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Abstract: **Background:** Few studies on gender-based diagnostic characteristics of adolescent suicide attempters in emergency departments (EDs) have included individuals with autism spectrum disorder (ASD).

**Objective:** This study aimed to examine the clinical features of adolescent suicide attempts in EDs, focusing on gender differences and considering individuals with ASD.

**Methods:** Ninety-four adolescent patients, aged less than 20 years, who had attempted suicide and had been hospitalized in an emergency department, participated in this study. Psychiatric diagnoses according to DSM-IV criteria and clinical features were compared between male and female patients.

**Results:** The number (%) of males was 15 (16.0), and that of females was 79 (84.0). The mean age (SD) of males was 17.1 (1.5), and that of females was 16.9 (1.6). The attempt methods were more serious, length of stay in the emergency room longer, and rate of outpatient treatment lower in males. In addition, suicide attempters with ASD were significantly more frequent in males. Adjusting for age and gender, adjustment disorder was significantly associated with the presence of suicide attempters with ASD using a multivariable logistic regression.

**Conclusion:** Males were less likely to visit psychiatric service previous to attempting suicides, and may be likely to complete suicides. In addition, suicide attempters with ASD are characteristic in male, and likely to have comorbid adjustment disorder. ED visits offer a window of opportunity to provide suicide prevention interventions for adolescents, and therefore, psychiatrists in EDs have a crucial role as gatekeepers of preventing suicide re-attempts, especially in adolescent males including individuals with ASD having adjustment disorder.

**Keywords:** Suicide, adolescence, gender, autism spectrum disorder, emergency department, suicidal predisposing factor.

1. **INTRODUCTION**

Suicide has been identified as a serious public health problem worldwide and also a major preventable public health problem in Japan (population of 126 million in October 2018) (Statistics Bureau, Ministry of Internal Affairs and Communications, 2019). Although more than 30,000 individuals per year have committed suicide from 1998 to 2013, the annual number of suicides has gradually decreased since 2009 and was about 20,000 in 2018 (National Police...
Agency and Ministry of Health, Labour and Welfare, 2019). The World Health Organization database shows that the suicide mortality rate (per 100,000 population) in Japan was 18.5 in 2016, and the rate has remained at a high level internationally since 2000, though the rate had been gradually decreasing (World Health Organization, 2018). As for suicide of adolescents in Japan, over 500 adolescents per year have committed suicide since 1998, and the number of suicides in adolescence has not been declining (National Police Agency and Ministry of Health, Labour and Welfare, 2019). In 2016, the suicide mortality rate among young people in the age groups of 15-19 years and 20-24 years was 7.2 and 17.0, respectively, and suicide was the leading cause of death in both groups (Health, Labour and Welfare Statistics Association, 2018).

A prior suicide attempt is a major risk factor in youth suicide (Bridge, Goldstein, & Brent, 2006; Gould, Greenberg, Velting, & Shaffer, 2003; Shain, 2007), and the psychiatric problem profiles of young suicide attempters are similar to the profiles of those who complete suicide (Gould et al., 2003). Additionally, the emergency department (ED) is an essential source of mental health care for children and adolescents (Ambrose & Prager, 2018). Taken together, to elucidate the features of completed suicide among adolescents, it is meaningful to examine suicide attempts, especially those requiring hospitalization in EDs owing to serious physical damage. Thus, this study first examined gender differences in adolescent suicide attempts, focusing on those requiring hospitalization in EDs.

Second, this study examined a contributing factor of suicide attempts with autism spectrum disorder (ASD). Our previous research on adolescent suicide attempts clarified the frequency and clinical features of ASD in adolescent suicide attempts (Mikami et al., 2009). However, comorbid psychiatric disorders, precipitating the suicide attempts of individuals with ASD, were not exactly considered. There were few studies on a risk factor of adolescent suicide attempters with ASD. We hypothesized that there was a psychiatric disorder which precipitated a suicide attempt of individuals with ASD. Thus, this study aimed to retrospectively examine the gender differences of adolescent suicide attempters in EDs, focusing on comorbid psychiatric disorders that precipitate the suicide attempts of individuals with ASD.

2. METHODS

2.1. Subject

This cross-sectional study used the same data of our previous study (Mikami et al., 2009). A total of 1,377 individuals who had attempted suicide were treated at the Advanced Critical Care Center (ED) of Tokai University Hospital from October 2004 to July 2007. Of the 1,377 individuals, 960 (665 females) had been hospitalized. Of these 960, we chose 94 individuals under the age of 20 years who had intentionally inflicted self-injury with suicidal ideation. Individuals who had been hospitalized for inpatient treatment were chosen because we wanted to exclude minor cases of self-injury and because interviews with individuals who had made serious but non-fatal suicide attempts could provide relevant information (Beautrais, Joyce, & Mulder, 1996).

2.2. Assessment

This medical center offers a full range of primary, secondary, and tertiary care services. Almost all individuals who attempt suicide in the area served by this medical facility and who require inpatient treatment are transferred to the ED of our hospital. All individuals who had been treated for suicide attempts are referred to the psychiatric department, where three or four psychiatrists are always on duty. One or two trained psychiatrists routinely examine the patients and obtain the patients’ personal history through interviews with the patients’ parents. The diagnoses on the basis of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) criteria (American Psychiatric Association, 2000) (e.g., psychotic disorders, mood disorders, anxiety disorders, adjustment disorder, ASD, substance dependence/abuse, eating disorders, borderline personality disorder (BPD), and other disorders/problems) are made while patients are treated in the hospital. A final psychiatric diagnosis is established after additional conferences with trained psychiatrists, including child and adolescent psychiatrists and general psychiatrists. The subjects in the present study underwent the abovementioned assessment procedure as well.
2.3. Statistical Analysis

Continuous variables were presented as means and standard deviation (SD). Categorical variables were compared between males and females using chi-squared test or Fisher’s exact test. Fisher’s exact test was used when 25.0% or more of cells had an expected count of less than 5. Continuous variables were compared between males and females using the Mann-Whitney U test. The influence of a comorbid psychiatric disorder on suicide attempters of individuals with ASD was evaluated using logistic regression analysis adjusting for age and gender. IBM SPSS Statistics version 20 for Windows was used for data analysis.

2.4. Ethics

This cross-sectional study was retrospectively conducted. The Institutional Review Board for Clinical Research of the Tokai University School of Medicine approved this study.

3. RESULTS

3.1. Background

Table 1 provides the background data of the 94 subjects. The number of females was about five times greater than that of males. Drug overdose was a major method of suicide attempt and was significantly more frequent in females than in males. Jumping was the second leading method for both males and females. Outpatient history was significantly more frequent in females than in males.

3.2. Characteristics of Diagnosis

The gender differences of diagnosis are shown in Table 2. These diagnosis include overlapping ones. Psychiatric disorders were diagnosed in more than 90% of males or females. ASD was more frequent in males, as reported in our previous study. BPD was frequent in females, but not at a significant level.

A contributing factor of suicide attempts with ASD was examined. Of the 94 subjects, 2 with a deferred diagnosis were excluded from the analysis, and the remaining 92 subjects were analyzed. In the individuals with ASD, adjustment disorder was the leading comorbid diagnosis. Ten of the 12 ASD individuals had adjustment disorder, as did 24 of the 80 non-ASD individuals ($p = 0.001$). Adjusting for age and gender, adjustment disorder was significantly associated with the presence of ASD diagnosis of the individuals who had attempted suicide, according to a logistic regression (Table 3).

Table 1. Characteristics of male and female groups.

| Characteristics            | Male       | Female     | $P$   |
|----------------------------|------------|------------|-------|
| n (%)                      | 15 (16.0)  | 79 (84.0)  |       |
| Age, mean (SD)             | 17.1 (1.5) | 16.9 (1.6) | 0.571 |
| Methods                    |            |            |       |
| Overdoses                  | 7 (46.7)   | 63 (79.7)  | 0.019 |
| Others*                    | 8 (53.3)   | 16 (20.3)  |       |
| Outpatient history†         | 6 (42.9)   | 60 (76.9)  | 0.020 |
| LOS in ED, mean (SD)‡       | 5.3 (3.3)  | 3.8 (4.7)  | 0.022 |
| LOS in hospital, mean (SD)‡ | 9.4 (11.0) | 6.3 (10.5) | 0.067 |

Notes. LOS, length of stay; ED, emergency department.
* Male group: jumping, 3; carbon monoxide poisoning, 2; poisoning, 2; hanging, 1.
† Female group: jumping, 11; carbon monoxide poisoning, 2; poisoning, 2; stabbing, 1.
‡ There were two missing data.
One patient who died during hospitalization was excluded from analysis.
3.3. Length of Stay (LOS) in Hospital and ED

The gender differences in the LOS in our hospital or ED are shown in Table 1. The average LOS in our ED was significantly greater in males than in females.

4. DISCUSSION

The results showed that the suicide attempt methods were significantly more serious, LOS in the ED was significantly longer in males, and the rate of outpatient treatment was significantly lower in males. These findings suggested that males may be likely to complete suicide by one attempt. Additionally, males with ASD were significantly more frequent suicide attempters, and adjustment disorder may be a contributing factor in suicide attempters with adolescent ASD. To our knowledge, this research is the first to show the gender-related diagnostic characteristics of adolescent suicide attempters in EDs, considering comorbid psychiatric disorders that precipitate the suicide attempts of individuals with ASD.
ED visits offer a window of opportunity to deliver life-saving suicide prevention interventions (Asarnow, Babeva, & Horstmann, 2017). For children and adolescents, the ED is an essential source of mental health care and, additionally, the EDs serve as a crucial opportunity for suicide screening and subsequent targeted interventions and resource management (Ambrose & Prager, 2018). In this study, the rate of outpatient treatment was significantly lower in males than in females. Also, in our previous study, the suicide attempters with ASD showed the lower rate of psychiatric histories than those without ASD (Kato et al., 2013). Thus, for males in adolescence and individuals with ASD attempting suicide, the ED was the first window for approaching psychiatric care. ED psychiatrists have a crucial role as gatekeepers of preventing suicide re-attempts, particularly in adolescent males and individuals with ASD.

Since our case report (Mikami, Ohya, Akasaka, & Matsumoto, 2006) and clinical study (Mikami et al., 2009) have been published, there has been a gradual increase in case reports (Kocourkova, Dudovalova, & Koutek, 2013; Mikami, Onishi, & Matsumoto, 2014; Spencer et al., 2011) and clinical studies (Chen et al., 2017; Kato et al., 2013; Mayes, Gorman, Hillwig-Garcia, & Syed, 2013; Mukaddes & Fateh, 2010; Paquette-Smith, Weiss, & Lunsky, 2014; Raja, Azzoni, & Frustaci, 2011; Storch et al., 2013; Takara & Kondo, 2014) on suicide behaviors among adolescents or young adults with ASD. However, only a few studies have addressed the subjects of suicide attempters with ASD directly (Kato et al., 2013; Mikami et al., 2009; Paquette-Smith et al., 2014; Takara & Kondo, 2014). Recent reviews on suicidality in ASD suggest that the individuals with ASD are at heightened risk of both suicidal ideation and attempts (Richa, Fahed, Khoury, & Mishara, 2014; Segers & Rawana, 2014; Zahid & Upthegrove, 2017). Hannon and Taylor (Hannon & Taylor, 2013), the first and most representative review on this topic, stress that clinicians treating individuals with suicidal behaviors need to be aware of the features of ASD and refer for assessment, mainly focusing on our previous study (Mikami et al., 2009).

What factors are more likely to facilitate suicide attempts for individuals with ASD? First, low self-esteem due to repeated failure to develop interpersonal relationships, and/or poor communication with the patient’s parents since childhood due to each other’s unawareness of the characteristics of ASD appear to be the most common psychosocial predisposing factors of suicide attempts in adolescents with ASD (Hannon & Taylor, 2013; Mikami et al., 2009; Mikami et al., 2006; Mikami et al., 2014; Richa et al., 2014). ASD individuals, as was the case with Asperger’s syndrome, who are more skillful in personal relationships and communication, accordingly, have more contacts with others. This may cause more problems with personal relationships and result in suicide (Mikami et al., 2009). Second, a lack of active imagination, frequently observed among individuals with ASD (Wing, 1997), may facilitate suicide attempts. Generally, for typically developed individuals, imagining the process to more serious bodily harm or death, and their change of living arrangement after suicide may cause conflict and help inhibit a suicide attempt, whereas individuals with ASD, in particular, having adjustment disorder, may have difficulty in such imaginings. Third, impulsive behavior, which is a characteristic of individuals with ASD, a contributing factor for suicidal behavior of individuals with adolescent ASD. Impulsive behavior and poor interpersonal problem-solving skills have been linked to an increased risk of suicidal behavior in youths (McKeown et al., 1998; Rotheram-Borus, Trautman, Dopkins, & Shrout, 1990). In addition, higher levels of impulsivity and aggression are associated with suicide (Dumais et al., 2005). Fourth, comorbid adjustment disorder with depressive and/or anxious state, as was discussed in detail below, may accelerate the above-mentioned low self-esteem, lack of imagination, and impulsivity. Consequently, comorbid adjustment disorder may precipitate suicide attempts of individuals with ASD.

Suicide attempters with ASD were significantly more likely to have adjustment disorder than those without ASD; this was a new finding of the current study. There is firm evidence that adolescents with depression attempt suicide at a higher frequency than the general population (Gould et al., 2003). Also, it has been suggested that in adolescent ASD suicide attempters, comorbidity with depression is greater than for typically developed individuals (Richa et al., 2014; Segers & Rawana, 2014; Zahid & Upthegrove, 2017). The current research does not reject these studies. The population in this research consists of suicide attempters and we do not compare them to the general population. When the
ASD group and the non-ASD group within the population of suicide attempters were compared in the frequency of comorbidity with adjustment disorder, the ASD group had a higher frequency of comorbidity with adjustment disorder. In other words, not only depression but also depressive and/or anxious state due to adjustment disorder may contribute to suicidal behavior in individuals with ASD. Several case reports (Mikami, Ohya, Akasaka, & Matsumoto, 2006; Mikami et al., 2014; Spencer et al., 2011) and clinical studies (Kato et al., 2013) on suicide attempters with ASD have shown similar results: ASD attempters are frequently male and have a comorbid adjustment disorder. Adjustment disorder is not usually thought to be a risk factor of adolescent suicide, but comorbid adjustment disorder with ASD may accelerate suicide attempts in individuals with ASD. Clinicians treating individuals with ASD thus need to pay attention to comorbid depression and the depressive and/or anxious state due to adjustment disorder because of precipitating suicide attempts.

The individualism-collectivism cultural syndrome appears to be the most significant cultural difference among cultures (Triandis, 2001). In collectivist cultures, people are interdependent in groups (family, school, company, etc.), and prioritize the goals of their in-group (Triandis, 2001). In individualist societies, people are autonomous and independent from their in-group, and prioritize their personal goals over the goals of their in-groups (Triandis, 2001). According to this dichotomization, the Japanese may be divided into collectivist cultural people. However, individualism, which is a temperament character for American and European people, has spread actively in Japan, especially in the most urbanized cities, due to rapid modernization and Westernization after World War II (Yamawaki, 2012). Accordingly, the Japanese may no longer be thought as wholly collectivist, but they tend to construe the self as fundamentally connected to others (Cross, Hardin, & Garcek-Swing, 2011). This means that people in Japan may still think that others are a source of definition for the self and demonstrating one’s ability to fit into the group is an important basis of self-esteem. We cannot state with certainty that this characteristic of Japanese people is related to Japanese adolescent suicide. However, in our clinical experience, we believe that the major characteristic of adolescent suicide attempters is that they excessively consider the feelings of the people in close proximity, and are not able to talk easily to the people around them, particularly their family, about an extremely serious problem such as their suicidal ideation. Furthermore, when we consider these adolescents’ early development history, their characteristics were that, from early childhood, they made few demands on their families, plus they showed a strong concern for other people. That is, they were so-called children who required less care. This hesitation to ask for help which has been continuing since early childhood may be a psychosocial predisposing factor of suicide attempts in adolescence.

Taking the above into account, to prevent adolescent suicide attempts, regardless of whether there is a psychiatric diagnosis or drug therapy, it is critical to reinforce the protective function of the family and rebuild the parent-child relationships so that the adolescent can easily seek help from their family. To do this, a psychiatric treatment method where the adolescent, the family, and the therapist carefully coordinate with the patient’s early developmental history is extremely important.

The present study had the following limitations that must be acknowledged. First, the number of cases was rather small because only one institution was involved. Therefore, the accumulation of more data from multiple institutions is necessary. Second, the comparisons were within a clinical sample. To reveal the characteristics of this study more clearly, comparisons with a general population are needed. Third, the current study used the same data as our previous study that clarified the clinical feature of adolescent suicide attempters with ASD (Mikami et al., 2009).

CONCLUSION

In conclusion, males were less likely to visit psychiatric service previous to attempting suicides, and may be likely to complete suicides. In addition, suicide attempters with ASD are characteristic in male. Furthermore, the suicide attempters with ASD are likely to have a comorbid adjustment disorder. ED visits offer a window of opportunity to provide suicide prevention interventions for adolescents, and therefore, psychiatrists in EDs have a crucial role as gatekeepers of preventing...
suicide re-attempts, especially in adolescent males including individuals with ASD having adjustment disorder.

LIST OF ABBREVIATIONS
ASD = Autism Spectrum Disorder
ED = Emergency Department
LOS = Length of Stay

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