



## Investigation of the Relation Between Intraarticular Bleedings and Symptom Severity of Attention Deficit Hyperactivity Disorder in Children and Adolescents with Haemophilia

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### Abstract

**Aim:** Intra-articular bleedings in haemophilia patients and movement restrictions and joint deformities that occur as a result of these bleedings constitute an important health problem and deteriorate the quality of life for children. The purpose of this study is to investigate the relation between intra-articular bleedings and symptom severity of attention deficit hyperactivity disorder and disruptive behavior disorders in children and adolescents with haemophilia.

**Method:** 24 boys with haemophilia were included in the study. During the interviews with children and their mothers, their sociodemographic features and frequency of intra-articular bleedings were examined. Following the interviews, mothers were asked to fill out the Disruptive Behavior Disorder Screening and Rating Scale based on Turgay Diagnostic and Statistical Manual of Mental Disorders Fourth Edition, Text Revision. SPSS for Windows 16.0 software program was used for the statistical analysis of the study.

**Results:** As a result of the correlation analysis, no relation was determined between the symptom severity of attention deficit and frequency of intra-articular bleeding ( $p>0.05$ ). A statistically significant positive relation was determined between the frequency of bleedings within the knee and ankle joints and symptom severities of hyperactivity, impulsivity, oppositional defiant disorder, and conduct disorder ( $p<0.05$ ). No significant relation was detected between the frequency of bleedings within the elbow joint and subscale scores ( $p>0.05$ ).

**Conclusion:** The results of our study have made us think that the frequency of bleeding especially within the knee and ankle joints is related with the symptom severity of hyperactivity/impulsivity, oppositional defiant disorder, and conduct disorder, and children having frequent bleedings within these joints should be evaluated from this aspect along with prophylactic treatment.

**Key Words:** Hemophilia; Attention Deficit And Hyperactivity Disorder; Intraarticular Bleeding.

### Hemofiliili Çocuk ve Ergenlerde Eklem İçi Kanamalar İle Dikkat Eksikliği ve Hiperaktivite Bozukluğu Belirti Şiddeti Arasındaki İlişkinin İncelenmesi

#### Özet

**Amaç:** Hemofili hastalarında ortaya çıkan eklem içi kanamalar ve buna bağlı ortaya çıkan hareket kısıtlılıkları, eklem deformiteleri önemli bir sağlık sorunu oluşturmakta, çocuğun yaşam kalitesini bozmaktadır. Çalışmamızda hemofiliili çocuk ve ergenlerde eklem içi kanamalar ile dikkat eksikliği ve hiperaktivite bozukluğu ve yıkıcı davranış bozuklukları belirti şiddeti arasındaki ilişkinin incelenmesi amaçlanmıştır.

**Yöntem:** Çalışmaya hemofiliili 24 erkek çocuk dahil edildi. Çocuklar ve anneleri ile yapılan görüşmede sosyodemografik özellikler ve eklem içi kanama sıklığı sorgulandı. Görüşmenin ardından olguların anneleri tarafından Turgay çocuk ve ergenlerde davranım bozuklukları için ruhsal bozuklukların tanısı ve sayımsal el kitabı 4. Baskısına dayalı tarama ve değerlendirme ölçeği dolduruldu. Çalışmanın istatistiksel analizinde SPSS for Windows 16.0 paket programı kullanıldı.

**Bulgular:** Yapılan korelasyon analizinde dikkat eksikliği belirti şiddeti ile hiçbir eklem içi kanama sıklığı arasında ilişki saptanmadı ( $p>0,05$ ). Diz ve ayak bilek eklemleri içine olan kanama sıklığı ile hiperaktivite/impulsivite, karşıt olma karşı gelme bozukluğu ve davranım bozukluğu belirti şiddeti arasında istatistiksel olarak anlamlı düzeyde pozitif bir ilişki saptandı ( $p<0,05$ ). Dirsek eklemi içine olan kanamaların sıklığı ile hiçbir alt ölçek puanları arası anlamlı ilişki saptanmadı ( $p>0,05$ ).

**Sonuç:** Çalışma sonuçlarımız özellikle diz ve ayak bileği eklemlerindeki kanama sıklığının hiperaktivite/impulsivite, karşıt olma karşı gelme bozukluğu ve davranım bozukluğu belirti şiddeti ile ilişkili olduğunu, profilaktik tedavinin yanında bu eklemlerde sık kanama yaşayan çocukların bu açıdanda değerlendirilmesinin fayda sağlayabileceğini düşündürmektedir.

**Anahtar Kelimeler:** Hemofili; Dikkat Eksikliği Ve Hiperaktivite Bozukluğu; Eklem İçi Kanama.

## INTRODUCTION

A life-long chronic disease seen in children, haemophilia is caused by the inherited deficiency, absence, or malfunction of factors VIII and IX, which are involved in clotting system. Its incidence is 1/5000. Bleeding and early or late complications induced by bleeding constitute the clinical signs of the disease (1). With

superficial skin bleedings, internal bleedings, intra-articular bleedings along with related movement restrictions and joint deformities, haemophilia disrupts the child's quality of life while also posing a significant health problem. It is also a source of fear and nuisance because it always carries the risk of recurrence after therapy (2). The most common joints that bleed in haemophilia are the knee joints, elbows, and ankles. The repetitive intra-articular bleeding in haemophilia may

cause "chronic hemophilic arthropathy" followed by complete loss of range of motion and permanent disability (3). There are various studies reporting the psychosocial problems in children with haemophilia (1,4-7). The frequent bleeding, physical ailments, and deformities experienced at school age especially lead to psychological problems such as school absenteeism, depression, and anxiety (4,8).

Attention Deficit Hyperactivity Disorder (ADHD) is a common neuropsychiatric disorder in children (9). It has often been reported that children diagnosed with ADHD have a more higher rate of getting injured due to frequent accidents (10-17). The fact that children with ADHD suffer injuries due to frequent accidents has recurrently been associated with attention deficiency, hyperactivity, and impulsivity, all of which are the basic conditions in ADHD (18-20). It has also been put forward that mental disorders such as oppositional defiant disorder (ODD), conduct disorder (CD), and developmental coordination disorder, which frequently accompany ADHD, increase the risk of accidents through aggressive behavior and risk-taking behaviour (12,16,21,22).

Wodrich et al.'s study has shown that ADHD is more common in children with haemophilia (23). A study that compares children with haemophilia with those without haemophilia in terms of symptoms of attention deficit and hyperactivity-attention deficit has found out that children with haemophilia had higher attention deficit and hyperactivity-attention deficit scores according to teachers' notifications as they also had higher hyperactivity-attention deficit scores according to parents' notification (24). Studying injuries resulting from accidents in children diagnosed with ADHD is common practice. However, to our knowledge, there is no study in the literature that examines the relationship between ADHD symptom severity and intra-articular bleeding in children with ADHD despite the fact that ADHD has been reported to be more common in children with haemophilia. Therefore, in this study, we aim to evaluate the relationship between hemarthrosis and symptom severity of ADHD and disruptive behaviour disorders in children and adolescents with haemophilia.

## MATERIALS and METHODS

Our study includes 24 boys with haemophilia who were admitted to Paediatric Haematology Unit at Gaziantep Children's Hospital. Before including the patients in the study, we informed their parents and obtained informed consent forms. Throughout the interviews with children and their mothers, we investigated the sociodemographic characteristics of the patients and frequency of bleedings in the joints with forms created by practitioners conducting the study. After the interviews, we asked the caregiving parents to complete the screening and evaluation scale forms, which were prepared in line with Turgay Diagnostic Statistical Manual of mental disorders to behavior disorders in children and adolescents, 4th edition (DSM-IV). Throughout the study, we used sociodemographic data

forms and screening and evaluating scales for behavioural disorders in children and adolescents based on DSM-IV criteria.

Sociodemographic Data Form: Created by those carrying out the study, this form evaluates the patients in terms of age, gender, education level, family status, level of education of parents, and the frequency of intra-articular bleeding. The form only questions the frequency of intra-articular bleeding within the past month.

The Screening and Assessment Scale for Behavior Disorders in Children and Adolescents Based on DSM-IV Criteria (SBDCA): This scale was developed by Turgay based on DSM-IV diagnostic criteria (25). It is made up of 41 questions, 9 of which evaluate attention deficit, another 9 evaluate hyperactivity and impulsivity, and 15 questions focus on behavioural disorder. Each item is scored as follows: 0: none; 1: slightly; 2: quite a lot; 3: too much. At least 6 of the 9 items questioning lack of attention and, again, at least 6 of the 9 items questioning hyperactivity and impulsivity must score 2 or 3 for a diagnosis of ADHD. For ODD, at least 4 of the 8 items must score 2 or 3. For a diagnosis of CD, the child must have at least 2 of the 15 items for the last 6 or 12 months. The validity and reliability of the test in Turkey was conducted by Ercan et al. (26).

For the statistical analysis of our study, we used SPSS for Windows 16.0 software package. In addition to descriptive analyses, we applied correlation analyses to continuous variables using the Spearman correlation coefficient. Results were evaluated within 95% confidence interval and at the  $p < 0.05$  statistical significance level.

## RESULTS

24 boys with haemophilia at ages ranging from 6.2 to 14.1 (mean age:  $9.85 \pm 2.46$ ) were included in the study. Socio-demographic characteristics of the patients are shown in Table 1. The average incidence of intraarticular haemorrhage of the patients in the last month was as follows:  $1.29 \pm 1.27$  ankle joint;  $1.50 \pm 1.67$  knee; and  $1.25 \pm 1.36$  elbow joint. The correlation between the base scores of Turgay Screening and Assessment Scale for Behavior Disorders in Children and Adolescents Based on DSM-IV Criteria and the incidence of ankle, knee, and elbow intraarticular haemorrhages is shown in Table 2.

The correlation analysis did not show any relationship between the severity of symptoms of attention deficit and the frequency of an intra-articular bleeding ( $p > 0.05$ ). We found a statistically significant positive relationship between the frequency of bleeding within the knee and ankle joints, and the symptom severity of hyperactivity/impulsivity, oppositional defiant disorder (ODD), and conduct disorder (CD) ( $p < 0.05$ ). We did not detect any significant relationship between the frequency of bleeding into the elbow joints and the sub-scale scores of any disruptive behavior disorders ( $p > 0.05$ ).

**Table 1.** Socio-demographic characteristics of the patients.

	n	%
<b>Sex</b>		
Girl	0	0.0
Boy	24	100.0
<b>Educational background</b>		
Primary School	23	95.8
High School	1	4.2
<b>Caretakers</b>		
Mother and father	22	91.7
Mother	2	8.3
<b>Educational background (Mother)</b>		
Illiterate	4	16.7
Primary School	20	83.3
<b>Educational background (Father)</b>		
Illiterate	1	4.2
Primary School	19	79.2
High School	4	16.7
<b>Family type</b>		
Nuclear family	18	75.0
Extended family	4	16.7
Seperated family	2	8.3
<b>Socio-economic background of the family</b>		
Low	21	87.5
Middle	3	12.5
High	0	0.0

**Table 2.** Correlation between the base scores of Turgay Screening and Assessment Scale for Behavior Disorders in Children and Adolescents Based on DSM-IV Criteria and the incidence of ankle, knee, and elbow intraarticular bleeding

	Ankle joint		Knee joint		Elbow joint	
	r	p	r	p	r	p
Attention deficit	-0,158	0,460	-0,213	0,318	-0,164	0,445
Hyperactivity	0,637	0,001	0,574	0,003	0,118	0,581
Impulsivity	0,700	<0,001	0,333	0,111	0,068	0,753
Oppositional defiant disorder	0,565	0,04	0,430	0,036	-0,114	0,597
Conduct disorder	0,756	<0,001	0,775	<0,001	0,233	0,274

## DISCUSSION

Today, the most common complication of hemophilia are permanent joint damages. Following bumps and falls that frequently occur when they are actively playing games, skin bruising and intra-articular bleeding in large joints (hemarthrosis) are common in children with haemophilia. The most commonly affected 3 main joints in haemophilia are the knee, elbow, and ankle joints, respectively, and it is very common to see permanent joint damages even at an early ages in children who do not receive appropriate treatment (27). School absences caused by intra-articular haemorrhage and deformities in children with haemophilia does not only disrupt the educational progress but also adversely affects psychological and social status of the child (1,4,28). The frequency of intra-articular bleeding in the knee, elbow, and ankle joints in these patients makes one assume that this is because these areas are open to external traumas. Therefore, prevention of accidents is very important for haemophilia patients.

Several studies have shown that risk of having accidents is high in children with ADHD (10-17). In addition, it has also been reported that children with ADHD have a

higher risk of severe and multiple injuries along with longer hospital stays (16, 29-30). Although there are studies in the literature indicating that ADHD is more common in children with haemophilia, we did not come across a study investigating the relationship between the severity of ADHD and injuries and bleedings in these children. Our results have revealed that hyperactivity, one of the core symptoms of ADHD, is associated with ankles and knees while impulsivity is associated with bleeding in the ankle joint. We did not observe any correlation between intra-articular bleeding in the elbow and any of the core symptoms of ADHD. These results may have an outcome of the fact that knees and ankles tend to be used more than the elbow joint while playing in energetic children and, therefore, these joints are exposed to traumas more.

It has been put forward that the main symptoms of ADHD like attention deficit, hyperactivity, and impulsivity are associated with unwanted accidents (18-20). Our study has shown that hyperactivity and impulsivity, two of the sub-symptoms of ADHD, are in a closer relationship with intra-articular bleeding. We did not detect any association between the lack of attention and any of the intra-articular haemorrhage types. Shilon

et al. have not found any statistically significant correlation between hyperactivity/impulsivity scores and unwanted accidents though they have found significant correlation between attention deficit and accidents (11). Our results and literature data point to the idea that attention deficit is associated with undesirable accidents although intra-articular bleeding in haemophilia patients is more related to bumps and falls due to extreme mobility of these children. In addition, it is known that the type of ADHD in which attention deficit disorder is more dominant is more common in girls while ADHD with dominant hyperactivity-impulsivity symptoms are more frequently seen in boys. The fact that all our cases were boys may have resulted in dominant hyperactivity and impulsivity symptoms, rather than attention deficit symptoms, and, thus, in a more prevalent relationship between intra-articular bleeding and these symptoms.

It has previously been reported that the presence of comorbid mental or behavioural problems in children with ADHD as well as the use of psychotropic drugs due to other mental illnesses accompanying ADHD are associated with undesirable accidents (12,15,16,22). Our study, too, has found the severity of oppositional defiant disorder (ODD) and conduct disorder (CD), both of which often co-exist with ADHD, to be associated with bleeding in the joints. These results make us think that haemophilic children with symptoms of oppositional defiant disorder and conduct disorder are more prone to be exposed to traumas and, therefore, may suffer from intra-articular bleeding more frequently. However, it is also common to come across parents restricting their children for protection against frequent injuries that may cause intra-articular bleeding; this, in turn, results in intense conflicts between parents and children. In such cases, parents describe symptoms of oppositional defiant disorder and conduct disorder more commonly.

Our results have shown that the frequency of intra-articular bleeding especially in the knee and ankle is associated with the severity of hyperactivity/impulsivity, ODD, and CD symptoms and that, in addition to prophylactic treatment, patients with bleeding in these joints should be evaluated for ADHD. We believe that an adequate treatment of ADHD will reduce the risk of exposure to traumas and, accordingly, the risk of bleeding in the joints.

The most important drawback of our study is the limited number of patients we have evaluated. Due to the limited number of patients, we were only able to perform a correlation analysis. Another limitation of our study is that ADHD diagnosis was not settled through clinical assessment. There is need for studies comparing the difference between haemophilic patients with ADHD and those without ADHD through a wider field of clinical evaluation. Investigating the effects of parenting styles on hyperactivity and oppositional defiant disorder will also guide such studies on treatment options.

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