demographic areas, both rural and urban. The more social and active children in the two older age cohorts showed less occasions of TDI. Having one parent/guardian protected the child from dental injury just as well as two parents/guardians. Parents born outside of the Nordic countries showed children with less TDI. Low parental education was related to more occasions of TDI among the children.⁶¹

Benjamin Mahmoodi et al (2015) investigated the frequency and patterns of traumatic dental injuries in a University dental emergency service over four years. A retrospective investigation on all dental trauma patients presenting at the dental emergency service of the University Medical Center Mainz, Germany between 01/2010 and 12/2013 was conducted. Out of 16,301 patients, 1,305 patients (60.1 % male, 39.9 % female) came due to trauma. The most frequent reason for injuries was falls (54.6 %). No correlation could be found between the cause and the kind of trauma. In 48.6 % of the cases only one tooth was involved, in 33.5 % two. The permanent dentition was traumatized in 56.6 % of cases, the deciduous teeth in 41.1 %. The most frequently affected tooth was the central upper incisor (61.0 %). Hard-tissue injuries were significantly more frequent in the permanent dentition, while periodontal injuries were seen significantly more often in the deciduous dentition. It was concluded that 8% of all patients seeking help at the dental emergency service presented with trauma, meaning that dental traumatology is one of the major topics in emergencies. To improve the quality of care, further public education, expert knowledge among dental professionals and a well-structured emergency service are necessary.⁶²

Ionela Teodora Dascălu et al (2016) undertook a study to determine the prevalence of dental trauma to southwestern Romanian schoolchildren aged 6 to 14. The survey included a 1684 schoolchildren attending public schools, randomly chosen. Data were collected from October 2012 to December 2013. Age and gender distribution, etiological factors, risk factors and the cause of injuries were the parameters taken into consideration. The overall prevalence of dental trauma was 4.63% amongst the subjects examined. The maxillary central incisor was the most commonly affected tooth (85.19% in boys and 97.87% in girls). We observed a significant statistical difference in the number of children with one, two or three fractured teeth from the urban and rural areas. The %age of schoolchildren with

crown fractures that we examined was of 3.09% in the urban area and 1.54% in the rural area. The traumatic injuries of the maxillary upper teeth were most prevalent. Since the dental trauma of incisors has a strong impact on the quality of life of children and their families, health preventive policies are needed in order to avoid psychological implications on the lifelong existence of children affected.⁶³

Leon Bilder et al (2016) assessed the prevalence and severity of TDI in permanent teeth among seventh- and tenth-grade schoolchildren. Schoolchildren were examined in four schools in the capital city of Tbilisi, two schools in two other major cities, and one school in four additional villages. In addition to demographical data, the following parameters were collected and recorded: Overjet (OJ), lip competence, number and type/location of the teeth with TDI and Type of TDI. The study population comprised of children aged 12 and 15 years old. A total of 823 schoolchildren were examined. The overall prevalence of TDI among Georgian population was found to be 10.4%. The prevalence of TDI was greater in the older age cohort. Lip posture did not seem to have a marked effect on TDI. Children with an OJ greater than 5 mm were more likely to present with dental injuries compared to children with an OJ equal to or smaller than 5 mm. Children from rural areas presented with greater prevalence of TDI compared to their urban counterparts. The maxillary central incisors were the most common teeth to be affected by trauma accounting for 85.2% of the TDI cases. Enamel fracture was the main type of TDI (91.3%).⁶⁴

T A Oyedele, A T Jegede and M O Folayan (2016) determined the prevalence, risk factors and family related factors for crown trauma among 8 to 16 year-old children in a suburban population, Nigeria. The participants were 8 to 16-year-old resident in suburban Nigeria. The independent variables for the study were age, sex, socioeconomic status, and birth rank, family size and parenting status. Only 167 (7.9 %) of the 2107 study participants had crown trauma. The teeth level prevalence of crown trauma was 0.33 %. Children with middle socioeconomic status had reduced odds of having crown trauma when compared with children with low socioeconomic status. The odds of having crown trauma was more than doubled in males when compared with females and almost doubled in children living with single parents when compared with children living with both parents. It was concluded that

the prevalence of crown trauma was low in this study population. Being a female and having low socioeconomic status significantly reduced the risk factors for crown trauma while living with single parents increased risk for crown trauma.⁶⁵

Paulo Floriani Kramer et al (2017) investigated the association between malocclusion/dentofacial anomalies and traumatic dental injuries (TDI) in adolescents. The sample of this cross-sectional study comprised 509 adolescents aged 11 to 14 years enrolled at public schools in the city of Osório, southern Brazil. The prevalence of TDI was 11.6%, and the prevalence of defined, severe, and handicapping malocclusion was 24.0%, 21.6%, and 22.0%, respectively. The probability of TDI was approximately twofold higher among adolescents with severe malocclusion and handicapping malocclusion comparison to those with normal occlusion or minor malocclusion. Defined malocclusion was not significantly associated with the outcome. Among the dentofacial anomalies evaluated, the probability of TDI was nearly twofold higher among adolescents with overjet greater than 3 mm and 2.2-fold higher among those with an abnormal molar relationship, after controlling for confounding variables. It was concluded that severe and handicapping malocclusion, accentuated overjet, and abnormal molar relationship were strongly associated with the occurrence of TDI.⁶⁶

Leon Bilder et al (2019) evaluated the epidemiological data on dental injuries in permanent teeth among seventh and tenth grade schoolchildren in the Republic of Moldova. Schoolchildren aged 12 and 15 years old were examined: In the capital city (four schools), in two other major cities- (two schools each city), and in four villages (one per each village) in accordance with the WHO's recommendations. A total of 720 seventh and tenth grade schoolchildren were examined. The overall prevalence of TDI was found to be 16.4% (total of 118 children). The prevalence of TDI was greater in the older age cohort. Children from rural areas presented with greater prevalence of TDI compared to children who live in urban region. The maxillary central incisors were found to be the most common teeth affected by trauma constituting 57.1% of the evaluated TDI cases. Enamel fracture was the main type of TDI (83%).⁶⁷

Jackeline Nogueira de Paula Barros et al (2019) conducted a retrospective study to evaluate the dental trauma profile in primary and permanent teeth from patients between 0 and 15 years old who attended the Faculty of Dentistry of the Federal University of Rio de Janeiro. Data regarding gender, age, trauma classification, tooth type, and affected tissues were obtained from dental records. Data associated with 333 traumatized teeth (70% primary and 30% permanent teeth) was included. The mean ages of children with affected primary and permanent teeth were 3.35 ± 2.02 and 9.09 ± 2.43 years, respectively. Males presented more permanent teeth with trauma (64.4%) than primary ones (55.6%). The upper central incisors, both primary (68.9%) and permanent (69.4%), were the teeth most commonly affected. Primary teeth showed a higher frequency of supportive tissue trauma (73.3%) and lower frequency of hard tissue trauma (40.7%) than those in permanent ones (51.5% and 60.6%, respectively). The most frequent trauma in the supportive tissue was subluxation (27.2%) and permanent lateral luxation (42.0%). In the hard tissues, permanent teeth presented a higher prevalence of trauma than primary ones. With affected primary teeth, there was a greater frequency of trauma in the gingival mucosa in the permanent ones, traumatic lesions in the chin region were the most prevalent. Trauma was recurrent in 26.3% of primary teeth and in 20.2% permanent teeth. Therefore, primary and permanent teeth showed distinct trauma profiles, suggesting that distinct preventive and therapeutic approaches are needed for these two groups.⁶⁸

Jennifer L Cully et al (2019) assessed the prevalence of traumatic dental injuries (TDIs) in the primary dentition that presented to the emergency department (ED) of a level-one trauma center at a children's teaching hospital. Electronic health records of 1,170 patients with 2,746 traumatic dental injuries who presented to the ED over a 55-month period were reviewed in the retrospective cohort study. A subset of these (541 patients) with multiple injuries in primary teeth were examined. The prevalence of primary tooth injury was 41 %. Most injuries were sustained by males; lateral luxations were the most common injuries to the primary dentition. The primary maxillary central incisors were the most common teeth to be injured. Concomitant injuries were reported in 50 (4.5 %) primary teeth. It was concluded that traumatic dental injuries occurred frequently in the primary dentition, with lateral luxations being reported most often. Over 40 % of all reported TDIs occurred in the primary

dentition. Emergency room providers should be prepared to manage primary tooth TDIs.⁶⁹

A cross sectional study was conducted by **Kishor Dighe et al (2019)** to assess the prevalence and causes of traumatic dental injury (TDI) in 9-14 year school-going children in Mumbai, Maharashtra, India. The study consisted of 2,055 primary and secondary school-going children aged between 9 and 14 years, from 20 municipal corporation schools of Mumbai city, was selected through a stratified random sampling technique. Children were examined clinically for any signs of TDI in the permanent anterior teeth in their respective schools by two examiners trained in using WHO criteria for oral and dental examination. Data analysis involved descriptive statistics including a frequency distribution. The prevalence of TDI to anterior teeth in school children of Mumbai was 16.3%. The commonest cause of trauma was fall followed by sports activities, collision, and road traffic accidents.⁷⁰

A study was published by **Ramesh Nagarajappa et al (2019)** to assess the pattern of traumatic dental injuries and their relationship with predisposing factors among 12- and 15-year-old school children in Kanpur, India. The cross-sectional study was conducted on 1100 boys and girls aged 12 or 15 years. Anterior permanent teeth were examined based on the modified Ellis classification. Type of damage, size of incisal overjet, and adequacy of lip coverage were also recorded. The prevalence of traumatic dental injuries to anterior teeth was 10.9%. Age and gender distribution indicated that most injuries occurred in 15-year-old age group (11.3%) and among boys (11.5%). The gender-related difference was statistically significant. Maxillary central incisors (83.7%) were frequently involved. The predominant injury type was enamel fracture (68.3%) mainly due to falls (52.5%). Increased overjet, inadequate lip coverage, type of school, and gender were significant contributing factors for traumatic dental injuries.⁷¹

Vaida Zaleckienė et al (2020) identified the prevalence and determinants of dental trauma in permanent anterior teeth among 11- to 13-year-old schoolchildren, to compare self-reported dental trauma rates with clinical examination trauma rates, and to examine mouthguard use among children engaged in contact sports. A total of 2621 caregiver consent forms were sent, of which 807 were returned (31%). Clinical

examinations included assessment of dental trauma experience (trauma index with five severity codes), lip competence and incisal overjet. Child- and tooth-level analyses were performed. Clinical evidence of dental trauma was found in 52% of participants, 13% self-reported dental trauma, and 7% of children did not remember the occurrence of any trauma. The two most frequently self-reported reasons of dental injury were falls or collisions with objects (63%) and sport/leisure activities (32%). Nearly half of the more severe dental injuries did not receive the necessary treatments. One-third of schoolchildren participated in contact sport activities, but only 3% always used mouthguards. There was a substantial difference between the clinical and self-reported findings. Logistic regression analyses revealed no statistically significant associations between dental trauma experience and the potential determinants studied: gender, lip coverage and overjet. It was concluded that the prevalence of traumatic dental injuries was 52%.⁷²

V Faus-Matoses et al (2020) determined the incidence of TDIs in a population in Valencia (Spain) and investigate influential variables. In addition, a protocol for TDI data collection is proposed. 481 TDIs in 251 patients were examined at a private dental practice in Valencia. The population comprised 62.5% men and 37.5% women, aged 1 to 78 years. The highest frequency of tooth injuries occurred in children aged 9 years or younger. The most frequent injury was non-complicated crown fracture (43.2%). Upper central incisors were the most commonly affected teeth. The most frequent place where TDI was produced was in the street (28.7%), tripping over an immobile object being the most common cause (29%).⁷³

Suleiman M O Ergieg et al (2020) assessed the mean overjet in school-going Libyan children and to examine the relationship between increased overjet and permanent incisor's trauma. The study was a part of a cross-sectional investigation of aspects of dental health of 2015 school going Libyan children aged between 6 and 16 years old of both genders from both rural and urban areas. Overjet was measured as the horizontal distance in millimetres between the upper and lower incisors. Trauma to permanent incisors was assessed according to Elli's Classification. The relationship between increased overjet and incisor trauma was tested using the Chi-square test at 0.05 significance level. The overjet measurement ranged from -2 mm to 8 mm with the mean overjet of 3.062. The prevalence of incisor trauma was statistically

significantly higher in children with increased overjet. It was concluded that the average mean overjet value in Libyan children is between 2 mm and 3 mm and below or above these values, considered decreased or increased, respectively. Traumatic injuries to permanent incisors significantly increased with increased overjet.⁷⁴

D Di Venere et al (2020) analyzed the predisposing factors of upper incisal trauma in children candidates for orthodontic treatment. No substantial association between gender and trauma emerged from the study. Patients between the age range of 11-15 years appear to be at increased risk. A statistically significant correlation between increase in overjet and traumatic events was found. A link was discovered between labial incompetence and trauma, since this condition increases the risk of trauma by exposing part of the surface of the upper incisors. A correlation also emerged between Skeletal Class II and the increased risk of traumatic injury. It was concluded that dental trauma, especially in the anterior sector, is a fairly frequent occurrence in pediatric and adolescent patients and is linked to several factors. In our study subjects with Skeletal Class II division I malocclusion with elevated overjet are more predisposed to dental trauma.⁷⁵

Chirine Abdel Malak, Carole Chakar, Alain Romanos and Samar Rachidi (2021) undertook a study to evaluate the prevalence of dental trauma and its potential association with different predisposing factors among 12-and 15-year-old schoolchildren in Lebanon. The prevalence of dental trauma to anterior teeth was 10.9%. Maxillary central incisors (83.7%) were commonly affected. The most common type of injury was enamel fracture (68.3%), falls being the main reason (52.5%). Increased overjet, deficient lip coverage, and gender were significant predisposing factors for dental trauma. This research highlighted many predisposing factors for dental trauma that affect commonly the anterior teeth. Based on these results, the implementation of strategic preventive measurements targeting especially the identified risk groups remains crucial.⁷⁶

Andreas Agouropoulos et al (2021) assessed TDI in primary and permanent teeth among children and adolescents who presented to the Department of Paediatric Dentistry, National and Kapodistrian University of Athens, Greece, during a period of 5 years. The age of the patients ranged from 1 to 18 years old, with a mean of 8.63

years. There were 395 anterior traumatized teeth and 2 cases with traumatized posterior teeth. Children suffered trauma more often at the ages of 5 years, 7 years, and 11 years. In this cohort, 60% were boys who had a higher chance of having trauma than girls. Most traumatized teeth were permanent (80%). Maxillary central incisors in both dentitions were injured most often and significantly more compared to lateral incisors. The most common type of injury was a fracture in the permanent dentition (60%) and luxation injuries (69%) in the primary dentition. It was concluded that traumatic dental injuries in this cohort occurred mostly in spring, affected boys more than girls, permanent teeth more than primary teeth, maxillary incisors more than mandibular incisors, and central incisors more than lateral incisors, while children aged 5, 7, and 11 years old had the most injuries.⁷⁷

MATERIALS AND METHODS

The present cross-sectional study was conducted in the Department of Pediatric and Preventive Dentistry, Babu Banarasi Das College of Dental Sciences (BBDCODS). After obtaining clearance from institutional ethical committee of BBDCODS, Lucknow, participants who fulfilled the inclusion and exclusion criteria, were enrolled in the study. A written informed consent was obtained from the school authorities and parents of children below the age of 8 years along with assent forms for children above 8 years of age before the study was initiated. The study was done with an aim to evaluate the prevalence of traumatic dental injuries and its association with various parameters in children and adolescents.

SAMPLE SIZE CALCULATION:

The minimum sample size was calculated to be 1200 by using the following formula:-

$$n = (Z_{\alpha/2} + Z_{\beta})^2 \times P(1-P)/(p_1-p_2)^2$$

p₁: Prevalence in group.

p₂: Prevalence in group.

P: Pooled prevalence = (p₁+p₂)/2.

Z_{α/2}: Significance level.

Z_β: Power of the study.

ELIGIBILITY CRITERIA:

Inclusion criteria:

- ✓ Healthy children of either gender aged 2-18 years.

Exclusion Criteria:

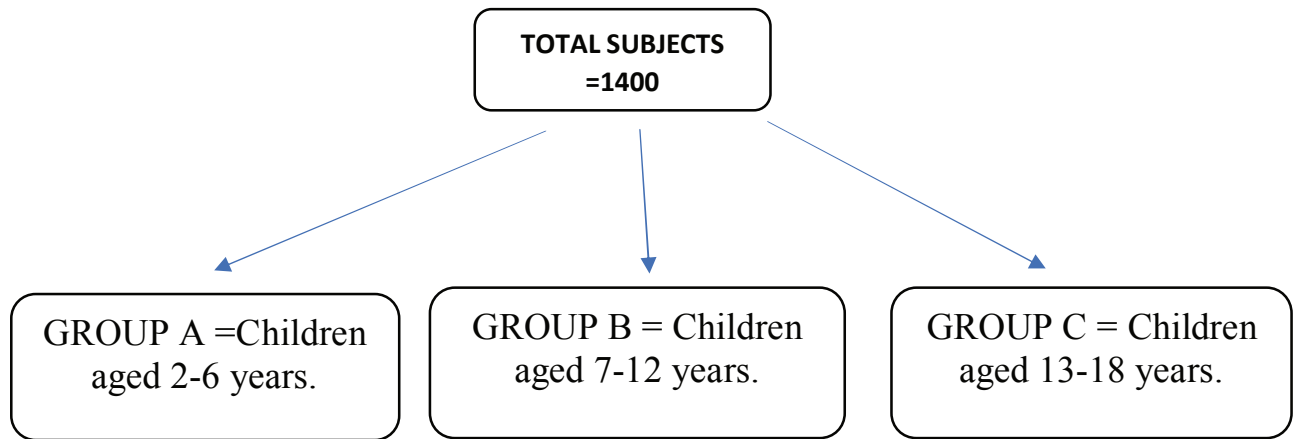
- ✓ Children with special health care needs and those with any systemic diseases.
- ✓ Children with missing anterior teeth due to any reason other than trauma.
- ✓ Children who are not cooperative and do not allow any check up to be done.

MATERIALS USED:

- Mouth mirror
- Cotton rolls
- Kidney tray
- Probe
- Explorer
- Tweezer
- Mask
- Ruler
- Questionnaire

STUDY DESIGN:

- The target population was children with the age group of 2-18 years attending various play schools, private and public schools in rural, semi urban and urban areas and those reporting to the OPD of the department.
- The sample size was calculated to be 1400 children.
- The sample size is divided into 3 groups according to age:
 - ❖ GROUP A = Children aged 2-6 years.
 - ❖ GROUP B = Children aged 7-12 years.
 - ❖ GROUP C = Children aged 13-18 years.



METHODOLOGY:

The present study was conducted in the Department of Pediatric and Preventive Dentistry, Babu Banarasi Das College of Dental Sciences (BBDCODS). After obtaining clearance from institutional ethical committee of BBDCODS, Lucknow, participants who fulfilled the inclusion and exclusion criteria, were enrolled in the study. The study included a self-designed questionnaire consisting of questions regarding demographic data and various parameters related to the study. The questionnaire was drafted based on previous studies that had been performed for the same and necessary changes were made according to the structure of the study design. A list was drawn of the many play schools, private and public schools in rural, semi urban and urban areas in an around the city and a consent letter was drafted to obtain approval from their authorities. After selecting some schools in the city which were centrally located, the post graduate student went to the heads of the various institutions to attain approval for performing the survey and questionnaire based dental check-up in their schools. The principals were informed about the possible outcomes of the study and their importance for well-being of the society and the scientific community. After obtaining the consent from the institutional heads, the consent and assent letters for parents as well as the children was drafted and passed on to obtain approval. Parents who agreed to the participation of their children were asked to fill the questionnaire which included questions about the socio demographic data, socio economic status as well as questions about the child’s past dental history and various behavioural modalities.

The duration of the present study was 3 years (2018-2021), and during this time there was a sudden global outbreak of the novel Coronavirus which resulted in bringing some changes to the methodology. The questionnaire that was designed earlier was modified and placed on an online platform which was sent to all the parents to be filled. Due to the shift of the questionnaire online and inability to examine patients, certain variables eg. Overjet and Lip closure were not included. Hence, it was decided that the prevalence would be calculated on the whole sample size whereas the association of these factors would be found out in a subset of the population (1000).

The children within the age group of 2-18 years attending these schools and those reporting to the OPD of the department were examined. The participants were divided into 3 groups according to age:

- GROUP A = Children aged 2-6 years.
- GROUP B = Children aged 7-12 years.
- GROUP C = Children aged 13-18 years.

Pre-Covid, screening camps were conducted at every school, which gave the permission to examine the children. The camps were conducted regularly. The instruments used for examination were sterilized and packed individually to avoid any chances of cross infection. A total of 1000 participants were included and examined. The examination started by evaluating the children based on their classes and sections, completing two sections in one appointment. The children were examined under natural light using appropriate individual cross infection protection equipment and under visible light. All the children were examined by one post graduate student and another post graduate student recorded all the details in the given questionnaire sheet. At first all the demographic details were recorded and a rapport was established with the child by the means of communication which helped in behaviour modification and a positive response of the children. The past dental history of the children was noted. The children were then examined for any signs of trauma to their teeth using a sterile mouth mirror and a probe. In case of trauma being present, the place of injury and the etiology was enquired from the older children whereas for the younger children the questions were included in the questionnaire given to the parents to be filled. For those children who had either a past history of dental trauma or who

had dental trauma, a questionnaire was filled by the operator in which the various parameters of the study were taken into consideration. These children were then examined for the type of fracture that was present and precautions were taken not to cause any pain to the child.

The lip closure of the child was examined and was classified to be either adequate or inadequate. Using a ruler and a divider the overjet of the patient was checked and noted. At the end of each examination session, the group of children were explained about traumatic dental injuries, their causes and how to prevent them. The elder children who were actively participating in sports were advised to wear mouthguards for the prevention of traumatic dental injuries. The children were explained about the importance of timely visit to the dentist after TDI, the steps to be taken for emergency management of traumatic dental injuries at the site of accident. Educating the children ensured a better understanding of the child about traumatic dental injuries so as to reduce the prevalence and for an effective management of traumatic dental injuries.

During Covid, since the schools were closed and due to safety issues, an online questionnaire was prepared. The online questionnaire consisted of all the questions regarding demographic data and various parameters related to the study, but only the part that had to be filled by the examiner after examination was not included. The questionnaire was drafted in such a way that all parents could understand it and also visual representation was provided wherever necessary. This online questionnaire was then forwarded to all the parents of children aged 2-18 years. The filled format was then received via Google forms. The total number of responses received was 400.

The data was tabulated and sent for statistical analysis.



RESULTS AND OBSERVATIONS

Statistical analysis

The continuous data were summarised as Mean \pm SD (standard deviation). The discrete (categorical) data were summarised in number (n) and percentage (%) and compared by chi-square (χ^2) test. A two-tailed ($\alpha=2$) $P < 0.05$ was considered statistically significant. Analysis was performed on SPSS software (Windows version 22.0).

Results and Observations

The present study assesses prevalence of traumatic dental injuries (TDI) and their correlation with associated factors in children and adolescents. Total 1400 subjects (1000 pre Covid and 400 during Covid), age between 2 to 18 years, both males and females were recruited.

The outcome measures of the study were demographic characteristics (age, sex, family monthly income, number of children in the family, visit to dentist, reason for visit to dentist and dental parameters (visit to dentist, reason for visit to dentist, trauma seen or not, place of trauma, tooth number, type of trauma, cause of trauma, overjet, lip closure and what kind of activities does the child prefer more).

The variables viz. age, sex, family income, number of children in the family, visit to dentist, reason for visit to dentist, trauma seen or not, place of trauma and cause of trauma were assessed/available on all 1400 (pre Covid + during Covid) participants; whereas tooth number, type of trauma, overjet and lip closure were assessed/available in 1000 (pre Covid) participants, and arch (tooth number: upper or lower) and kind of activities does the child prefer more were assessed/available in 400 (during Covid) participants.

The primary objective of the study was (i) to find the prevalence of traumatic dental injuries and the secondary objectives were (ii) to correlate the presence of TDI with the age, sex, family income, number of children in the family, place of trauma and cause of trauma, (iii) to correlate the cause of trauma with age and gender, (iv) to correlate the presence of TDI with the tooth number, type of trauma, overjet and lip closure in pre Covid subjects, (v) to correlate the presence of TDI with the arch (tooth

number: upper or lower) and kind of activities preferred by the child in subjects enrolled during Covid.

Outcome measures

A. Total participants

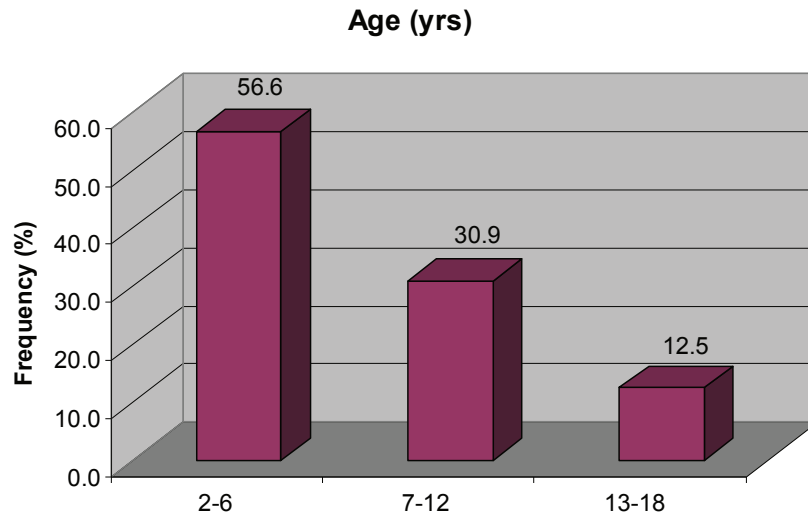
Demographic characteristics (age, sex, family monthly income, number of children in the family, visit to dentist, reason for visit to dentist) of total 1400 recruited subjects is summarised in Table 1 and also depicted in Graph. 1-6, respectively. The age of all participants ranged between 2-18 years with mean (\pm SD) 6.79 ± 4.15 years and median 6 years. Most of the participants were 2-6 years (56.6%) and males (51.4%).

Further, for most of the participants the monthly family income of their parents was ≥ 199862 Rs (26.1%), the number of children present in the family were 2 (55.1%), (67.9%) children had visited the dentist before, the reason for visit to dentist was stated as “regular check-up” (33.6%).

Table 1: Frequency distribution of demographic and dental characteristics of total studied subjects (n=1400)

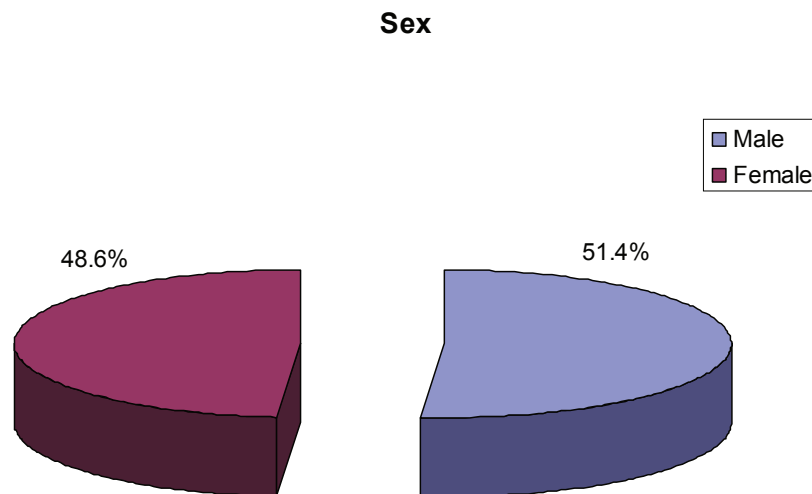
Variable	No of subjects (n=1400) (%)
Age (years): 2-6 7-12 13-18	793 (56.6) 432 (30.9) 175 (12.5)
Sex: Male Female	719 (51.4) 681 (48.6)
Monthly family income (Rs): ≥199862 99931-199861 74756-99930 49962-74755 29973-49961 10002-29972 ≤10001	365 (26.1) 287 (20.5) 243 (17.4) 296 (21.1) 156 (11.1) 11 (0.8) 42 (3.0)
No. of children in the family: One Two >2	614 (43.9) 771 (55.1) 15 (1.1)
Visit to dentist: No Yes	449 (32.1) 951 (67.9)
Reason for visit to dentist: Cleaning of teeth Fracture of tooth Pain or discomfort in teeth Regular check up Not visited the dentist	57 (4.1) 141 (10.1) 302 (21.6) 471 (33.6) 429 (30.6)

Frequency distribution of demographic and dental characteristics of total studied subjects were summarised in number (n) and percentage (%).



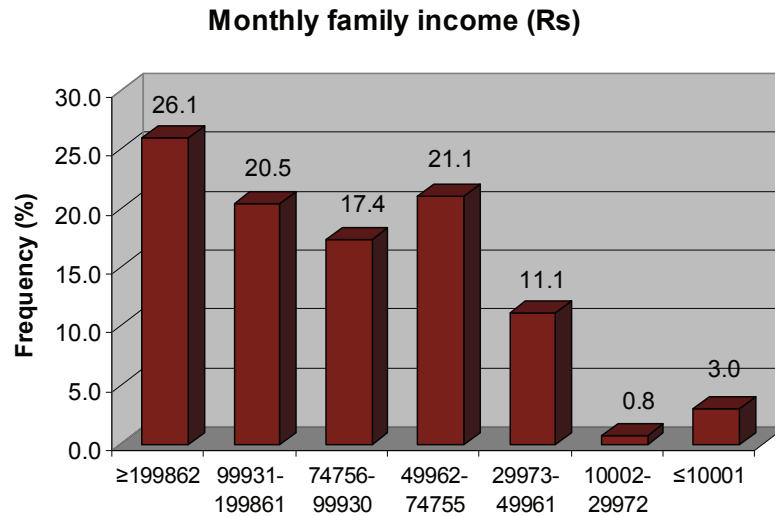
Graph. 1. Distribution of age of total studied subjects.

Graph.1 shows the distribution of age of the total study population. Maximum children (56.6%) lied in the age group of 2-6 years followed by children aged 7-12 years (30.9%) and children aged 13-18 years (12.5%). The mean age was (\pm SD) 6.79 \pm 4.15 years and median 6 years.



Graph. 2. Distribution of sex of total studied subjects.

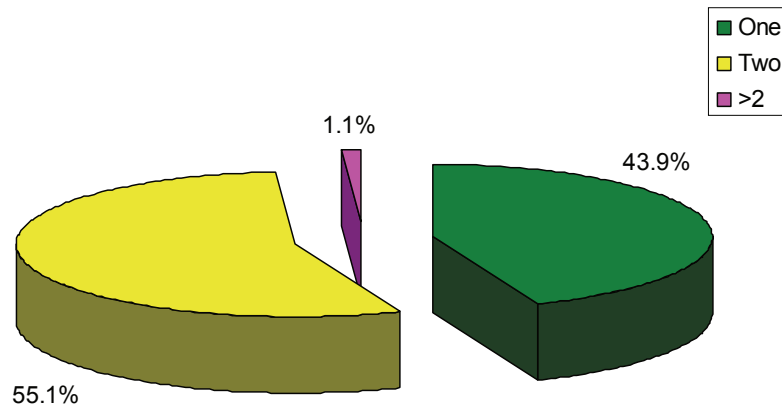
Graph.2 shows the distribution of sex/gender of the total studied population. The maximum participants were males (51.4%) whereas there were 48.6% females in the study population.



Graph. 3. Distribution of monthly family income of total studied subjects.

Monthly family income was categorised according to the Kuppaswamy Scale which consisted of 7 different groups. Graph.3 shows the distribution of monthly family income in the study population. Majority of the the participants fell into the group of family monthly income \geq Rs 199862 (26.1%), followed by those falling in the income group of Rs.49962-74755 (21.1%), Rs.99931-199861 (20.5%), Rs.74756-99930 (17.4%), Rs.29973-49961 (11.1%), Rs. \leq 10001(3.0%), Rs.10002-29972 (0.8%).

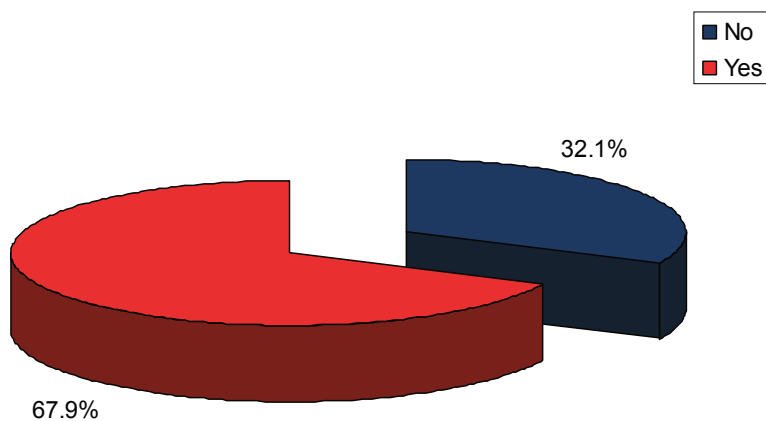
No. of children in the family



Graph. 4. Distribution of no. of children in the family of total studied subjects.

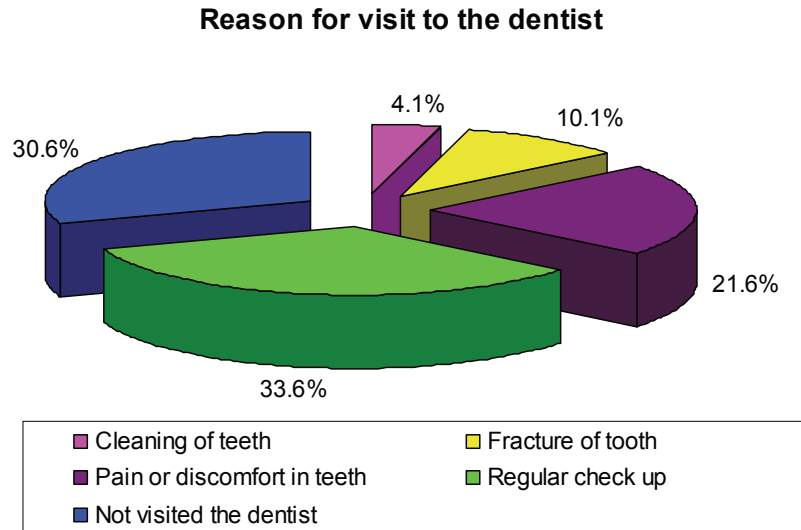
The distribution of number of children in the family of the total study population is given in Graph 4. The results demonstrate that maximum families had two children (55.1%) followed by 43.9% families which had one child and only 1.1% families had >2 children.

Visit to dentist



Graph. 5. Distribution of visit to dentist in total studied subjects.

The response of previous visit to the dentist was noted and the distribution was assessed in Graph 5. It demonstrates that maximum participants i.e. 67.9% had previously visited a dentist whereas, 32.1% participants had never visited a dentist before.



Graph. 6. Distribution of reason for visit to the dentist in total studied subjects.

The reason for the previous visit to the dentist was analysed and the distribution was grouped in Graph 6. It shows that the most frequent reason to visit to the dentist was for regular check-ups (33.6%) whereas 30.6% participants had never visited a dentist before. 21.6% participants had visited a dentist because of complaint of pain or discomfort in teeth followed by fracture to teeth (10.1%), cleaning of teeth (4.1%).

Overall prevalence of dental trauma

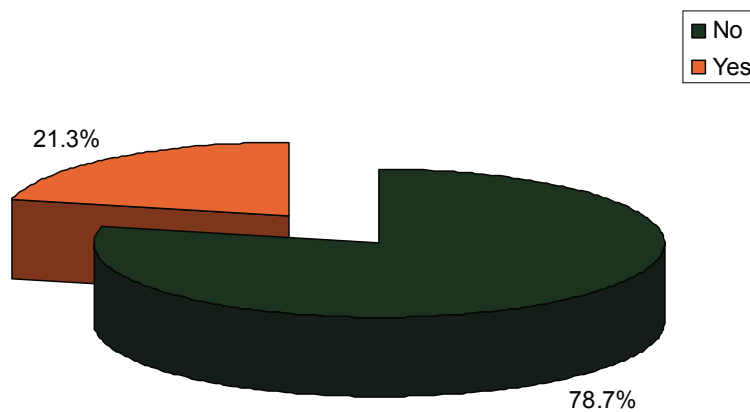
Out of the total 1400 participants, TDI was observed in 298 (21.3%) participants whereas 1102 (78.7%) did not experience any TDI. The overall prevalence of dental trauma in children was 21.3% (Table 2 and Graph. 7). Further, among all participants, 152 (10.9%) participants experienced trauma at home, 125 (8.9%) in school and 21 (1.5%) on the street (Table 2 and Graph. 8). Moreover, among all the participants, 22 (1.6%) had experienced trauma due to sports activity and 276 (19.7%) due to an accident or by falling (Table 2 and Graph. 9).

Table 2: Overall prevalence of dental trauma in total studied subjects (n=1400)

Variable	No of subjects (n=1400) (%)
Presence of Trauma :	
No	1102 (78.7)
Yes	298 (21.3)
Place of trauma:	
No trauma seen	1102 (78.7)
Home	152 (10.9)
School	125 (8.9)
Street	21 (1.5)
Cause of trauma:	
No trauma seen	1102 (78.7)
Due to sports activity	22 (1.6)
Due to accident or by falling	276 (19.7)

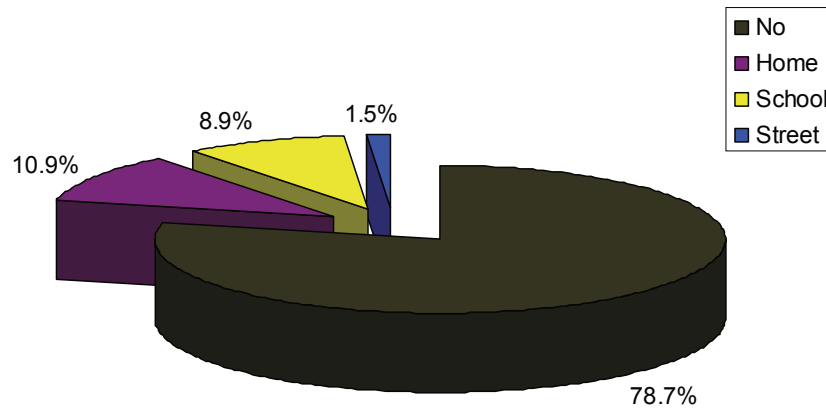
Prevalence of dental trauma in total studied subjects were summarised in number (n) and percentage (%).

Overall prevalence of dental trauma



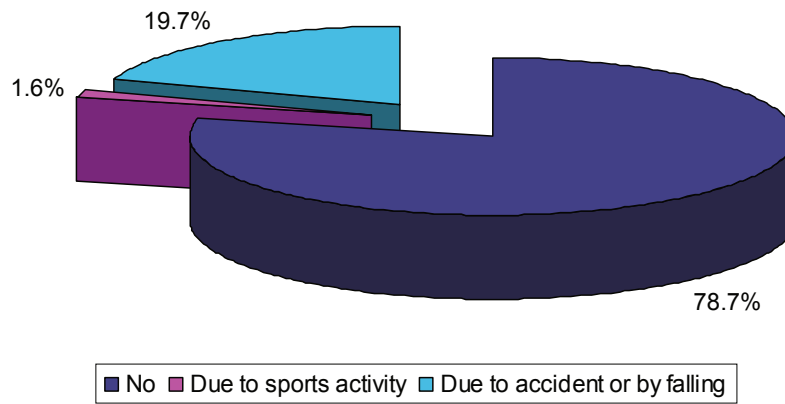
Graph. 7. Distribution of overall prevalence of dental trauma among total studied subjects.

Place of dental trauma



Graph. 8. Distribution of place of dental trauma among total studied subjects.

Cause of dental trauma



Graph. 9. Distribution of cause of dental trauma among total studied subjects.

Correlation

(i) Presence of Trauma

Out of the total participants, the correlation of trauma (TDI seen or not) with different demographic (age, sex, monthly family income, no. of children in the family) and dental (place of trauma and cause of trauma) predictor variables is summarised in Table 3 and also shown graphically in Graph. 10-15, respectively. The presence (prevalence) of dental trauma decreases comparatively with increase in age but evidently similar between males and females.

In contrast, on an average, the prevalence of dental trauma increases with increase in monthly income of the family, increase in no. of children in the family, place of trauma at home and school than street, trauma occurred due to accident or falling than due to sports activity.

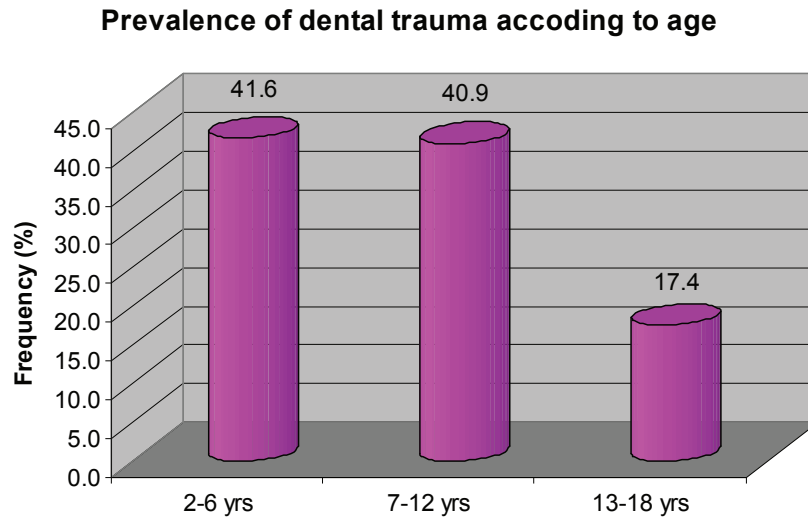
On comparison, the χ^2 test showed significant ($P < 0.01$ or $P < 0.001$) association of presence of dental trauma with age ($\chi^2=35.00$, $P < 0.001$), monthly family income ($\chi^2=78.62$, $P < 0.001$), no. of children in the family ($\chi^2=41.23$, $P < 0.001$), place of trauma ($\chi^2=1400.00$, $P < 0.001$) and cause of trauma ($\chi^2=1400.00$, $P < 0.001$).

However, presence of dental trauma did not ($P > 0.05$) show any association with the sex ($\chi^2=0.07$, $P = 0.789$).

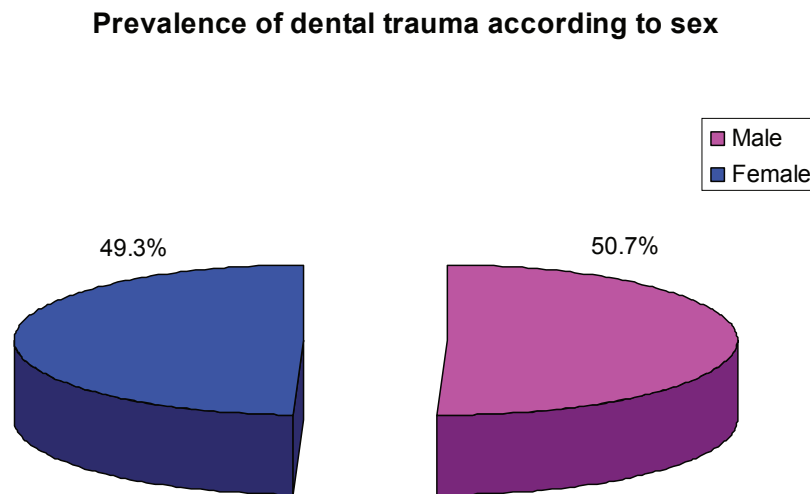
Table 3: Correlation of trauma seen or not with different demographic and dental characteristics in total studied subjects (n=1400)

Variable	Trauma seen or not		χ^2 value	P value
	No (n=1102) (%)	Yes (n=298) (%)		
Age (years):				
2-6	669 (60.7)	124 (41.6)	35.00	< 0.001
7-12	310 (28.1)	122 (40.9)		
13-18	123 (11.2)	52 (17.4)		
Sex:				
Male	568 (51.5)	151 (50.7)	0.07	0.789
Female	534 (48.5)	147 (49.3)		
Monthly family income (Rs):				
\geq 199862	314 (28.5)	51 (17.1)	78.62	< 0.001
99931-199861	217 (19.7)	70 (23.5)		
74756-99930	198 (18.0)	45 (15.1)		
49962-74755	239 (21.7)	57 (19.1)		
29973-49961	111 (10.1)	45 (15.1)		
10002-29972	10 (0.9)	1 (0.3)		
\leq 10001	13 (1.2)	29 (9.7)		
No. of children in the family:				
One	528 (47.9)	86 (28.9)	41.23	< 0.001
Two	559 (50.7)	212 (71.1)		
>2	15 (1.4)	0 (0.0)		
Place of trauma:				
No	1102 (100.0)	0 (0.0)	1400.00	< 0.001
Home	0 (0.0)	152 (51.0)		
School	0 (0.0)	125 (41.9)		
Street	0 (0.0)	21 (7.0)		
Cause of trauma:				
No	1102 (100.0)	0 (0.0)	1400.00	< 0.001
Due to sports activity	0 (0.0)	22 (7.4)		
Due to accident or by falling	0 (0.0)	276 (92.6)		

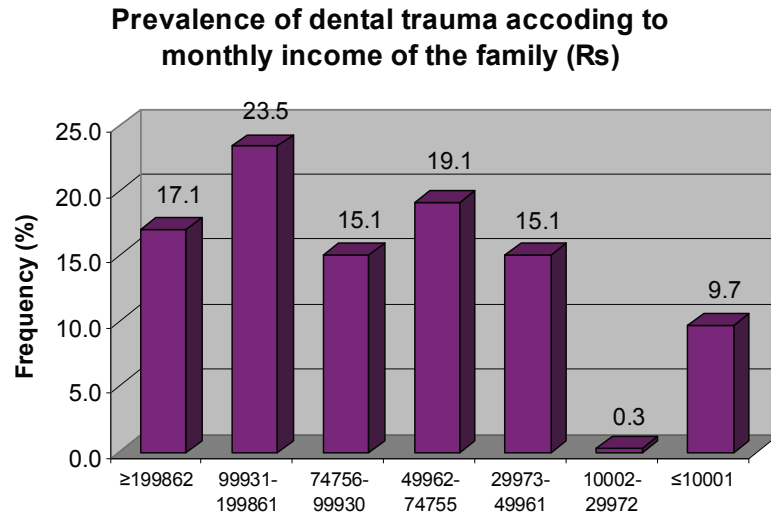
Correlation of trauma seen or not with different demographic and dental characteristics in total studied subjects were summarised in number (n) and percentage (%) and compared by χ^2 test (χ^2 value).



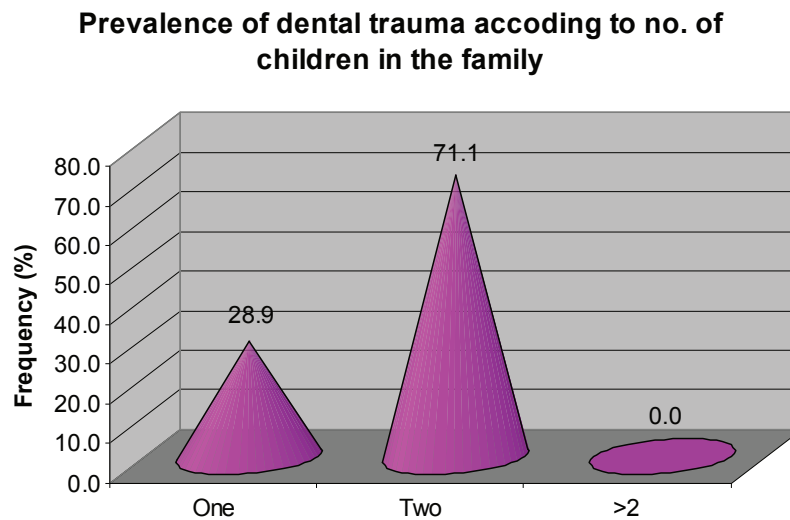
Graph. 10. Age wise prevalence of dental trauma in total studied subjects.



Graph. 11. Sex wise prevalence of dental trauma in total studied subjects.

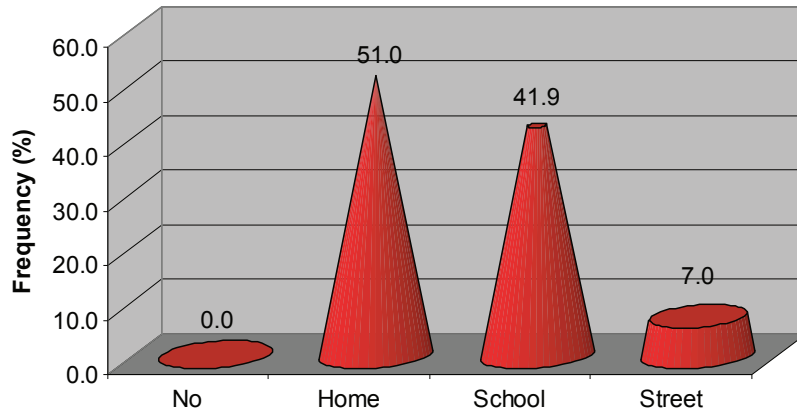


Graph. 12. Prevalence of dental trauma in total studied subjects according to monthly income of the family.



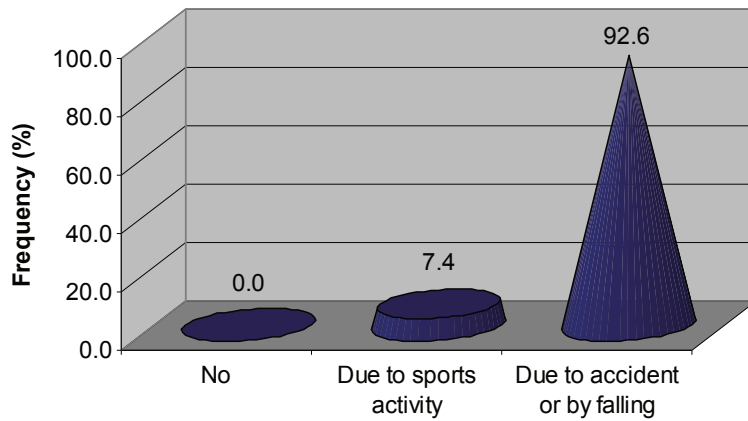
Graph. 13. Prevalence of dental trauma in total studied subjects according to no. of children in the family.

Prevalence of dental trauma according to place of trauma



Graph. 14. Prevalence of dental trauma in total studied subjects according to place of trauma.

Prevalence of dental trauma according to cause of trauma



Graph. 15. Prevalence of dental trauma in total studied subjects according to cause of trauma.

(ii) Cause of trauma

In the total study population, the correlation of cause of trauma (no trauma, due to sports activity and due to accident or by falling) with demographic age and sex is summarised in Table 4. On comparing, the χ^2 test showed significant ($P < 0.001$) association of cause of trauma with both age ($\chi^2=67.98$, $P < 0.001$) and sex ($\chi^2=19.14$, $P < 0.001$).

Table 4: Correlation of cause of trauma with age and sex of total studied subjects (n=1400)

Variable	Cause of trauma			χ^2 value	P value
	No (n=1102) (%)	Due to sports activity (n=22) (%)	Due to accident or by falling (n=276) (%)		
Age (years):				67.98	< 0.001
2-6	669 (60.7)	22 (100.0)	102 (37.0)		
7-12	310 (28.1)	0 (0.0)	122 (44.2)		
13-18	123 (11.2)	0 (0.0)	52 (18.8)		
Sex:				19.14	< 0.001
Male	568 (51.5)	21 (95.5)	130 (47.1)		
Female	534 (48.5)	1 (4.5)	146 (52.9)		

Correlation of cause of trauma with age and sex of total studied subjects were summarised in number (n) and percentage (%) and compared by χ^2 test (χ^2 value).

B. Pre Covid participants

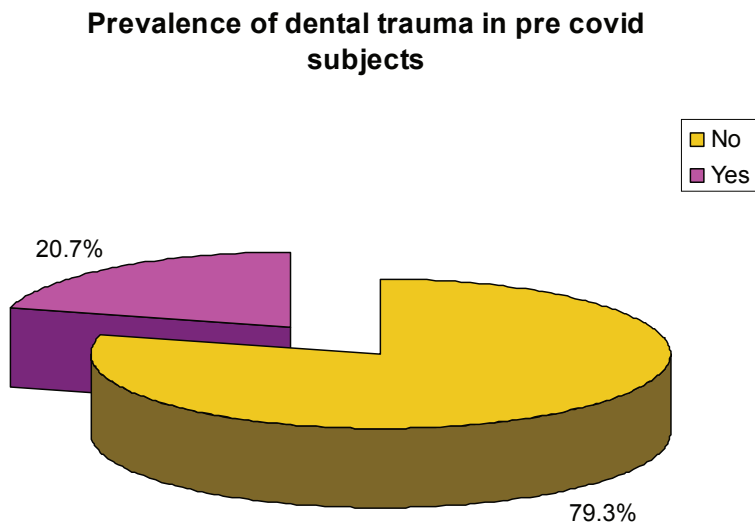
Prevalence of dental trauma in pre Covid subjects

Out of total 1000 pre Covid participants, TDI was seen in 207 (20.7%) participants and 793 (79.3%) did not experience any TDI. Thus, the overall prevalence of dental trauma in pre Covid children was 20.7% (Table 5 and Graph. 16).

Table 5: Prevalence of dental trauma in pre Covid subjects (n=1000)

Variable	No of subjects (n=1000) (%)
Trauma seen or not:	
No	793 (79.3)
Yes	207 (20.7)

Prevalence of dental trauma in pre Covid subjects were summarised in number (n) and percentage (%).



Graph. 16. Prevalence of dental trauma in pre Covid subjects.

Further, in pre Covid participants, the correlation of presence of TDI (seen or not) with tooth number, type of trauma, overjet and lip closure is summarised in Table 6 and also shown graphically in Graph. 17-19, respectively. The presence (prevalence) of dental trauma was comparatively higher in tooth number 11 and 61 than other teeth. High prevalence of both enamel crack and enamel fracture than both enamel, dentin fracture with pulp exposure and enamel, dentin fracture without pulp exposure was seen. Majorly higher prevalence of TDI was seen in participants with overjet ≥ 3 mm than < 3 mm and with lip closure inadequate than adequate.

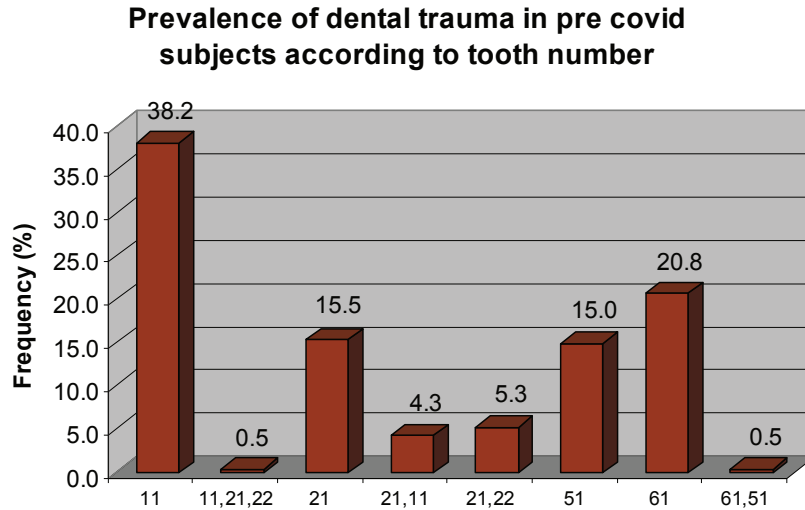
Results and Observations

On comparing, the χ^2 test showed significant ($P < 0.001$) association of presence of dental trauma with tooth number ($\chi^2=1000.00$, $P < 0.001$), type of trauma ($\chi^2=1000.00$, $P < 0.001$), overjet ($\chi^2=1000.00$, $P < 0.001$) and lip closure ($\chi^2=1000.00$, $P = 0.001$).

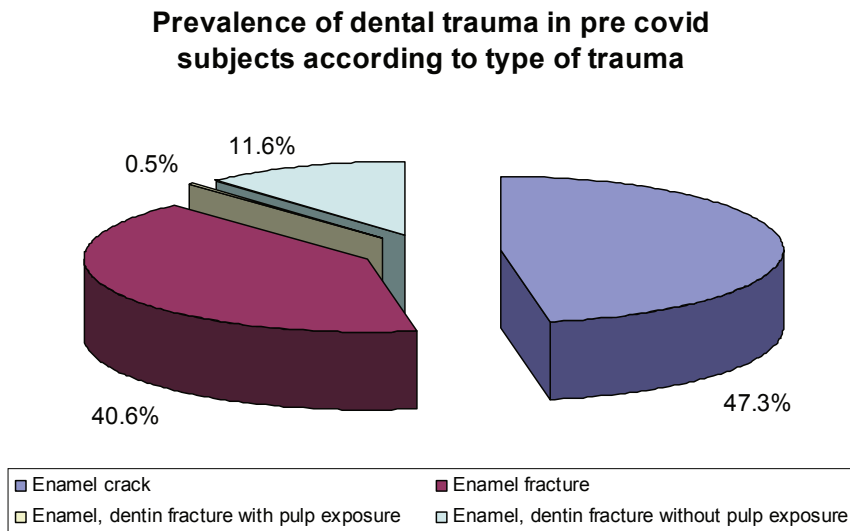
Table 6: Correlation of trauma seen or not with tooth number, type of trauma, overjet and lip closure of pre Covid subjects (n=1000)

Variable	Trauma seen or not		χ^2 value	P value
	No (n=793) (%)	Yes (n=207) (%)		
Tooth number:				
No	793	0 (0.0)	1000.00	< 0.001
11	(100.0)	79 (38.2)		
11,21,22	0 (0.0)	1 (0.5)		
21	0 (0.0)	32 (15.5)		
21,11	0 (0.0)	9 (4.3)		
21,22	0 (0.0)	11 (5.3)		
51	0 (0.0)	31 (15.0)		
61	0 (0.0)	43 (20.8)		
61,51	0 (0.0)	1 (0.5)		
Type of trauma:				
No	793	0 (0.0)	1000.00	< 0.001
Enamel crack	(100.0)	98 (47.3)		
Enamel fracture	0 (0.0)	84 (40.6)		
Enamel, dentin fracture with pulp exposure	0 (0.0)	1 (0.5)		
Enamel, dentin fracture without pulp exposure	0 (0.0)	24 (11.6)		
Overjet (mm):				
No	793	0 (0.0)	1000.00	< 0.001
<3	(100.00)	69 (33.3)		
≥3	0 (0.0)	138 (66.7)		
Lip closure:				
No	793	0 (0.0)	1000.00	< 0.001
Adequate	(100.00)	85 (41.1)		
Inadequate	0 (0.0)	122 (58.9)		

Correlation of trauma seen or not with tooth number, type of trauma, overjet and lip closure of pre Covid subjects were summarised in number (n) and percentage (%) and compared by χ^2 test (χ^2 value).

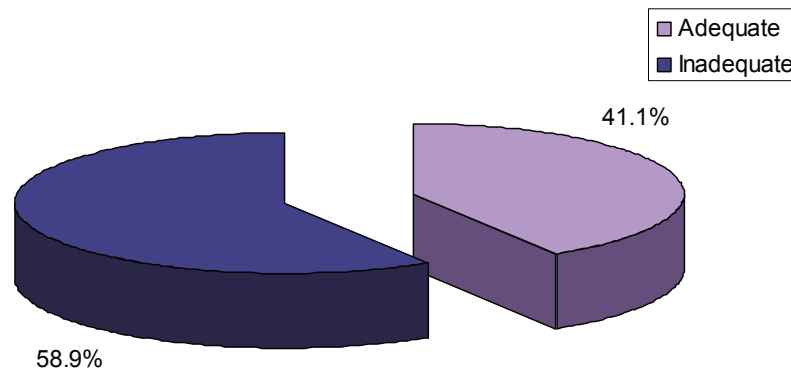


Graph. 17. Prevalence of dental trauma in pre Covid subjects according to tooth number.



Graph. 18. Prevalence of dental trauma in pre Covid subjects according to type of trauma.

Prevalence of dental trauma in pre covid subjects according to lip closure



Graph. 19. Prevalence of dental trauma in pre Covid subjects according to lip closure.

C. Participants enrolled during Covid

Prevalence of dental trauma in subjects enrolled during Covid

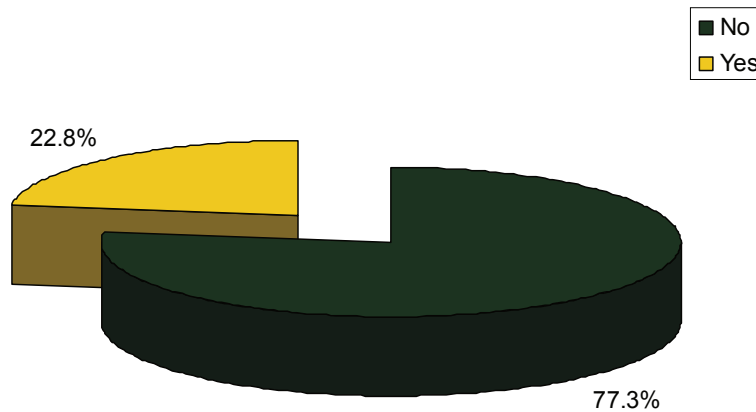
Out of the total 400 participants that were taken during Covid, TDI was seen in 91 (22.8%) participants and 309 (77.3%) did not experience any TDI thus, the overall prevalence of dental trauma during Covid was 22.8% (Table 7 and Graph. 20).

Table 7: Prevalence of dental trauma in during Covid subjects (n=400)

Variable	No of subjects (n=400) (%)
Trauma seen or not:	
No	309 (77.3)
Yes	91 (22.8)

Prevalence of dental trauma in subjects enrolled during Covid were summarised in number (n) and percentage (%).

Prevalence of dental trauma in post covid subjects



Graph. 20. Prevalence of dental trauma in subjects enrolled during Covid.

Further, in participants enrolled during Covid, the correlation of presence of TDI (trauma seen or not) with tooth number (arch: lower front teeth and upper front teeth) and the kind of activities the child prefers is summarised in Table 8 and also shown graphically in Graph. 21-22, respectively. The presence (prevalence) of TDI was comparatively higher in upper front teeth than in lower front teeth and children who were keener on playing outdoor sports experience more TDI.

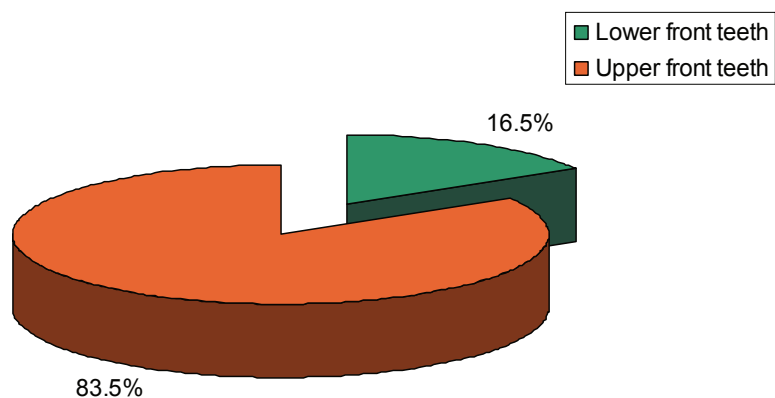
On comparing, the χ^2 test showed significant ($P < 0.001$) association of presence of dental trauma with arch ($\chi^2=400.00$, $P < 0.001$) but insignificant ($P > 0.05$), association with kind of activities ($\chi^2=0.00$, $P = 0.957$).

Table 8: Correlation of trauma seen or not with arch (tooth number: upper or lower) and kind of activities does the child prefer more in subjects enrolled during Covid (n=400)

Variable	Trauma seen or not		χ^2 value	P value
	No (n=309) (%)	Yes (n=91) (%)		
Arch:				
No	309 (100.0)	0 (0.0)	400.00	< 0.001
Mandibular arch (Lower front teeth)	0 (0.0)	15 (16.5)		
Maxillary arch (Upper front teeth)	0 (0.0)	76 (83.5)		
Kind of activities:				
Indoor games	84 (27.2)	25 (27.5)	0.00	0.957
Outdoor games	225 (72.8)	66 (72.5)		

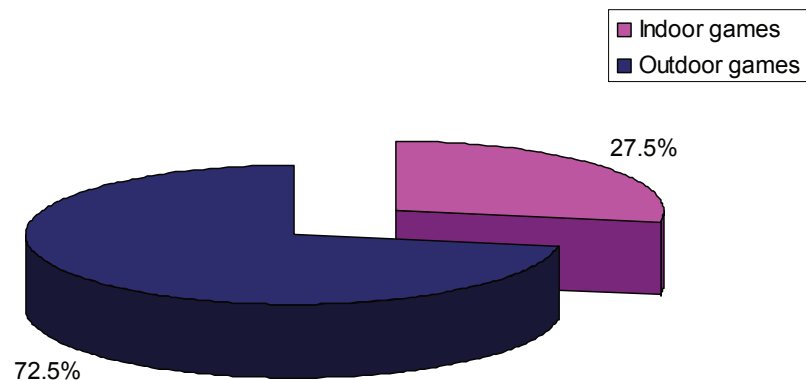
Correlation of trauma seen or not with arch and kind of activities does the child prefer more in subjects enrolled during Covid were summarised in number (n) and percentage (%) and compared by χ^2 test (χ^2 value).

Prevalence of dental trauma in post covid subjects according to tooth arch



Graph. 21. Prevalence of dental trauma in subjects enrolled during Covid according to tooth arch.

Prevalence of dental trauma in post covid subjects according to kind of activities



Graph. 22. Prevalence of dental trauma in subjects enrolled during Covid according to kind of activities.

D. Prevalence of dental trauma: Pre Covid vs. during Covid

Lastly, prevalence of TDI (trauma seen or not) was also compared between pre Covid and during Covid sample (Table 9). The χ^2 test showed similar ($P > 0.05$) frequency (%) of presence of dental trauma in pre Covid and (20.7% vs. 22.8%, $\chi^2=0.72, P = 0.397$).

Table 9: Prevalence and comparison of dental trauma in pre Covid (n=1000) and during Covid (n=400) subjects

Variable	Pre Covid (n=1000) (%)	During Covid (n=400) (%)	χ^2 value	<i>P</i> value
Trauma seen or not:				
No	793 (79.3)	309 (77.3)	0.72	0.397
Yes	207 (20.7)	91 (22.8)		

Prevalence of dental trauma in pre Covid and subjects enrolled during Covid were summarised in number (n) and percentage (%) and compared by χ^2 test (χ^2 value).

DISCUSSION

Traumatic dental injury is not a result of a disease but, a consequence of several factors that will accumulate throughout life if not treated properly. Dental trauma is a common form of injury, especially in children and it can result in pain, loss of function, poor esthetics and psychological trauma. Usually it represents a serious problem associated with many aspects of the patient's life.

There are geographical and cultural variances in all noncommunicable diseases. In addition, TDI has showed differences in various parts of the world. It's critical to see global parallels as well as localised differences. This is necessary for the development of effective interventions for improving awareness, TDI prevention, emergency care, and overall management. Several educational programmes have been recommended globally to determine the importance of early treatment for dental trauma, ways of preventing traumatic injuries and procedures for appropriate emergency management. These educational programmes for the public should preferably be preceded by an investigation of the background information on the occurrence of oro-dental injuries in that community. Knowledge about the country and state wise distribution are also the basis of health policies at state, national and international levels.

There is a plethora of available studies globally investigating different parameters of dental trauma. The most commonly investigated parameters are frequency, aetiology, appropriate treatment plan and methods for prevention of the dental trauma. Another factor investigated in the literature is the age wise distribution of trauma. Also, predisposing factors like increased over-jet, short upper lip, incompetent lips, mouth breathing and class II malocclusion have been considered.

The results from all these studies present a contrasting volume of data that may be attributed to differences in experimental design among the studies, differences in the population studied and variation in the age or the sample size.

TDI's have largely been an ignored segment of non-communicable oral diseases hence, there is lack of sufficient data in the city of Lucknow. Our study aims at providing better insight into TDI and its various associated factors. This information gathered can be utilized to prepare the contents of a programme and hence put to use in educating the masses and also, identification of the problem, severity, risk factors, burden and treatment needs can help in the formulation of effective preventive strategies and planning interventions specific to a region.

In the present study the prevalence of traumatic dental injuries in children aged 2-18 years has been observed and also the correlation of traumatic dental injuries with various associated factors was established. Reddy KV et al (2017)⁷⁸ conducted a similar study to determine the prevalence of traumatic injuries in 3–18 year old children in Tirupati.

The classification used to identify the type of trauma was Garcia-Godoy classification which is a deviation of the WHO classification. The reason for using the former classification, instead of the more widely used WHO classification or Ellis and Davey's classification was because of its simplicity and ease of epidemiological field applicability^{79,80}. Another reason was that in Garcia-Godoy classification, broad terms like complicated and uncomplicated fractures (WHO classification) or simple and extensive fractures were not used, which were not suggested for epidemiological studies.^{81,82}

The present study identified an overall prevalence of 21.3% of TDI to the primary and permanent anterior teeth among 1400 school going children in the age group of 2-18 years. This result corroborates with the earlier studies done by Kahabuka FK et al (2001)⁸³, Garcia-Godoy P (1981)⁸⁴ and Garcia-Godoy F (1986)⁸⁵ where the prevalence was found to be 21%, 18.1 and 21.3% respectively. However, studies conducted by Rai SB et al (1998)⁸⁶ and Ozge Eyuboglu et al (2008)⁸⁷ have reported lower prevalence than the present study. The reason for that can be attributed to sample selected (age range studied, sample size, socio- demographic and behavioural indicators, rural/urban

population, among others), the classification used to report the traumatic injuries, the type of study and the methodology used.

Age is a frequently reported risk factor where studies indicate that trauma experience was inclined towards the younger population (toddlers, children, adolescents and young adults). The specific age(s) was another source of variation which can be affected by local and methodological differences. Local differences include the environment, standard of living, access to services and culture. In the present study a statistically significant difference was seen in association of prevalence of TDI with age (**Table 3**). The highest prevalence of TDI was recorded in the age group 2-6 years old children followed by children aged 7-12 and 13-18 years. The prevalence of TDI in the age group of 2-6 years old children reflected the injuries of primary dentition while those in 7-12- and 13-18-years age group comprised the trauma to permanent anterior teeth. These findings were in accordance to studies carried out by Bastone EB et al (2000)⁹², Ozge Eyuboglu et al (2008)⁸⁷. There is a general trend indicating toddlers sustained injuries from involuntary falls while adolescents experienced accidental injuries from contact sports and other impact injuries.

In contrast to the results of the present study, Reddy KV et al (2017)⁷⁸ conducted a study which reported that the highest frequency of TDI was in the 10–12 year old participants and lowest frequency was in 3–6 year old children.

In the present study, it was observed that males were affected more than females with a prevalence of 50.7% and 49.3% respectively. Although this result was statistically insignificant (Table 3), it may be explicable by the fact that males are more aggressive and venture into more risks and participate more in sports activities although, nowadays females are as active as males, which was not the case earlier. Apart from that in the Indian scenario cultural trends also have a role to play in the lower prevalence of trauma in females.⁸⁹ Except for a study carried out in school children in Santo Domingo of Dominican Republic by Garcia-Godoy⁸⁴, almost all other studies reported a higher prevalence of traumatic injuries in males than in females. The author reported that more girls suffered traumatic injuries than boys.

However, in a later study⁸⁵ done on the same population by the same author, the finding was reversed and was in favor of males. This was also observed in many studies including the one conducted by Harold D Sgan-Cohen et al (2008)⁸⁸ which reported a higher prevalence of traumatic dental injuries in males as compared to females.

In the present study the income of the parents was measured with the help of the Modified Kuppuswamy Scale (2020)⁹³ (**Annexur XII**) and it was found that the prevalence of traumatic dental injuries was maximum in the group with monthly income of parents ranging from Rs. 99931-199861 followed by monthly income ranging from Rs. 49962-74755 and Rs. \geq 199862 respectively. We obtained statistically significant results for the same (**Table 3**) which were also in accordance with the findings of Basha S et al (2015).⁹⁴ On the contrary Freire-Maia FB et al (2018)⁹⁵ demonstrated that children are subject to TDI, regardless of socioeconomic status.

In the present study the correlation between number of children present in the family and TDI was established. A statistically significant difference was obtained and the maximum percentage of traumatic dental injuries was present in families with 2 children (71.1%) followed by those with only one child (28.9%). This can also be explained by the fact that in families with more members the attention of the parents towards the child is distributed due to lack of time. This was also observed in a study conducted by the World Health Organization (2009)⁹⁶.

In India, there has been a lack of knowledge about importance of dental health and the effect it has on the quality of life of a child. This trend has lately been on a decline due to the constantly increasing concerns of parents regarding their child's esthetics. In this study we assessed as to how many children had visited a dentist before and found that 67.9% children had already visited a dentist and the most frequent reason for visiting the dentist was for regular check-ups (33.6%) followed by those who visited the dentist due to a complaint of pain or discomfort in the teeth (21.6%) (**Table 1**).

To have a better understanding for creating preventive measures, the present study evaluated the correlation between the place of trauma and the occurrence of TDI. A statistically significant association was established which stated that 51.0% of traumatic injuries occurred at home followed by school (41.9%) and street (7.0%) accordingly (**Table 3**). This can be attributed to variability in the methods of recording this factor and the reliability of information provided by the children. This was similar to the findings of Bastone EB (2000) and Tapias M A (2003) who reported home as the most common location for TDI to occur.^{92, 127, 98}

In this study causes of trauma have been categorized into trauma due to assault or fight, trauma due to an accident or by falling and trauma due to sports activities or others. The association between the presence of TDI with the cause of trauma as well as the correlation of age with the cause of trauma was determined. A statistically significant difference was found in which the maximum TDI had occurred because of an accident or by falling (92.6%) followed by trauma that occurred due to sports activities (7.4%) (**Table3**). The correlation between age and the place of trauma depicted a statistically significant difference stating that the maximum trauma that occurred due to sports activities was in the age group of 2-6 years (100%) and trauma that occurs due to an accident or by falling was maximum in the age group of 7-12 years (44.2%) followed by children aged 2-6 years (37.0%) and 13-18 years (18.8%) respectively (**Table 4**). Studies carried out by Reddy KV et al (2017)⁷⁸, Juneja P et al (2018)⁹⁹, Tewari N et al (2020)¹⁰⁰ also stated that the maximum TDI had occurred due to an accident or by falling.

Due to the outbreak of the novel Corona Virus, the study had to be completed in two segments. One being the pre covid questionnaire and the other being the online questionnaire during the pandemic. Due to this discrepancy, the association between traumatic dental injuries and factors such as tooth number, type of fracture, over jet and lip closure could only be examined in the first half of the participants (n=1000).

In the present study the correlation between the tooth number and TDI was assessed. A statistically significant association between the tooth number and the presence of TDI was observed (**Table 6**). The most affected tooth in the permanent

dentition was the right maxillary central incisors (38.2%) followed by the left maxillary central incisor (15.5%) and the left lateral incisor (5.3%) respectively. In the primary dentition, the most commonly affected tooth was the left central incisor (20.8%) followed by the right central incisor (15.0%). Gupta S et al (2011)¹⁰¹ stated that the maxillary central incisors are the most common teeth to be affected by trauma.

Due to the difficulty of parents in understand the tooth number in the online questionnaire, the question drafted differently which included the option of upper front teeth and lower front teeth for better understanding. The statistically significant correlation between the arch and the presence of TDI was obtained (**Table 8**). It was seen that the maximum number of traumatic dental injuries presented in the maxillary arch (83.5%) followed by the mandibular arch (16.5%). The reason can be explained by the fact that in the vertical plane, the maxillary arch is located more anteriorly than the mandibular arch as a result of which the impact of injury would be more on the maxillary arch. Within the arch, the proclination of central incisors and their forward placement in the vertical plane also makes them more prone for the injury¹⁰².

The association between TDI and type of fracture seen was established. We found that Enamel cracks (Garcia Godoy Class 0) were the most prevalent type of traumatic dental injuries seen (47.3%) followed by enamel fractures (40.6%), enamel and dentin fractures without pulpal exposure (11.6%) and enamel and dentin fractures with pulpal exposure (0.5%) respectively. In accordance to the results of this study Tovo et al (2004)¹⁰³ reported the maximum cases of fracture in enamel whereas studies by Robert M. Love et al, Ozge Eyuboglu et al reported the highest prevalence of enamel dentin fracture without pulpal exposure^{97, 87}.

Increased overjet is one of the earliest predisposing factors described in literature. It was observed that there was a tendency for children with an incisal overjet greater than 3 mm and inadequate lip coverage to have experienced dental injuries. The present study correlated the presence of TDI with overjet and found a statistically significant difference for the same (**Table 6**). The results showed a greater prevalence of TDI in children who

had an overjet of ≥ 3 mm (66.7%) compared to those children who had an overjet of < 3 mm (33.3%). A review of literature conducted by Tewari N et al (2020)¹⁰⁰ concluded that individuals with an overjet > 3 mm have 3.53 times higher odds to experience TDI than the individuals with overjet =3 mm.

Inadequate lip coverage has been identified as the most powerful independent predictor for occurrence of anterior-tooth injuries. The present study determined the association between inadequate lip closure and TDI to be statistically significant (**Table 6**). It was concluded that children having inadequate lip coverage had a higher chance of experiencing TDI (58.9%) as compared to those having adequate lip coverage (41.1%). Studies conducted by Marcenés W et al (1999), Burden DJ (1995) and Baldava P et al (2007) stated that there was a higher risk of TDI in individuals with inadequate lip coverage¹⁰⁴⁻¹⁰⁶. A review of literature conducted by Tewari N et al (2020)¹²⁹ concluded that the individuals with inadequate lip coverage have 3.35 times higher odds than the individuals with adequate lip coverage to experience TDI.

In the online survey conducted, a field of type of activities preferred by the child was added and its correlation with TDI was determined (**Table 8**). Although statistically insignificant, it was observed that kids who preferred outdoor activities more were more prone to dental trauma (72.5%) as compared to those who preferred indoor activities (27.5%).

To observe the change in trend of TDI in both the phases of the study, the comparison between presence of TDI in both was obtained (**Table 9**). Although statistically insignificant but, it was found that the prevalence of TDI was higher in the online survey (22.8%) as compared to that examined in the first phase of the study (20.7%).

CONCLUSIONS

The present cross-sectional study was conducted in the Department of Pediatric and Preventive Dentistry, Babu Banarasi Das College of Dental Sciences (BBDCODS), Babu Banarasi Das University, Lucknow.

On the basis of observations made during the course of the study and their analysis, the following conclusions have been drawn:

- In the city of Lucknow, there is an overall 21.3% prevalence rate of TDI seen in children and adolescents. This was found to be more common in children aged 2-6 years (41.6%) followed by 7-12 years (40.9%), and 13-18 years (17.4%).
- In both, permanent as well as the primary dentition maxillary central incisors were the most affected teeth.
- Enamel cracks were the most common type of injury in children aged 2-6 years, while enamel fractures and enamel dentine fractures without pulp exposures were most common type of injuries in 7-11 years and 13-18 years age groups respectively.
- The maximum occurrence of TDI were seen at home for children in age group of 2-6 years, at school for children in age group of 7 to 12 years and at street for children in age group of 13 to 18 years.
- Children of low socioeconomic status, those with an inadequate lip closure and those having an overjet of ≥ 3 mm were found to be at a higher risk of TDI.

Hence, more emphasis must be placed on these problems related to TDI so as to educate the parents, teachers and schoolchildren about the prevention and immediate management of dental trauma.

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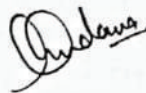
Annexure I
Institutional Research
Committee Approval

**BABU BANARASI DAS COLLEGE OF DENTAL SCIENCES
(FACULTY OF BBD UNIVERSITY), LUCKNOW**

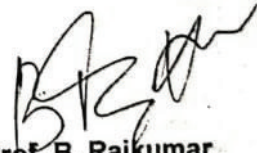
INSTITUTIONAL RESEARCH COMMITTEE APPROVAL

The project titled "Prevalence of Traumatic Dental Injuries and Their Correlation With Associated Factors in Children and Adolescents." submitted by Dr Srishti Beera Post graduate student from the **Department of Paedodontics & Preventive Dentistry** as part of MDS Curriculum for the academic year 2018-2021 with the accompanying proforma was reviewed by the Institutional Research Committee present on 27th November 2018 at BBDCODS.

The Committee has granted approval on the scientific content of the project. The proposal may now be reviewed by the Institutional Ethics Committee for granting ethical approval.



Prof. Vandana A Pant
Co-Chairperson



Prof. B. Rajkumar
Chairperson

Annexure II
Institutional Ethical
Committee Approval

Babu Banarasi Das University
Babu Banarasi Das College of Dental Sciences,
BBD City, Faizabad Road, Lucknow – 226028 (INDIA)

Dr. Lakshmi Bala
Professor and Head Biochemistry and
Member-Secretary, Institutional Ethics Committee
Communication of the Decision of the VIIth Institutional Ethics Sub-Committee

IEC Code: 19

BBDCODS/01/2019

Title of the Project: Prevalence of Traumatic Dental Injuries and Their Correlation With Associated Factors in Children and Adolescents.

Principal Investigator: Dr. Srishti Beera **Department: Paedodontics & Preventive Dentistry**

Name and Address of the Institution: BBD College of Dental Sciences Lucknow.

Type of Submission: New, MDS Project Protocol

Dear Dr. Srishti Beera,

The Institutional Ethics Sub-Committee meeting comprising following four members was held on 10th January 2019.

- | | |
|---|--|
| 1. Dr. Lakshmi Bala
Member Secretary | Prof. and Head, Department of Biochemistry, BBDCODS,
Lucknow |
| 2. Dr. Amrit Tandan
Member | Prof. & Head, Department of Prosthodontics and Crown &
Bridge, BBDCODS, Lucknow |
| 3. Dr. Rana Pratap Maurya
Member | Reader, Department of Orthodontics & Dentofacial Orthopedics,
BBDCODS, Lucknow |
| 4. Dr. Sumalatha M.N.
Member | Reader, Department of Oral Medicine & Radiology,
BBDCODS, Lucknow |

The committee reviewed and discussed your submitted documents of the current MDS Project Protocol in the meeting.

The comments were communicated to PI thereafter it was revised.

Decisions: The committee approved the above protocol from ethics point of view.

Lakshmi Bala
22/01/19
(Dr. Lakshmi Bala)
Member Secretary
Member-Secretary
IEC Institutional Ethic Committee
BBD College of Dent
BBD City
Faizabad Road, Lucknow-226028

Forwarded by:
[Signature]
(Dr. Pratik Kumar)
Principal
Babu Banarasi Das College of Dental Sciences
(Babu Banarasi Das College of Dental Sciences)
BBDCODS
88D City, Faizabad Road, Lucknow-226028

Annexure III

Babu Banarasi Das College of Dental Sciences

(Babu Banarasi Das University)

BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

Consent Form

(English)

Title of the Study: PREVALENCE OF TRAUMATIC DENTAL INJURIES AND THEIR CORRELATION WITH ASSOCIATED FACTORS IN CHILDREN AND ADOLESCENTS”.

Study Number.....

Subject’s Full

Name..... Date of

Birth/Age

Address of the Subject.....

Phone no. and e-mail address.....

Qualification

Occupation: Student / Self Employed / Service / Housewife/

Other (Please tick as appropriate)

Annual income of the Subject.....

Name and of the nominees(s) and his relation to the subject..... (For the purpose of compensation in case of trial related death).

1. I confirm that I have read and understood the Participant Information Document datedfor the above study and have had the opportunity to ask questions.
OR I have been explained the nature of the study by the Investigator and had the opportunity to ask questions.
2. I understand that my participation in the study is voluntary and given with free will without any duress and that I am free to withdraw at any time, without giving any reason and without my medical care or legal rights being affected.
3. I understand that the sponsor of the project, others working on the Sponsor’s behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and

any further research that may be conducted in relation to it, even if I withdraw from the trial. However, I understand that my Identity will not be revealed in any information released to third parties or published.

4. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).

5. I permit the use of stored sample (tooth/tissue/blood) for future research. **Yes** [] **No** [] **Not Applicable** []

6. I agree to participate in the above study. I have been explained about the complications and side effects, if any, and have fully understood them. I have also read and understood the participant/volunteer's Information document given to me. Signature (or Thumb impression) of the Subject/Legally Acceptable Representative:.....

Signatory's Name..... Date

Signature of the Investigator..... Date.....

Study Investigator's Name..... Date.....

Signature of the witness..... Date.....

Name of the witness.....

Received a signed copy of the PID and duly filled consent form

Signature/thumb impression of the subject or legally Date.....
Acceptable representative

Annexure IV

Babu Banarasi Das College of Dental Sciences

(Babu Banarasi Das University)

BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

Child Assent Form

Study Title **PREVALENCE OF TRAUMATIC DENTAL INJURIES AND THEIR CORRELATION WITH ASSOCIATED FACTORS IN CHILDREN AND ADOLESCENTS**

Study Number _____
Subject's Full Name _____
Date of Birth/Age _____
Address _____

I _____, exercising my free power of choice, hereby give my consent for participation in the study entitled:

“.....”

I have been informed, to my satisfaction, by the attending physician, about the purpose of the study and the nature of the procedure to be done. I am aware that my parents/guardians do not have to bear the expenses of the treatment if I suffer from any trial related injury, which has causal relationship with the said trial drug. I am also aware of right to opt out of the trial, at any time during the course of the trial, without having to give reasons for doing so

Signature of the study participant

_____ Date: _____ Name of the study participant _____


Signature of the Witness

_____ Date _____ Name of the Witness _____

Signature of the attending

Physician _____ Date: _____ Name of the attending Physician _____

Annexure V

	Babu Banarasi Das College of Dental Sciences (A Constituent Institution of Babu Banarasi Das University) BBD City, Faizabad Road, Lucknow – 227105 (INDIA)
शिशु सहमति पत्र	
मैं _____ में भाग लेने के लिए अपनी सहमति प्रदान करता हूँ। मुझे इस अध्ययन के हेतु और उसमें की जाने वाली प्रक्रिया के बारे में चिकिस्तक द्वारा बताया गया है। मुझे पता है कि अध्ययन सम्बन्धी किसी हानि जिसका अध्ययन की दवा से सम्बन्ध है उसका खर्च मेरे माता पिता अथवा अभिवाहक को नहीं करना है । मुझे यह भी पता है कि मैं इस अध्ययन से किसी समय बिना कोई कारण बताये बाहर हो सकता हूँ।	
अध्ययन में भाग लेने वाले का नाम और हस्ताक्षर _____ दिनांक _____	
गवाह के हस्ताक्षर _____ दिनांक _____	
गवाह का नाम _____	
चिकिस्तक का नाम और हस्ताक्षर _____ दिनांक _____	

Annexure VI

Babu Banarasi Das College of Dental Sciences

(Babu Banarasi Das University)

BBD City, Faizabad Road, Lucknow – 227105 (INDIA)

**Guidelines for Devising a Participant / Legally Acceptable Representative
Information**

Document (PID) in English

1. Study Title

Prevalence of traumatic dental injuries and their correlation with associated factors in children and adolescents.

2. Invitation Paragraph

You are being invited to take part in a research/trial study. Before you decide it is important for you to understand why the research/study is being done and what it will involve. Please take time to read the following information carefully and discuss it with friends, relatives and your treating physician/family doctor if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

3. What is the purpose of the study?

This study aims to evaluate the prevalence of traumatic dental injuries and its association with various parameters in children and adolescents.

4. Why have I been chosen?

The participant has been chosen on the basis of his/her age and the teeth present in the oral cavity. There will be a total of 6000 children who will be selected for the same. Children with any systemic disease will not be taken in the study.

5. Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason.

6. What will happen to me if I take part?

The study just involves screening the patients once in their play schools, public and private schools.

The children will be screened for the presence of traumatic dental injuries if any. Various parameters will be checked in the form of a questionnaire and clinical evaluation.

7. What do I have to do?

There are no special instructions that have to be given to the children that have to be screened for the study.

8. What is the procedure that is being tested?

There is no drug device that will be used only screening will be carried out at various centers.

9. What are the interventions for the study?

Only check up will be done to see the presence of any traumatic dental injuries in all the patients that will be included in the study.

10. What are the side effects of taking part?

There are no known side effects of taking part in the study since no invasive procedure is been carried out.

11. What are the possible disadvantages and risks of taking part?

No such disadvantages are there for the participants.

12. What are the possible benefits of taking part?

The patients if agreed to taking part in the study, can help in spreading awareness amongst all public about traumatic dental injuries since it is a very neglected part of dental awareness.

13. What if new information becomes available?

If additional information becomes available during the course of the research then the participant will be informed about the same. An updated consent form will be given to the participants if they wish to continue for the study.

14. What happens when the research study stops?

Nothing will happen to the participants.

15. What if something goes wrong?

The participants parents will be well informed about the study but still if something goes wrong a proper available address with the contact number of the concerned person would be provided to them before the beginning of the study.

16. Will my taking part in this study be kept confidential?

All information collected about you during the course of the research will be kept strictly confidential. Any information which leaves the laboratory will have your name and address removed so that you cannot be recognized from it.

17. What will happen to the results of the research study?

The participants will be informed about the results. They will not be identified in any report/publication.

18. Who is organizing the research?

The research is been done in the DEPARTMENT OF PEDIATRIC AND PREVENTIVE DENTISTRY,BBDCODS. The research is self-funded.

19. Will the results of the study be made available after study is over?

This will be decided once the study is over.

20. Who has reviewed the study?

The HOD and the members of IRC of the institution have reviewed and approved the study.

21. Contact for further information

Name of the PI-Dr SRISHTI BEERA,
Address-BBD UNIVERSITY, LUCKNOW
e-mail address- srishibeera@gmail.com
Telephone Numbers 8006629832

Member Secretary of Ethics Committee of the institution
(Dr. Lakshmi Bala, Member Secretary, bbdcods.iec@gmail.com) with address,
e-mail address with telephone numbers (ext. no. 1291).

THANK YOU FOR TAKING OUT YOUR PRECIOUS TIME FOR READING
THE DOCUMENTS AND PARTICIPATING IN THE STUDY.

Signature of PI.....

Name.....

Date.....

Annexure VII

Participation Information Document (PID)- Hindi

1. अध्ययन शीर्षक

दर्दनाक दंत चोटों की व्यापकता और बच्चों और किशोरों में संबंधित कारकों के साथ उनका संबंध।

2. निमंत्रण पैराग्राफ

आपको एक शोध/परीक्षण अध्ययन में भाग लेने के लिए आमंत्रित किया जा रहा है। निर्णय लेने से पहले आपके लिए यह समझना महत्वपूर्ण है कि शोध/अध्ययन क्यों किया जा रहा है और इसमें क्या शामिल होगा। कृपया निम्नलिखित जानकारी को ध्यान से पढ़ने के लिए समय निकालें और यदि आप चाहें तो मित्रों, रिश्तेदारों और अपने इलाज करने वाले चिकित्सक/पारिवारिक चिकित्सक के साथ इस पर चर्चा करें। हमसे पूछें कि क्या कुछ ऐसा है जो स्पष्ट नहीं है या यदि आप अधिक जानकारी चाहते हैं। यह तय करने के लिए समय निकालें कि आप भाग लेना चाहते हैं या नहीं।

3. अध्ययन का उद्देश्य क्या है?

इस अध्ययन का उद्देश्य दर्दनाक दंत चोटों की व्यापकता का मूल्यांकन करना है और यह बच्चों और किशोरों में विभिन्न मापदंडों के साथ जुड़ा हुआ है।

4. मुझे क्यों चुना गया है?

इस अध्ययन का उद्देश्य दर्दनाक दंत चोटों की व्यापकता का मूल्यांकन करना है और यह बच्चों और किशोरों में विभिन्न मापदंडों के साथ जुड़ा हुआ है।

5. क्या मुझे भाग लेना है?

यह आपको तय करना है कि भाग लेना है या नहीं। यदि आप भाग लेने का निर्णय लेते हैं तो आपको यह सूचना पत्र अपने पास रखने के लिए दिया जाएगा और सहमति प्रपत्र पर हस्ताक्षर करने के लिए कहा जाएगा। यदि आप भाग लेने का निर्णय लेते हैं तब भी आप किसी भी समय और बिना कोई कारण बताए वापस लेने के लिए स्वतंत्र हैं।

6. अगर मैं भाग लूंगा तो मेरा क्या होगा?

अध्ययन में सिर्फ एक बार मरीजों को उनके प्ले स्कूल, सार्वजनिक और निजी स्कूलों में स्क्रीनिंग करना शामिल है। बच्चों को दर्दनाक दंत चोटों की उपस्थिति के लिए जांच की जाएगी यदि कोई हो। प्रश्नावली और नैदानिक मूल्यांकन के रूप में विभिन्न मापदंडों की जांच की जाएगी।

7. मुझे क्या करना है?

अध्ययन के लिए जिन बच्चों की स्क्रीनिंग की जानी है, उन्हें कोई विशेष निर्देश नहीं दिया जाता है।

8. वह प्रक्रिया क्या है जिसका परीक्षण किया जा रहा है?

कोई दवा उपकरण नहीं है जिसका उपयोग किया जाएगा केवल विभिन्न केंद्रों पर स्क्रीनिंग की जाएगी।

9. अध्ययन के लिए हस्तक्षेप क्या हैं?

अध्ययन में शामिल किए जाने वाले सभी रोगियों में किसी भी दर्दनाक दंत चोट की उपस्थिति को देखने के लिए केवल जांच की जाएगी।

10. भाग लेने के दुष्प्रभाव क्या हैं?

अध्ययन में भाग लेने के कोई ज्ञात दुष्प्रभाव नहीं हैं क्योंकि कोई आक्रामक प्रक्रिया नहीं की गई है।

11. भाग लेने के संभावित नुकसान और जोखिम क्या हैं?

प्रतिभागियों के लिए ऐसा कोई नुकसान नहीं है।

12. भाग लेने के संभावित लाभ क्या हैं?

यदि रोगी अध्ययन में भाग लेने के लिए सहमत होते हैं, तो वे सभी लोगों के बीच दर्दनाक दंत चोटों के बारे में जागरूकता फैलाने में मदद कर सकते हैं क्योंकि यह दंत जागरूकता का एक बहुत ही उपेक्षित हिस्सा है।

13. यदि नई जानकारी उपलब्ध हो जाए तो क्या होगा?

यदि शोध के दौरान अतिरिक्त जानकारी उपलब्ध हो जाती है तो प्रतिभागी को इसके बारे में सूचित किया जाएगा। यदि वे अध्ययन जारी रखना चाहते हैं तो प्रतिभागियों को एक अद्यतन सहमति प्रपत्र दिया जाएगा।

14. जब शोध अध्ययन रुक जाता है तो क्या होता है?

प्रतिभागियों को कुछ नहीं होगा।

15. अगर कुछ गलत हो जाए तो क्या होगा?

प्रतिभागियों के माता-पिता को अध्ययन के बारे में अच्छी तरह से सूचित किया जाएगा, लेकिन फिर भी कुछ गलत होने पर संबंधित व्यक्ति के संपर्क नंबर के साथ एक उचित उपलब्ध पता उन्हें अध्ययन शुरू होने से पहले प्रदान किया जाएगा।

16. क्या इस अध्ययन में भाग लेने को गोपनीय रखा जाएगा?

शोध के दौरान आपके बारे में एकत्र की गई सभी सूचनाओं को पूरी तरह गोपनीय रखा जाएगा। प्रयोगशाला से निकलने वाली किसी भी जानकारी से आपका नाम और पता हटा दिया जाएगा ताकि आपको इससे पहचाना न जा सके।

17. शोध अध्ययन के परिणामों का क्या होगा?

प्रतिभागियों को परिणामों के बारे में सूचित किया जाएगा। किसी रिपोर्ट/प्रकाशन में उनकी पहचान नहीं की जाएगी।

18. शोध का आयोजन कौन कर रहा है?

यह शोध पेडोंटिक्स एंड प्रिवेंटिव डेंटिस्ट्री, बीबीडीसीओडीएस विभाग में किया गया है। शोध स्व-वित्त पोषित है।

19. क्या अध्ययन के परिणाम अध्ययन के बाद उपलब्ध कराए जाएंगे?

अध्ययन समाप्त होने के बाद यह तय किया जाएगा।

20. अध्ययन की समीक्षा किसने की?

संस्थान के एचओडी और आईआरसी के सदस्यों ने अध्ययन की समीक्षा और अनुमोदन किया है।

21. अधिक जानकारी के लिए संपर्क करें

पीआई-डॉ सृष्टिबीरा,

पता-बीबीडी विश्वविद्यालय, लखनऊ

ईमेल पता- srishtibeera@gmail.com

टेलीफोन नंबर 8006629832

संस्था की आचार समिति के सदस्य सचिव

(डॉ. लक्ष्मी बाला, सदस्य सचिव, bbdcods.iec@gmail.com) पते के साथ,

टेलीफोन नंबरों के साथ ई-मेल पता (विस्तार संख्या 1291)।

दस्तावेजों को पढ़ने और अध्ययन में भाग लेने के लिए अपना कीमती समय

निकालने के लिए धन्यवाद।

पीआई का हस्ताक्षर

नाम

तारीख

ANNEXURE- VIII
Formula used for the analysis

Arithmetic Mean

The most widely used measure of central tendency is arithmetic mean, usually referred to simply as the mean, calculated as

$$\bar{X} = \frac{\sum_{i=1}^n X_i}{n}$$

Standard deviation and standard error

The standard deviation (SD) is the positive square root of the variance, and calculated as

$$SD = \sqrt{\frac{\sum X_i^2 - \frac{(\sum X_i)^2}{n}}{n-1}}$$

and SE (standard error of the mean) is calculated as

$$SE = \frac{SD}{\sqrt{n}}$$

where, n= no. of observations

Minimum and Maximum

Minimum and maximum are the minimum and maximum values respectively in the measure data and range may be denoted as below

Range = Min to Max

and also evaluated by subtracting minimum value from maximum value as below

Range = Maximum value-Minimum value

Median

The median is generally defined as the apical measurement in an ordered set of data. That is, there are just as many observations larger than the median as there are smaller. The median (M) of a sample of data may be found by first arranging the measurements in order of magnitude (preferably ascending). For even and odd number of measurements, the median is evaluated as

M= [(n+1)/2]th observation- odd number

M= [n(n+1)/2]th observation – even number

Chi-square test

The chi-square (χ^2) test is used to compare the categorical data as

$$\chi^2 = \sum \sum \frac{(F_{ij} - f_{ij})^2}{f_{ij}}$$

where, F_{ij} is the observed frequency while f_{ij} the expected frequency. The degrees of freedom (DF) is calculated as

$$DF = (r-1)(c-1)$$

Statistical significance

Level of significance " P " is the probability signifies level of significance. The mentioned P in the text indicates the following:

$P > 0.05$ - not significant (ns)

$P < 0.05$ - just significant (*)

$P < 0.01$ - moderate significant (**)

$P < 0.001$ - highly significant (***)

ANNEXURE IX & X

QUESTIONNAIRE 1.

➤ **TO BE FILLED BY PATIENT / PARENT**

1. NAME-

2. AGE-

3. SEX-

4. HEIGHT -

5. WEIGHT -

6. DATE OF BIRTH-

7. ADDRESS-

8. CONTACT NUMBER-

9. MONTHLY FAMILY INCOME IN RUPEES -

- $\geq 199,862$
- 99,931 - 199,861
- 74,756 - 99,930
- 49,962 - 74,755
- 29,973 - 49,961
- 10,002 – 29,972
- $\leq 10,001$

10. NUMBER OF CHILDREN IN THE FAMILY-

- One
- Two
- >2

11. HAS THE CHILD VISITED THE DENTIST BEFORE? IF YES THEN WHY?

- Not visited the dentist
- Regular check up
- Cleaning of teeth
- Pain or discomfort in teeth
- Fracture of tooth

12. DOES THE CHILD HAVE ANY MEDICAL PROBLEM? IF YES THEN SPECIFY.

➤ **TO BE FILLED BY OPERATOR**

1. What is the place of trauma?

- Home
- School
- Street
- Others

2. Which tooth number is involved?

3. What is the type of fracture?

- CLASS 0 = Enamel crack
- CLASS 1 = Enamel fracture
- CLASS 2 = Enamel Dentine fracture without pulp exposures
- CLASS 3 = Enamel Dentine fracture with pulp exposure
- CLASS 4 = Enamel- Dentine-cementum fracture without pulp exposure
- CLASS 5 = Enamel- Dentine-cementum fracture with pulp exposure
- CLASS 6 = Root fracture
- CLASS 7 = Concussion
- CLASS 8 = Luxation
- CLASS 9 = Lateral displacement
- CLASS 10 = Intrusion
- CLASS 11 = Extrusion
- CLASS 12 = Avulsion.

4. What is the etiology or cause of the trauma?

- Has the trauma occurred due to any assault?
 - Has the trauma occurred due to an accident?
 - Has the trauma occurred due to a sports injury?
 - Has the trauma occurred due to falling down?
 - Trauma occurring due to any other reasons
-

5. Degree of overjet present

- ≥ 3 mm
- ≤ 3 mm

6. Lip closure

- Adequate
- Inadequate

7. What is the malocclusion seen in the patient?

- Class I
- Class II
- Class III

Questionnaire 2 (Online)

- NAME -
- AGE-
- SEX-
 - Male
 - Female
 - Others

- HEIGHT -
- WEIGHT -
- ADDRESS-

- CONTACT NUMBER-

- MONTHLY FAMILY INCOME IN RUPEES -
 - $\geq 199,862$
 - 99,931 - 199,861
 - 74,756 - 99,930
 - 49,962 - 74,755
 - 29,973 - 49,961
 - 10,002 – 29,972
 - $\leq 10,001$

- NUMBER OF CHILDREN-
 - One
 - Two
 - >2

- HAS THE CHILD VISITED THE DENTIST BEFORE? IF YES THEN WHY?
 - Not visited the dentist
 - Regular check up
 - Cleaning of teeth
 - Pain or discomfort in teeth
 - Fracture of tooth

- DOES THE CHILD HAVE ANY BROKEN TOOTH DUE TO TRAUMA?
 - Yes
 - No

- WHAT IS THE PLACE OF TRAUMA?
 - Home
 - School
 - Street
 - Others

- WHICH TOOTH WAS AFFECTED?
 - Upper front teeth
 - Lower front teeth

- WHAT IS THE PROBABLE CAUSE OF THE TRAUMA?
 - Trauma occurred due to any assault or fight
 - Trauma occurred due to an accident or by falling
 - Trauma occurred due to a sports activity
 - Others

ANNEXURE- XI

Garcia Godoy Classification (1981)

- CLASS 0 = Enamel crack
- CLASS 1 = Enamel fracture
- CLASS 2 = Enamel Dentine fracture without pulp exposures
- CLASS 3 = Enamel Dentine fracture with pulp exposure
- CLASS 4 = Enamel- Dentine-cementum fracture without pulp exposure
- CLASS 5 = Enamel- Dentine-cementum fracture with pulp exposure
- CLASS 6 = Root fracture
- CLASS 7 = Concussion
- CLASS 8 = Luxation
- CLASS 9 = Lateral displacement
- CLASS 10 = Intrusion
- CLASS 11 = Extrusion
- CLASS 12 = Avulsion.

ANNEXURE- XII**Kuppuswamy scale for Socioeconomic status (2020)**

Monthly Family Income in Rupees	SCORE
$\geq 199,862$	12
99,931 - 199,861	10
74,756 - 99,930	6
29,973 - 49,961	4
49,962 - 74,755	3
10,002 – 29,972	2
$\leq 10,001$	1



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