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# Are behaviour risk factors for traumatic dental injuries in childhood different between males and females?

## ABSTRACT

**Aim** Examination of the risk factors for childhood traumatic dental injuries for male and female patients have been elusive. The present study aimed to examine whether males and females are differentially vulnerable to Traumatic Dental Injuries in relation to emotion regulation, attention deficiency hyperactive disorder symptomatology and behaviour problems.

**Materials and Methods** An institutional ethical review board approved the case-control study carried out at the Gazi University, Faculty of Dentistry, Turkey. A total of 80 patients with traumatic dental injuries and 80 patients with other dental problems participated in the study. Patients' parents filled in two scales: Conners' Rating Scales-Revised Attention Deficiency Hyperactive Disorder-Index, Oppositional Behavior, Hyperactivity, Anxious-Shy, Social Problems, Inattentive and Hyperactive-Impulsive subscales; and Emotion Regulation Checklist, with two subscales of Emotional Lability and Emotion Regulation. Multiple logistic regression analyses were performed separately for male and female patients.

**Results** Oppositional behaviour, hyperactivity and social problems were found to be risk factors for male patients. Being anxious/shy was the protective factor for both males and females. Classification accuracy for males and females were calculated to be 79.2% and

85.2% respectively.

**Conclusion** Several risk factors for childhood traumatic dental injuries were found to differ for male and female patients.

**Keywords** Behaviour problems; Dental trauma; Risk factors for dental injuries.

## Introduction

Traumatic dental injuries (TDI) are known to be common among children of all ages. TDI's seem to have a negative impact both on children and their parents' quality of life [Kramer et al., 2013]. Oral factors (e.g., increased overjet with protrusion), environmental factors (e.g., living in deprived areas), and human behaviour (e.g., risk taking) were found to increase the risk for the TDI's [Glendor, 2009].

As retrospective [Bruce et al., 2007], prospective [Shilon et al., 2012] and cross-sectional [Uslu et al., 2007] studies indicate that children with attention deficit hyperactivity disorders (ADHD) are more prone to experience accidental injuries, ADHD is proposed to be a risk factor for the childhood TDI. While some study findings supported ADHD as a risk factor, others showed that ADHD has little influence—if any—in increasing the risks for TDIs. For example, based on parental reports of TDI, Sabuncuoglu et al. [2005] found that children with ADHD are more likely to experience TDIs than their non-ADHD counterparts. Thikkurissy et al. [2012] indicated that children with TDI may have higher hyperactivity/impulsivity symptoms but they are not different compared to the overall ADHD symptoms of the control group. Likewise, in another study dental records of children with and without symptoms of ADHD and learning difficulty were examined and there were no differences between the groups regarding TDI [Blomqvist et al., 2004]. Likewise, Odoi et al. [2002] demonstrated that children with and without TDI did not differ in terms of emotional problems, conduct disorders and hyperactivity symptoms. Peer problems was the only risk factor for childhood TDI.

A possible explanation for the differences would be emotion regulation. A recent study indicated that ADHD could be heterogeneous regarding emotional regulation [Musser, 2013]. Furthermore emotional regulation is known to be associated with ADHD [Walcott and Landau, 2004], risk taking [Boyer, 2006], and bullying [Mahady-Wilton et al., 2000] and all these variables were suggested to be the risk factors for childhood TDI [Glendor, 2009].

Furthermore ADHD is known to be related with gender; male and female ratio was found to be as high

as 6:1 [Bianchini et al., 2013]. Similarly, males were found to be more vulnerable to TDI, with a ratio varying from 1.28:1 [Ivancic et al., 2009] to 2.5:1 [Naidoo et al., 2009]. As to our knowledge, there is no published study that investigated the role of emotional regulation and ADHD symptomatology in the occurrence of TDI for males and females separately.

Therefore the present study aimed to examine whether males and females are differentially vulnerable to TDI in relation to emotion regulation, ADHD symptomatology and various behavior problems.

## Materials and methods

The Research Ethics Committee of Gazi University School of Dentistry approved the study. A hospital based case-control study design was carried out based on data of 160 patients living in Ankara, Turkey. The age range of all participating patients was 7-15. The minimum sample size requirements were met. Sample size calculations were performed using PASS software (NCSS, LLC, Kaysville, UT, USA) [Hintze, 2008], and it was estimated at 128 children with 80% confidence interval level and a standard error of 5%.

The Andreasen modification of the WHO criteria was used [Glendor, 2009]. In order to increase the accuracy for TDI classification, dental examinations of the patients were performed by two experienced operators in paediatric dentistry (MB and HB). Dental trauma was categorised as either absent or present. Both operators verified the presence of TDI. The inter-rater reliability of the diagnosis was almost perfect as calculated by Kappa statistics (.97) [Landis and Koch, 1977]. Only in a few cases there was disagreement. The final decision on the diagnosis was made after discussion.

Of these patients 80 had TDI (T=Trauma group), the remaining 80 patients exhibited tooth decay and other dental problems (NT=Non-trauma group). Inclusion criteria for the T group were occurrence of TDI in the previous two weeks. Having dental problems other than TDI were the inclusion criteria for the NT groups. The age inclusion criteria were 7-15 for both groups. Children were excluded from the study if they had a known diagnosis of developmental disorder or mental retardation. These patients were referred to the Faculty of Dentistry, Department of Paediatric Dentistry of Gazi University, Ankara, Turkey, over a period of four months from February 2013 to May 2013.

Signed informed consent was received from the parents of the participating patients. The study was explained to parents and they were asked to fill in two scales. The first is the Conners' Rating Scales-Revised (CRSR: Conners) [Conners, 2001]. The ADHD index of CRSR is a 12-item scale that is most likely to identify children at risk for DSM-IV diagnosis of ADHD. In addition to the ADHD index, parents were also asked to

<b>Trauma group</b>	<b>n = 80 (SD)</b>
Mean age	10.50 (2.60)
Female	30
Male	50
<b>Non-Trauma group</b>	<b>n= 80 (SD)</b>
Mean age	10.51 (2.20)
Female	24
Male	56
<b>Teeth affected</b>	<b>n = 80</b>
Maxillary central incisor	69
Maxillary lateral incisor	9
Mandibular central incisor	2
<b>Type of TDI</b>	<b>n = 80</b>
Crown fracture	18
Enamel dentin fracture	5
Complicated crown fracture	32
Intrusive luxation	14
Extrusive luxation	3
Avulsion	3
Crown root fracture	3
Root fracture	2

**TABLE 1**  
Sample and TDI characterisation.

fill in items for the oppositional behavior, hyperactivity, anxious-shy, social problems, DSM IV-inattentive, and DSM-IV Hyperactive-Impulsive subscales. Parents also filled in the 24-item Emotion Regulation Checklist scale, with the two subscales Emotional Lability and Emotion Regulation [Shields and Cicchetti, 1997] adapted for Turkish children by Kapci et al. [2009]. For both CRSR and the Emotion Regulation Checklist, higher scores indicate an increase in severity of the problem area.

In order to examine gender differences, multiple logistic regression analyses including CRSR and emotion regulation subscales as predictors of TDI status were performed separately for male and female patients.

## Results

An equal number of children were included in the Trauma and Non-Trauma groups with an age range of 7-15. The mean ages of the two groups were not statistically different; T group mean age was 10.50 (SD=2.60), and NT group mean age was 10.51 (SD=2.20),  $t(158) = .03$ ,  $p > .05$  (Table 1). The number of males in T and NT groups were 50 and 56: females were 30 and 24 respectively (Table 1).

The injuries in the T group were: complicated crown fracture (32), uncomplicated crown fracture (18), intrusive luxation (14), enamel dentin fracture (5), crown root fracture (3), extrusive luxation (3), avulsion

Male			
Opposition symptoms	32	66.1	1.43*
Hyperactivity symptoms	44	64.3	1.67*
Social problems	40	66.1	2.41*
Anxious-shy symptoms	67.1	39	1.13*
Female			
Opposition symptoms	28.7	37.5	-
Anxious-shy symptoms	69.6	25	0.74*

\* The superscript letters indicate statistical significance between T and NT (P < 0.001)

**TABLE 2** Comparison of TDI and Odds ratio (OR) for CSRS subscales between males and females.

	Male (%)	Female (%)
Accuracy	79.2	85.2
Sensitivity	78.6	75
Specificity	80	93.3

**TABLE 3** Distribution for emotion regulation subscales between males and females.

(3) and root fracture (2) (Table 1). The NT group exhibited tooth decay and other dental problems.

The results for males indicated that opposition problems (Wald  $\chi^2=11.28$ ,  $df=1$ ,  $p<.001$ ), hyperactivity symptoms (Wald  $\chi^2=5.007$ ,  $df=1$ ,  $p<.02$ ), and social problems (Wald  $\chi^2=11.62$ ,  $df=1$ ,  $p<.001$ ) were found to predict TDI. Anxious-shy symptoms (Wald  $\chi^2=16.81$ ,  $df=1$ ,  $p<.0001$ ) was a protective factor for TDI.

The analyses demonstrated that 66.1% of males in the T group had significant opposition symptoms as opposed to 32% males in the NT group (OR=1.43) (Table 2). The odds ratio (OR) for hyperactivity symptoms, social problems and anxious-shy symptoms subscale were 1.67, 2.41 and 1.13 respectively. Additionally 64.3%, 66.1% and 39% of the males in the T group had hyperactivity, social problems and anxious-shy symptoms as opposed to 44%, 40% and 67.1% in the NT group respectively (Table 2).

Logistic regression analyses for females demonstrated that only the anxious-shy subscale of the CSRS was found to be a protective factor the TDI (Wald  $\chi^2=4.05$ ,  $df=1$ ,  $p<.04$ ); 25% of the females in the T group (OR=.74) were found to experience anxious-shy symptoms as opposed to 69.6% in the NT group. It should be added that the opposition subscale of the CSRS approached significance for females in the T group (Wald  $\chi^2=3.12$ ,  $df=1$ ,  $p<.07$ ), and the 37.5% of these females were found to exhibit opposition symptoms.

Classification accuracy using the logistic regression model was calculated separately for males and females. It was 79.2% for males and 85.2% for females. These percentiles were significantly greater than by chance accuracy criteria of 52.8% and 55.6% respectively. The

sensitivity and specificity rates for males were 78.6% and 80% respectively. The classification accuracy rates for females were found to be slightly higher. Specificity rates for females were higher than sensitivity rates (93.3% and 75% respectively) (Table 3).

## Discussion

The present study aimed to investigate whether males and females are differently vulnerable to childhood TDI in relation to ADHD symptomatology, behaviour problems and emotion regulation.

Multiple logistic regression analyses showed that the risk factors for childhood TDI differed for males and females [Dame-Teixeira et al., 2013]. First, opposition symptoms, hyperactivity symptoms and social problems were found to be risk factors for males, but not for females. In one of the earlier studies peer problems was the single risk factor for childhood TDI [Odoi et al., 2002]. Considering the possible item overlap between peer problems and social problems, this finding highlights the importance of social relationship in the incidence of TDI. The study of Thikkurissy et al. [2012] partly supports the present study, since they found hyperactivity/impulsivity symptoms but not ADHD symptoms as a risk factor. It should be noted that both the above studies [Thikkurissy et al., 2012; Odoi et al., 2002], did not examine whether peer problems or hyperactivity/impulsivity symptoms would differ for male and female patients.

In the present study neither the full ADHD index nor the emotion regulation and emotional lability were found to be risk factors. This may explain relatively lower sensitivity rates (males 78.6%, females 75%). Nevertheless specificity was found to be higher especially for females (93.3%). Anxious-shy symptoms were found to be a protective factor for both males and females. Previous studies reported a moderate negative correlation between internalising (e.g., anxious-shy) and externalising (e.g., opposition-conduct) disorders [Achenbach, 1991]. Consequently it may not be erroneous to assume that children who exhibit higher internalising problems may have lower externalising problems, this would in turn may contribute to be a preventive factor for the incidence of TDI.

The present study is not free from limitations. Firstly, the number of female patients was low compared to male patients. Secondly all the assessment instruments were based on parental reports. Assessment of emotional regulation was also based on parental reports. It is not clear how the results would differ with the use of different evaluation methods such as physiological indices of emotional regulation. Another limitation is that patients did not go through a full clinical diagnosis for the ADHD and other disruptive behavioural or emotional disorders.

Despite these limitations the present study highlights the importance of evaluating the risk factors for childhood TDI separately for male and female patients. Prospective studies from representative populations are needed to confirm the findings of the present study and examine risk factors for male and female patients separately. Finally, it is well known that the prevalence of childhood psychopathology including ADHD and other social-emotional problems changes by age and future studies should take into account both gender and developmental differences. Only then preventive approaches to decrease TDI will be more successful.

## Conclusion

There are few case-control studies on behavioural risk factors concerning TDI in children. In this paper several behavior risk factors for childhood TDI were found to differ for male and female patients. This study can help paediatric dentists in the education of parents for prevention of TDI.

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