

Gender-based Multilevel Analysis of Influential Factors for Suicide Attempts among At-risk Non-referred Adolescents in Korea

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Objective: Effective suicide prevention for at-risk adolescents requires increased access to medical treatment. Investigating the unique characteristics of suicide in this vulnerable at-risk non-referred sample can contribute to establishing effective suicide prevention policies. This study aimed to (a) examine at-risk non-referred adolescents' suicide attempt rate, (b) investigate influential multilevel factors in predicting these adolescents' suicide attempts, and (c) compare the results of (a) and (b) by gender.

Methods: A total of 401 samples (216 boys and 185 girls) were recruited through a school-based mental health project for at-risk adolescents. Multivariate hierarchical logistic regression analyses were performed at the individual-, contextual-, and protective levels to evaluate three multilevel models as well as to investigate predictabilities for the overall group and by gender.

Results: The suicide attempt rate of the overall sample was 29.4% (boys: 18.1%, girls: 42.7%), which was significantly higher than that of community samples. For boys, individual-level predictors (depression and conduct problems) had the most significant contribution in predicting suicide attempts. In contrast, for girls, protective-level predictors (family satisfaction) contributed the most to the prediction of suicide attempts, followed by contextual-level predictors (academic grades).

Conclusion: This study is an important step in understanding the unique characteristics of at-risk non-referred adolescents who have not yet been considered in mental health policies. Improving medical accessibility will be the first step in establishing effective suicide prevention policies for these vulnerable samples.

KEY WORDS: Suicide, attempted; Mental health; School; Vulnerable; Students.

INTRODUCTION

Suicide attempts are intentional self-harming behaviors, that are a significant factor affecting committed suicides [1-4]. Overall, 30% of adolescents who attempted suicide had again attempted it within a year, and 5% had died by suicide after nine years [5-7]. According to national data in Korea, the suicide attempt rate of adolescents (aged 13 – 18 years) was 2.6% in 2017 [8]. This rate differs according to gender and samples. Girls' suicide at-

tempts (3.2%) were reported to be higher than those of boys (2.0%) [8]. In addition, adolescent who had diagnosed with a depressive disorder (i.e., clinically depressed samples) reported a significantly higher rate of suicide attempts (47.2%) [9] compared to community samples.

A systematic review of the literature indicated that adolescent suicides are caused by multidimensional factors, including individual and contextual factors [1,4,10-18]. Individual factors refer to personal characteristics that affect adolescents' suicidal behaviors, including gender [1,10,19,20], mental disorders such as depression [9,14,16], and attention-deficit/hyperactivity disorder (ADHD) [21-23], and psychological impairment (e.g., conduct and emotional problems) [18,24,25]. A significant gender difference was also found. Whereas depression, emotional symptoms, and peer problems are more common in girls [9,10,26], ADHD, hyperactivity,

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and conduct problems are more common in boys [22,23,27].

Contextual factors include school (e.g., academic grades) and family factors (e.g., economic status) [18,28,29] as the representative environmental factors of adolescents' suicidal behaviors. School levels do not necessarily coincide with age, and each school level has a different educational administration system and curriculum, causing significant differences in the school environment. Thus, it is assumed that school level is an important contextual factor for adolescents. The highest suicide attempt rate for boys was in high school (10th grade), and that of girls was in middle school (8th grade) [30]. In addition, suicide attempt rates for both boys and girls were highest when academic grades were low [30,31]. Furthermore, family-related variables proved to have a significant impact on suicide attempts [29,32]. The suicide attempt rate was higher when the family structure was unstable [33], family economic status was low [34], and there was abuse in the family [35]. However, no gender-specific analysis has been conducted regarding family-related variables.

In addition to individual and contextual factors, overall quality of life (i.e., life satisfaction) has proven to be an influential protective factor to reduce adolescent suicide attempts [29,35,36]. Adolescents who attempted suicide reported a significantly lower level of life satisfaction compared with those who had no such attempt experience [26,37]. A gender difference was also found. Boys had higher life satisfaction than girls, and girls were more affected by their satisfaction in life compared to boys [38,39].

Due to limitations in collecting data from research subjects, to date, studies on suicide have targeted either community samples or clinical samples (e.g., psychiatric in-patients or emergency room patients) [2,4,9,15,29,40], very few studies have been conducted with at-risk non-referred adolescents who have not visited or been unable to visit the hospital. In Korea, 2.6% (boys: 2.0%, girls: 3.2%) of adolescents have attempted suicide in the last 12 months, and the rate of psychiatric treatment after suicide attempts was 17.9% (boys: 25.1%, girls: 13.1%) [41]. Effective suicide prevention for at-risk adolescents requires increased access to medical treatment; however, many at-risk adolescents do not receive professional psychiatric services due to various reasons (e.g., negative per-

ceptions and/or financial difficulties). Investigating the unique characteristics of suicide in this vulnerable at-risk non-referred sample can contribute to establishing effective suicide prevention policies. Therefore, this study aimed to (a) examine at-risk non-referred adolescents' suicide attempt rate, (b) investigate influential multilevel factors in predicting these adolescents' suicide attempts, and (c) compare the results of (a) and (b) by gender (boys vs. girls).

METHODS

Data

Since 2012, the Ministry of Education of Korea (MEK) has conducted Mental Health Screening Tests among 1st and 4th grade elementary students, 1st grade middle school students, and 1st grade high school students. Approximately 99% of students receive this test, and about 5% are classified as high risk. Schools are required to encourage high-risk students to obtain services by referring to specialized mental health professionals [18]. However, 20–30% of high-risk students do not visit external professionals for various reasons, such as parents not acknowledging their child's problem/difficulties or environmental constraints. Since 2016, the MEK has implemented the Professional School Visits Project, which is an outreach program to support these adolescents. This project operates seven regional centers nationwide; each center employs several trained mental health professionals and a psychiatrist with at least ten years of clinical experience as its director. Upon request from a school, mental health professionals visit the school and conduct standardized interviews with students, parents, and teachers. After the interviews are completed, case conferences are held to establish management plans for each student through discussion with team members and the psychiatrist. Based on the case conference, students are provided with compensation for their psychiatric treatment expenses or a referral to the public welfare service system, and parents and teachers are provided with mental health education and counseling to help them understand and manage their child/student's problems.

In this study, data from 1,151 middle and high school students who received mental health services through the Professional School Visits Project in 2017 were first included. Then, 461 students who received medical ex-

penses compensation were chosen as the at-risk non-referred adolescents. These students were chosen because the criteria for medical expenses compensation are students needing psychiatric care but who refuse psychiatric treatment due to socioeconomic reasons or negative perceptions of psychiatric treatment. Among them, 50 students were excluded due to missing data. As a result, a total of 401 students (216 boys and 185 girls) were finally included in this study. The age range was 13 to 18 years old (mean [M] = 14.96, standard deviation [SD] = 1.56).

Measures

The individual-level predictors were divided into three folds: gender (1 item), clinical diagnosis (2 items), and mental health status (4 items) as follows. First, gender was the sub-group of this study (0 = boy, 1 = girl). Second, clinical diagnoses of depression and ADHD, the most common diagnoses associated with adolescents' suicidal behaviors, were selected (0 = without diagnosis, 1 = with diagnosis). These diagnoses were confirmed by psychiatrists based on the criteria of the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5) during the clinical evaluation stage. In this study, major depressive disorder, persistent depressive disorder, and unspecified depressive disorder of DSM-5 were classified as depression category. We excluded disruptive mood dysregulation disorder or bipolar disorder. Third, the self-reported Strengths and Difficulties Questionnaire (SDQ) was used for mental health status. The SDQ is a behavioral screening questionnaire developed by Goodman [42]. The SDQ consists of 25 items, including five sub-scales: prosocial behaviors, hyperactivity-inattentive, emotional symptoms, conduct problems, and peer problems. The peer problems of SDQ were classified as individual factors because the items constituting peer problems (e.g., "I am usually on my own, I generally play alone or keep to myself") are similar to individual characteristics related to peer relationships. For this study, the validated Korean version of the self-reported SDQ [43] was adapted (four difficulties sub-scales: total of 20 items). The internal consistency of the Korean version of the self-reported SDQ was between 0.80 and 0.90 [43], and that of the current study was between 0.57 and 0.79. For the conduct problems subscale, one item, "I usually do what I'm told," was excluded due to low reliability.

The contextual-level predictors were divided into two

folds: school-related factors (2 items) and family-related factors (3 items). First, school-related factors included school level (0 = middle school, 1 = high school) and academic grades (from 1 = poor to 5 = excellent). Second, family-related factors included family structure (0 = nuclear, 1 = others), family economic status (public assistance recipients) (0 = no, 1 = yes), and abuse experience (0 = no, 1 = yes).

The protective-level predictors indicated their satisfaction in life. The Multidimensional Students' Life Satisfaction Scale (MSLSS) is a perceived life satisfaction questionnaire developed by Huebner [44]. The MSLSS consisted of 40 items, including five sub-scales: family, friends, school, living environment, and self-satisfaction. For this study, the validated Korean version of the MSLSS (K-MSLSS) [45] was used (three sub-scales: family, friends, and school; a total of 18 items). The internal consistency in the Korean study was between 0.62 and 0.88 [45], and that of the current study was between 0.90 and 0.93.

Data for the outcome variable, suicide attempt status (0 = absent, 1 = present), were collected from clinical interviews with mental health professionals at the clinical evaluation stage, about experiences such as self-injury and suicide attempts within the last 12 months.

Statistical Analysis

SPSS 23.0 (IBM Co., Armonk, NY, USA) was used to analyze the data as follows. First, descriptive analyses were conducted to examine all predictors' characteristics at baseline, and group differences between the genders. Specifically, *t* test and chi-square (χ^2) analysis were conducted to assess gender differences. Second, correlation analysis was conducted to identify multicollinearity between the 15 predictors. Third, univariate logistic regression analysis was performed to determine whether each variable predicted adolescents' suicide attempts. Then, multivariate hierarchical logistic regression analyses were performed (at the individual-, contextual-, and protective-levels) using 11 predictors to evaluate three multilevel models as well as to investigate predictive capabilities for the overall group and by gender. The predictors were entered in three separate blocks in the multilevel regression equation. First, seven individual-level predictors were entered in block 1 (at the first level). Second, two contextual factors (school level and academic grades) were entered in block 2 (at the second level).

Finally, two protective factors (family and school satisfaction) were added in block 3 (at the third level) (statistical significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

RESULTS

Descriptive Analysis of Three-level Predictors

The clinical characteristics of the overall sample are shown in Table 1. In total, data from 216 boys and 185 girls were analyzed, accounting for 53.9% and 46.1%, respectively. Of 15 predictors, six predictors showed sig-

nificant gender differences between boys and girls as follows. With regard to level 1, whereas girls (56.8%) were diagnosed with depression more than boys (28.7%), boys (30.1%) were diagnosed with ADHD more than girls (8.6%). Also, girls ($M = 1.32$, $SD = 0.47$) had significantly greater emotional symptoms than boys ($M = 0.91$, $SD = 0.57$). In terms of level 2, middle school boys (aged 13–15 years; 67.1%) and high school girls (aged 16–18 years; 45.4%) were referred to mental health professionals significantly more often than the opposite genders (middle school girls: 54.6%, high school boys: 32.9%).

Table 1. Descriptive analysis of three-level predictors and outcome variable for the overall sample and by gender

Three-level predictors and outcome variable			Overall sample (n = 401)	By gender			
				Boys (n = 216)	Girls (n = 185)	Group differences	
						χ^2	t
Level 1: Individual-level predictors							
Subgroup	1 Gender	Boy	216 (53.9)	-	-		
		Girl	185 (46.1)	-	-		
Clinical diagnosis	2 Depression	No	234 (58.4)	154 (71.3)	80 (43.2)	32.270***	
		Yes	167 (41.6)	62 (28.7)	105 (56.8)		
Mental health status (SDQ)	3 ADHD	No	320 (79.8)	151 (69.9)	169 (91.4)	28.428***	
		Yes	81 (20.2)	65 (30.1)	16 (8.6)		
	4 Hyperactivity-inattentive		1.06 ± 0.45	1.03 ± 0.45	1.11 ± 0.44		-1.850
	5 Emotional symptoms		1.10 ± 0.56	0.91 ± 0.57	1.32 ± 0.47		-7.783***
	6 Conduct problems		0.55 ± 0.41	0.57 ± 0.41	0.53 ± 0.42		1.040
	7 Peer problems		0.76 ± 0.41	0.73 ± 0.43	0.79 ± 0.38		-1.360
Level 2: Contextual-level predictors							
School factors	8 School level	Middle	264 (61.3)	145 (67.1)	101 (54.6)	6.603*	
		High	155 (38.7)	71 (32.9)	84 (45.4)		
	9 Academic grades	Poor	246 (61.3)	136 (63.0)	110 (59.5)	4.339	
		Fair	89 (22.2)	45 (20.8)	44 (23.8)		
		Good	40 (10.0)	21 (9.7)	19 (10.3)		
	Very good	16 (4.0)	11 (5.1)	5 (2.7)			
	Excellent	10 (2.5)	3 (1.4)	7 (3.8)			
Family factors	10 Structure	Nuclear ^a	236 (58.9)	129 (59.7)	107 (57.8)	0.146	
		Others ^b	165 (41.1)	87 (40.3)	78 (42.2)		
	11 Economic status (PAR)	No	335 (83.5)	183 (84.7)	152 (82.2)	0.475	
	Yes	66 (16.5)	33 (15.3)	33 (17.8)			
	12 Abuse experience	No	300 (74.8)	166 (76.9)	134 (72.4)	1.033	
	Yes	101 (25.2)	50 (23.1)	51 (27.6)			
Level 3: Protective-level predictors							
Life satisfaction	13 Family satisfaction		3.65 ± 1.25	3.86 ± 1.16	3.42 ± 1.33		3.541***
	14 Friend satisfaction		4.16 ± 1.10	4.14 ± 1.17	4.18 ± 1.01		-0.350
	15 School satisfaction		2.88 ± 1.42	3.16 ± 1.47	2.56 ± 1.29		4.330***
Outcome variable							
Suicide attempt	Non-attempt (absent)		283 (70.6)	177 (81.9)	106 (57.3)	29.150***	
	Attempt (present)		118 (29.4)	39 (18.1)	79 (42.7)		

Values are presented as frequency (%) or mean ± standard deviation.

ADHD, attention-deficit/hyperactivity disorder; SDQ, Strengths and Difficulties Questionnaire; PAR, public assistance recipients.

^aA family structure consisting of two parents (both father and mother) and their children; ^bOther family structures (e.g., extended family, single parent family).

Asterisks indicate statistical significance between genders; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 2. Univariate logistic regression analysis of the overall sample

Three-level predictors		B	SE	Wald	df	Sig.	Exp(B)
Level 1: Individual-level predictors							
Subgroup	1 Gender*	1.22	0.23	27.817	1	0.000	3.38
Clinical diagnosis	2 Depression*	0.83	0.22	13.750	1	0.000	2.29
	3 ADHD*	-0.94	0.33	8.314	1	0.004	0.39
Mental health status	4 Hyper-inattentive*	0.90	0.26	12.134	1	0.000	2.46
	5 Emotional symptoms*	1.07	0.22	23.620	1	0.000	2.90
	6 Conduct problems*	0.52	0.26	3.899	1	0.048	1.57
	7 Peer problems*	0.81	0.27	8.879	1	0.003	2.25
Level 2: Contextual-level predictors							
School factors	8 School level*	0.47	0.22	4.433	1	0.035	1.60
	9 Academic grades*	0.24	0.11	7.124	1	0.008	1.33
Family factors	10 Structure (n.s.)	-0.07	0.22	0.104	1	0.747	0.93
	11 Economic status (n.s.)	-0.13	0.30	0.176	1	0.675	0.88
	12 Abuse exp. (n.s.)	0.08	0.25	0.104	1	0.747	1.08
Level 3: Protective-level predictors							
Life satisfaction	13 Family*	-0.37	0.09	16.730	1	0.000	0.69
	14 Friend (excluded)	(-0.12)	(0.109)	(1.453)	1	(0.228)	(0.89)
	15 School*	-0.25	0.08	9.009	1	0.003	0.78

B, unstandardized beta; SE, standard error; ADHD, attention-deficit/hyperactivity disorder; Hyper-inattentive, hyperactivity-inattentive; n.s., not significant.

Asterisk indicates statistical significance at the 0.001 level; The predictor 14 (friends satisfaction) was excluded due to the multicollinearity with predictor 7 (peer problems).

With respect to level 3, boys ($M = 3.86$, $SD = 1.16$) were significantly more satisfied with their family than were girls ($M = 3.42$, $SD = 1.33$). Moreover, boys ($M = 3.16$, $SD = 1.47$) also had significantly higher school satisfaction than girls ($M = 2.56$, $SD = 1.29$).

Suicide Attempt Rate

The suicide attempt rate of the overall sample was 29.4% (see Table 1). According to gender, 18.1% of boys and 42.7% of girls attempted suicide. The χ^2 analysis showed that girls attempted suicide significantly more frequently than boys, $\chi^2 = 29.150$, $p < 0.001$.

Correlations between Predictors

Correlation analysis was conducted to identify multicollinearity among the 15 predictors. Due to the predictors being measured on different types of scales (e.g., nominal vs. interval), Cramer's V, contingency coefficient, Eta, and Pearson correlation were separately performed. A significant negative correlation (above 0.5) was found between predictor 7 (peer problems) and predictor 14 (friend satisfaction) ($r = -0.61$), indicating a problem with multicollinearity. To select one of these two predictors (predictors 7 and 14), univariate logistic regression was performed in the following step. No significant effect was

found for predictor 14, which was then excluded from the final analysis.

Univariate Logistic Regression

As shown in Table 2, 11 predictors had a significant association with suicide attempts and were included in the hierarchical logistic regression model for the multilevel analyses.

Multivariate Hierarchical Logistic Regression

Table 3 provides the multilevel model fit statistics for the three models and Table 4 shows each predictor's predictive capabilities in terms of adolescents' suicide attempts for the overall sample and by gender.

As shown in Table 3, for the overall sample, all three models had statistically significant results at the 0.001 level in terms of model fit (Model 1: $\chi^2 = 55.879$; Model 2: $\chi^2 = 62.581$; and Model 3: $\chi^2 = 69.069$). With regard to model changes, Model 2 was significantly improved at the 0.05 level ($\chi^2_{\text{change}} = 6.702$) by adding contextual-level predictors (level 2) to Model 1. Model 3 was also improved at the 0.05 level ($\chi^2_{\text{change}} = 6.488$) when protective-level predictors (level 3) were added to Model 2. These results imply that all individual, contextual, and protective-level predictors significantly contributed to predicting the over-

Table 3. Model fit statistics for each model (overall sample and by gender)

Samples		Model χ^2	Step χ^2	df	-2LogL	Nagelkerke R^2	Overall correct (%)
Overall sample (n = 401)	Model 1	55.879***	55.879***	7	430.074	0.185	71.8
	Model 2	62.581***	6.702*	9	423.372	0.206	71.8
	Model 3	69.069***	6.488*	11	416.884	0.225	73.1
By gender							
Boys (n = 216)	Model 1	25.896***	25.896***	6	178.109	0.185	81.9
	Model 2	31.027***	5.131	8	172.979	0.219	84.3
	Model 3	33.335***	2.308	10	170.671	0.234	84.3
Girls (n = 185)	Model 1	7.368	7.368	6	245.142	0.052	60.5
	Model 2	13.411	6.043*	8	239.099	0.094	61.6
	Model 3	20.474*	7.064*	10	232.035	0.141	63.8

Model 1: individual-level predictors; Model 2: individual and contextual-level predictors; Model 3: individual-, contextual-, and protective level predictors.

Asterisks indicate statistical significance; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4. Multilevel logistic regression analysis of the overall sample and by gender

Predictors	Overall sample (n = 401)				By gender							
					Boys (n = 216)				Girls (n = 185)			
	B	OR	Lower	Upper	B	OR	Lower	Upper	B	OR	Lower	Upper
Level 1: Individual-level predictors												
1 Gender	0.92 ^a ***	2.51 ^a	1.50 ^a	4.19 ^a	-	-	-	-	-	-	-	-
2 Depression	0.38	1.47	0.87	2.49	0.97 ^a *	2.65 ^a	1.09 ^a	6.42 ^a	0.01	1.00	0.51	1.98
3 ADHD	-0.35	0.71	0.36	1.53	-0.23	0.80	0.25	2.50	-0.10	0.91	0.27	3.00
4 Hyperactivity-inattentive	0.57	1.77	0.95	3.32	0.38	1.46	0.53	4.03	0.84	2.32	0.98	5.48
5 Emotional symptoms	0.19	1.21	0.69	2.11	0.21	1.24	0.53	2.92	0.04	1.04	0.47	2.27
6 Conduct problems	0.47	1.61	0.84	3.07	1.34 ^a ***	3.85 ^a	1.39 ^a	10.53 ^a	-0.26	0.77	0.32	1.85
7 Peer problems	0.46	1.59	0.83	3.06	0.22	1.25	0.45	3.47	0.80	2.23	0.88	5.65
Level 2: Contextual-level predictors												
8 School level	0.14	1.15	0.70	1.88	0.72	2.06	0.88	4.82	-0.25	0.78	0.41	1.48
9 Academic grades	0.33 ^a *	1.38 ^a	1.08 ^a	1.77 ^a	0.32	1.38	0.91	2.09	0.34 ^a *	1.40 ^a	1.00 ^a	1.96 ^a
Level 3: Protective-level predictors												
13 Family satisfaction	-0.25 ^a *	0.78 ^a	0.63 ^a	0.96 ^a	-0.16	0.85	0.58	1.25	-0.35 ^a *	0.71 ^a	0.54 ^a	0.92 ^a
15 School satisfaction	-0.01	0.99	0.80	1.21	-0.15	0.86	0.63	1.18	0.17	1.18	0.88	1.98

Eleven predictors were selected based on Table 2.

ADHD, attention-deficit/hyperactivity disorder; B, unstandardized coefficients; odds ratio (OR) = Exp (B).

^aStatistical significance. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

all sample's suicide attempts.

All three models for boys were statistically significant at the 0.001 level (Model 1: $\chi^2 = 25.896$; Model 2: $\chi^2 = 31.027$; and Model 3: $\chi^2 = 33.335$). In terms of model changes, neither Model 2 ($\chi^2_{\text{change}} = 5.131$) nor Model 3 ($\chi^2_{\text{change}} = 2.308$) significantly improved the previous models, when contextual and protective-level predictors were added to the logistic regression equation. These results imply that individual-level predictors have the most significant contribution in predicting boys' suicide attempts, compared to contextual- and protective-level predictors.

In contrast to the findings for boys, only Model 3 for girls showed small but significant model fit ($\chi^2 = 20.474$). With respect to model changes, Model 2 was significantly improved by adding contextual-level predictors to Model 1 ($\chi^2_{\text{change}} = 6.043$). Also, Model 3 was significantly improved when protective-level predictors were added to Model 2 ($\chi^2_{\text{change}} = 7.064$). These results imply that protective-level predictors contribute the most to the prediction of suicide attempts by girls, followed by contextual-level predictors.

As for each predictor's predictive capabilities (see Table

4), gender ($B = 0.92$) was significantly associated with the overall sample's suicide attempts, such that girls were 2.51 times more likely to attempt suicide (95% confidence interval [CI]: 1.50–4.19) than boys.

Significant predictors related to boys' suicide attempts were depression ($B = 0.97$) and conduct problems ($B = 1.34$). Boys with depression were about 2.65 times more likely to attempt suicide (95% CI: 1.09–6.42) than those without depression. Also, boys with higher conduct problems were 3.85 times more likely to attempt suicide (95% CI: 1.39–10.53) than those with lower conduct difficulties.

In contrast to the findings for boys, family satisfaction ($B = -0.35$) and academic grades ($B = 0.34$) were significantly influential predictors associated with girls' suicide attempts. Girls with lower family satisfaction were 0.71 times more likely to attempt suicide (95% CI: 0.54–0.92) than those with higher family satisfaction. Also, girls with higher academic grades were 1.40 times more likely to attempt suicide (95% CI: 1.00–1.96) than those with lower grades.

Ethics Approval and Consent to Participate

This study was approved by the Institutional Review Board of Hallym University Sacred Heart Hospital (HALLYM 2018-08-002-001). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

DISCUSSION

The purpose of this study was to investigate how individual-, contextual-, and protective-level predictors affected at-risk non-referred adolescents' suicide attempts and to compare the results by gender. This study's sample showed a higher suicide attempt rate than community samples, displayed high levels of psychosocial differences and showed different risk and protective factors depending on gender.

The suicide attempt rate of the overall sample was 29.4%, which was lower than that of clinically depressed adolescent samples (47.2%) [9], but considerably higher than that of community samples (2.6%) [8]. The difference in suicide attempt rates can be interpreted as a re-

flexion of the unique characteristics of the study samples. Similar to clinically depressed adolescent samples, this study samples were vulnerable and exposed to risk. However, they were found and received medical expenses compensation through the Professional School Visits Project and were able to undergo psychiatric treatment. Since psychiatric treatment was effective in reducing the suicidal behavior of clinical samples [46,47], it is expected to be effective in this study sample, which has similar or even more severe characteristics. Therefore, implementing a policy to increase the accessibility of professional intervention in these samples could contribute to preventing suicide.

Significant gender differences in suicide attempt rates (girls: 42.7%, boys: 18.1%) were also demonstrated. The suicide attempt rate for girls was higher than that for boys for both community (girls: 3.2%, boys: 2.0%) [8] and clinically depressed samples (girls: 54.9%, boys: 31.4%) [9]. These results are consistent with previous studies that showed adolescent girls' suicide attempts are 2 to 3 times higher than those of adolescent boys [10,48]. The rate of suicide attempts increases as puberty develops [49]. From a developmental perspective, girls start puberty sooner than boys [50]. This may contribute to the higher rate of girls' suicide attempts [1,49,50].

Previous studies have reported that family-related factors have a significant impact in predicting adolescents' suicide attempts [1,12,15,16,29,35]; the results of this study did not prove otherwise, which could be interpreted as follows. First, the concept of vulnerable family environment in this study sample should be considered. In 2017, the divorce rate in Korea was 2.1%, and the rate of family abuse was 2.2% [8]. For this study's sample, however, 41.1% of adolescents belonged to other family types (e.g., divorced family) and 25.3% of adolescents experienced family abuse, indicating evidence of vulnerability in terms of poor family environment. Thus, unlike in community samples, family-related factors were not significant influential risk factors for attempting suicide in this already vulnerable at-risk non-referred sample. Second, family economic difficulties had a less significant contribution to adolescents' suicide attempts, compared to the characteristics of adult suicides [30]. This can be explained such that family economic status is often not a major consideration for adolescents. That is, they are either unaware of the economic condition of their family or recognize the

family's economic status but tend to be less concerned (compared to their concerns about peers and school).

Gender was an influential factor in predicting suicide attempts of the overall sample, with the girls attempting suicide significantly more frequently than boys. These findings are consistent with previous studies that showed girls are more vulnerable to suicidal behaviors than boys [10,48,51]. For boys, both depression and emotional problems showed up as significant risk factors in the univariate analysis. In the multilevel analysis, however, only depression was significant, although these two variables are expected to be highly correlated. This can be interpreted to mean that either depression is a more influential factor in suicide attempts than a broad range of emotional problems or that objective clinical evaluation by a professional may be more sensitive for assessment of suicide risk than a self-assessment of emotional problems. In addition, in multilevel analysis, individual-level predictors (depression and conduct problems) proved to have the most significant contribution in predicting boys' suicide attempts. That means that these vulnerable boys with higher depression or more conduct problems are more likely to attempt suicide than those with lower depression or fewer conduct problems, and therefore, professionals need to be more sensitive to this group's suicidal risk. Depression is a well-known risk factor in predicting suicide attempts in boy adolescents [52], and the impact of conduct disorder on suicidal behavior in males is higher than in females [28,53,54]. Young males may be less predisposed to help-seeking behaviors in an attempt to exhibit masculine behaviors [55] or a male tendency to adopt avoidance strategies [56], and adolescents with behavioral problems have difficulty socializing with others and form superficial relationships [22]. These factors may contribute to making it more difficult for them to cope with emotional and behavioral problems and easily lead to suicidal behavior.

For girls, on the other hand, protective-level predictors (family satisfaction) contributed the most to the prediction of suicide attempts, followed by contextual-level predictors (academic grades). That is, girls with less family satisfaction and those with higher academic grades were more likely to attempt suicide than those with more family satisfaction and with lower academic grades. This finding implies that family satisfaction played a significant role as a protective factor to reduce the likelihood of girls' at-

tempting suicide [35,37]. In addition, whereas previous studies showed that low academic grades significantly affected adolescents' suicidal behaviors [10,57], this study found that academic grades had a significant impact on girls, especially when their grades were higher. This can be explained in terms of relative deprivation. Although their academic grades were high, it might have been difficult to receive psychological and financial support from their parents; therefore, as previous studies mentioned that the frustration they experienced is estimated to be greater than that of adolescents in community samples [58,59]. Furthermore, considering our results, in the case of girls with high academic achievement who have grown up with a low socioeconomic status and poor family relationships, it may be necessary to provide an appropriate community care system that can give psychological and social welfare support outside the home for reducing suicide risk. This system could help girls overcome their relative deprivation and adjust psychologically as well as provide opportunities for them to explore their own strength. Lastly, regarding girls' depression, it should be noted that the samples in this study are not community samples, has not set up in control groups, and are all mental high-risk samples. If the factors affecting girls' suicidal behaviors had been analyzed in this sample through a comparison with normal control groups, the relationship with depression in girls may have been greater, as has been previously shown [1,19,20]. However, the factors affecting the suicide attempts of this sample may differ from those in previous studies because the girls in this study belong to highly vulnerable at-risk mental health groups.

Several limitations must be addressed in this study. First, the research samples were adolescents (aged 13–18 years). Other age groups, such as younger children (aged 10–12 years), were not included in this study. Considering the tendency that suicidal behaviors gradually lower with age [60–62], further studies on older children should be carried out in the future. Second, there was no information about the severity of suicide attempts (e.g., frequency, methods, situation at the time of suicide attempt). Depending on the severity, the factors involved are expected to vary. Therefore, further studies are suggested to identify non-suicide attempts, suicide attempts, and repeated suicide attempts based on their severity, and then compare among groups [52]. Third, this study analyzed data derived from the National School Mental

Health Project. Thus, there are limitations such that diagnoses (e.g., depression, ADHD) were not made through structured interviews and validated instruments for specific psychiatric symptoms. Clinical psychiatric evaluations should be used for more accurate diagnoses in the future [63].

Despite these limitations, the implications of this study should be acknowledged. First, given that most studies of adolescent suicide were carried out either with community or clinical samples, this study investigated at-risk non-referred adolescents and compared by gender. That is, this study is an essential step in understanding the unique characteristics of these vulnerable samples that have not yet been addressed in mental health policies. Improving medical accessibility will be the first step in establishing effective suicide prevention policies for the at-risk non-referred adolescent samples. In addition, whereas previous studies analyzed various influential factors at one level, this study applied multi-level analysis to more specifically investigate at-risk non-referred adolescents' suicide attempts. Thus, the findings of this study highlight the need to examine vulnerable boys' and girls' suicidal behaviors in a hierarchical structure, which in turn will inform policies that can help these adolescents overcome their difficulties and become healthy members of Korean society.

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■ Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

■ Author Contributions

Conceptualization: Hyun Ju Hong, Yumi Lee, Dayoung Lee. Data acquisition: Yumi Lee. Formal analysis: Yumi Lee. Funding: Hyun Ju Hong. Supervision: Hyun Ju Hong, Writing—original draft: Yumi Lee. Writing—review & editing: Hyun Ju Hong, Dayoung Lee, Yumi Lee.

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