

Original Article

Occurrence of Traumatic Dental Injury (TDI) in A Group of Egyptian Autistic Children Compared to Normal Children (A Prospective Cohort Study).

Marwa Mousa Mohamed¹, Rania Abdallah Nasr², Shaimaa Sabry³

¹ B.D.S, 2014. Faculty of Dentistry, Cairo University

² Associate Professor of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Cairo University

³ Lecturer of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Cairo University.

E-mail: Marwa.Mousa@dentistry.cu.edu.eg

ABSTRACT

The aim of the study is to assess the occurrence of traumatic dental injury (TDI) in a group of Egyptian autistic children compared to normal children. This study was a prospective cohort study, the study group consisted of a group of children with autism spectrum disorder (ASD), the control group consisted of a group of normal children, 200 children in each group. Study group was recruited from Abbaseya Mental Health Hospital and Advance Center for Handicapped and Autistic Children. Control group was recruited from the Outpatient Clinic of Pediatric Dentistry and Dental Public Health Department at Faculty of Dentistry, Cairo University. A clinical examination was performed to assess the occurrence of TDI. Result: Out of 400 children, the occurrence of traumatic injuries in the autistic group was 28 out of 200 children (14.0%) while in the normal children group, it was 21 out of 200 children (10.5%). Conclusion: Majority of the autistic children usually exhibited higher occurrence of TDIs than normal children.

Key words: autism, trauma, dental injury, TDI, ASD, autism spectrum disorder, dental trauma.

I. INTRODUCTION

Traumatic dental injury is one of the serious public health problems among children and adolescents over the world and can range from minor enamel fractures to extensive maxillofacial damage involving the supporting structures and displacement or avulsion of teeth according to **World Health Organization (WHO)**. TDI is more common in schoolchildren,

and evidence reveals that the prevalence of TDI is increasing. Dental trauma accounts for over one-fifth of all body injuries in some communities. TDI is not a disease but a consequence of numerous unavoidable risk factors in life [1]

Epidemiological studies show that the annual TDI incidence globally is about 4.5%. TDI is associated with a wide variety of negative physical, adaptive and psychological effects over the life course and can even lead to psychiatric illness. No individual is at zero risk over their activities of daily living. [2][3]

ASD is a neurodevelopmental disorder characterized by difficulties with social interaction and communication, ASD is associated with a combination of genetic and environmental factors. In every 270 children in the world, there is one child with ASD according to **WHO**, In the last 50 years there is an increase in the incidence of ASD and that may be due to environmental factor. [4] There is not sufficient evidence to classify ASD as a dental trauma risk

II. SUBJECTS AND METHODS:

This study was a prospective cohort study. Evidence of TDI, risk factors were assessed in a group of autistic children in comparison to normal group as control. It was reviewed and approved by the Dental Research Ethics Committee Faculty of Dentistry, Cairo University. (13/3/20)

A. Sample Size:

A power analysis was designed to have adequate power to apply a 2-sided statistical test of the research hypothesis that there is no difference in the occurrence of TDI in children with ASD and normal children. According to the results of Habibe et al. (2016) [8] in which the prevalence of TDI in the study group was 24 of 61 (0.393) and in the control group it was 16 of 61 (0.262) - critical z value was found to be (1.96). By adopting an alpha (α) level of 0.05 (5%), and a beta (β) level of 0.20 (20%), as power=80%; the predicted sample size (n) was found to be a total of (400) cases i.e. (200) cases per group. Sample size calculation was performed using G*Power version 3.1.9.4.

factor as there are few research investigating the oral health of children with ASD. Children with ASD are characterized by repetitive, restricted behaviours and self-injury which may make them vulnerable to TDI in addition to oral habits as bruxism, lip biting, thumb sucking and tongue thrusting which also contribute to TDI occurrence. [5] Management of TDIs in children with ASD poses a major challenge because these children can't cooperate during dental care. [6] Therefore, increasing awareness and dental knowledge of children and parents about TDI occurrence will help in decreasing the incidence of TDI [7]. However, there is a lack of information about TDIs in children with ASD therefore, the purpose of this study was to assess the occurrence of TDI in autistic children and compare it with normal children.

A total of 400 children aged from 6 to 12 years old were recruited for this study. The study group was recruited from Abbaseya Mental Health Hospital and Advance Center for Handicapped and Autistic Children. Control group was recruited from the Outpatient Clinic of Pediatric Dentistry and Dental Public Health Department at Faculty of Dentistry Cairo University. A selected sample was used to select the sample for the study group and age- and gender-matched control group.

The investigator made an interview with the parents of both groups, giving them a questionnaire based on previous questionnaires designed by **Goettems et al. (2014)**, **Habibe et al. (2016)** and **Al-Sehaibany (2018)** [8], [9] [10]. Sections I & II and III were taken from **Goettems et al. (2014)** [9]. In section I, we took age, gender, school type, family structure, school attendance, sports activity and make some modifications as we added; the level of autism and number of siblings.

Sections II & III cover the risk factors of TDI, the oral habits & malocclusion found [8], [9].

Also, sections IV and V (history and type of TDI) were adopted from **Sehaibany (2018)**[10] and **Habibe et al. (2016)**[8]. As questions of age at the time of TDI, tooth type, number of injured teeth and type of TDI.

Children whose parents assigned informed consent were recruited. The researcher clarified any part of the question in the questionnaire. Only the investigator was trained and calibrated on examination to get reliability, after the questionnaires were answered, data was collected and subjected to analysis.

All children were examined clinically for TDI by using dental mirrors, dental explorer and tweezer under the light of the dental unit but in some cases, the examination was done under daylight conditions. X-ray is performed when needed or parents had the x-ray from a previous TDI.

B. Participants

Inclusion Criteria:

-Autistic and normal children.

III. RESULTS

Categorical data were presented as frequencies (n) and percentages (%) and were analyzed using chi-square test.

A. Prevalence of TDI:

The prevalence of TDI in the autistic group was 28(14.0%) while in the normal children group it was 21(10.5%). The prevalence of TDI in both groups was presented in **figure (1)**.

B. Association between risk factors and the occurrence of dental trauma:

a) Autistic group:

The association between risk factors and occurrence of TDI in the autistic group is shown in **table (1)**:

-Children aged from 6 to 12 years old irrespective of gender.

Exclusion Criteria:

-Children with a dental structural defect.

-Parents that refused to give informed consent.

-Medically compromised children.

C. Matching Criteria and Allocation Ratio:

The control group was matching the study group by age(± 3 months) and gender, with an allocation ratio of 1:1.

D. Statistical Analysis:

Categorical data were presented as frequencies (n) and percentages (%) and were analyzed using the chi-square test. The significance level was set at $p \leq 0.05$ for all tests. Statistical analysis was performed with R statistical analysis software version 4.1.0 for Windows(R: The R Project for Statistical Computing, 2021).

b) Normal group:

The association between risk factors and the occurrence of TDI in the normal group is shown in **table (2)**:

C. Association between oral habits and the occurrence of TDI:

a) Autistic Group:

There was a significant association between TDI occurrence and oral habits & malocclusion ($p < 0.001$). Association between oral habits and TDI occurrence in the autistic group was presented in **table (3)**.

b) Normal Group:

There was a significant association between TDI occurrence and oral habits ($p = 0.006$) and malocclusion ($p < 0.001$). Association between

oral habits and TDI occurrence in the normal group was presented in **table (4)**.

table 1: The association between risk factors and occurrence of TDI in the autistic group

Parameter	Value	Occurrence of TDI		p-value			
		No	Yes				
School type	None	N	29	5	0.955ns		
		%	16.9%	17.9%			
	Public	N	89	15			
		%	51.7%	53.6%			
	Private	N	54	8			
		%	31.4%	28.6%			
Family structure	Nuclear	N	153	24	0.618ns		
		%	89.0%	85.7%			
	Non-nuclear	N	19	4			
		%	11.0%	14.3%			
	Main caregiver	Mother	n	168		26	0.059ns
			%	97.7%		92.9%	
Father		n	1	2			
		%	0.6%	7.1%			
Mother& father		n	2	0			
		%	1.2%	0.0%			
Other	n	1	0				
	%	0.6%	0.0%				
Number of siblings	None	n	15	2	0.481ns		
		%	8.7%	7.1%			
	One	n	50	6			
		%	29.1%	21.4%			
	Two	n	72	10			
		%	41.9%	35.7%			
	Three	n	23	6			
		%	13.4%	21.4%			
	More than three	n	12	4			
		%	7.0%	14.3%			
School retention	No	n	119	23	0.618ns		
		%	69.2%	82.1%			
	Yes	n	53	5			
		%	30.8%	17.9%			
Level of autism	Mild	n	74	5	0.009*		
		%	43.0%	17.9%			
	Moderate	n	68	12			
		%	39.5%	42.9%			
	Severe	n	30	11			
		%	17.4%	39.3%			

Sports participation	No	n	146	22	0.398ns	
		%	84.9%	78.6%		
Yes	n	26	6			
	%	15.1%	21.4%			
Activities duration	None	n	145	22		0.106ns
		%	84.3%	78.6%		
	1 hour	n	13	4		
		%	7.6%	14.3%		
	2 hours	n	8	0		
		%	4.7%	0.0%		
	3 hours	n	4	0		
%		2.3%	0.0%			
More than three hours	n	2	2			
	%	1.2%	7.1%			

table 2: The association between risk factors and the occurrence of TDI in the normal group

Parameter	Value	Occurrence of TDI		p-value	
		No	Yes		
School type	None	n	4	0	0.595ns
		%	2.2%	0.0%	
	Public	n	152	17	
		%	84.9%	81.0%	
Private	n	23	4		
	%	12.8%	19.0%		
Family structure	Nuclear	n	160	16	0.078ns
		%	89.4%	76.2%	
	Non-nuclear	n	19	5	
		%	10.6%	23.8%	
Main caregiver	Mother	n	173	21	0.696ns
		%	96.6%	100.0%	
	Father	n	5	0	
		%	2.8%	0.0%	
	Mother& father	n	0	0	
%		0.0%	0.0%		
Other	n	1	0		
	%	0.6%	0.0%		
Number of siblings	None	N	9	0	0.820ns
		%	5.0%	0.0%	
	One	N	41	6	
		%	22.9%	28.6%	
	Two	N	68	8	
		%	38.0%	38.1%	
Three	N	38	5		
	%	21.2%	23.8%		

Parameter	Value	Occurrence of TDI		p-value	
		No	Yes		
	More than three	N	23	2	
		%	12.8%	9.5%	
School retention	No	N	22	0	0.089ns
		%	12.3%	0.0%	
	Yes	N	157	21	
		%	87.7%	100.0%	
Sports participation	No	N	154	17	0.532ns
		%	86.0%	81.0%	
	Yes	N	25	4	
		%	14.0%	19.0%	
Activities duration	None	N	154	17	0.454ns
		%	86.0%	81.0%	
	1 hour	N	9	0	
		%	5.0%	0.0%	
	2 hours	N	10	3	
		%	5.6%	14.3%	
	3 hours	N	5	1	
		%	2.8%	4.8%	
	More than three hours	N	1	0	
		%	0.6%	0.0%	

table 3: Association between oral habits and TDI occurrence in the autistic group

Parameter	Value	Occurrence of TDI		p-value	
		No	Yes		
Oral habits	None	n	122	8	<0.001*
		%	70.5%	26.7%	
	Bruxism	n	14	4	
		%	8.1%	13.3%	
	Lip biting	n	3	5	
		%	1.7%	16.7%	
	Mouth breathing	n	2	1	
		%	1.2%	3.3%	
	Nail biting	n	18	5	
		%	10.4%	16.7%	
	Thumb sucking	n	13	5	
		%	7.5%	16.7%	
	Tongue thrusting	n	1	2	
		%	0.6%	6.7%	
None	n	145	7	<0.001*	

Parameter	Value	Occurrence of TDI		p-value
		No	Yes	
Malocclusion		%	83.8%	23.3%
		n	1	0
	Anterior cross bite	%	0.6%	0.0%
		n	7	0
	Crowding	%	4.0%	0.0%
		n	8	12
	Incompetent lip	%	4.6%	40.0%
		n	1	8
	Maxillary teeth protuberance	%	0.6%	26.7%
		n	3	0
Open bite	%	1.7%	0.0%	
	n	3	0	
Overjet	%	1.7%	0.0%	
	n	5	3	
Ugly duckling	%	2.9%	10.0%	

Table 4: Association between oral habits and TDI occurrence in the normal group

Parameter	Value	Occurrence of TDI		p-value
		No	Yes	
Oral habits	None	n	160	15
		%	89.4%	71.4%
	Bruxism	n	1	0
		%	0.6%	0.0%
	Lip biting	n	0	1
		%	0.0%	4.8%
	Mouth breathing	n	5	3
		%	2.8%	14.3%
	Nail biting	n	6	0
		%	3.4%	0.0%
Thumb sucking	n	6	2	
	%	3.4%	9.5%	
Tongue thrusting	n	1	0	
	%	0.6%	0.0%	
Malocclusion	None	n	137	7
		%	76.5%	33.3%
	Anterior cross bite	n	2	0

	%	1.1%	0.0%
	n	1	0
Cleft	%	0.6%	0.0%
	n	13	1
Crowding	%	7.3%	4.8%
	n	1	0
Deep bite	%	0.6%	0.0%
	n	1	4
Incompetent lip	%	0.6%	19.0%
	n	5	4
Maxillary teeth protuberance	%	2.8%	19.0%
	n	5	1
Open bite	%	2.8%	4.8%
	n	1	0
Overbite	%	0.6%	0.0%
	n	5	2
Overjet	%	2.8%	9.5%
	n	8	2
Ugly duckling	%	4.5%	9.5%

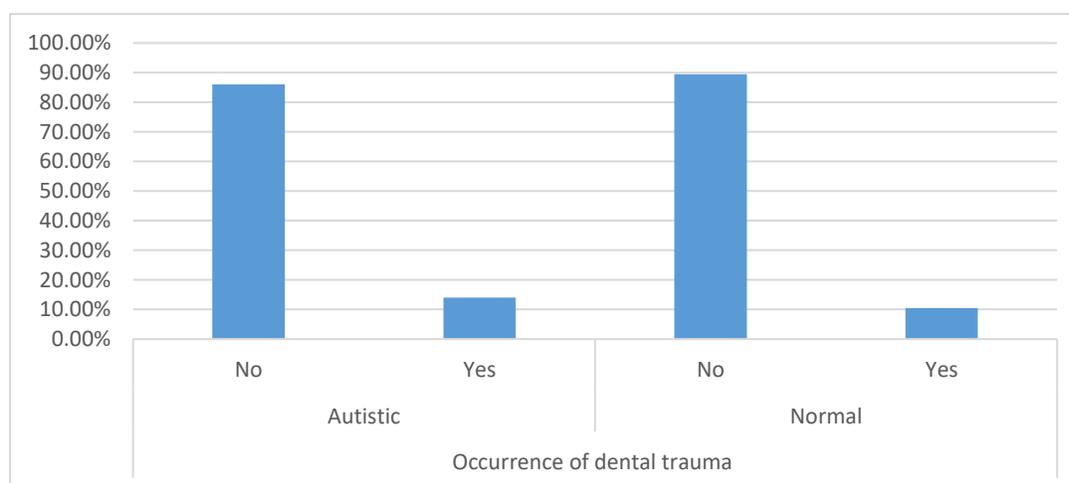


Figure 1:

Bar chart showing prevalence of TDIs.

IV. DISCUSSION

Few and dated studies investigated the incidence and prevalence of dental trauma in autistic children and even fewer studies have compared the oral injuries in these patients with a control group. [12] This study helps in increasing patient awareness as well as dental knowledge about dental trauma occurrence. This study was conducted to assess the occurrence of TDI in a

group of Egyptian autistic children compared to normal children.

Regarding the occurrence of TDI; in this study, it was determined that 14% of the autistic children and 10.5% of the normal children had suffered TDI. Similar results were obtained by Zafer et al. (2017)[14] showed a high frequency (30.4%) of dental trauma in children with autism with a significant difference between autism and

the remaining groups. Similarly, Altun et al. (2010)[15] stated that the rate of injury was higher among the autistic group (23%) than the normal group (15%). Another study by Al-Sehaibany (2017) [6] reported that the prevalence of TDIs was significantly higher in the autistic group (25.7%) than in the control group (16.3%). In the same order of ideas, [8] evaluated that TDI prevalence in autistic children was higher (39.3 %) than in the normal group (26.2 %), however, Du et al. (2015) [14] evaluated that, children with and without ASD had similar prevalence of TDI. Unlike [15] who stated that dental trauma in autistic patients (24.6%) was lower than in normal patients (41.2%).

Autistic children usually have muscle incoordination, which is a comorbidity that can lead to accidental falls producing TDIs. Furthermore, this altered muscle tone frequently results in an open bite with maxillary incisor labial flaring and lip incompetence, predisposing these teeth to fractures.[11]

Regarding socioeconomic status: there are conflicting reports on the association between the prevalence of TDI and socioeconomic status. This study showed that autistic children who enrolled in private schools and whose number of siblings is minimal, suffered less TDIs than others in public schools or have more than one sibling, as children with low socioeconomic status are more exposed to public areas with less protective facilities.

Some studies reported that the prevalence of TDI was highest in children with low socioeconomic status [16][17], as children from families with a high level of social instability are more likely to exhibit TDIs. Others have reported a higher prevalence of TDIs in children with high socioeconomic status as children with a high socioeconomic position may have access to leisure products and equipment.[18]

Regarding risk factors: in the present study, the autistic and normal groups presented higher percentages of TDI in sports activities 21%, 19% respectively, as TDIs are more common when the duration of activities increases. Similar results were found in the following studies: [19] [20] In the literature, there are limited studies about this risk factor.

This study revealed also that the level of autism affected the occurrence of TDI as the severe level of ASD has a high risk of TDI than the mild form of autism. This study showed that 39.3% of severe level, 42.9% of moderate level and 17.9% of mild form experienced TDIs. This comes in accordance with a previous study; [8], [15]. As the severe and moderate forms of ASD show more distress in communication.

Regarding oral habit, it was found that thumb sucking, lip biting and nail biting 16.7%, 16.7%, 16.7% respectively were the predominant cause of TDIs in the autistic group, followed by bruxism, tongue thrusting and mouth breathing 13.3%, 6.7%, 3.3% respectively. In the normal group, it was found that mouth breathing and thumb sucking were the predominant cause of TDI. As these oral habits may result in an open bite with maxillary incisor labial flaring and lip incompetence, predisposing the teeth to fractures.

Malocclusion is another commonly observed condition in deciduous and permanent teeth due to the interplay of various genetic, environmental, and behavioural factors. In this study, it was found that incompetent lip, maxillary teeth protuberance followed by ugly duckling stage 10%, 26%, 37.5% respectively were the most common cause of the TDIs frequency in subjects with malocclusion. In the control group, we found that incompetent lip 19% and maxillary teeth protuberance 19% were the most common cause of TDIs occurrence. These certain occlusal features may predispose the child to trauma as it could expose the maxillary anterior teeth to greater conditions of vulnerability.

Similar results were shown in recent studies regarding malocclusion. Abdel Malak *et al.* (2021)[16] reported that children with insufficient lip coverage had a 5.73 times greater chance of having traumatic injuries. Lips play a crucial role in the protection of the underlying teeth thus; lip incompetence is considered a major risk factor for TDIs.

Finally, the study shows that children with ASD usually exhibit a higher occurrence of TDI than normal children. Regarding the oral habit, thumb sucking and lip biting were the predominant cause of TDIs in the autistic group. In the normal group, mouth breathing and thumb sucking were the predominant cause of TDI. In subjects with malocclusion, incompetent lip and maxillary teeth protuberance were the most common cause of TDI occurrence.

Conflict of Interest and Source of Funding:

Self-funding

V. REFERENCES:

1. **Kerns, C.M., Newschaffer, C.J. & Berkowitz, S.J. (2015)** "Traumatic Childhood Events and Autism Spectrum Disorder," *Journal of Autism and Developmental Disorders*, 45(11), pp. 3475–3486.
2. **Lam, R. (2016)** "Epidemiology and outcomes of traumatic dental injuries: a review of the literature," *Australian Dental Journal*, 61(supplement S1), pp. 4–20.
3. **Dighe, K., Kakade, A., Takate, V., Makane, S., Padawe, D. et al. (2019)**. Prevalence of Traumatic Injuries to Anterior Teeth in 9-14 Year School-going Children in Mumbai, India. *The journal of contemporary dental practice*, 20(5), 622–630.
4. **Rogers, S.J. (2009)** "What are infant siblings teaching us about autism in infancy?" *Autism Research*, 2(3), pp. 125–137.
5. **Surabian, S.R. (2013)** "Dentistry's intrinsic link to provision of services for persons with disabilities.," *Journal of the California Dental Association*, 41(9), pp. 677–83, 686–8.
6. **Al-Sehaibany, F.S. (2017)** "Occurrence of oral habits among preschool children with autism spectrum disorder," *Pakistan Journal of Medical Sciences*, 33(5), pp. 1156–1160.
7. **Al-Haj Ali, S.N., Algarawi, S. A., Alrubaian, A. M., & Alasqah, A. I. (2020)** "Knowledge of General Dental Practitioners and Specialists about Emergency Management of Traumatic Dental Injuries in Qassim, Saudi Arabia," *International Journal of Pediatrics*, 2020, pp. 1–7.
8. **Habibe, R. C. H., Ortega, A. O. L., Guaré, R. O., Diniz, M. B., & Santos, M. T. B. R. (2016)**. Risk factors for anterior traumatic dental injury in children and adolescents with autism spectrum disorders: a case–control study. *European Archives of Paediatric Dentistry*, 17(2), 75–80.
9. **Goettems, M. L., Torriani, D. D., Hallal, P. C., Correa, M. B., & Demarco, F. F. (2014)**. Dental trauma: prevalence and risk factors in schoolchildren. *Community Dentistry and Oral Epidemiology*, 42(6), 581–590. <https://doi.org/10.1111/cdoe.12113>
10. **Al-Sehaibany, F.S. (2018)** "Occurrence of traumatic dental injuries among preschool children with autism spectrum disorder," *Pakistan Journal of Medical Sciences*, 34(4).

11. **Marra P. M., Parascandolo S., Fiorillo L., Ciccì M., Cervino G., et al. (2021)** "Dental Trauma in Children with Autistic Disorder: A Retrospective Study", *BioMed Research International*, 2021, pp 6
12. **Zafar, S., Boyd, D. & Siddiqi, A. (2017)** Dental Management of a Child with Autism Spectrum Disorder and Attention. *Deficit Hyperactivity Disorder. Australia*.
13. **Altun, C., Guven, G., Yorbik, O., & Acikel, C. (2010)**. Dental injuries in autistic patients. *Pediatric dentistry*, 32(4), 343–346.
14. **Du, R. Y., Yiu, C. K., King, N. M., Wong, V. C., & McGrath, C. P. (2015)**. "Oral health among preschool children with autism spectrum disorders: A case-control study," *Autism: the international journal of research and practice*, 19(6), 746–751.
15. **Andrade, N. S., Dutra, T. T., Fernandes, R. F., Moita Neto, J. M., Mendes, R. F. et al. (2016)** "Retrospective study of dental trauma in children with autism spectrum disorders: a paired study," *Special Care in Dentistry*, 36(5), pp. 260–264.
16. **Abdel Malak, C., Chakar, C., Romanos, A. & Rachidi, S. (2021)** "Prevalence and Etiological Factors of Dental Trauma among 12- and 15-Year-Old Schoolchildren of Lebanon: A National Study". *The Scientific World Journal*, vol. 2021.
17. **Sharma, S., Sinha, R. & Kedia, N.B. (2015)**: Risk Factors Associated with Anterior Teeth Trauma in children Risk Factors Associated with Anterior Teeth Trauma in Children, *Int J Dent Med Res*. 15(1), 96-103.
18. **Oyedele, T.A., Jegede, A.T. & Folayan, M.O. (2016)**. Prevalence and family structures related factors associated with crown trauma in school children resident in suburban Nigeria. *BMC Oral Health* 16, 116.
19. **Veeresh D J, Shukla A, Srikanth A, Jain A, Lalani B, Lobo CW (2020)**. Assessment of knowledge, attitude, and practices toward orofacial injuries among students engaged in sports from Davangere city: A cross sectional survey. *Int J Oral Health Sci*; 10:26-31
20. **Durham, J., Moore, U. J., Hill, C. M., & Renton, T. (2017)**. "Oral surgery II: Part 6. Oral and maxillofacial trauma," *British Dental Journal*, 223(12), pp. 877–883.