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Associated Factors of Depression and Suicidal Behaviors among Korean Adolescents: Web-based Survey of the Korea Youth Risk Behavior in 2015~2017

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Purpose: Suicide among adolescents is a serious problem worldwide, and especially, the suicide rate of teenagers is increasing rapidly in South Korea. This study was conducted to investigate the factors affecting the respective suicidal behavior in terms of home-environment characteristics, health behavior characteristics, and psychological health characteristics in Korean adolescents. **Methods:** The data of the Web-based Survey of the Youth Risk Behavior from 2015 to 2017 collected by the Korea Centers for Disease Control and Prevention (KCDC) was analyzed using multivariable logistic regression analysis. **Results:** The influential factors by depression and suicidal behavior (suicidal ideation (SI), suicidal plan (SP), and suicidal attempt (SA)) were female(adjusted odds ratios [aOR], 1.45, 1.69, 1.30, 2.19), age (aOR 1.03, 0.98, 0.97, 0.90), no family members (aOR 1.21, 1.36, 2.11, 2.32), living with only the father (aOR 1.05, 1.06, 1.07, 1.11), high economic status (aOR 1.15, 1.22, 1.34, 1.46), residence in relatives' home (aOR 1.6, 1.36, 2.34, 1.97), drinking experience (aOR 1.35, 1.47, 1.57, 1.76), smoking experience (aOR 1.28, 1.30, 1.31, 1.94), hospital treatment experience due to violence (aOR 2.18, 3.33, 6.24, 8.40), bad health status (aOR 1.23, 1.48, 2.00, 2.15), unhappiness (aOR 2.49, 6.14, 6.72, 8.89), and a lot of stress (aOR 6.05, 10.40, 4.86, 5.52). **Conclusion:** The suicidal behavior risk screening and prevention program for adolescents should be developed considering the subjective happiness and hospital treatment experience status due to violence that affects suicidal behavior.

Key Words: Adolescent; Depression; Suicidal ideation; Suicide attempted

INTRODUCTION

Adolescence is a transitional period when one grows into an adult through the fastest physical, emotional, and intellectual change, acquires various knowledge, skills, abilities, and attitudes, and experiences stress and confusion while performing development tasks given to him or her [1]. Due to conflict, stress, disappointment, and frustration arising in relation to development tasks, some youths attempt problem behaviors, such as drug use, misdemeanor, school violence, runaway, and suicide [2]. Among them, adolescent suicide emerges as a serious problem, and it arouses social interest [3].

According to the '2020 Suicide Prevention White Paper' data, Korea's teenage suicide rate was 4.2-4.9 per 100,000 people by 2017, but it was 5.8 in 2018, the highest rate of increase (22.1%) compared to other age groups, which is 1.7 times higher than the average rate of suicide among teenagers in Organization for Economic Cooperation and Development (OECD) countries 3.4. In addition, intentional self-harm and suicide ranked first among the top 10 causes of death, accounting for 35.7% of the total causes of death, 2.5 times the number of malignant neoplasms in the second place. Given the socio-economic losses caused by juvenile suicide and the occurrence of secondary mental illness [4], the severity is very high, and preventive intervention is urgently needed.

Suicide is the end to life for oneself, and suicidal behav-

주요어: 청소년, 우울, 자살생각, 자살계획, 자살시도

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ior is a series of process concepts that include suicidal ideation (SI), suicidal plan (SP), suicidal attempt (SA), and suicide death [5], and is a multidimensional action determined by the interaction of various factors, not a disability or diagnosis name [6]. Not everyone who thinks of SP or SA, but it is common for those who think of or plan it to have a high risk of dying from suicide [7,8]. In addition, it is reported in many previous studies that depression, which is the most powerful predictor of suicide [9], mediates the relationship between suicide risk factors and adolescent suicide and is a direct influential factor on SI [10]. Also, depression as an illness factors on adolescents suicide explains suicidal behavior [11-13].

However, previous studies on the suicide of adolescents in South Korea focused mainly on SI, because there are limits of collecting study subjects [14]. There are studies related to SA, however, they focus mainly on fragmentary results to identify risk factors, and those that approach the suicide as a series of stages of suicidal ideation, SP, and SA, including depression are very insufficient. Moreover, as adolescents are emotionally unstable and immature, when they are faced with pain which they can't handle, they often attempt suicide without planning in advance as part of escape from reality rather than seek help from outside [15], and since the suicide can't receive an immediate treatment intervention after the situation occurs, identifying the factors affecting each stage of suicidal behavior, including depression, will be important data for adolescent suicide prevention and early intervention.

According to previous studies, it is reported that the suicide of adolescent is caused by the Home environment related factors, such as gender, low self-esteem, sexual violence experience, life stress, misdemeanor experience of drinking, smoking, and drugs, relationship with parents, lack of family support, family economic level, parental divorce, and school violence and by various complex factors related to health behavior and mental health [9,10]. When analyzing suicidal behavior, it is also essential to analyze considering not only a single problem behavior, but also the complex factors and stepwise dimension including Home environment related characteristics, health behaviors and mental health characteristics, and to make multi-dimensional intervention such as the preparation of preventive measures accordingly.

Therefore, by analyzing the Korea Youth Risk Behavior Web-based Survey (KYRBS) of three years from 2015 to 2017, and by grasping which factor of Home environment related characteristics, health behaviors, and mental health characteristics has a greater impact on the stages of depression, SI, SP, and SA, this study was intended to be used for the basic data for the high-risk group screening and suicide prevention programs for adolescent suicide prevention.

METHODS

1. Design of Study

This study is a cross-sectional survey study conducted to identify the factors affecting the suicidal behavior of Korean adolescents using the KYRBS data.

2. Subjects of Study

Of the KYRBS conducted annually by the Ministry of Education and the KCDC, three-year data from 2015 to 2017 was used, and since the raw data was open to the public, it was used after it was officially approved for use through the KYRBS website. The subjects of this study were the 11th (2015), 12th (2016), and 13th (2017) KYRBS. The KYRBS was designed to represent middle and high school students nationwide using the stratified sample collection method, and students with a long absence, children with disabilities, and students with literacy disabilities were excluded from the sample students. From 2015 to 2017, the total number of populations in the KYRBS was 70,362, 67,983, and 64,991, respectively, with 68,043, 65,528, and 62,276 actual participants, respectively, and 188,959 people were selected as the final subjects in this study.

3. Study Tools

Independent and dependent variables were selected through a literature review on adolescent suicide [16,17].

1) Home environment related characteristics

The Home environment related characteristics of the subjects included gender, age, family members, parents' cohabitation, parents' education level, parents' Korean nationality status, socio-economic status, and residence type.

2) Health Behavior characteristics

Health behavior characteristics included drinking experience, smoking experience, and treatment experience due to violence. For drinking, the question whether they had drunk more than one glass of alcohol so far, for smoking, that whether they had smoked at least one or two cigarettes so far, and for treatment experience due to violence, that whether they had been treated at a hospital due to vio-

lence (physical assault, intimidation, bullying, etc.) by friends, seniors, and adults in the last 12 months were used.

3) Mental health characteristics

Mental health characteristics included subjective health cognition, subjective happiness, and stress cognition. Subjective health cognition, which is subjective health status that one feels, was reclassified into being healthy (very healthy, healthy), moderate, and bad (not healthy, very unhealthy). Subjective happiness, which is the subjective happiness status that one feels, was reclassified into happiness (very happy, happy), moderate, and unhappiness (somewhat unhappy, very unhappy). Stress cognition, a degree that one normally feels, was reclassified into feeling a lot (feeling so much, feeling a lot), feeling a little, and no feeling (no feeling very much, no feeling at all).

4) Dependent variables

(1) Depression: If one answered 'yes' to the question, 'Have you ever felt sad or desperate enough to stop your daily life for two weeks in the last 12 months?' has been a depression

(2) Suicidal behaviors

- Suicidal ideation (SI): If one answered 'yes' to the question, 'Have you ever seriously considered suicide in the last 12 months?' has been a suicidal ideation.
- Suicidal plan (SP): If one answered 'yes' to the question, 'Have you ever made any specific plans to commit suicide in the last 12 months?' has been a suicidal plan.
- Suicidal attempt (SA): If one answered 'yes' to the question, 'Have you ever committed suicide in the last 12 months?' has been a suicidal attempt.

4. Statistical Analysis

Of the KYRBS conducted annually by the Ministry of Education and the KCDC, three-year data from 2015 to 2017 was used, and since the raw data was open to the public, it was used after it was officially approved for use through the KYRBS website. The data was integrated according to the raw data analysis guidelines, and the complex sample design elements were designated and analyzed using the IBM SPSS statistics for windows (Version 24.0; Armonk, NY, USA) program. The results of data analysis of this study presented the results of correcting the weight variables. Descriptive statistical analysis was used for the Home environment related characteristics, health behaviors, and mental health characteristics of the subjects, and they were presented as frequency that did not reflect the weights and as percentage that reflected the weights. Rao-Scott x^2 test and t-test was used for testing the difference between Home environment related characteristics, health behavior, and mental health characteristics according to suicidal behavior, and multiple logistic regression was performed to identify the factors affecting suicidal behavior.

5. Ethics Statement

This study was conducted with the approval of the Bioethics Review Committee of Konyang University (IRB No. KYU-2018-169-01).

RESULTS

1. The Home Environment Related Characteristics, Health Behavior and Mental Health Characteristics of the Subjects

The Home environment related characteristics, health behavior and mental health characteristics of the subjects are as shown in Table 1. For gender, men were 52.1%, and women were 47.9%. For family structure type, healthy family type was 99.2%, which accounted for the largest portion, and for residence type, 84.4% lived with their parents. For parent education, college graduates were the highest with 53.4% and 47.4%, respectively. For the economic status, the ratio of average was 46.9%, which was the highest. For health behavior characteristics, 39.6% had drinking experience, 15.0% had smoking experience, and 2.0% had hospital treatment experience due to violence. In subjective health cognition of mental health characteristics, 5.9% responded that they were not healthy, and 7.7% responded that they were not happy. 36.3% responded that they felt a lot of stress.

2. Relationship between Home Environment Related Characteristics, Health Behavior, Mental Health Characteristics and Suicidal Behavior

Relationship between Home environment related characteristics, health behavior, mental health characteristics and suicidal behavior is as shown in Table 2. Examining the prevalence of the suicidal behavior of adolescents, depression was 15.5%, SI rate 7.9%, SP rate 2.3%, and SA rate 2.3%. In Home environment related characteristics, gender, age, family structure, parents' cohabitation status, pa-

Table 1. General Characteristics of Subjects (*N*=188,959) (Weighted *N*=3,090,634)

Variables	Categories	n (%) or M±SD
Gender	Male	97,080 (52.1)
	Female	91,879 (47.9)
Age (year)		15.10±0.0
Family structure	Nuclear + Extended	187,421 (99.2)
	Grandparents	681 (0.3)
	Brothers and sisters	185 (0.1)
	No family	672 (0.4)
Parent living together	Only the father	8,031 (3.9)
	Only the mother	17,871 (9.3)
	Parents	158,079 (84.4)
	No Parent	4,978 (2.4)
Father education status	≤Middle school	4,078 (2.1)
	High school	51,424 (27.7)
	≥University	93,497 (53.4)
	Unknown	32,607 (16.7)
Mother education status	≤Middle school	3,451 (1.8)
	High school	63,500 (34.7)
	≥University	84,249 (47.4)
	Unknown	31,286 (16.0)
Father nationality	Korean	181,198 (99.8)
	Not Korean	408 (0.2)
Mother nationality	Korean	180,394 (99.0)
	Not Korean	2,092 (1.0)
Socioeconomic status	High	71,031 (37.9)
	Medium	88,992 (46.9)
	Low	28,936 (15.2)
Residence type	Family	180,426 (95.9)
	Relatives' home	1,368 (0.7)
	Boarding, living alone, dormitory	6,482 (3.1)
	Childcare facilities	683 (0.3)
Drinking	Yes	73,083 (39.6)
	No	115,876 (60.4)
Smoking	Yes	27,542 (15.0)
	No	161,417 (85.0)
Violence treatment	Yes	3,739 (2.0)
	No	185,220 (98.0)
Health status	Healthy	137,636 (72.5)
	Moderate	40,338 (21.5)
	Bad	10,985 (5.9)
Perceived happiness	Happiness	126,631 (66.5)
	Moderate	48,115 (25.9)
	Unhappiness	14,213 (7.7)
Perceived stress	A lot of stress	68,485 (36.3)
	Little stress	81,764 (43.5)
	Not stressed	38,710 (20.1)

rents' education, parents' Korean nationality status, economic status, and residence type were statistically significant in depression, SI, SP, and SA. In health behavior characteristics, drinking experience, smoking experience, and hospital treatment experience due to violence were statistically significant in depression, SI, SP, and SA. In mental health characteristics, subjective health status, subjective happiness, and stress cognition were statistically significant in depression, SI, SP, and SA.

3. Factors Affecting Suicidal Behavior

The relevant factors affecting suicidal behavior are as shown in Table 3. In gender of the Home environment related characteristics, female students showed a higher risk of depression, SI, SP, and SA than male students, and among them, the risk of suicidal attempt was 2.19 times higher than that of SA of male students. In the family structure, students in a broken family type with no parents or only siblings showed a gradual increase in the risk of depression, SI, SP, and SA, compared to those in the healthy family type consisting of a couple and children. Among them, the risk of SA of students with no parents was highest at 2.32 times, and that of SA in a family structure consisting of only siblings was 1.90 times higher. In parent cohabitation status, the risk of depression, SI, SP, and SA (aOR, 1.11; 95% confidence interval [CI], 0.96~1.28) got gradually higher in the case of living with only the father, compared to the case of living with parents. In addition, it was found that the risk of SA increased by 1.14 times in the case of living with only the mother as well. In the socioeconomic status, those who replied, 'High' or 'Low' showed a gradual higher risk of depression, SI, SP, and SA (aOR, 1.46, 95% CI, 1.35~1.57; aOR, 1.28, 95% CI, 1.17~1.40), compared to those who replied, 'Average'. In residence type, the risk of depression, SI, and SP (aOR, 2.34; 95% CI, 1.81~3.04) got higher in the case of living in a relative's house, compared to the case of living with family members, however, the risk of SA (aOR, 1.97; 95% CI, 1.49~2.61) got lower. In addition, in the case of living in a childcare facility and in a boarding house, living alone, or in a dormitory, it was found that there were some similarities or lower risks, compared to the case of living with family members. In the health behavior characteristics, those who had drinking experience showed a gradual increase in the risk of depression, SI, SP, and SA (aOR, 1.76; 95% CI, 1.63~1.89), compared to those who had none. Those who had smoking experience showed a gradual increase in the risk of depression, SI, SP, and SA (aOR, 1.94; 95% CI, 1.77~2.11), compared to those who had none. Those who had hospital

Table 2. Factors Affecting Health and Suicidal Behavior (*N*=188,959) (Weighted N=3,090,634)

Variables	Categories	Health	Depression	Suicidal ideation	Suicidal plan	Suicidal attempt	Rao-Scott x^2 (p)
		n (%)	n (%)	n (%)	n (%)	n (%)	
Gender	Male	74,849 (76.7)	12,451 (13.1)	5,956 (6.2)	2,148 (2.2)	1,676 (1.7)	2,486.76
	Female	61,420 (66.7)	16,739 (18.3)	8,913 (9.8)	2,223 (2.4)	2,584 (2.8)	(<.001)
Age† (year)		15.05±0.01	15.36±0.02	15.17±0.02	14.98±0.03	14.86±0.03	196.43 (<.001)
Family structure	Nuclear & extended	135,306 (72.0)	28,944 (15.6)	14,712 (7.9)	4,301 (2.3)	4,158 (2.2)	280.13
	Grandparents	455 (66.6)	105 (16.3)	73 (11.3)	21 (2.6)	27 (3.2)	(<.001)
	Brothers & sisters	114 (62.7)	25 (12.2)	24 (12.6)	7 (4.6)	15 (7.9)	
	No family	394 (56.9)	116 (17.5)	60 (9.6)	42 (6.9)	60 (9.1)	
Parent living together	Only the father	5,375 (66.2)	1,377 (17.6)	758 (9.8)	250 (3.1)	271 (3.4)	674.80
	Only the mother	12,054 (67.3)	3,098 (17.5)	1,734 (9.7)	458 (2.6)	527 (3.0)	(<.001)
	Parents	115,633 (73.0)	23,820 (15.2)	11,892 (7.6)	3,497 (2.2)	3,237 (2.0)	
	No Parent	3,207 (63.5)	895 (18.5)	485 (10.1)	166 (3.5)	225 (4.4)	
Father education status	≥Middle school	2,738 (67.0)	710 (17.5)	394 (9.9)	101 (2.5)	135 (3.0)	262.7
	High school	37,079 (72.0)	8,157 (16.0)	3,971 (7.8)	1,113 (2.1)	1,104 (2.1)	(<.001)
	≤University	67,049 (71.6)	14,815 (15.9)	7,467 (8.1)	2,204 (2.3)	1,962 (2.1)	
	Unknown	24,542 (75.1)	4,269 (13.3)	2,327 (7.2)	711 (2.2)	758 (2.3)	
Mother education status	≤Middle school	2,300 (66.8)	588 (16.8)	349 (10.5)	101 (2.9)	113 (3.0)	335.66
	High school	45,690 (71.8)	10,230 (16.2)	4,872 (7.7)	1,345 (2.1)	1,363 (2.1)	(<.001)
	≥University	60,344 (71.4)	13,255 (15.9)	6,804 (8.2)	2,036 (2.4)	1,810 (2.1)	
	Unknown	23,690 (75.7)	4,013 (12.9)	2,217 (7.1)	665 (2.1)	701 (2.3)	
Father nationality	Korean	131,159 (72.2)	27,881 (15.5)	14,112 (7.9)	4,116 (2.2)	3,930 (2.1)	74.81
	Not Korean	249 (61.0)	70 (15.9)	47 (12.6)	13 (2.9)	29 (7.6)	(<.001)
Mother nationality	Korean	130,550 (72.2)	27,756 (15.5)	14,083 (7.9)	4,092 (2.2)	3,913 (2.1)	31.95
	Not Korean	1,474 (69.5)	330 (15.8)	159 (7.9)	55 (2.7)	74 (4.0)	(<.001)
Socioeconomic status	High	52,607 (73.8)	10,359 (14.7)	4,932 (7.1)	1,608 (2.2)	1,525 (2.1)	1,739.33
	Medium	65,538 (73.4)	13,519 (15.4)	6,516 (7.4)	1,762 (2.0)	1,657 (1.8)	(<.001)
	Low	18,124 (62.8)	5,312 (18.3)	3,421 (11.8)	1,001 (3.4)	1,078 (3.6)	
Residence type	Family	130,544 (72.2)	27,686 (15.5)	14,127 (7.9)	4,088 (2.2)	3,981 (2.2)	481.55
	Relatives' home	778 (55.7)	246 (18.7)	163 (11.9)	89 (6.8)	92 (6.9)	(<.001)
	Boarding, living alone, dormitory	4,494 (69.2)	1,167 (17.9)	528 (8.2)	158 (2.7)	135 (2.0)	
	Childcare facilities	453 (64.4)	91 (13.8)	51 (8.0)	36 (5.9)	52 (7.9)	
Drinking	Yes	47,800 (65.5)	13,819 (19.0)	7,028 (9.7)	2,149 (2.9)	2,287 (3.1)	553.93
	No	88,469 (76.2)	15,371 (13.4)	7,841 (6.8)	2,222 (1.9)	1,973 (1.7)	(<.001)
Smoking	Yes	17,309 (62.8)	5,468 (20.1)	2,729 (9.9)	891 (3.2)	1,145 (4.1)	1,595.33
	No	118,960 (73.6)	23,722 (14.8)	121,407 (7.6)	3,480 (2.1)	3,115 (1.9)	(<.001)
Violence treatment	Yes	1,592 (41.8)	723 (19.8)	557 (15.2)	376 (10.1)	491 (13.0)	3,795.51
	No	134,677 (72.5)	28,467 (15.5)	14,312 (7.8)	3,995 (2.1)	3,769 (2.0)	(<.001)
Health status	Healthy	105,548 (76.5)	19,002 (14.0)	8,406 (6.2)	2,500 (1.8)	2,180 (1.6)	7,601.43
	Moderate	25,537 (61.5)	7,766 (19.3)	4,508 (11.2)	1,197 (2.9)	1,330 (3.2)	(<.001)
	Bad	5,184 (47.2)	2,422 (21.9)	1,955 (17.9)	674 (6.1)	750 (6.9)	
Perceived happiness	Happiness	102,595 (80.9)	15,470 (12.4)	5,409 (4.3)	1,759 (1.4)	1,398 (1.1)	2,6461.31
	Moderate	29,495 (61.5)	10,311 (21.4)	5,548 (11.6)	1,369 (2.8)	1,392 (2.8)	(<.001)
	Unhappiness	4,179 (29.5)	3,409 (24.0)	3,912 (27.6)	1,243 (8.6)	1,470 (10.3)	
Perceived stress	A lot of stress	34,555 (50.5)	16,734 (24.5)	11,035 (16.2)	2,967 (4.3)	3,194 (4.6)	2,7982.56
	Little stress	65,913 (80.4)	10,601 (13.1)	3,340 (4.2)	1,082 (1.3)	828 (1.0)	(<.001)
	Not stressed	35,801 (92.3)	1,855 (4.9)	494 (1.3)	322 (0.8)	238 (0.6)	

† t -test.

Table 3. Factors Affecting the Suicidal Behavior (*N*=188,959) (Weighted N=3,090,634)

Variables	Categories	Depression		Suicidal ideation		Suicidal plan		Suicidal attempt	
		aOR (95%CI)	*p*	aOR (95%CI)	*p*	aOR (95%CI)	*p*	aOR (95%CI)	*p*
Gender	Male	1		1		1		1	
	Female	1.45 (1.39~1.50)	<.001	1.69 (1.60~1.78)	<.001	1.30 (1.19~1.42)	<.001	2.19 (1.99~2.41)	<.001
Age (year)		1.03 (1.02~1.05)	<.001	0.98 (0.96~0.99)	.023	0.97 (0.93~0.99)	.045	0.90 (0.87~0.94)	<.001
Family structure	Nuclear & Extended	1		1		1		1	
	Grandparents	0.94 (0.74~1.21)	.648	1.38 (1.02~1.87)	.038	1.12 (0.65~1.95)	.677	1.09 (0.66~1.80)	.729
	Brothers & sisters	0.67 (0.41~1.10)	.114	1.34 (0.82~2.19)	.241	1.35 (0.52~3.48)	.540	1.90 (0.99~3.64)	.053
	No family	1.21 (0.94~1.57)	.136	1.36 (0.98~1.89)	.062	2.11 (1.38~3.24)	.001	2.32 (1.50~3.58)	<.001
Parent living together	Parents	1		1		1		1	
	Only the father	1.05 (0.98~1.12)	.178	1.06 (0.97~1.15)	.194	1.07 (0.94~1.23)	.314	1.11 (0.96~1.28)	.159
	Only the mother	1.06 (1.01~1.11)	.010	1.07 (1.01~1.14)	.023	0.98 (0.89~1.09)	.771	1.14 (1.03~1.27)	.010
	No parents	1.07 (0.97~1.19)	.174	0.95 (0.83~1.09)	.475	0.76 (0.59~0.98)	.032	0.87 (0.69~1.10)	.248
Socioeconomic status	High	1.15 (1.11~1.19)	<.001	1.22 (1.17~1.28)	<.001	1.34 (1.24~1.44)	<.001	1.46 (1.35~1.57)	<.001
	Medium	1		1		1		1	
	Low	1.06 (1.02~1.10)	.003	1.22 (1.16~1.28)	<.001	1.31 (1.20~1.43)	<.001	1.28 (1.17~1.40)	<.001
Residence type	Family	1		1		1		1	
	Childcare facilities	0.79 (0.61~1.02)	.071	0.81 (0.57~1.15)	.242	1.45 (0.97~2.15)	.068	1.42 (0.97~2.08)	.074
	Boarding, living alone, dormitory	1.02 (0.95~1.10)	.565	1.04 (0.94~1.16)	.452	1.33 (1.11~1.58)	.002	1.02 (0.83~1.24)	.868
	Relatives' home	1.16 (0.99~1.37)	.071	1.36 (1.11~1.68)	.004	2.34 (1.81~3.04)	<.001	1.97 (1.49~2.61)	<.001
Drinking	Yes	1.35 (1.31~1.39)	<.001	1.47 (1.41~1.53)	<.001	1.57 (1.47~1.69)	<.001	1.76 (1.63~1.89)	<.001
	No	1		1		1		1	
Smoking	Yes	1.28 (1.23~1.33)	<.001	1.30 (1.23~1.38)	<.001	1.31 (1.19~1.44)	<.001	1.94 (1.77~2.11)	<.001
	No	1		1		1		1	
Violence treatment	Yes	2.18 (1.98~2.40)	<.001	3.33 (2.99~3.72)	<.001	6.24 (5.48~7.11)	<.001	8.40 (7.38~9.56)	<.001
	No	1		1		1		1	
Health status	Healthy	1		1		1		1	
	Moderate	1.10 (1.06~1.14)	<.001	1.14 (1.09~1.19)	<.001	1.15 (1.06~1.24)	<.001	1.28 (1.19~1.38)	<.001
	Bad	1.23 (1.16~1.30)	<.001	1.48 (1.39~1.59)	<.001	2.00 (1.81~2.21)	<.001	2.15 (1.94~2.37)	<.001
Perceived happiness	Happiness	1		1		1		1	
	Moderate	1.43 (1.39~1.48)	<.001	1.94 (1.86~2.02)	<.001	1.68 (1.54~1.83)	<.001	1.92 (1.77~2.09)	<.001
	Unhappiness	2.49 (2.36~2.62)	<.001	6.14 (5.79~6.51)	<.001	6.72 (6.11~7.40)	<.001	8.89 (8.08~9.77)	<.001
Perceived stress	Not stressed	1		1		1		1	
	A lot of stress	6.05 (5.74~6.38)	<.001	10.40 (9.46~11.44)	<.001	4.86 (4.26~5.53)	<.001	5.52 (4.78~6.37)	<.001
	Little stress	2.59 (2.46~2.73)	<.001	2.82 (2.56~3.10)	<.001	1.62 (1.42~1.85)	<.001	1.55 (1.34~1.80)	<.001
						F=186.554, $p<.001$			

aOR=adjusted odds ratio; CI=confidence interval.

treatment experience due to violence showed a gradual increase in the risk of depression, SI, SP, and SA (aOR, 8.40; 95% CI, 7.38~9.56).

In mental health characteristics, those who replied that their subjective health status was bad showed a gradual increase in the risk of depression, SI, SP, and SA (aOR, 2.15; 95% CI, 1.94~2.37), compared to those who replied that their subjective health was good. Those who replied that they were unhappy in their subjective happiness showed a gradual increase in the risk of depression, SI, SP, and SA (aOR, 8.89; 95% CI, 8.08~9.77), compared to those who replied they were happy. In stress cognition, those who replied that they received a lot of stress showed a gradual increase in the risk of depression and SI (aOR, 10.40; 95% CI, 9.46~11.44), however, a decrease in the risk of SP (aOR, 4.86; 95% CI, 4.26~5.53) and SA (aOR, 5.52; 95%CI, 4.78~6.37), compared to those who replied that they did not receive stress.

As a result of calculating the F-value to verify the model fit, it was verified to be statistically significant (F=186.554, $p < .001$).

DISCUSSION

Adolescence is a period when adolescents become an adult physically, mentally, and socially, and suffer from identity confusion due to conflicts and wandering according to the surrounding location.

As a result of this study, in the gender of the Home environment related characteristics, female students showed the gradual increase in the risk as they passed through the stages of depression, SI, SP, and SA, compared to male students. Among them, female students showed the risk of suicidal attempt of 2.19 times higher than that of the SA of male students, which supports the results of previous studies [3,8,14,15]

Male and female students have different physical and psychological development levels and different ways of coping with problems, and female students value interpersonal relationships and attachment to others, so when they are faced with a crisis in a relationship with a meaningful person, they are more likely to commit suicide than male students [18]. In particular, it is reported that female students have chronically a higher level of depression during adolescence than male students, and that the level does not decrease even when they are in late adolescence [18], so when developing programs related to suicide prevention, it is necessary to prepare differentiated early intervention methods by gender. In this study in family structure, the students in a broken family without parents or with only siblings showed a gradual increase in the risk of the stages of depression, SI, SP, and SA, compared to those in the healthy family structure consisting of a couple and children, as they passed through the stages. In particular, the risk of SA of students without parents increased by 2.32 times, which was similar to the results of previous studies [19]. In the case of a child head of household, it is thought that the risk of suicide gets higher due to economic difficulties and the loss of the parent support system [20,21].

In addition, in the case of a grandson's family, the risk of SI increased by 1.38 times than nuclear family and extended family that indicating that SI are possible due to the poor family environment, but it is believed that they cannot even SP or SA. However, since there are studies that adolescents in their grandchildren's families increased susceptibility to suicide due to the disconnection of communication due to generation gaps rather than support from their grandparents and the dual stress problem of caring for the family [19], and that the suicide has nothing to do with family structure [22], it is thought that follow-up studies are needed.

In the case of living with parents, those who lived with the mother showed an increase in the risk of depression by 1.06 times, the risk of SI by 1.07 times and SA by 1.14 times, respectively, compared to the case of living with parents. However, the risk of SP of living without parents was lower than the risk of SP of living with parents.The risk of depression, SI and SA could have no significant when it compared to the case of living with parents. It is thought that since the children of single-parent families experience the psychological and emotional problems which require emotional handling, such as sadness or deloss due to the absence of one parent, problems adapting to changes in life, and problems, such as overweight of the role of the parent that should act as a parent [23], the risk of suicidal behavior might increase. In the future, it is considered that research will be needed to compare the risk of suicidal behavior by subdividing a single parent family type into a divorced family, a bereaved family, a single mother, and a single father family.

In the economic status, the students who responded 'High' or 'Low' showed a gradual increase in the risk of the stages of the depression, SI, and SP, compared to those who answered 'Average', however, those who answered 'Low' showed a decrease in the risk of the stage of SP, and those who answered 'High' showed an increase in the risk of SA by 1.46 times. The result of this study was different from the results of previous studies that the lower the economic level, the higher the risk of suicide [24,25], however,

it was similar to the result of study of Lee et al [8], that the risk of suicide is higher in the order of the upper, lower, and middle classes. In the study of Park and Jang [26], in the case of depression and SI, a higher distribution was shown in a low socio-economic group, and in the case of stress, the rate of experience of children in a generation with a high socio-economic level was higher than that of those in other groups, which indicates that the economic status cannot be interpreted merely from a material point of view. That is, since parents' high economic level imposes excessive expectations on adolescents, and adolescents' mental health can be threatened due to inherent conflicts between parents and children [26], it is necessary to analyze the factors affecting suicidal behavior in depth for teenagers with high economic level.

In residence type, those who lived in a relative's house showed an increase in the risk of the stages of SI, and SP by 1.36 times, and 2.34 times respectively, compared to those who lived with family members, however, they showed a little decrease in the risk of the stage of SA by 1.97 times. In the case of living in childcare facilities is no significant difference compared to those who lived with family members. The reason why the case of living in a children's facility showed no significant difference from the case of living with a family is thought to be that it is possible to receive the attention and care of facility officials, and that there is no need to nunchi. This result was similar to the results of previous studies that SI rate was higher in relatives' homes than childcare facilities [27], and was different from the study result of Kim et al. [28], that the risk of the SP and SA of the students who resided in childcare facilities increased the most by 3.23 times and 3.36 times. However, this result is in line with the results of existing studies that the risk of suicidal behavior increases, compared to the case of living with someone other than family members or in an unstable environment. Recently, the number of students who do not live with their parents due to the unemployment or divorce of parents has increased, and due to that, the dysfunction of the family, which is unstable and lacks emotional support, is thought to affect the suicide of adolescents. Therefore, it is necessary to pay special attention and care to them.

Among health behavior characteristics, drinking experience, smoking experience and hospital treatment status due to violence emerged as the influential factors of suicidal behavior, and the risk increased as the stages of depression, SI, SP, and SA progressed. Drinking and smoking experience emerged as the risk factors of depression, SI, SP, and SA, which was similar to the results of previous studies [29,30]. Drinking and smoking, which are typical health behavior problems among adolescents, are known to be caused by a heavy burden on grade, stress due to worry about going to school, and interpersonal problems [26]. In particular, in this study, it was indicated that smoking had a greater impact on SA, which is the result similar to previous studies that reported that smoking had a significant effect on the SI, SP, and SA of adolescents [31,32]. There were the results of previous studies that in the education environment focused on entrance exams, stressful adolescents sometimes often smoke to relieve tension or maintain relationships with their peers, which can lead to other misdemeanors [29]. Alcohol and tobacco are known as a gateway to all drugs [26], so it is necessary to prevent access to these drugs early, and to provide adequate education and active preventive measures. In addition, it is necessary to select and manage students with high frequency of smoking and drinking as a high-risk group, and to find and manage the suicidal behaviors of them early on.

In particular, adolescents who experienced hospital treatment due to violence damage showed a significant increase in the risk as the process of depression SI, SP, and SA proceeded, compared to those who had none, which turned out to be a major risk factor of suicidal behavior. This was similar to the results of previous studies that suicidal behavior could be caused by the damage of school violence [30-32]. Adolescents, the victims of violence, may show psychological problems, internalized symptoms, and externalized problem behaviors due to experience of school violence, and among them, it is thought that depression, psychological problem, may emerge. Considering depression as a predisposing factor in SI, special attention and care should be paid to the adolescents who have been victimized by violence. It was indicated that among the mental health characteristics, subjective health status, subjective happiness, and stress cognition were the influential factors of suicidal behavior. In subjective health status, the students who thought they were unhealthy showed a gradual increase in the risk as they passed through the stages of depression, SI, SP, and SA. This result is similar to the results of previous studies that the risk of suicide increases if the recognition of one's health status is not healthy [8]. In subjective happiness, the students who thought they did not feel happy showed a gradual increase in risk as they passed through the stages of depression, SI, SP, and SA. Among them, the risk of suicidal attempt increased by 8.89 times, which was identified as a major variable affecting suicidal behavior. Therefore, it is thought that the happiness perceived by adolescents can be an important intervention to reduce suicidal behavior. In stress cogni-

tion, in the case of high stress, the risk of SI was the highest at 10.40 times, and, it showed a decrease of 4.86 times in SP, and 5.52 times in SA, however, it was still high. It was similar to the results of previous studies that stress caused by various factors such as study, friendship, and family environment increases the risk of suicide [33]. Adolescents with high stress have a high degree of aggression, feel suicidal impulse, and often choose suicide as a means of extreme expression of stress [34]. The need for stress management and intervention is also urgent, and mental health variables should be examined as important predictors of suicide behavior

In conclusion, it was indicated that the suicidal behavior of adolescents is a combination of Home environment related characteristics, health behavior, and mental health characteristics. Among them, preventive approach to school and domestic violence is important to prevent suicide, and multidimensional interventions to prevent suicide will be needed, since mental health-related factors have a great influence on suicide.

The limitations of this study are as follows. First, as this study is a cross-sectional survey using the KYRBS, there are limitations in explaining various factors affecting the suicidal behavior of Korean adolescents. Second, as the questions about suicidal behavior are sensitive, there are limitations that they may not have been honestly answered. Third, as the questions about depression, SI, SP, and SA are dichotomous (yes, or no), there are limitations in grasping the degree of severity of suicidal behavior.

However, this study is significant in that it integrates and analyzes the 2015-2017 KYRBS data to identify whether or not the Home environment related characteristics, health behavior and mental health characteristics affect the depression, SI, SP, and SA of adolescents, lowers the suicide rate of adolescents by finding the risk factors of suicidal behavior in advance and grasping the factors possible to correct, and presents as basic data for the development of a suicide prevention program for adolescents.

CONCLUSION

This study was conducted to provide basic data for the development of suicidal behavior prevention program by identifying the risk factors of the depression, SI, SP, and SA of adolescents using the KYRBS in three years from 2015 to 2017.

As a result of study, the Home environment related characteristics (gender, family structure, parents' cohabitation, socio-economic status, and residence type), health behavior characteristics (smoking experience, drinking experience, and hospital treatment experience due to violence), and mental health characteristics (subjective health status, subjective happiness, and stress cognition) have an effect on the depression, SI, SP, and SA of Korean adolescents. Through this study, it was identified that suicidal behavior is caused by a combination of health behaviors and mental health characteristics, as well as Home environment related characteristics. In particular, it could be known that subjective happiness and hospital treatment experience status due to violence had a significant impact on suicidal behavior.

Based on the results of this study, it is suggested as follows. First, this study was conducted on the adolescents from 1st grade of middle school to 3rd grade of high school, and didn't include those outside school. Those who are outside school are considered to have additional risk factors in addition to health behaviors and mental health characteristics, and therefore, further studies are needed to identify the factors affecting suicidal behavior. Second, it is thought that studies are needed to subdivide the family structure and compare the risk of suicidal behavior. Third, the studies that analyze the factors affecting suicidal behavior in depth are needed for adolescents with a high economic level. Fourth, it is necessary to have follow-up research from an ecological perspective, including the factors affecting suicidal behavior as a second study of data using three-year complex sample data.

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