Original Article

Adolescents with Attention Deficit and Hyperactivity Disorder/Learning Disability and Their Proneness to Accidents

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Abstract. ***Objective :*** The aim of the study was to determine if attention deficit and hyperactivity disorder (ADHD)/ learning disability (LD) adolescents are more prone to accidents and to investigate the parental mode of coping with that risk. ***Methods :*** One hundred and eight high school pupils diagnosed with ADHD/LD and studying in an institute of "special education" were examined and interviewed on the subject of accidents. Eighty-seven pupils, studying in a nearby academic high school, served as a control group. ***Results :*** The results showed that pupils in the study group had been involved in 0.57 ± 1.6 accidents (until the present study) in comparison to 0.23 ± 0.4 accidents in the control group (p=0.001). The accidents in the ADHD/LD study group had occurred at the mean age of 11.1 ± 3.4 yr. Eight decimal three percent of these pupils had been involved in recurrent accidents. Circumstances and locations where the accidents occurred were: falls while running or participating in sports activities (38.5%), home environment (23%), school environment (19.2%) and road accidents (11.5%). ***Conclusion :*** The study shows that there is a real risk for ADHD/LD adolescents to be involved in all kinds of accidents. Parents should be counting on the help of professional advisors to decrease that risk. Physicians should caution these adolescents and their parents about that risk and advise them on ways and means of accident prevention. **[Indian J Pediatr 2006; 73 (4) : 299-303]**
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There is a commonly held belief that children diagnosed as ADHD/LD are more prone to be involved in accidents and are at a higher risk of injury than their peers. The relevent studies are not homogeneous and also inconsistent. Discala *et al.*[1] confirmed the connection between ADHD and proneness to accidents and pointed out that ADHD adolescents have more severe accidents, the injured surface is larger, hospitalization after an accident is longer, they are treated more frequently in the intensive care unit and they tend to become disabled and need rehabilitation. Their injuries occurred as pedestrians or while riding bicycles; damage included fractures and head trauma. Many authors emphasized the connection between ADHD accidents and injuries. Beck *et al.*[2] agreed that ADHD adolescents are accident-prone. Even as children they had violated traffic regulations and had been involved in accidents before receiving their driving license. The more severe were the ADHD symptoms, the higher were risk for accidents and injuries. Gerring *et al*[3] and Sherrard *et al*[4] found that ADHD adolescents are predisposed to head injuries. Barkley[5] showed that ADHD adolescents are more involved in driving accidents. ADHD sufferers are affected throughout their lifetimes. Besides driving, they will have persistent problems in their academic pursuits, employment and sexual relationships and their health care costs will be higher. Woodward *et al*[6] and Gayton *et al*[7] pointed out that both sexes are involved in these accidents. Nada-Raja *et al*[8] explained the proneness to auto accidents among ADHD by their aggressive driving. Lam[9] confirmed that, among hospitalized accident victims, there are more ADHD cases, and their hospitalization stay was often longer. Brehaut *et al*[10] pointed out that behavioral problems, such as impulsivity or aggressiveness, seen in the ADHD adolescent group, increased the risk of accidents by a factor of 1.5, resulting in fractures, open wounds, poisonings, concussions or burns.

Some authors have argued that there is no connection between ADHD and accidents. Wozaniak *et al*[11] stated that ADHD was not a predictor for trauma occurrence, except in the presence of comorbidity and an uninhibited state. Davidson *et al*[12] pointed out that ADHD is not a risk factor for injury, provided that there is a skillful parenting and permanent supervision. Ford *et al*[13] mentioned that ADHD was not a risk for accidents, except if

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accompanied by oppositional defiant disorder (ODD).

A variety of factors have been proposed to explain the relationship between ADHD and accidents, such as lack of sustained attention and inability to respond appropriately to many situations.[1] Their impulsivity leads them to be involved in fights and become injured.[14] They have difficulties as well with their motor coordination; the absence of pharmaceutical treatment (stimulants) increases the risk of driving accidents.[1] Barkley *et al*[15] linked this tendency of accident proneness to their being less attentive, committing more blunders and having difficulties with intellectual processes. Irwin *et al*[16] call this tendency for accidents "injury-related behavior". Among young adults, it is manifested by driving at excessive speeds on a motorcycle, or in a car without a helmet, and in many cases, driving under the influence of alcohol or drugs. Brehaut *et al.*[10] point out the ADHD adolescent motor coordination difficulties. Bijur *et al.*[17] also believe their early (even at the age of five years) and later aggressive behavior is a predictor for future injuries. Barkley *et al*[5] reminded us that ADHD is a problem throughout lifetime and difficulties, including risky driving habits, will persist for many future years. Woodward *et al*[6] outlined the following difficulties that ADHD children/adolescents will have to cope with: educational, psychological and social failure, as well as academic underachievement, delinquency, drugs, unemployment, interpersonal relationship problems and psychiatric difficulties. These will make him/her more stressed, frustrated, aggressive and nervous with a penchant to lose control, and from here, it is a short way to become involved in accidents and injuries.

The aims of the present study :

(i) To determine if there were more accidents in the group of ADHD/LD adolescents.

(ii) To investigate parental beliefs about ADHD/LD proneness for accidents and to record their efforts for preventing these accidents.

MATERIALS AND METHODS

The target population in the study was a selection of high school pupils diagnosed having ADHD/LD. They were studying in a school devoted to special education. The diagnosis of ADHD was performed by neurologists and psychiatrists according to 18 criteria of the DMS IV, and that of LD by authorized teachers. One hundred and eight pupils in the 10th, 11th and 12th grades with their parents were invited for a meeting and examination by a school physician. The data of participants are summarized in table 1.

As ADHD is intrinsically bound to LD (and *vice versa*), the pupils were studied as a single group. The parents were asked to complete an informative questionnaire about the child's/adolescent's past accidents and injuries. Five parents (new immigrants), who were not able to take part because of language difficulties, were not included in the study.

Table 1. Data of Participants and Percentages of ADHD/LD Pupils

Parameters	ADHD/LD Group		Control Group	
	No.	Scores	No.	Scores
Age (years)	108	16.6 ± 0.7	87	16.6 ± 0.8
Sex ratio: boys/girls	48:60	44.4:55.6	38:49	43.7:56.3
Grade:				
10th	41	38%	24	27.6%
11th	39	36.1%	36	41.4%
12th	28	25.9%	27	31.9%
ADHD diagnosis	78	72.2%		
at age (yrs)		6.3 ± 1.9		
LD diagnosis	88	81.5%		
at age (yrs)		7.8 ± 1.9		
Taking Ritalin	17	15.2%		
Length of time (yrs)		0.5 ± 1.2		

Eighty-seven high school pupils studying in the 10th, 11th and 12th grades at an academic high school situated near the study group's school served as a control group. The SES data of families in both schools were identical. All pupils, examined by the school physician, and their parents reported about on the accidents that had occurred. Accidents were divided into subgroups according to types, circumstances, location and the body region involved. Parents were also asked if they believed the risk of proneness to accidents existed and what were their suggestions to prevent these accidents. The statistical analysis was done by the Epidemiologic Unit of the hospital. The means used included: prevalences, averages, correlations, $\div^2$ and t-test. A $p < 0.05$ was considered significant.

RESULTS

Data and kinds of accidents are summarized in table 2. The corporal region affected by the accidents are summarized in table 3. The locations of the accident occurrence are summarized in table 4.

The risk to be involved in accidents in the ADHD/LD group is more than twice that of the control group. Seventeen adolescents took Ritalin (methylphenidate), and of these, 3 (17.6%) were involved in accidents *vs* 6 (35.8%), who did not take Ritalin and were involved in accidents (NS). The use of this medication had an interesting indirect influence upon this issue. Nineteen out of 107 (17.7%) parents reported their fear that their child would be involved in accidents; this result was compared with the control group parents who revealed that they did not have any special fear concerning child accidents (p=0.000). Among parental suggestions on how to prevent involvement of their child/adolescent in accidents, worthy of mention are the following: having repeated discussions with their child/adolescent about his/her risk and the meaning of proneness to accidents;

Table 2. Prevalence and Kind of Accidents in Both Groups

Parameters	ADHD/LD Group		Control Group		
	No.	Scores	No.	Scores	p
No. of accidents	86	0.56 ± 1.6	80	0.23 ± 0.4	0.001
Age at time of accidents (yrs)		11.8 ± 3.4		10.3 ± 0.4	
Kinds of accidents					
Contusions, cuts and fractures	23	27.8%	17	19.9%	
Bites	2	2.5%	2	2.3%	
Poisoning/intoxication	1	1.2%	1	1.2%	
Reoccuring accidents	9	8.3%	0		

Table 3. Prevalence and Corporal Regions of Accidents*

Corporal regions	ADHD/LD Group		Control Group	
	No.	Scores (%)	No.	Scores (%)
Limbs	16	20	13	14.9
Head	7	8.3	3	3.4
Abdomen	1	1.25	2	2.3
Back	1	1.25	2	2.3
Thorax	0		1	1.1

*Statistical results: NS

Table 4. Prevalence and Places of Accidents*

Parameters	ADHD/LD Group		Control Group	
	No.	Scores (%)	No.	Scores (%)
Sport activities (including falls on school grounds)	12	46.2	14	66.6
Home	6	23	3	14.3
School	5	19.2	2	9.5
Road	3	11.5	2	9.5

*Statistical results: NS

increased supervision of the child's/adolescent's activities; prevention of his/her participation in dangerous play activity; and medication to increase his/her attention span and influence his/her behavior.

DISCUSSION

The principal finding of the study is that ADHD/LD adolescents were prone to most kinds of accidents. The mean age at which accidents occurred was 11.1 ± 3.4 years. The most frequent accidents were falls with orthopedic and surgical consequences due to cuts, contusions, bleeding and bone fracture. Limbs and head were most frequently injured. The injuries occurred as a result of falls while running or practicing sports activities. They could have happened in the streets, at school or at home.

Parents of ADHD/LD adolescents are apprehensive about the risk of involvement of their child in accidents. Parental suggestions for preventing involvement in accidents included: frequent discussions, explanations and counseling sessions by a professional with ADHD adolescents about their risk and proneness to accidents; informing them about data from actual accidental case reports; increase supervision of adolescent activities, especially during days when his/her behavior is problematic, prevent him/her from participating in dangerous activities; and give him/her pharmaceutical treatment (Ritalin) in order to improve his/her attention span and moderate his/her behavior.

As for prevalence of accidents, ADHD adolescents were involved in double the number of accidents in comparison with their peers in the control group. Similar results were found in a number of studies.[3,5,9,18] Etiological factors which can explain the occurrence of injuries among these children include: inattention, hyperactivity, motor difficulties, clumsiness, difficulties in spatial coordination, impulsiveness, conduct disorders and inappropriate decision making. On the other hand, the frequency of accidents decreases as a result of increasing parental concern and activism leading to better supervision. Other points are as follows: these children are more isolated and participate less in social and sports activities; while encouraging them to be more active and social will decrease the risk of accidents; 8.3% of ADHD adolescents had more than one incident of injury, and an increasing number of accidents in the past can be an indicator for a higher risk of involvement in accidents in the future.[19]

As for prevalence of accidents, contusions while falling or receiving blows are the most frequent injuries among these ADHD/LD children. The injury can also be the result of close contact, such as being kicked or pushed down while participating in sports activities. Scratches and/or bites by animals occur to these ADHD children as a result of their love for domestic animals and their desire to play closely with them. The limbs are the most frequently injured body parts in these accidents, while head trauma can cause very serious damage with resulting loss of consciousness and cognitive damage. Studies have shown that head trauma was a frequent accident occurring to ADHD children.[1,3] As mentioned previously, these children also suffer from and are influenced by the disorderliness in their home with a corresponding lack of organization. Impulsivity of the

child is a major reason for increased involvement in accidents. Ideally school should be a safe, peaceful place where parents can send their child, but this is not always the case. ADHD/LD children, due to their hyperactivity, act out in the breaks and during lessons when accidents occur. Increased supervision by parents or teachers could be the answer to these situations.

ADHD children are also involved as passengers in road accidents, and later, as youths, as drivers of vehicles. A summary of the data from Barkley *et al*[20] shows that they are involved in four times as many accidents, receive more traffic citations and have their driving licenses suspended more frequently. The authors explain that their proneness to accidents is tied to their risk-taking behavior, decrease in their attention span, difficulties in executive functions, and specifically, using the brakes when there is no need and not using them when it is required. These ADHD/LD drivers do not pay enough attention to details when driving, and due to a deficiency in motor coordination, can even have difficulty in holding the steering wheel and in judging distances. Finally of course, their impaired judgement skills cause problems and end in accidents. Woodward *et al*[6] emphasize disruptive behavior (ADHD comorbidity) as important causes of accidents. Beck *et al*[2] mention a high percentage of accidents in the period even before receiving their driving license.

ADHD children have poor impulse control, and the more active they are, the risk to be involved in accidents is greater. Most accidents of adolescents are explained by the presence of the following factors: decreased attention span,[21] absence of maturity and feelings of responsibility with emotional lability, behavioral disturbances with anger and aggression,[22,23] and conduct disorders.[8] Wazana[24] pointed out their aggressive behavior (comorbidity). Within their family life, stressful situations, exposure to injury and poor parental supervision can be found.

Taking Ritalin may decrease the risk of accidents and result in better driving performance.[25] In the present study, only 15.2% of ADHD adolescents reported taking this stimulant and only for a mean period of half a year. The principal reason was parental fears about Ritalin's reported side effects - headaches, abdominal pains, sleep disturbances and a lack of appetite.[26] Cox *et al*[25] recommend that an individual with ADHD should have the therapeutic benefit of a stimulant medication when operating a motor vehicle.

Parents of ADHD/LD adolescents should be familiar with their proneness to accidents. Parents should know the circumstances of accidents his/her child has undergone and recognize that an increased number of past injuries mean a higher risk of accidents in the future.[19]

Among the parental suggestions mentioned in this study to reduce the risk of accidents was for parents and professional care givers to continually counsel the child/adolescent about his/her accident risk involvement and to prevent the child from participation in dangerous activities.

CONCLUSIONS

The limitation of the present study was the size of the ADHD/LD group. It has been verified that ADHD adolescents are prone to all kinds of accidents because of their impulsiveness, hyperactivity, deficient motor coordination and impairment of spatial orientation. Parents and professional caregivers should remember that severe ADHD/LD symptoms significantly disturb the quality of life and make the child/adolescent prone to accidents. Prevention of injuries are more effective than treatment after accident occurrence. The ADHD/LD child/adolescent should be counseled more effectively on a one-to-one basis by professional caregivers and/or he/she should participate in group therapy, where he/she will receive advice on how to reduce the risk of accidents.

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