



ASSESSMENT OF TRAUMATIC DENTAL INJURIES OF PERMANENT INCISORS IN A GROUP OF VISUALLY IMPAIRED EGYPTIAN CHILDREN AND ITS ASSOCIATION WITH INFLUENCING FACTORS

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ABSTRACT

Background: prevalence of traumatic dental injuries (TDIs) among visually impaired children varies from one country to another. Different factors aside visual impairment influences the prevalence as well as the severity of such injuries. Evaluating the level of the health care provided for those children by comparing number of traumatized cases and number of treated cases would help in documenting the need for creating a special health care program for them. **Aim:** this study aims at assessment of traumatic dental injuries in a group of visually impaired Egyptian children and the effect of the relative factors in their prevalence.

Design: A cross sectional analytic study using a questionnaire and clinical examination was conducted to assess the prevalence of TDIs of the upper and lower permanent incisors and its relevant factors in children attending two governmental schools for blind children, one school for girls and the other one for boys.

Results: Among 402 blind students examined in the current study, 210 (52.2%) students were males and 192 (47.8%) were females. Prevalence of traumatic dental injuries among the study population was 9.95% (40 students). Prevalence of traumatic dental injuries among males was (11.43%) while it was (8.33%) among females, the difference was not significant. Upper central incisors had the highest frequency of trauma (72.5%) and fracture of enamel and dentine was the most frequent TDIS (57.5%). Fall was the most common cause of injury (55%) and the most frequent place of injury was at home (55%). Mean age of children at time of injury is 11.85 (± 1.47) years. Only five cases (12.5%) had dental treatment and restoration of their traumatic injuries. There were significant correlations between increased overjet and/ or inadequate lip coverage and the prevalence of TDIs.

Conclusions: Environmental factors proposed to influence the prevalence of TDIs were difficult to evaluate in the presence of similar conditions in both schools. The most significant oral factors in predisposing TDIs in blind children are increased overjet and inadequate lip coverage. More efforts are needed to provide better dental health care service for visually impaired children.

KEYWORDS: Dental trauma – Visually impaired children – Predisposing Factors.

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INTRODUCTION

Risk factors of traumatic dental injuries (TDIs) comprise oral factors, environmental factors and human behavior⁽¹⁾.

Oral predisposing factors embrace increased overjet, inadequate lip coverage⁽²⁻⁵⁾, anterior open bite, position of the teeth, rigidity of the maxilla versus flexibility of the lower jaw and malocclusion traits.⁽⁶⁾

Environmental factors are typically associated with material deficiency; this is usually associated with overcrowding and presence of unsafe playgrounds at schools in deprived communities, and adverse psychological environments and socio-economic status^(6, 7, and 8).

TDIs results from falls, crashes and being hit by an object. What make some vulnerable persons more susceptible to TDIs are environmental factors as material deprivation as well as human behavior such as: Risk-taking children⁽⁹⁾, emotional stressful conditions⁽¹⁰⁾, and obesity⁽¹¹⁾.

Prevalence of TDIs in children with special health care needs varied according to the type of handicapping problem. Children suffering from attention-deficit hyperactivity disorder⁽¹²⁾, learning disabilities⁽¹³⁾ and hearing or visual impairment⁽¹⁴⁾ have higher prevalence of TDIs than in healthy populations.

The 11th revision of the WHO International Statistical Classification of Diseases, Injuries and Causes of Death, defined Low Vision visual acuity of less than 6/18 but equal to or better than 3/60, or corresponding visual field loss to less than 20°, in the better eye with the best possible correction. "Blindness" is defined as visual acuity of less than 3/60, or corresponding visual field loss to less than 10°, in the better eye with the best possible correction. "Visual Impairment" includes both low vision and blindness⁽¹⁵⁾.

Blind children move and play as healthy children, however, they are more liable to misfortunes, such

as crashes and falls, in contrast to seeing children hence, they experience more mental traumas⁽¹⁶⁾.

The World Health Organization Stated That blindness institutes a public health problem when countrywide blindness rate is 0.5% or greater⁽¹⁷⁾.

A community blindness rate of 1% or greater signifies that blindness is a public health problem.

In Egypt a crude blindness rate of 2.1% was estimated in a study in Alexandria Governorate⁽¹⁸⁾.

Blindness rates were expected to increase in Egypt from approximately 1.6% to 2.2% in the year 2000 to be 3.1% in the year 2020⁽¹⁹⁾. A study on the prevalence of visual impairment and blindness in Upper Egypt revealed a rate of 23.9% of best eye presenting visual impairment, 6.4% with severe visual impairment and 9.3% of blindness⁽²⁰⁾.

The prevalence of traumatic dental injury of permanent anterior teeth in visually impaired children is ranging worldwide from 4.1% to 58.6%⁽²¹⁾.

Prevalence of traumatic injuries of the permanent teeth in 80 visually impaired children was 35% compared to 4% in matched number of sighted children in Iran⁽¹⁶⁾.

In India nearly the same prevalence 34.95% were found among 103 blind individuals⁽²²⁾ while it was 35.7% among 80 visually impaired children in another study⁽²³⁾ with Increased overjet and inadequate lip coverage being significantly associated with the occurrence of trauma in both studies.

Another Indian study performed over a larger visually impaired children population (400) reveals a 39% prevalence of TDIs where most of the TDIs were at home most often because of fall or crashes⁽²⁴⁾.

Prevalence of TDIs in visually impaired population in Sudan was found close to the previously mentioned percentages in other countries where it was 32.6% among 141 visually impaired individual

in a study in two institutes in Khartoum North ⁽²⁵⁾.

The current study aims at assessment of traumatic dental injuries in a group of visually impaired Egyptian children and the effect of the relative factors in their prevalence.

According to the education administration department there were 3000 blind students distributed over 30 schools all over Egypt.

MATERIALS AND METHODS

This study conducted using a questionnaire and clinical examinations to assess the prevalence of TDIs of the upper and lower permanent incisors and its relevant factors in four hundred and two children, who accepted to be included in the study, attending two governmental schools for blind children, one school for girls and the other one for boys.

This study was approved by the Research Ethical Committee, Faculty of Dentistry, Cairo University. A letter from the faculty was introduced to the educational administrations responsible for these schools. Nature of the study was explained to the school authorities.

The researcher offered an arrangement for dental treatment for any child at both schools at the Dental Unit of Children with Special Health Care Needs at the Faculty of Dentistry, Cairo University.

Written permissions were signed by the parents / guardians of the children to be included in the dental examination and the study.

Both schools have children in the different grads starting from kindergarten level to high school level. Boys' school is a boarding school while the school for girls is a non-boarding school.

Visually impaired children with the following Inclusion criteria were included in the current study:

1- Apparently healthy children rather than blindness.

2- Childrn had trauma to their teeth either treated or not treated.

3- Children aged 10-17 years.

Exclusion criteria:

1- Children with any other medical or mental conditions.

2- Children with fractured anterior teeth due to caries.

3- Children whose' parents refused to sign the consent form to be included in the study.

The researcher conducted both the interview and the clinical examination.

The questionnaire

The questionnaire used in the current study includes data for age, gender, cause, time, and place of injury (Figure 1).

Personal Data and history of (TDIs) of visually impaired children.

Name: _____

Age: _____

Gender: _____

Grade: _____

History of traumatic dental injury:

When (age at which dental trauma occurred):

Where:

HOW :

Fig. (1) The questionnaire used in the current study

Clinical examination for traumatic injuries

The clinical examination was carried out in the daylight while the children seated on a chair. Infection control measures were followed. Adequate number of disposable diagnostic kits and autoclavable community periodontal index probe were used in each day of the examination. All the children included in the study were examined



Fig. (2) Increased overjet > 3mm.



Fig. (3) Inadequate lip coverage.

for the measurement of incisor overjet using the periodontal probe (Figure 2). Overjet was measured from the palatal-incisal line angle of the most prominent maxillary incisor to the labial aspect of the corresponding mandibular incisor. Overjet was recorded as increased if it is more than 3.0 mm. Lip coverage was considered adequate when the lips covered the upper incisors in the rest position. If most of the incisors crowns were exposed at rest position, the lip coverage is recorded as inadequate (Figure 3) ⁽²⁶⁾.

All the maxillary and mandibular anterior permanent teeth were examined for traumatic injury. Trauma was recorded according to Ellis classification (1970) ⁽²⁷⁾.

Numbers of students with fractured anterior teeth due to trauma that have been restored were

also recorded.

Environmental factors at the schools represented in the degree of crowding, safety measures of the stairs and the playground areas were recorded for both schools.

Statistical Analysis

- Categorical variables were described in terms of frequency and percentage and numerical variables were described in terms of mean and standard deviation (SD).
- Pearson's Chi-squared test was used to assess the relationship between presence of a traumatic injury with overjet and lip coverage.
- The significance level was verified at $P \leq 0.05$.
- R statistical package, version 3.5.2 (20-12-



Fig. (4) students of grade 5 in the classroom.

2018) was used in the statistical analysis of this study. Copyright (C) 2018.

[Reference: *R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.URL <https://www.R-project.org/>.]

RESULTS

In regard to the selected schools for the current study, total number of students in the boy’s school was 316 students while the school for girls was 261 students.

Education for blind children needs special environment and arrangements in the classroom as well as in the playground and in the stairs. Both schools were found to have satisfactory measures in regard to the mentioned factors. Number of students per class was ranging from 8 to 12 students. Discs for the children are arranged in a unique way to avoid collision between the students (Figure 4).

Among 402 blind students examined in the current study, 210 (52.2%) students were males and 192 (47.8%) were females. Prevalence of traumatic dental injuries among the study population was 9.95% (40 students). Prevalence of traumatic dental injuries among males was (11.43%) (24 students) while it was (8.33%)(16 students) among females (Table 1).

Table (1): Descriptive analysis for dental traumatic injuries regarding gender:

No. of students	Without trauma	With Trauma
N=402	362 (90.05%)	40 (9.95%)
Males n=210 (52.24%)	186 (88.57%)	24 (11.43%)
Females n=192 (47.76%)	176 (91.67%)	16 (8.33%)

Descriptive analysis regarding the different variables is shown in table 2.

TABLE (2): Descriptive analysis for Children with dental traumatic injuries regarding different variables:

Children with trauma n=40		n (%)
Tooth involved	7	3 (7.5%)
	8	18 (45%)
	9	11 (27.5%)
	10	1 (2.5%)
	7 and 8	1 (2.5%)
	8 and 9	3 (7.5%)
	7, 8 and 9	1 (2.5%)
	9 and 10	2 (5%)
Number of teeth involved	1	33 (82.5%)
	2	6 (15%)
	3	1 (2.5%)
Type of injury according to Ellis classification	Ellis class I- Enamel fracture	6 (15%)
	Ellis Class II- Enamel and dentine fracture	23 (57.5%)
	Ellis class III- Enamel and dentine fracture with pulp exposure	3 (7.5%)
	Ellis class VI- A tooth devitalized by trauma with or without loss of tooth structure.	2 (5%)
	Ellis class V - Teeth lost as a result of trauma.	1 (2.5%)
Fracture and restoration		5 (12.5%)
Cause of injury	Falls	22 (55%)
	Collisions	15 (37.5%)
	Violence	2 (5%)
	Road traffic accidents	1 (2.5%)
Place of injury	Home	22 (55%)
	Street	8 (20%)
	School	10 (25%)
		Mean (±SD)
Age at time of trauma	11.85 (±1.47)	

- **Tooth involved:** Upper right central incisor has the highest frequency of trauma with a proportion of 45%, followed by the upper left central incisor with a proportion of 27.5%.
- **Number of teeth involved:** 82.5% (33 children) with trauma have one injured tooth.

TABLE (3): Comparison between children with and without traumatic injuries regarding gender distribution, Overjet and Lip coverage:

		Children without Traumatic injury n=362	Children with Traumatic injury n=40	Pearson's Chi-squared test
		n (%)	n (%)	p-value*
Gender	Males	186 (51.38%)	24 (60%)	0.385
	Females	176 (48.62%)	16 (40%)	
Overjet	Normal	347 (95.86%)	22 (55%)	<0.0001
	Increased	15 (4.14%)	18 (45%)	
Lip Coverage	Adequate	350 (96.69%)	25 (62.5%)	<0.0001
	Inadequate	12 (3.31%)	15 (37.5%)	

*Significance level at $p\text{-value} \leq 0.05$.

- **Type of injury:** Class II Ellis classification, Enamel and dentine fracture was the most common type of injury in 57.5% of the children (23 children), Six children (15%) have class I Ellis classification, Enamel fracture, three children (7.5%) have Class III Ellis classification, Enamel and dentine fracture with pulp exposure, while two children (5%) have class IV Ellis classification, A tooth devitalized by trauma. Only one child (2.5%) has class V Ellis classification, Teeth lost as a result of trauma.
- Five children (12.5%) have restorations of fractured teeth due to trauma.
- **Cause of injury:** Falls is the most common cause of injury in 55% (22 children), followed by collisions in 37.5% (15 children).
- **Place of injury:** Home is the most common place of injury in 55% (22 children), street was the place TDIS in 8 children, (20%) while in 10 children (25%) TDIs occurred at schools.
- **Age at the time of injury:** Mean age of children at time of injury is 11.85 (± 1.47) years.

Universal Tooth Numbering system of permanent

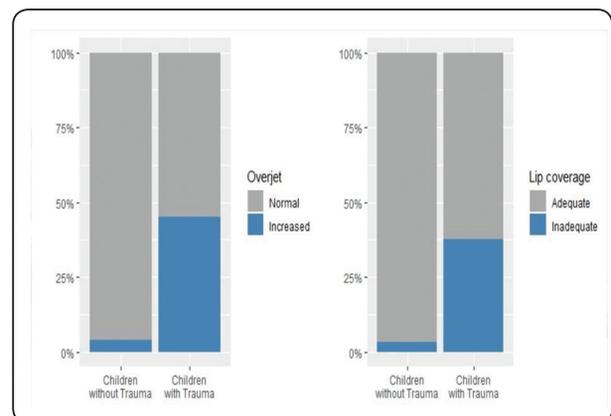


Fig. (5) Correlations between overjet and Lip coverage with traumatic injuries

dentition was used in the recording, starting from 1 to 32.

Correlations between gender distribution, Overjet and Lip coverage with traumatic injuries are shown in table 3 and Figure 5.

- **Gender:** 51.38% of children without trauma are males and 48.62% are females; while in children with trauma, 60% are males and 40% are females. The difference between both groups is statistically insignificant ($p\text{-value}=0.385$).

- **Overjet:** 95.86% of children without trauma have normal Overjet And 4.14% have increased Overjet; while in children with trauma, 55% have normal Overjet and 45% have increased Overjet. The difference between both groups is statistically significant (p-value=<0.0001).
- **Lip coverage:** 96.69% of children without trauma have adequate lip coverage and 3.31% have inadequate lip coverage; while in children with trauma, 62.5% have adequate lip coverage and 37.5% have inadequate lip coverage. The difference between both groups is statistically significant (p-value=<0.0001).

DISCUSSION

This study was carried out to address the prevalence of traumatic injuries among a group of blind Egyptian children and the relevant factors associated with these injuries,

The prevalence of traumatic injuries among the study population was 9.95%. This is close to the prevalence in Saudi Arabia 9% ⁽¹⁴⁾, but less than the prevalence in Brazil 23.1% ⁽²⁸⁾ and in Kuwait 24.6% ⁽²⁹⁾ and much less than the prevalence in India 32.5% ⁽³⁰⁾.

Low prevalence is explained by the presence of strict rules for safety during the school time which in case of the male children, cover most of the week time being enrolled in a boarding school and also due to the limited activities of the blind children.

The slight increase in the prevalence of traumatic dental injuries in males compared to females is expected due to the difference in the activities of the two genders. However this difference was not significant in agreement with the results of previous studies in other countries ^(14, 24, 29, and 31). While some studies showed significant increase in the prevalence of dental traumatic injuries among males than females ^(1,24).

As the results showed that most of the injuries

occurred at home 55% and streets 20% this might explain the insignificant difference in traumatic injuries prevalence as the male children are kept at school most of the time.

Most of TDIs affect the central incisors .There were significant correlations between increased overjet and/or inadequate lip coverage and prevalence of TDIs. This is in agreement of all the studies which correlate the prevalence of TDIs and the degree of overjet and lip coverage ^(1, 14, 16, 22-25).

Falling and collision were the most reasons for traumatic injuries, this was logic as blind children are more liable to fall and crash against different objects than being involved in violent activities. These results were in agreement with the results of Agrawal et al ⁽²²⁾ Munot et al ⁽²⁴⁾.

The mean age at the time of trauma was 11.8 years; this may be due to increased activities of the children at this age with lack of complete muscle coordination and self care awareness.

Enamel and dentine fracture was the most common type of fracture found in the current study followed by enamel fracture; this was in agreement with the results of other studies where enamel fracture or enamel and dentine fracture were the most common type of fracture ^(14, 16, 22, and 24).

Lack of dental health care is obvious through the low percentage of treated TDIs where only 12.5% of the traumatized teeth were treated and restored.

CONCLUSIONS

- 1- Environmental factors proposed to influence the prevalence of TDIs were difficult to evaluate in the presence of similar conditions in both schools.
- 2- The most significant oral factors in predisposing TDIs in blind children are increased overjet and inadequate lip coverage.

RECOMMENDATIONS

- 1- Dental health care for children with special needs should have a priority among governmental planes for health care. Blind children with no other physical or mental problems have the same dreams and hopes for their future as most of the sighted children.
- 2- More efforts should be done by health authorities to reach for those children and to introduce a better dental health service for them.

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