Association between Attention Deficit Hyperactivity Disorder and Suicide Attempts in Patients with Bipolar Disorder

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Abstract

Objective: The present study aimed to examine the association between ADHD and suicide attempts among adolescents with bipolar disorder.

Method: Participants were 168 adolescents who fulfilled DSM-IV-TR criteria for bipolar disorder. They were divided into 2 groups: The first group of patients with bipolar disorder with a history of suicide attempts (n = 84) and the second group without a history of suicide attempts (n = 84). ADHD and other variables were analyzed using a chi-squared test and logistic regression model.

Results: No significant difference was observed between the 2 groups in comorbidity of ADHD and other psychiatric disorders (P > 0.05). In the logistic regression model, and after controlling for other factors, gender (OR = 3.9, CI 95%: 1.5-9.6) and history of sexual abuse (OR = 3.4; CI 95%: 1.06-11.3) were the only 2 factors associated with a history of suicide attempts.

Conclusion: No significant association was found between ADHD and suicide attempts in adolescents with bipolar disorder.

Key words: Attention Deficit Hyperactivity Disorder; Bipolar Disorder; Suicide

The prevalence of bipolar disorder among children and adolescents has been reported to be 6.7% (1). Bipolar disorder is a severe disorder in childhood and it continues into adulthood with an increased risk of suicide (2). Of patients with bipolar disorder, 25%-50% have attempted suicide at least once and around 15% have committed suicide (3). Attention-deficit/hyperactivity disorder (ADHD), anxiety disorders, substance use disorders, and disruptive behavior disorders are the most common comorbid disorders in patients with bipolar disorder (4). ADHD is one of the most frequent neurodevelopmental disorders in childhood that is likely to exist before the incidence of bipolar disorder or simultaneously with bipolar disorder (4, 5). ADHD with an onset prior to bipolar disorder can be found in up to 90% of prepubertal children and in almost half of adolescents with bipolar disorder. Suicidal behaviors are a common problem among patients with ADHD, which may lead to negative social consequences (6).

The rate of suicide attempts and completed suicide increases linearly from childhood to adulthood (7). Among the general US population, in every 30 attempts, one results in completed suicide, while the ratio for patients with bipolar disorder is 1 in every 3-4 attempts (8). Previous studies have demonstrated that the overwhelming majority, nearly 96%, of adolescents with a history of suicide attempts have at least 1 psychiatric disorder (7). Despite a common comorbidity between ADHD and bipolar disorder (4, 5), few studies have been conducted on the effect of ADHD on suicide attempts among patients suffering from bipolar disorder. Among 15-to-24-year-old patients with bipolar disorder, ADHD has been reported to be an independent risk factor for suicide attempts (9).

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Article Information:
Received Date: 2018/12/17, Revised Date: 2019/07/06, Accepted Date: 2019/07/20
The present study was conducted to study the association between ADHD and suicide attempts among adolescents suffering from bipolar disorder.

Materials and Methods
This was a case control study for which ethical approval was obtained from the Ethics Committee of Shahid Beheshti University of Medical Sciences. The scope of the study was explained to the patients at the beginning and confidentiality of information was ensured. All participants provided oral and written informed consent before the study. Participants were consecutively selected from 2 university hospitals. All patients aged 12-18 years who were admitted to these 2 hospitals and received primary diagnosis of bipolar disorder were enrolled. Data collection began in April 2016. A total of 168 patients were studied and data collection was completed at the end of May 2017.

The patients were divided into 2 groups: the case group (patients with bipolar disorder with a history of suicide attempts) and the control group (patients with bipolar disorder without a history of suicide attempts). The history of suicide attempt was based on the interview with the patients and their parents considering 3 criteria: (1) A behavior that is potentially harmful to the individual, which he does so to die. (2) There is evidence of this behavior or the existing conditions. (3) The suicide attempt is likely to result in a serious injury. Given the limitation of statistical data and the 20% difference (based on the consensus of experts) between the 2 groups studied, the sample size was estimated to be 84 individuals per group with a power of 80% and error of 5%. All inpatient adolescents in the psychiatric wards of these 2 hospitals were visited by the researcher. Demographic information of the patients and their families was extracted by conducting interviews with the adolescents and their parents. Diagnosis of bipolar disorder and the comorbidities was confirmed by a child and adolescent psychiatrist based on the Persian version of the Kiddie Schedule for Affective Disorders and Schizophrenia-Present and Lifetime Version (K-SADS-PL-P), which is a semi-structured interview whose reliability and validity has been studied in Iran (11). History of abuse was also obtained based on the interview with the patient. The inclusion criteria allowed all 12- to 18-year-old patients suffering from bipolar disorder based on K-SADS-PL-P to enter the study. The exclusion criteria dismissed all patients with intellectual disability, autism spectrum disorder, conduct disorder, substance use disorder, and non-psychiatric chronic diseases, such as epilepsy.

Statistical Analysis
SPSS version 19 was used to describe and analyze data. To compare the variables across the 2 groups, a chi-squared test was used. Statistical significance was set at 0.05. Also, to assess the independent association between suicide attempts and covariates, a logistic regression analysis was used. The dependent variable was history of suicide attempts in patients with bipolar disorder.

Results
Results of the 168 patients, 103 were female and 65 male. The mean age of patients in the case and control groups was 15.5 and 15.3, respectively. There was a significant difference in gender. The sociodemographic characteristics of patients are shown in Table 1. The participants did not receive any treatment for ADHD during hospitalization.

In contrast to the frequency of physical abuse, the frequency of sexual abuse was significantly higher among participants with bipolar disorder and a history of suicide attempts. With respect to the frequency of psychiatric disorders, the highest frequency was related to ADHD in both groups. The 2 groups were not significantly different in the frequency of comorbid psychiatric disorders (Table 2).

The frequency of psychotic symptoms in the case group was lower than in the control group (14.3% vs 25%). Participants were studied to find the frequency of different types of bipolar disorder (type I, II, and NOS). Bipolar I disorder was the most frequent and bipolar II disorder was the least frequent; however, no significant difference was observed between the 2 groups (Table 2).

The variables closely related to history of suicide in the 2-variable analysis were analyzed in the logistic model, and the only significant suicide-related factors were still “female gender” (OR= 3.9, CI 95%: 1.5-9.6) and “history of sexual abuse” (OR= 3.4; CI 95%: 1.06-11.3) (independent relationship). Other factors did not show a significant relationship with suicide attempts (Table 3).
Table 1. Sociodemographic Characteristics of Patients with and without Bipolar Disorder

|                                | Bipolar disorder with suicide attempts (N=84) | Bipolar disorder without suicide attempts (N=84) | P value |
|--------------------------------|---------------------------------------------|--------------------------------------------------|---------|
|                                | Number (%)                                  | Number (%)                                      |         |
| Age                            |                                             |                                                  |         |
| 12-14                          | 17(20)                                      | 25(29.8)                                        | 0.154   |
| 15-18                          | 67(79.8)                                    | 59(70)                                          |         |
| Gender                         |                                             |                                                  |         |
| Boy                            | 22(33.8)                                    | 43(66.2)                                        | 0.001   |
| Girl                           | 62(60.2)                                    | 41(39.8)                                        |         |
| Number of children             |                                             |                                                  |         |
| Only child                     | 14(16.7)                                    | 17(20.2)                                        | 0.551   |
| Multiple children              | 70(83.3)                                    | 76(79.8)                                        |         |
| With both                      | 55(65.5)                                    | 62(73.8)                                        |         |
| Living with parents            |                                             |                                                  |         |
| With one parent                | 22(26.2)                                    | 20(23.8)                                        | 0.193   |
| Without parents                | 7(8.3)                                      | 2(2.4)                                          |         |
| History of abuse               |                                             |                                                  |         |
| Physical                       | 18(21.4)                                    | 18(21.4)                                        | 0.005   |
| Sexual                         | 19(22.6)                                    | 6(7.1)                                          |         |
| Low                            | 16(19)                                      | 25(8.29)                                        |         |
| Family's economic status       |                                             |                                                  |         |
| Average                        | 60(71.4)                                    | 45(65.3)                                        | 0.056   |
| High                           | 8(9.5)                                      | 14(7.16)                                        |         |
| History of psychiatric disorder (mother) | yes                                     | 62(73.8)                                        | 0.135   |
| History of psychiatric disorder (father) | yes                                    | 63(75)                                          | 0.131   |
| History of psychiatric disorder (siblings) | yes                                    | 50(59.5)                                        | 0.089   |
| History of psychiatric disorder (relatives) | yes                                   | 62(73.8)                                        | 0.177   |
| History of suicide attempts (mother) | yes                                   | 10(11.9)                                        | 0.32    |
| History of suicide attempts (father) | yes                                   | 5(6)                                            | 0.117   |
| History of suicide attempts (parents) | yes                                   | 13(56.5)                                        | 0.183   |
| History of suicide attempts (siblings) | yes                                   | 10(11.9)                                        | 0.047   |
| History of suicide attempts (relatives) | yes                                   | 21(25)                                          | 0.033   |
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Table 2. Comorbid Psychiatric Disorder in Bipolar Disorder with and without Suicide Attempts

| and without Suicide Attempts | Bipolar disorder with suicide attempts (N=84) | Bipolar disorder without suicide attempts (N=84) | P value |
|-----------------------------|---------------------------------------------|-------------------------------------------------|---------|
|                             | Number (%)                                  | Number (%)                                      |         |
| Attention deficit hyperactivity disorder | 59(70)                                      | 47(56)                                          | 0.055   |
| Obsessive compulsive disorder  | 23(27.4)                                     | 32(38.1)                                        | 0.139   |
| Oppositional defiant disorder  | 24(28.6)                                     | 26(31)                                          | 0.736   |
| Anxiety disorder              | 34(40.5)                                     | 29(34.5)                                        | 0.426   |
| Bipolar disorder with psychotic features | 12(14.3)                                     | 21(25)                                          | 0.081   |
| Bipolar disorder Type 1       | 41(34.4)                                     | 43(36.2)                                        |         |
| Type 2                       | 8(6.7)                                       | 6(5)                                            | 0.45    |
| NOS                          | 35(29.4)                                     | 30(29.4)                                        |         |

Table 3. Logistic Model for Factors Associated With a History of Suicide Attempts in Bipolar Disorder

|                         | OR(95%CI) | P value |
|-------------------------|-----------|---------|
| Gender                  | 3.908 (1.580-9.665) | 0.003   |
| Low family economic level | 0.798 (0.188-3.379) | 0.415   |
| Attention deficit hyperactivity disorder | 1.792 (0.742-4.331) | 0.195   |
| Suicide attempts in second-degree relatives | 2.182 (0.783-6.080) | 0.136   |
| Suicide attempts in siblings | 6.663 (0.715-62.06) | 0.096   |
| History of physical abuse | 1.123 (0.357-3.53)  | 0.843   |
| History of sexual abuse  | 3.469 (1.065-11.306) | 0.039   |
| Constant                | 0.032     | 0       |

Discussion
This was the first study in Iran to estimate the association between ADHD and suicide attempts in adolescents with bipolar disorder. The results of this study showed that, although the frequency of ADHD was higher in patients with bipolar disorder and a history of suicide attempts compared to patients with bipolar disorder and without a history of suicide attempts (a 14% difference), the difference was not significant. Furthermore, female gender and history of sexual abuse had an independent association with suicide attempts in patients with bipolar disorders. However, there are always some limitations in obtaining history of abuse, as some adolescents may not report it. Other covariates did not show any significant association with suicide attempts in patients with bipolar disorders.

Results of this study are comparable with those of Goldstein et al and Algorta. Goldstein et al indicated that the frequency of ADHD was lower in the group of patients suffering from bipolar disorder without a history of suicide than that of the group of patients suffering from bipolar disorder with a history of suicide. Also, Algorta et al demonstrated that the frequency of ADHD, oppositional defiant disorder, and anxiety disorder was not significantly different in the 2 groups of patients suffering from bipolar disorder with and without a history of suicide. Findings of this study are consistent with those of previous studies confirming that the frequency of ADHD was not significantly different in the 2 groups of patients suffering from bipolar disorder with and without a history of suicide attempts. Contrary to the present study, Lan et al indicated that ADHD is an independent risk factor among adolescents and adults with bipolar disorder. This may be due to the fact that Lan et al examined patients aged 15-24 years, with a mean age of 19, while the present study was conducted exclusively on youths aged 12-18 years, with a mean age of 15.5.

According to previous studies, impulsivity, as a symptom in ADHD, is associated with increased suicide...
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attempts (14, 15). However, in the present study, no significant difference was observed between the 2 groups with respect to the frequency of ADHD. According to Eaton et al, female gender is a risk factor for suicide attempt (16). In the present study, suicide attempts in patients with bipolar disorder were significantly higher in girls than in boys, which is in line with previous studies (17-19). Nevertheless, one should be cautious in generalizing the results, as this study was conducted on patients with bipolar disorder who needed to be admitted and the sample might have had some peculiarities, not fully representing all patients with bipolar disorder.

Limitations
There are some limitations in this study which should be noted. First, the number of girls in the case group was significantly higher than in the control group. Thus, as ADHD is more frequent in boys, no difference was found between boys and girls, as there were more girls in the case group. Therefore, confounders were adjusted in the logistic regression analysis (Table 3). Second, most of the patients had been under pharmacological treatment before their hospitalization. Thus, this factor might have affected their suicide attempts either directly or indirectly. However, this has not been taken into account in the present study. Third, in spite of the factors evaluated in this study, other factors influencing suicide attempts, such as severity of psychiatric disorder and environmental stressors, were not evaluated. It was attempted though to minimize these limitations through adopting the principle of confidentiality and having a control group. Forth, the exact history of drug treatment for ADHD was not known at the time of the patients' past suicide attempts, which can be another limitation of this study. Finally, the study was conducted on inpatients with bipolar disorder; therefore, caution should be taken in generalizing the results to all individuals with bipolar disorder. Conducting further research in other settings using more precise methodology is highly recommended. Because of the high frequency of suicide attempts among patients with bipolar disorder, they should be carefully assessed for suicidality.

Conclusion
According to the finding of this study no significant association was found between ADHD and suicide attempts in adolescents with bipolar disorder, but more studies are needed to evaluate this relationship by including larger sample with inpatient and outpatient participants.

Acknowledgment
This study was financially supported by Behavioral Sciences Research Center affiliated in Shahid Beheshti University of Medical Sciences. We acknowledge all adolescent and their families who participated in this study.

Conflict of Interest
None.

References
1. Van Meter AR, Moreira ALR, Youngstrom EA. Meta-analysis of epidemiologic studies of pediatric bipolar disorder. J Clin Psychiatry. 2011;72(9):1250-6.
2. Birmaher B, Axelson D, Strober M, Gill MK, Valeri S, Chiappetta L, et al. Clinical course of children and adolescents with bipolar spectrum disorders. Arch Gen Psychiatry. 2006;63(2):175-83.
3. Latalova K, Kamaradova D, Prasko J. Suicide in bipolar disorder: a review. Psychiatr Danub. 2014;26(2):108-14.
4. Joshi G, Wilens T. Comorbidity in pediatric bipolar disorder. Child and adolescent psychiatric clinics of North America. 2009;18(2):291-319.
5. Tillman R, Geller B, Bolhofner K, Craney JL, Williams M, Zimmerman B. Ages of onset and rates of syndromal and subsyndromal comorbid DSM-IV diagnoses in a prepubertal and early adolescent bipolar disorder phenotype. Journal of the American Academy of Child & Adolescent Psychiatry. 2003;42(12):1486-93.
6. Impy M, Heun R. Completed suicide, ideation and attempt in attention deficit hyperactivity disorder. Acta Psychiatr Scand. 2012;125(2):93-102.
7. Nock MK, Green JG, Hwang I, McLaughlin KA, Sampson NA, Zaslavsky AM, et al. Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents: results from the National Comorbidity Survey Replication Adolescent Supplement. JAMA Psychiatry. 2013;70(3):300-10.
8. Simon GE, Hunkeler E, Fireman B, Lee JY, Savarino J. Risk of suicide attempt and suicide death in patients treated for bipolar disorder. Bipolar Disord. 2007;9(5):526-30.
9. Lan W-H, Bai Y-M, Hsu J-W, Huang K-L, Su T-P, Li C-T, et al. Comorbidity of ADHD and suicide attempts among adolescents and young adults with bipolar disorder: a nationwide longitudinal study. J Affect Disord. 2015 May 1;176:171-5.
10. Posner K, Oquendo MA, Gould M, Stanley B, Davies M. Columbia Classification Algorithm of Suicide Assessment (C-CASA): classification of suicidal events in the FDA’s pediatric suicidal risk analysis of antidepressants. Am J Psychiatry. 2007;164(7):1035-43.
11. Shahrivar Z, Kousha M, Moallemi S, Tehrani-Doost M, Alaghband-Rad J. The Reliability and Validity of Kiddie-Schedule for Affective Disorders and Schizophrenia-Present and Life-time Version-Persian Version. Child and Adolescent Mental Health. 2010;15(2):97-102.
12. Goldstein TR, Ha W, Axelson DA, Goldstein BI, Liao F, Gill MK, et al. Predictors of prospectively
examined suicide attempts among youth with bipolar disorder. Arch Gen Psychiatry. 2012;69(1):1113-22.
13. Algorta GP, Youngstrom EA, Frazier TW, Freeman AJ, Youngstrom JK, Findling RL. Suicidality in pediatric bipolar disorder: predictor or outcome of family processes and mixed mood presentation? Bipolar Disord. 2011;13(1):76-86.
14. Klonsky ED, May A. Rethinking impulsivity in suicide. Suicide Life Threat Behav. 2010;40(6):612-9.
15. Dvorak RD, Lamis DA, Malone PS. Alcohol use, depressive symptoms, and impulsivity as risk factors for suicide proneness among college students. J Affect Disord. 2013 Jul;149(1-3):326-34.
16. Eaton DK, Kann L, Kinchen S, Shanklin S, Flint KH, Hawkins J, et al. Youth risk behavior surveillance—United States, 2011. MMWR Surveill Summ. 2012;61(4):1-162.
17. Hauser M, Galling B, Correll CU. Suicidal ideation and suicide attempts in children and adolescents with bipolar disorder: a systematic review of prevalence and incidence rates, correlates, and targeted interventions. Bipolar Disord. 2013;15(5):507-23
18. Leverich GS, McElroy SL, Suppes T, Keck Jr PE, Denicoff KD, Nolen WA, et al. Early physical and sexual abuse associated with an adverse course of bipolar illness. Biol Psychiatry. 2002 15;51(4):288-97.
19. Goldstein TR, Birmaher B, Axelton D, Ryan ND, Strober MA, Gill MK, et al. History of suicide attempts in pediatric bipolar disorder: factors associated with increased risk. Bipolar Disord. 2005;7(6):525-35.