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RESEARCH ARTICLE
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PREVALENCE OF TRAUMATIC DENTAL INJURIES IN 7-13 YEARS OLD SCHOOL GOING CHILDREN IN RURAL AND URBAN TAMIL NADU, INDIA

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INTRODUCTION

Traumatic dental injuries (TDIs) among school-going children are a significant concern that can impact oral health, overall well-being, and quality of life. Traumatic dental injuries (TDI) are predicted to be the fifth most common condition worldwide (1). The occurrence of dental injuries in a population can be defined by its prevalence and incidence. The prevalence of Traumatic Dental Injuries is widespread in the population and varies worldwide; it could be less in developed countries and more in developing and under developing countries. Indeed, most of the studies have reported Traumatic Dental Injuries prevalence as high as 15–30% in the permanent and in the primary dentitions (2). The prevalence of traumatic dental injuries among school children in different parts of the world varies from a low of 2.6%15 to a high of 43.8 %.15-16. The pooled prevalence of TDI in Indian population was 13 cases in 100 individuals. The prevalence of TDI for age groups of ≤6 was 15% (males, 15%; females, 16%) and for >6 years was 12% (males, 13%; females, 8%) (3).

Dental trauma starts as early as the children begin to crawl although it is most common throughout the first ten years of their lives (4). During this time, the teeth and the oral and maxillofacial area are subjected to a range of unexpected and rapid encounters. In preschool children aged 0 to 6 years, the majority of trauma cases are caused by falling, which frequently occurs in the home environment during the day, followed by other trauma (5). Children aged 7 to 13 years are reported to be more susceptible to oral trauma as a result of unrestrained activities, with injuries resulting from being pushed, hit, and falling; these occur primarily in school or sports areas from contact sports such as football, basketball, and so on (6). In addition to this, injuries caused by collisions with objects or people, bicycles, and road traffic accidents also occurs among school going children (7).

Untreated fractures of an anterior tooth can have an impact on a child's actions and accomplishment at school and in everyday life (8). According to the literature, children who have had trauma to their anterior teeth are more likely to avoid smiling and laughing and to be self-conscious than children who have not had dental trauma (9). Similarly, children who have untreated dental trauma experience social isolation and humiliation, as well as a lower quality of life in terms of oral health (10). It has been established that teenagers with broken teeth are 20 times more disruptive in daily life than adolescents who have not had dental trauma (9). Parents tend to ignore early dentition injuries caused by dental crowns. In severe cases, however, damage to supporting structures such as the alveolar bone

is the reason for the first visit to the emergency room. The front teeth are the most commonly injured (4). Since, they are visible in the dental arch, the upper incisors are the most usually impacted teeth. Male children, children with prognathic maxillae, and children with a visible overjet are more likely to incur cutting injuries (9).

The prevalence of TDI for age groups >6 years was 12% (3). Many factors influence the occurrence of dental trauma, including age, gender, behavioural difficulties, the state of occlusion, lip position, tongue and lip piercing, chipped teeth, socioeconomic situation, and the absence of mouth protectors while participating in sporting activities. These factors may also have an impact on the prevalence of traumatic dental injuries. The link between socioeconomic status and treating traumatized dental injuries is widely recognized worldwide.

The prevalence of traumatic injuries among school children in Tamil Nadu has been investigated since 1981 addressing etiology, risk factors, and awareness. The target populations were different groups of school going children of a particular urban area or rural area. But no research study has compared the prevalence of traumatic injuries among school going children aged between 7 and 13 years in urban and rural areas of Tamil Nadu. For the present study, selected urban school children in Chennai and rural school children in Tiruchirappalli are the target samples. Hence, the aim of the present study was to evaluate the prevalence, etiological and risk factors of Traumatic Dental Injuries among 7 - 13 years old school going children in Rural and Urban Tamil Nadu.

MATERIALS AND METHODS:

The cross-sectional descriptive study was conducted to evaluate the prevalence of traumatic dental injuries among 7 - 13 years old school going children in Rural and Urban Tamil Nadu. The study was approved by the Institutional Review Board of Dr MGR Educational Research Institute. A written approval from the principal of the concerned school was obtained, and the children were priorly informed about the study.

PILOT STUDY

The questionnaires were pre-tested by means of a pilot evaluation, in order to establish consistency and effectiveness which was distributed among 100 randomly selected students of those parents who gave consent for their children to participate in the study. The data obtained in the pilot study were analysed by (authors). Based on the suggestions of the subject experts, the questionnaire was further improved. Finally, the questionnaire was designed, developed, validated and used for the main study.

SAMPLE SIZE DETERMINATION

The sample size was determined using the G power.

Z tests - Proportions: Difference between two independent proportions
Analysis: A priori: Compute required sample size
Input: Tail(s) = Two
Proportion p2 = 0.19
Proportion p1 = 0.12
α err prob = 0.05
Power (1-β err prob) = 0.90
Allocation ratio N2/N1 = 1
Output: Critical z = 1.9599640
Sample size group 1 = 714
Sample size group 2 = 714
Total sample size = 2142

The required sample size with 95% power is 714 per group and in total 1428. The total sample size must be multiplied by 1.5 (Design Effect) for cluster sampling method. Therefore, total sample size

is 1428 ×1.5 = 2142. Out of 2142 school children surveyed, 1117 are urban school children and 1025 are Rural School children.

INCLUSION CRITERIA

1. School children aged between7and 13 years.
2. Children who had obtained parental consent to participate in the study.
3. Children who had fully erupted permanent anterior teeth.

EXCLUSION CRITERIA

1. Children with extensive caries in the anterior teeth.
2. Dental anomalies in tooth structure
3. Discolored teeth other than trauma
4. History of undergoing orthodontic therapy
5. Restored anterior teeth but no history of trauma.
6. Children in whom the permanent anterior teeth had not yet erupted.
7. Children in whom the permanent anterior were lost due to caries/other than trauma.
8. Those having partial/complete anodontia involving permanent anterior.
9. Children who had not obtained parental consent to participate in the survey.

DATA PROCESSING AND STATISTICAL ANALYSIS

The data were entered in Microsoft Excel Sheet 2007, and analysis was done using the SPSS version 20 (SPSS Inc., IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp., USA) software. The prevalence of the examined variables was calculated for each gender, age group and type of school. The Chi-square test was done to determine the association between the independent variables and Traumatic Dental Injuries were determined using the chi-square test. $P = 0.05$ was considered as statistically significant.

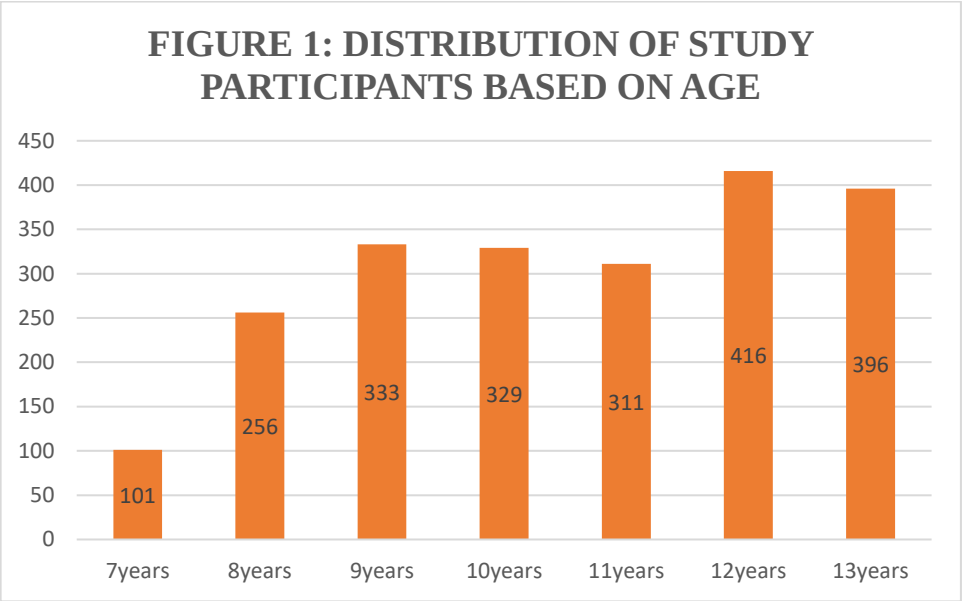
RESULTS:

The cross-sectional descriptive study was conducted to evaluate the prevalence of traumatic dental injuries among 7 - 13 years old school going children in Rural and Urban Tamil Nadu.

TABLE 1: DISTRIBUTION OF STUDY PARTICIPANTS BASED ON AGE AND GENDER

AGE	**N (%)**
7 years	101 (4.7%)
8 years	256 (12%)
9 years	333 (15.5%)
10 years	329 (15.4%)
11 years	311 (14.5%)
12 years	416 (19.4%)
13 years	396 (18.5%)
GENDER	**N (%)**
Male	1117 (52.1%)
Female	1025 (47.9%)

Table 1 shows that among the subjects 101 (4.7%) were 7 years old, 256 (12%) were 8 years old, 333 (15.5%) were 9 years old, 329 (15.4%) were 10 years old, 311 (14.5%) were 11 years old, 416 (19.4%) were 12 years old and 396 (18.5%) were 13 years old. Figure 1 shows the distribution of study participants based on age. There were 1117 (52.1%) were males and 1025 (47.9%) were females. It was observed that majority of the subjects were males. Figure 2 shows the distribution of study participants based on gender.



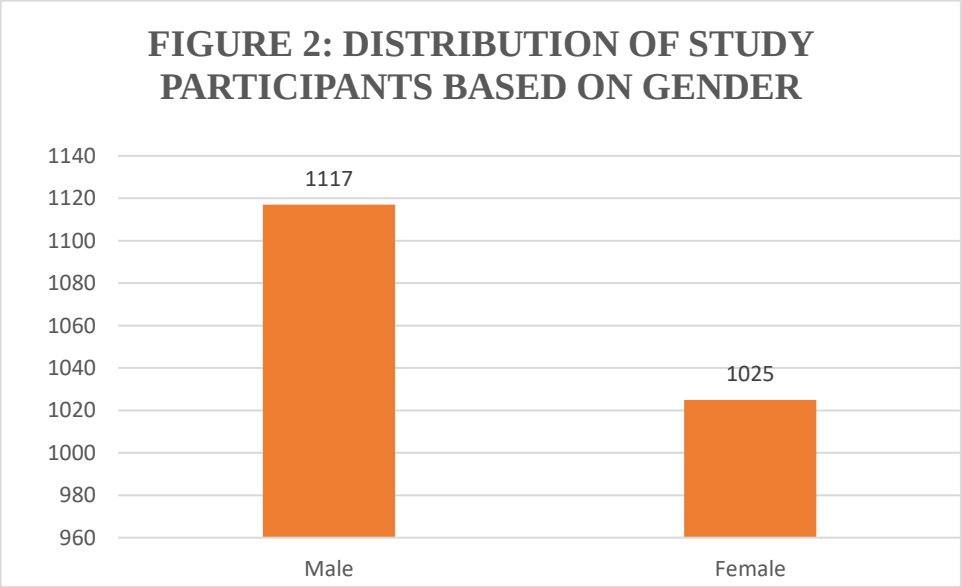


TABLE 2 DISTRIBUTION OF THE SCHOOL CHILDREN WITH HISTORY OF DENTAL TRAUMA.

History of Trauma	Area		P value
	Urban N (%)	Rural N (%)	
Absent	1015 (90.9%)	892 (87%)	0.004
Present	102 (9.1%)	133 (13%)	

*chisquare test $p<0.05$ statistically significant

Table 2 shows that 102 (9.1%) of the urban school children are found with history of Dental Trauma and 1015 (90.9%) have no history of Dental Trauma. In the Rural school children, 892 (87%) are found with no history of Dental Trauma and 133 (13%) have history of Dental Trauma and there is statistically significant difference between the Urban and Rural School children on the factor "History of Trauma".

Figure 3 shows the distribution of the school children with history of dental trauma.

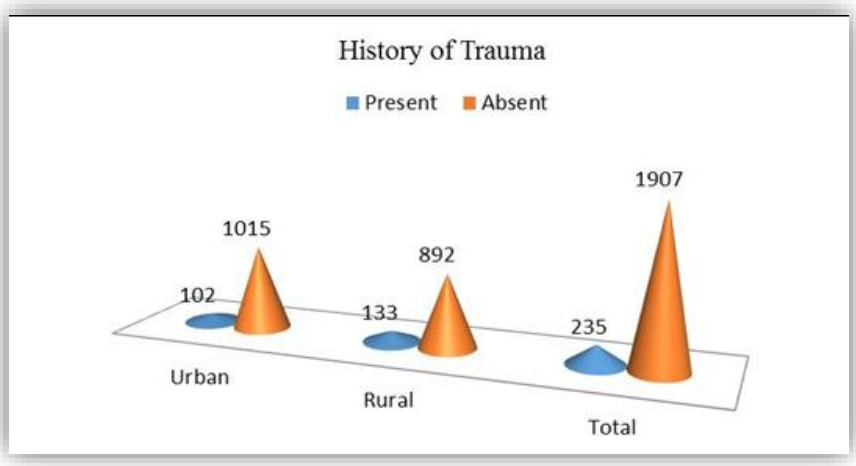


TABLE 3: DISTRIBUTION OF THE AGE OF TRAUMA IN SCHOOL CHILDREN BY AREA

Age of Trauma	Area		p-Value
	Urban	Rural	
	N (%)	N (%)	
7	7 (6.9%)	14 (10.5%)	0.230
8	15 (14.7%)	25 (18.8%)	
9	18 (17.6%)	31 (23.3%)	
10	30 (29.4%)	35 (26.3%)	
11	18 (17.7%)	19 (14.3%)	
12	8 (7.8%)	7 (5.3%)	
13	6 (5.9%)	2 (1.5%)	

*Chi square test p<0.05 statistically significant

Table 3 shows that among 235 school children who met with dental trauma, 21 (8.9%) of the children had trauma when 7 years old ; 7 (6.9%) are from urban area and 14 (10.5%) are from rural area, 40 (17%) of the children had trauma at the age of 8 years; 14.7% (15) are from urban and 25 (18.8%) are from rural area, about 49 (20.9%) of the children had trauma at 9 years of age; 18 (17.6%) are from urban and 31 (23.3%) are from rural area, about 65 (27.7%) of the children had trauma at the age of 10 years; 30 (29.4%)children are from urban and 35 (26.3%) are from rural area, about 37% (15.7%) of the children have 11 years old trauma; 18 (17.7%) children are from urban and 19 (14.3%) are from rural area, about 15 (6.4%)of the children had tram when 12 years old; 8 (7.8%) are from urban and 7 (5.3%) are from rural area and about 8 (3.4%) of the children had trauma at the age of 13; 6 (5.9%) children are from urban area and 2 (1.6%) are from rural area and no statistically significant difference was observed between Urban and Rural School children on the factor Age of Dental Trauma. Rural school children are exposed to dental trauma earlier than urban school children.

TABLE 4. DISTRIBUTION OF PLACES WHERE TRAUMA HAPPENED TO THE CHILDREN

Place of trauma	N (%)	P Value
Indoor sports	4 (1.7%)	0.032
Outdoor sports	109 (46.4%)	
House	85 (36.2%)	
Road accident	23 (9.8%)	
Violence	1 (0.4%)	
Others	13 (5.5%)	

*chi square test p<0.05 statistically significant

Table 4 shows that 235 school children have met with dental trauma. Among them 4 (1.7%) of the children met with trauma during the Indoor sports; 3 children are from Urban area and 1 child is from Rural area, for 109 (46.4%) of the subjects the outdoor sports were the reasons for the Dental Trauma; 46 children from Rural area and 63 children from Rural area, about 85 (36.2%) of the children met with trauma due to various activities in their house itself; 45 children from Urban area and 40 children from Rural area, for 23 (9.8%) of the children the road accident was reason for the Dental Trauma; 5 children from Urban area and 18 children from Rural area, for 1 (0.4%) rural school child the violence was reason for the Dental Trauma and for 3 (5.5%) of children had Dental Trauma due to other reasons; out of which 3 are from urban and 10 are from rural area and there is statistically significant difference between places. Figure 4 shows the distribution of places where trauma happened to the children.

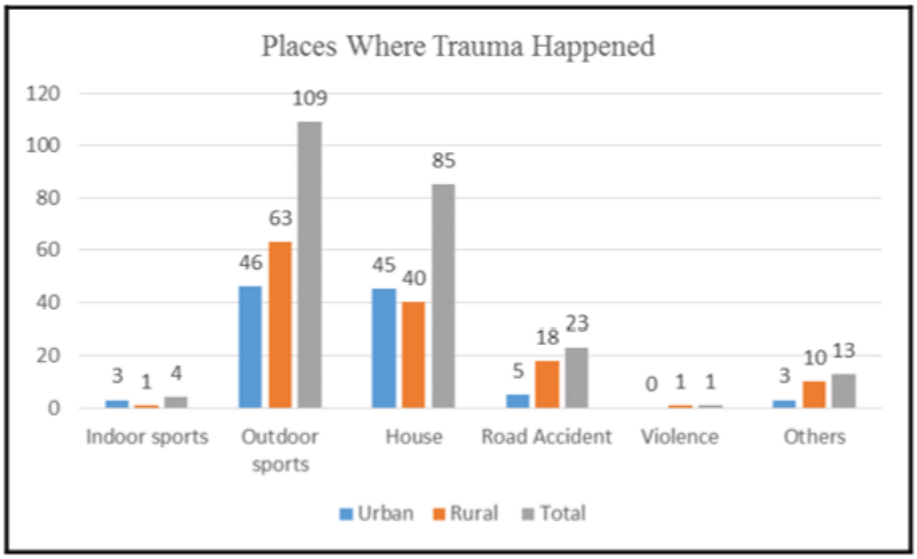


TABLE 5 DISTRIBUTION OF SPORTS ACTIVITY AMONG URBAN AND RURAL AREA

Involved in sports activity	**Area**		**P value**
	Urban	**Rural**	
	N %	**N (%)**	
Yes	10 (9.8%)	49 (36.8%)	0.001
No	92 (90.2%)	84 (63.2%)	

*Chi square test $p<0.05$ statistically significant

Table 5 shows the distribution of sports activity among urban and rural area. It was observed 10 children from urban area and 49 from rural area who actively involved in sports activities of both indoor and outdoor sports had Dental Trauma and for the majority of the school children 176 (74.9%) other than the sports activities are reasons for their Dental Trauma and there is statistically significant difference was observed between sports activity involved by urban and rural area. Figure 5 shows the distribution of sports activity involved by urban and rural area.

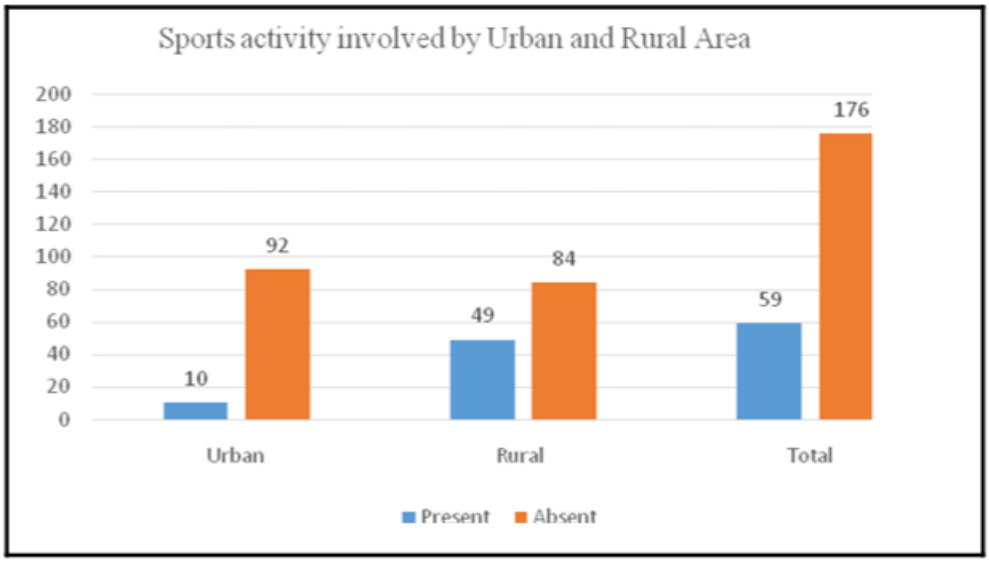


TABLE 6 DISTRIBUTION OF MALOCCLUSION AMONG URBAN AND RURAL AREA

Malocclusion	Area		P value
	Urban	Rural	
	N %	N %	
Class I	75 (73.5%)	79 (59.4%)	
Class II – Div I	27 (26.5%)	51 (38.3%)	0.039
Class II – Div II	0 (0%)	0 (0%)	
Class III	0 (0%)	3 (2.3%)	

*chi square test p<0.05 statistically significant

Table 6 shows that 75 from urban and 79 from rural area have the Class-I Mal Occlusion. About 78 (33.2%) subjects; 27 from urban and 51 from rural area have Class-II-Division I Mal Occlusion. About 3 (1.3%) rural subjects have Class-II Mal Occlusion and there is statistically significant difference was observed between rural and urban children based on malocclusion. Figure 5 shows the distribution of malocclusion among urban and rural area.

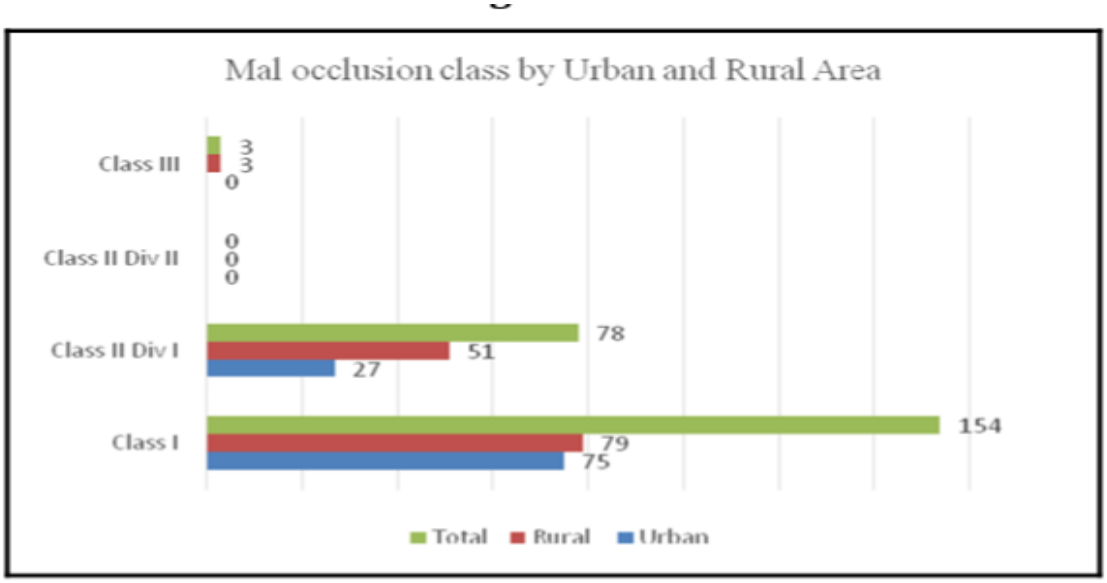


TABLE 7 DISTRIBUTION OF TYPE OF INJURIES AMONG URBAN AND RURAL AREA

Type of injuries	Area	
	Urban	Rural
	N (%)	N (%)
Treated Injury	6 (4.6%)	0 (0.0%
Enamel Fracture	85 (65.9%)	115 (62.9%)
Enamel and Dentin Fracture	29 (22.5%)	48 (26.2%)
Pulp Involvement	9 (7%)	19 (10.4%)
Missing tooth	0 (0.0%)	1 (0.5%)

The table 7 shows that there are 6 treated injuries and 200 enamel fracture; 85 were in urban subjects and 115 were in rural subjects, 77 enamel and dentine fracture were present; out of which 29 were in urban subjects and 48 were present in rural subjects, 28 subjects had dental injuries involving pulpal; 9 were in urban subjects and 19 were in rural subjects and 1 rural subject had missing tooth. Figure 6 shows the distribution of type of injuries and the number of teeth affected.

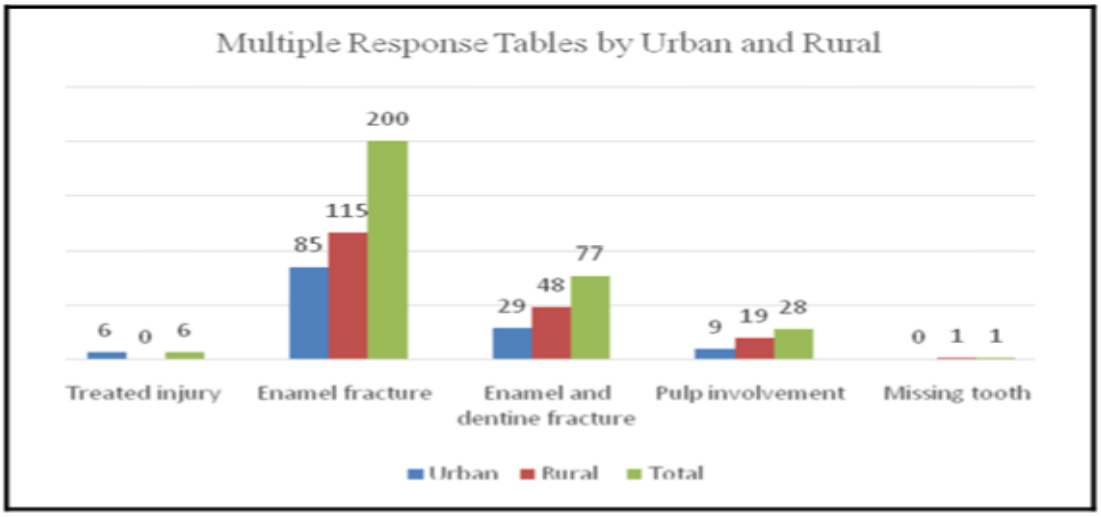


TABLE 8 DISTRIBUTION OF CHILDREN BASED ON DENTAL TREATMENT

Variables	Habits	Numbers	Percentage
Undergone First Aid	Yes	6	2.6%
	No	229	97.4%
	Total	235	100.0%
Whom visited after TDIs	General Physician	2	0.9%
	General Dentist	16	6.8%
	Paediatric Dentist	8	3.4%
	Did not visit any one	209	88.9%
	Total	235	100.0%
Undergoing any Dental Treatment for the TDIs	Yes	22	9.4%
	No	213	90.6%
	Total	235	100.0%
Need any Dental Treatment	Reconstruction	201	85.5%
	Pulp therapy	26	11.1%
	Others	1	0.4%
	Reconstruction & Pulp therapy	7	3.0%
	Total	235	100.0%

Table 8 shows that only 2.6% subjects who were affected by Trauma received First Aid and 97.4% affected children did not received First-Aid. When questioned about whom they visited after the trauma 0.9% children said visited General Physician, 6.85 children said consulted General Dentist, 3.4% children reported visited Paediatric Dentist and 88.9% children did not consulted any of them for their traumatized Dental Injuries. It is found that only 9.4% of the subjects underwent treatment and continuing the post treatment for the traumatized dental injuries and most of them 90.6% did not take or undergo treatment for the traumatized dental injuries.

DISCUSSION:

Prevalence of Traumatic Dental Injuries is currently seen as a public health problem because of the frequency and wide occurrence among young population during growth and development. Moreover, the treatment is often complex and expensive and there may be irreversible squeal, which would require treatment over the patient's entire life (11),(12),(13) and it may have an impact on children's quality of life, since a majority of dental trauma involves the anterior teeth. (13), (14), (15), (16), (17), (18),

In this study, out of 2142 school children, 235 subjects (11%) had the history of dental trauma among which 136 were males and 99 were females and the frequency of trauma in boys was higher than girls. Few studies have pointed out that the gender is a predisposing factor in dental trauma and a greater prevalence of trauma found among male subjects compared to females (13), (19), (20), (21), (22), (23),(24) since boys were agitated, aggressive and undisciplined whereas the girls were calm and obedient, which might have resulted in higher trauma rates among boys in earlier decades. Now, children even at an early age are encouraged to do whatever they want, regardless of gender. This study found significant difference in the history of dental trauma between gender and this is similar to the findings of many previous studies and also there was a significant association between the level of socio-economic deprivation and risk of Traumatic Dental Injuries (TDIs). This endorses the point that the compositional characteristics of the pupils in school setting affect the risk of injury to varying degrees. This is in agreement with the results of another study (31) which showed higher traumatic dental injuries among the rural school children than the urban children as rural parents belong to lower socio-economic groups. The health promotion, prevention and parenting programs should be implemented using culturally and educationally appropriate tools to the lower socio-economic groups to reduce traumatic dental injuries.

The survey also showed that 1.7% (4) children affected by dental trauma during the Indoor sports, and 46.4% (109) of the children affected during outdoor sports and about 85 children had trauma due to various activities in the house and 23 children met with road accidents and violence among children was the reason for Dental Trauma. In this study the frequency of trauma in boys was higher than girls. This is similar to the previous studies. (13),(19),(20),(21),(22),(23),(24). It is also reported that increased prevalence was found in the higher age groups. It was presumed that girls show calmer attitude and conservative behavior during puberty and usually involved with household activities and controlled social gatherings. However due to the great social and cultural changes now the girls become more involved in many social activities, in sport and outdo or activities and hence become vulnerable to traumatic dental injuries. Similar results of this study were shown by Garcia Godoy et al, 1985,(26) and Jamani, Fayyad, 1991 (27).

With regard to age of trauma, the majority of studies in the literature showed that the risk of trauma in the permanent anterior teeth increase with age and reaching a peak at 12 years then remained stable (28), (29). Though the result of this study showed that trauma is increasing with age, this increase is in a form of burst rather than being steady. The findings showed prevalence bursting at age 9-10 years, remaining almost the same and decreasing from age 12 in boys. This is in contradiction with results of some other studies of Virgin et al, 1981 (30) and Glendora, 2002,(31).

In this survey among affected by dental trauma, 1.7% (4) children were affected during the Indoor sports, for 46.4% (109) of the children the outdoor sports were the reasons for the Dental Trauma, about 85 children had trauma due to various activities in the house, 23 children met with road

accidents and for a child, violence was the reason for Dental Trauma. In this study the frequency of trauma in boys was higher than girls. This is similar to the previous studies (13), (19), (20), (21), (22), (23), (25) It is also reported that increased prevalence was found in the higher age groups.

In this study simple enamel fractures were 89.7% followed by enamel and dentin 6.5%, enamel, dentine and pulp exposure 1.7%, avulsion and discoloration each 0.5%. The result of the present study is similar to the results of many of studies. It was expected in epidemiological studies in which enamel fractures of the simple type predominates unlike the clinical data which was obtained from emergency clinics or hospitals in which the more complicated type of fracture had the greatest bulk.

Besides falls, sports activities, bicycling, hits and violence there are some other facts that cause Traumatic Dental Injuries. The factors such as Mal Occlusion class, increased overjet, Overbite, Open bite, lip incompetence, psychological impacts and speech difficulties that are also claimed to be predisposing to traumatic dental injuries when people meet with trauma or other activities. This survey found that among the subjects who had dental trauma, 65.53% (154) were children consisting of 75 from urban area and 79 from rural area have the Class-I MalOcclusion. About 33.2% (78) children, 27 from urban area and 51 children from rural area have Class-II-Division I Mall Occlusion. About 1.3% (3) of rural children have Class-III Mal Occlusion.

Hence a more comprehensive study needs to be carried out in difference districts of Tamil Nadu so as to compare the prevalence of dental trauma between the urban and the rural school children. As the results of the present survey reveals that a majority of children with Traumatic Dental Injuries were untreated, there is a need to improve the oral health policies in the country incorporating periodic checkups of school children aiming at prompt diagnosis and management of Traumatic Dental Injuries. Prospective cohort studies should be carried out in order to confirm the association between increased over jet and incompetent lips with Traumatic Dental Injuries. Educational programs on prevention of dental trauma directed at school children, teachers, sports staff and parents advocating the use of protective gears like mouth guards while playing sports, proper sitting and wearing helmets while in two wheelers and using the seat belts while travelling by four wheelers, First Aid, Transport medium for Avulsed teeth should be instituted as it might help reducing the traumas and the injuries besides preservation of Avulsed teeth. As the results of the present survey reveals that a majority of children with Traumatic Dental Injuries were untreated, there is a need to improve the oral health policies in the country incorporating periodic checkups of school children aiming at prompt diagnosis and management of Traumatic Dental Injuries.

CONCLUSION:

The prevalence of traumatic dental injuries among school children aged between 7and 13 years in Tamil Nadu was 11 % (235). Traumatic dental injuries can have an impact on children's personality and quality of life and thus dental trauma is of considerable public health importance. Dental Injuries to children's teeth can be very distressing for children as well as to their parents besides representing significant financial burdens. Therefore, in order to reduce the prevalence rate to 0% there is a need to attend the traumatic dental injuries at the right time with a right specialist. It would be better to consult Pedodontics specialist immediately after dental trauma and for the post treatments so as to avoid unwanted complications and consequences to children.

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