

Examining the Relationship Between Preventable Psychiatric Problems and Child Extremity Fractures

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ABSTRACT

Objective: Extremity fractures (EF) are among the most common causes of admission to hospitals in children. We aimed to evaluate children treated for EFs by comparing them with the control group from a psychiatric perspective.

Method: Thirty-six children aged between 3 and 17 years who administered to the Orthopedics and Traumatology clinic due to EF were included in the study. 36 children of similar age and gender with the study group were included as the control group. A child psychiatrist evaluated all children included in the study. A psychiatric diagnosis interview was conducted. The parents filled out the Conner's Parent Rating Scale-Revised Short Form (CPRS-R:S).

Results: Of the cases in the patient group, 66.7% were male. The ratio of rural residents in the patient group was higher compared to the control group. The most common fracture location was lower extremity (55.6%). The most common cause of the fracture was falling (52.8%). In the patient group, the ratio of the children who had previously experienced fracture was 36.1%. Psychopathology was detected to be at a higher level in the patient group. The most common was Attention Deficiency and Hyperactivity Disorder (ADHD). Children in the patient group scored higher on the CPRS-R:S than the control group.

Conclusion: Children with EF exhibited more impulsive and hyperactive behaviours than controls and had more psychopathology. For this reason, it is essential to evaluate children who apply due to fracture in terms of psychopathology.

Keywords: Extremity fracture, psychopathology, children

INTRODUCTION

Extremity fractures are among the most common causes of admission to emergency services and hospitalization in children (1). Although there are differences in the conducted studies, the risk of the occurrence of at least one fracture in childhood was found to be approximately 42-64% in boys and 27-40% in girls (2). Upon examining these fractures, it is observed that the age, at which the fracture occurs, displays a bimodal distribution. Accordingly, the first peak is observed at 6-7 years of age, and the second peak is observed at 13-14 years of age (3). Examining the etiology of extremity fractures observed in children, there are three leading causes, including trauma after an accident, non-accident trauma, and pathological conditions (4). The causes of trauma are usually falling, motor vehicle accidents, sports or bicycle injuries, and are mostly observed in the upper extremity (5).

Psychosocial characteristics of children applying with fractures that occurred due to traumatic injuries have been examined in various studies (6, 7). Childhood behavior disorders have been reported to increase the risk of injury in children 1.5 times (8). Among these disorders, Attention Deficiency and Hyperactivity Disorder (ADHD), which is characterized by intense inattention, mobility, and impulsivity, is the most common neurodevelopmental disorder of childhood (9). It was reported that ADHD adversely affects a person's daily life, and patients diagnosed with ADHD are more prone to accidents (10). The risk of fracture increases in patients with ADHD due to behavioral characteristics such as negligent behavior, clumsiness, disregard of rules during activities, and neglect of safety measures (11). It was suggested that children treated for extremity fractures had higher levels of impulsivity and hyperactivity than children treated for non-traumatic reasons (12).

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In our study, the presence of psychiatric disorders in pediatric patients who applied to the orthopedic clinic due to extremity fractures was compared with the control group. In this prospective controlled study, we investigated whether there were any psychiatric disorders, especially Attention Deficiency and Hyperactivity Disorder (ADHD), Conduct Disorder (CD), and Oppositional Defiant Disorder (ODD).

MATERIAL AND METHODS

Children between the ages of 3-17 who administered to orthopedics and traumatology clinic of our hospital due to extremity fracture between 1 January and 1 May 2019 were included in the study. Children with fractures due to intra-vehicular traffic accidents and due to suicidal attempt were excluded from the study. Also, children who were prone to accidents due to neuropsychiatric disorders, including mental retardation, autism spectrum disorder or epilepsy, and who had bone metabolism disorders such as osteogenesis imperfecta, and children with auditory or visual impairments were not included in this study. Finally, thirty-six children with fractures who met these criterias were included in this study as a patient group. The control group consisted of 36 children of similar age and gender with the patient group, who did not receive psychiatric treatment, and did not have a history of fracture according to the information obtained from the parents. After the treatment of the children was completed, they were referred to the child and adolescent psychiatry outpatient clinic for psychiatric evaluation. All children included in the study were evaluated by a semi-structured psychiatric interview as a detailed interview conducted by a child psychiatrist with the child himself/herself and his/her parents to determine whether there is any mental disorder in the child. We used the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Aged Children-Present and Lifetime Version (KSADS-PL) for this interview (13). The information form prepared by the clinician was completed by asking the questions to the parents. Also, we asked to fill out the Conner's Parent Rating Scale-Revised Short Form by all parents (14). Ethical committee approval was obtained on 02.01.2019 with the decision number 2019-01/02. Written informed consent was obtained from all children and parents included in this study.

DATA COLLECTION TOOLS

Information Form

This form was prepared by the researcher. The socio-demographic information of both groups was obtained by these forms (Name-surname, age, the place of living, class, parents' profes-

sion, parents' educational level, and monthly income of the family). Furthermore, fracture information was collected in the patient group (location of the fracture, aetiology, treatment modality, the presence of a previous fracture, etc.).

Conner's Parent Rating Scale-Revised Short Form (CPRS-R:S)

It consists of 27 items. The items were collected in three subscales (Oppositional Disorder-OD, Cognitive Problems-Inattention-CP/I, Hyperactivity-H) and one assistant scale (ADHD Index-ADHD). There are four answer options for each item with a score value ranging from 0 to 3: never correct (never, very rarely), 0 points; slightly correct (sometimes), 1 point; quite accurate (often, quite a lot), 2 points; very accurate (very often), 3 points. A high score indicates that the child has problems identified in the CPRS-R:S. The validity and reliability of the Turkish version of the scale were conducted by Kaner et al [15].

Statistical Analysis

Data were analyzed using the SPSS 22.0 program (Statistical Package for Social Sciences for Windows 22, SPSS Inc., Chicago, USA). The Shapiro-Wilk test was used to determine whether the data were normally distributed. For the data with non-normal distribution, the Mann-Whitney U test was used to compare two independent groups. The chi-square test was used to analyze categorical data. A p-value less than 0.05 was considered to be statistically significant with a 95% confidence interval (CI).

RESULTS

The sociodemographic data of the patient and control groups are presented in Table 1. There was no significant difference in terms of sociodemographic characteristics between the two groups matched by age and gender.

The fracture information of the patient group is presented in Table 2. We compared the localization of the fracture and the CPRS-R:S scores according to Mann Whitney-U test. No statistically significant difference was found between these parameters ($p=0.924$). Similarly, no significant difference was found between the treatment modality of the fracture and CPRS-R:S scores ($p=0.502$).

Data on the comorbid psychiatric disorders of the patient and control groups are given in Table 3. According to our findings, half of the children in the patient group had at least one comorbid psychiatric disorder. ADHD was the most detected psychiatric disorder. In other words, the rate of comorbid psychiatric disease in the patient group was significantly higher than in the control group ($p<0,001$). Five patients in the patient group had two comorbid psychiatric disorders. 3 of them had ADHD+ODD, 2 of them had ADHD and CD. On the other hand, there was only one children had ADHD+ODD in the control group. There was no significant difference between the two groups in this respect ($p=0,199$).

In 61.5% (n: 8) of the comorbid ADHD patients, fracture occurred due to falling, in 23.1% (n: 3) due to pedestrian injuries, in 7.7% (n: 1) due to a bicycle injury, and in 7.7% (n: 1) due to a playground injury. No significant difference was detected between ADHD comorbidity and the causes of fracture formation ($p=0.520$).

Main Points:

- Cervical cancer screening methods are proved one of the few screening methods that are thought to decrease invasive cancer incidence and mortality.
- It is the first study investigating HPV relationship under the title of atopic disease (allergic dermatitis, urticaria, atopic asthma, allergic rhinitis).
- There is no need to different and extra screening schedules for patients with atopic diseases such as asthma, rhinitis or urticaria.

		Patient	Control	P
Sex	Female	12 (33,3%)	10 (27,8%)	0,609
	Male	24 (66,7%)	26 (72,2%)	
Age (Year)		10,7 ± 3,6	10,0 ± 3,2	0,349
Place Of Residence	Province	20 (55,6%)	22 (61,1%)	0,841
	District	7 (19,4%)	7 (19,4%)	
	Town/Village	9 (25,0%)	7 (19,4%)	
Mother's Educational Status	Illiterate	5 (13,9%)	1 (2,8%)	0,053
	Primary School	20 (55,6%)	12 (11,1%)	
	Secondary School	3 (5,6%)	6 (16,7%)	
	High School	4 (13,9%)	11 (30,5%)	
	University	4 (13,9%)	6 (16,7%)	
Father's Educational Status	Primary School	13 (36,1%)	12 (33,3%)	0,716
	Secondary School	12 (33,3%)	9 (25,0%)	
	High School	7 (19,4%)	8 (22,2%)	
	University	4 (11,1%)	7 (19,4%)	
Family Structure	Nuclear Family	27 (75,0%)	29 (80,6%)	0,571
	Extended Family	9 (25,0%)	7 (19,4%)	
Family's Monthly Income*	< 2.000	17 (47,2%)	15 (41,7%)	0,422
	2.000 - 4.000	10 (27,8%)	15 (41,7%)	
	> 4.000	9 (25,0%)	6 (16,7%)	

*Turkish Liras

		n	%
Fracture Localization	Lower Extremity	20	55,6
	Upper Extremity	16	44,4
Causes Of Fractures	Falling	19	52,8
	Fighting	2	5,6
	Motor Vehicle Accidents (Pedestrian Injuries)	8	22,2
	Sport Injury	0	0
	Bicycle Injury	2	5,6
	Playground Injury	5	13,9
Treatment of fractures	Surgical	24	66,7
	Conservative	12	33,3
Previous fracture history	Yes	13	36,1
	No	23	63,8

	Patient* n:36	Control n:36	P
Ratio of comorbid psychiatric disorders in the whole group	18 (50,0%)	4 (11,1%)	< 0,001
ODD**	8 (22,2%)	2 (5,6%)	0,042
CD***	2 (5,6%)	0 (0,0%)	0,246
ADHD****	13 (36,1%)	3 (8,3%)	0,005

* Five patients in the patient group had two comorbid psychiatric disorders.
 ODD**: Oppositional Defiant Disorder, CD***: Conduct Disorder, ADHD****: Attention Deficiency and Hiperactivity Disorder

Table 4. Conners' Parent Rating Scale-Revised Short Form Sub-Scale Scores of patient and control group

Sub-scales	Patient (mean ± sd)	Control (mean ± sd)	p
Oppositional-O	7,7 ± 5,8	3,2 ± 3,7	< 0,001
Cognitive Problems-Inattention-CP/I	12,5 ± 10,0	4,5 ± 4,5	< 0,001
Impulsivity/Hyperactivity-I/H	6,4 ± 4,8	1,9 ± 2,7	< 0,001
Total Score	26,8 ± 17,7	9,7 ± 9,6	< 0,001

In 50.0% (n: 4) of the Oppositional Defiant Disorder (ODD) patients, fracture occurred due to falling, in 12.5% (n: 1) due to fighting, in 25.0% (n: 2) due to a pedestrian injury, and in 12.5% (n: 1) due to a playground injury. No significant difference was detected between ODD comorbidity and the causes of fracture formation (p = 0.772).

In the patient group, children with a history of a previous fracture (n: 13) and children who had a fracture (n: 23) for the first time were compared. When a comparison was performed in terms of comorbid psychiatric diagnoses, a statistically significant difference was found (p: 0.02). According to this, 69.2% (n: 9) of children with a history of a previous fracture had a comorbid psychiatric disorder, and this rate was higher compared to those who had a fracture for the first time. A significant difference was found when the children with a history of fracture and the children who had a fracture for the first time were compared in terms of the scores obtained from the CPRS-R:S scale (p<0.01).

Table 4 displays the CPRS-R:S scores of the children in the patient and control groups. Accordingly, the children in the patient group scored significantly higher in all three subscales than their peers in the control group.

DISCUSSION

In the present study, children with extremity fractures were examined by being compared with the control group in terms of comorbid psychiatric disorders. Psychiatric disorders, especially ADHD, CD, and ODD, were evaluated. The most important finding we achieved as a result of our study is that children with a fracture are more likely to have comorbid psychiatric disorders than the control group. It has been reported that children with a fracture display more hyperactive-impulsive behaviours, psychosomatic complaints, and behaviour disorders (7).

It has also been indicated in many studies to date that children with behaviour disorders have a 1.5-times higher risk for injuries and that from these behaviour disorders especially ADHD constitutes a risk factor for injuries (8,15-18). However, our study stands out in terms of conducting face-to-face interviews by a child psychiatrist.

ADHD makes children vulnerable to accidents and injuries due to many reasons, especially inattention and impulsivity (19). Injuries in these children have been reported to be caused by reasons such as inattentive behaviours, clumsiness, disobedience to the rules during activities like a game, and difficulties in peer relationships (16,20). It has also been reported that children diagnosed with ADHD are inadequate in predicting the possible severe consequences of risky behaviours and in taking precau-

tions against injuries, thus are more prone to accidents (18). In a study comparing children with and without ADHD, individuals in the ADHD group were found to apply to emergency services and to experience recurrent injuries at higher rates than those without ADHD (21). In a recent study conducted in our clinic in which 212 ADHD children and 215 healthy controls were compared, both one-time fracture (35.8%, 18.1% respectively; p<0.001) and recurrent fracture (12.7%, 6.0% respectively; p=0.018) rates were found to be significantly higher in the ADHD group than in the controls (22). In the present study, the most common comorbid psychiatric disorder was observed to be ADHD in the patient group.

In our study, the patient group had higher scores than the control group in all three subscales of the CPRS-R:S (Table 4). In other words, children who apply due to a fracture display more impulsive/hyperactive behaviours than the control group. Detecting the higher rate of psychopathology in the fracture group is similar to the results obtained by Uslu et al (11). Similarly to our study, a study reported that from the cases who applied to the hospital due to a fracture, those displaying impulsive/hyperactive behaviours had fractures mostly in the lower extremity and these fractures were more severe and required open reduction (23). In our study, we encountered mostly lower extremity fractures requiring surgical treatment in the patient group (Table 2). In addition to this, in terms of the general distribution, it is known that childhood extremity fractures are mostly observed in the upper extremity, unlike adults (4,5). It has been reported that children with ADHD have slower reaction times, and this situation may be associated with lower extremity fractures (24). Likewise, Clancy et al. (20) suggested that children with ADHD exhibit defective conservative reactions under experimental conditions and that this situation may explain why upper extremity fractures are less common in these children.

Several studies in the literature reported that the majority of the patients with fracture were male (3,5). In our study, the majority of the patients with extremity fracture were also male (Table 1). It is emphasized that boys are exposed to more severe injuries than girls due to a higher number of risky behaviours (25).

Some studies investigating the difference between urban and rural life in terms of fracture occurrence demonstrated that the rate of accidents and fractures was higher in rural areas (26,27). In our study, the majority of the children in the patient group were also children of families with low socioeconomic status.

In our study, the most common cause of fracture occurrence was found to be falling with a ratio of 52.8%, and this result was similar to the study, conducted by Rennie et al (3). Again in a study,

the most common cause of injury was found to be falling, followed by motor vehicle accidents and burns (28).

Of the fracture group, 36.1% had a history of a previous fracture. A higher rate of comorbid psychiatric diagnosis, especially ADHD, was detected in children with a history of fracture than children who had a fracture for the first time. The presence of comorbid psychiatric disorders in children with more than one fracture has also been emphasized in previous studies (29).

Our study has some limitations. These are the facts that the sample number was small, the duration of the study was short, and the study was single-centered. On the other hand, the prospective nature of our study, the fact that the data were not based solely on scale information, and in addition to the information received from the parent, the children were evaluated from a psychiatric perspective by conducting a diagnostic interview by the child psychiatrist are the superior aspects of our study.

CONCLUSION

Consequently, we found that the fracture group was determined to have more psychiatric disorders, especially ADHD, than the control group. Psychopathology was more common in children with more than one fracture history. Furthermore, these children were determined to exhibit more hyperactive/impulsive behaviours by both clinical examination and the CPRS: R-S.

Based on all these results, we recommend that children who present to the emergency department and/or orthopedics outpatient clinic for fractures and exhibit risky behaviors and/or have a history of multiple fractures should be evaluated by a child and adolescent psychiatrist. This situation will also reduce the mortality and morbidity associated with future fractures in these children.

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Conflict of Interest: The authors have no conflicts of interest to declare.

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