

# Impact of emotional state and suicidal intentions on suicide attempts among Korean adolescents with household financial difficulties following the outbreak of COVID-19

## A cross-sectional study

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### Abstract

The recent prolonged coronavirus disease-2019 pandemic has brought an economic crisis to various households, leading to negative mental health such as depression, anxiety, traumatic distress, and suicide risk among adolescents. Adolescents with household financial difficulties due to the coronavirus disease-2019 pandemic show high suicidal tendencies and attempts such as suicidal ideation and plans, their suicidal ideation and plans increase the risk of suicide attempts in South Korea. The purpose of this study was to determine the effects of emotional state and suicidal tendencies on suicide attempts among adolescents with household financial difficulties in early pandemic. This was a secondary data analysis study using statistical data from the 16th (2020) Korea Youth Risk Behavior Web-based Survey. Among 54,948 who participated in the survey, 16,839 (30.6%) adolescents who had household financial difficulties were included in final analysis. Descriptive statistics, chi-squared test, and logistic regression analysis were conducted to analyze data. The strengthening the reporting of observational studies in epidemiology checklist was used for reporting this study. 16,839 adolescents (mean age  $15.68 \pm 1.76$  years; 8709, 51.7% male) who experienced household financial difficulties in the prior year revealed 3 percent (508) had attempted suicide. Suicide attempts differed according to several characteristics and were significantly associated with sex, residence type, drinking experience, depressive mood, perceived happiness, suicidal ideation, and suicide planning. The findings indicate high-risk adolescents with household financial difficulties need a multi-dimensional safety network, suicide screening, and emotional interventions during the pandemic.

**Abbreviations:** COVID-19 = coronavirus disease-2019, KYRBS = Korea youth risk behavior web-based survey.

**Keywords:** adolescent, attempted, COVID-19, mental health, school mental health services, suicidal ideation, suicide

### 1. Introduction

The prolonged coronavirus disease-2019 (COVID-19) pandemic that began in late 2019 led to an economic crisis for many households<sup>[1]</sup> that contributed to adverse mental health conditions such as depression, anxiety, traumatic distress, and suicide risk.<sup>[2]</sup> Under such circumstances, adolescents may suffer from educational, psychological, and social developmental disorders in addition to mental health problems and thus require more attention.<sup>[1]</sup> A previous study revealed that depression, anxiety, and concern increased among adolescents during the COVID-19 pandemic, and they experienced 3 times more extreme suicidal ideation.<sup>[3]</sup> The prevalence of suicide attempts among Korean adolescents in 2020 early pandemic was higher than its expected prevalence in a trend analysis from 2005 to 2020.<sup>[4]</sup>

Adolescents perceive economic risks, new infectious diseases, and crimes as the main anxiety-causing factors in our society, and approximately 48.4% of adolescents reported that their school life was negatively affected by COVID-19.<sup>[5]</sup> Thus, it is necessary to assess adolescent mental health in social, economic, and environmental contexts.

Adolescent mental health is difficult to assess without close observation,<sup>[6]</sup> but it has been shown that COVID-19-related quarantine measures, which limited school activities and many aspects of daily life, caused various mental health problems in this population.<sup>[7]</sup> For example, reduced daily activities can aggravate depression in adolescents who are typically physically active.<sup>[8]</sup> In addition, adolescents with social and economic difficulties experienced more stress

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The data that support the findings of this study are available from a third party, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are available from the authors upon reasonable request and with permission of the third party.

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related to poor academic achievement or reduced access to classmates.<sup>[9]</sup> Economic crises caused by COVID-19 not only increased existing social inequality<sup>[10]</sup> but also affected their parent's attitudes toward parenting and their marital relationships. These effects weaken family function and, in turn, lead to severe social anxiety and emotional depression for adolescents.<sup>[10]</sup> Adolescents with low socioeconomic status were highly unlikely to be able to obtain medical information during the COVID-19 pandemic, further increasing their depression and anxiety.<sup>[11]</sup> Among 570 adolescents aged 13 to 18 in Korea, 14.2% and 11.2% had depression and anxiety during the COVID-19 pandemic.<sup>[12]</sup> In addition, among students in grades 9 to 12 (N = 7705) in the United States, 44.2% experienced persistent feelings of sadness or hopelessness, 19.9% had seriously considered attempting suicide, and 9.0% had attempted suicide during the COVID-19 pandemic.<sup>[13]</sup> For many adolescents during the pandemic, mental health was affected by social isolation, school closures, fear of family loss or illness, family economic hardship, and reduced access to health care because of inadequate insurance coverage.<sup>[14]</sup> However, adolescents without financial difficulties at home are highly likely to be able to access medical care after suicide attempts, even if they are impacted by the same predictors. Therefore, it is necessary to actively search for causes of suicidal behavior among adolescents with financial difficulties at home. Adolescents with low socioeconomic status were highly unlikely to be able to obtain medical information during the COVID-19 pandemic, further increasing their depression and anxiety,<sup>[11]</sup> as fear of COVID-19 was shown to cause adolescents to experience indirect psychological trauma.<sup>[15]</sup>

Furthermore, adolescence is when individuals establish their self-esteem, and stress from the negative emotions of guilt or having a guilty conscience can cause extreme emotional conflicts and can contribute to suicide.<sup>[16]</sup> In fact, adolescents from households with financial difficulties due to the COVID-19 pandemic reportedly had higher suicidal tendencies, such as having suicidal ideation and plans,<sup>[17]</sup> which increase their risk for attempting suicide in South Korea.<sup>[10]</sup> These findings suggest that the emotional state and suicidal tendencies of adolescents with household financial difficulties due to the COVID-19 pandemic may be key factors affecting their suicide attempts.

Therefore, we assessed the emotional state, suicidal tendencies, and suicide attempts in adolescents with household financial difficulties due to COVID-19 and identify factors affecting suicide attempts during the early COVID-19 pandemic. The effects of these factors on suicide attempts were empirically verified to determine ways to minimize mental health problems due to COVID-19, contribute to the prevention of suicide attempts, and improve the quality of life of adolescents. to provide basic data for the development of adolescent suicide prevention programs.

### 1.1. Research questions and hypotheses

The current study was guided by 2 purposes. The first aim of this study was to assess differences in suicide attempts according to the general characteristics, emotional state, and suicidal tendencies of adolescents with household financial difficulties due to COVID-19. It was hypothesized there are significant differences in suicide attempts depending on the general characteristics, emotional state, and suicidal tendencies of the participants. The second aim was to identify factors affecting suicide attempts to provide basic data for the development of adolescent suicide prevention programs. We anticipated that the general characteristics, emotional state, and suicidal tendencies of adolescents with household financial difficulties due to the COVID-19 pandemic would be statistically significant factors affecting their suicide attempts.

## 2. Materials and methods

### 2.1. Research design

We conducted a secondary data analysis using statistical data from the 16th (2020) Korea Youth Risk Behavior Web-based Survey (KYRBS) to evaluate the effects of emotional states and suicidal tendencies of adolescents with household financial difficulties due to COVID-19 on suicide attempts.

### 2.2. Participants

KYRBS is an annual self-reported online survey of first-year middle school to third-year high school students in Korea to understand the health behaviors of Korean adolescents using 93 indicators in 15 areas, including smoking, alcohol consumption, obesity, diet, and physical activity.<sup>[18]</sup> For the 2020 edition of the annual survey, a total of 17 cities and provinces in Korea were recruited using 39 regional groups and school types (middle schools, general high schools, and specialized [special-purposed] high schools) as the primary stratification variable. Secondary sampling was conducted using a sample class, and all students included in the sample class were selected for the study.<sup>[18]</sup> There was a total of 57,925 students at the 793 schools (398 middle schools and 395 high schools) selected for the survey, but 2977 students were excluded due to either long-term absences, special disabilities, or reading disabilities. Thus, a total of 54,948 students participated in the 2020 survey, and the final participation rate was 94.9%. For the present study, our final analysis included those whose survey responses indicated that they had household financial difficulties due to COVID-19, a total of 16,839 (30.6%) of the 2020 Health Behavior Survey respondents.

### 2.3. Research instruments

**2.3.1. General characteristics.** A total of 10 items on general characteristics were included: age, sex, grade, academic achievement, subjective health status, subjective economic status, economic support status, sleep satisfaction, residence type, and drinking experience. Regarding sex, the survey only offers the response options “man” or “woman” (no non-binary options were provided).

**2.3.2. Emotional state.** “Emotional state” included perceived stress, depressive mood (sadness/desperation), loneliness, generalized anxiety disorder, and perceived happiness. Stress was assessed with the question using “How much stress do you usually feel?” We condensed the answers into 3 categories: *high stress* (for responses “I feel it very much” and “I feel it a lot”), *a little stress* (for “I feel it a little”), and *low/rare stress* (for “I do not feel it very much” and “I do not feel it at all”).

“Depressive mood” (sadness/desperation) was assessed using a dichotomous item on the experience of sadness or hopelessness leading to the cessation of daily activities for 2 weeks over the past 12 months (*yes* or *no*). Loneliness was evaluated by the frequency of feelings of loneliness over the past 12 months, and the responses were condensed into 3 categories: *rarely felt lonely* (for responses “not lonely at all,” “rarely felt lonely”), *a little lonely* (for “sometimes I felt lonely”), and *lonely* (for “I often felt lonely” or “I always felt lonely”).

“Generalized anxiety disorder” was assessed according to 7 indicators of anxiety. The response options were based on how often the participant experienced each of the indicators. We condensed the responses for each of the 7 indicator items to a scale from 0 to 3 points (from 0 = *not at all* to 3 = *almost every day*). Thus, the highest possible total score for anxiety was 21 points based on the overall degree to which they are hampered by anxiety, with *none/normal anxiety* indicated by 0–4 total points, *light/mild anxiety* for 5–9 total points, *moderate*

**Table 1**  
**Differences in suicide attempts by general characteristics (N = 16,839).**

Variables	Categories	n (%) or M ± SD	Suicide attempts		$\chi^2$ (P)
			No 16,331 (97.0%)	Yes 508 (3.0%)	
			n (%)	n (%)	
Age (yr)		15.20 ± 1.76			
Sex	Male	8709 (51.7)	8539 (98.0)	170 (2.0)	69.90 (<.001)
	Female	8130 (48.3)	7792 (95.8)	338 (4.2)	
Grade	Middle school	8505 (50.5)	8249 (97.0)	256 (3.0)	0.00 (.958)
	High school	8334 (49.5)	8082 (97.0)	252 (3.0)	
Academic achievement	High	1706 (10.2)	1673 (97.5)	43 (2.5)	77.22 (<.001)
	Middle	13,041 (77.4)	12,703 (97.4)	338 (2.6)	
	Low	2082 (12.4)	1955 (93.9)	127 (6.1)	
Subjective health status	Healthy	11,184 (66.4)	10,967 (98.1)	217 (1.9)	194.31 (<.001)
	Middle	4040 (24.0)	3878 (96.0)	162 (4.0)	
	Poor	1615 (9.6)	1486 (92.0)	129 (8.0)	
Subjective economic status	High	1088 (6.5)	1054 (96.9)	34 (3.1)	63.52 (<.001)
	Middle	14,963 (88.9)	14,550 (97.2)	413 (2.8)	
	Low	788 (4.6)	727 (92.3)	61 (7.7)	
Economic support status	Yes	2721 (16.2)	2599 (95.5)	122 (4.5)	23.87 (<.001)
	No	14,118 (83.8)	13,732 (97.3)	386 (2.7)	
Sleep satisfaction	Enough	4575 (27.1)	4506 (98.5)	69 (1.5)	115.47 (<.001)
	Mild	5702 (33.9)	5575 (97.8)	127 (2.2)	
	Deprived	6562 (39.0)	6250 (95.2)	312 (4.8)	
Residence type	Living with families	15,854 (94.2)	15,406 (97.2)	448 (2.8)	122.95 (<.001)
	Living with relatives	116 (0.7)	102 (87.9)	14 (12.1)	
	Living with friends	114 (0.6)	103 (90.4)	11 (9.6)	
	In a dormitory	678 (4.0)	658 (97.1)	20 (2.9)	
	In a foster home	77 (0.5)	62 (80.5)	15 (19.5)	
Drinking experience	Yes	6304 (37.4)	5998 (95.1)	306 (4.9)	116.25 (<.001)
	No	10,535 (62.6)	10,333 (98.1)	202 (1.9)	

M = mean, SD = standard deviation.

*anxiety* for 10–14 total points, and *severe anxiety* for 15–21 total points.

“Perceived happiness” was assessed using an item on the perceived usual level of happiness. The responses were categorized as *happy* (for “very happy” or “a bit happy”), *moderately happy* (for “usually happy”), and *unhappy* (for “a little bit unhappy” or “very unhappy”).

**2.3.3. Suicidal tendency.** “Suicidal tendency” consisted of suicidal ideation and plans. Suicidal ideation and planning were evaluated using dichotomous items asking if the respondent had serious ideation of suicide and detailed suicide plans in the past 12 months, respectively. Response options were *yes* or *no*.

**2.3.4. Suicide Attempts.** “Suicide Attempts” was assessed using dichotomous items asking whether the respondent had seriously thought of suicide in the last 12 months and whether they had made specific plans to commit suicide in the last 12 months. Response options were *yes* or *no*.

## 2.4. Ethical considerations

The KYRBS is an approved statistical survey (approval number 117058) conducted annually based on the National Health Promotion Act (Article 19). Since 2015, the survey has been conducted without deliberation based on the enforcement regulations of the Bioethics and Safety Act. All data processing steps and methods in this study complied with the regulations on disclosure and the use of raw data of the KYRBS. Since this study uses information open to the general public and does not collect or record personal identification information on the participants, it was approved for research exemption from deliberation by the Institutional Review Board of Konyang University (no. KYU 2021-07-014).

## 2.5. Data analysis

We used the SPSS 26.0 program (SPSS Inc, Chicago, IL) to analyze the collected data. General characteristics, emotional state, suicidal tendencies, and suicide attempts by frequency, percentage, mean, and standard deviation. We conducted a chi-square test to evaluate differences in suicide attempts according to general characteristics, emotional state, and suicidal tendencies and hierarchical logistic regression analysis (odds ratio, 95% confidence interval [CI]) to assess the effects on suicide attempts.<sup>[19,20]</sup> A 2-sided *P* value less than .05 was considered significance.

## 3. Results

### 3.1. General characteristics, emotional state, suicidal tendencies, and suicide attempts of study participants

Participants’ general characteristics are shown in detail in Table 1. The mean age of the participants was 15.68 ± 1.76 years, and 8709 (51.7%) male students and 8130 (48.3%) female students were included in the study. Among the participants, 8505 (50.5%) and 8334 (49.5%) were middle and high school students, respectively. A total of 1706 (10.2%), 13,041 (77.4%), and 2082 (12.4%) participants had “high,” “middle,” and “low” academic achievement, respectively. Subjective health status was “healthy,” “middle,” and “poor” in 11,184 (66.4%), 4040 (24.0%), and 1615 (9.6%) participants, respectively. Among the participants, 1088 (6.5%), 14,963 (88.9%), and 788 (4.6%) had “high,” “middle,” and “low” subjective economic status, respectively, and 2721 (16.2%) responded that they had received economic support status in the last 12 months. A total of 4575 (27.1%) participants had enough sleep satisfaction to recover from fatigue in the last 7 days. In contrast, 5702 (33.9%) and 6562 (39.0%) had mild and deprived amounts of sleep, respectively. Most of the participants lived

with their families (15,854 participants, 94.2%), followed by those who lived in a dormitory (678 participants, 4.0%), with relatives (116 participants, 0.7%), with friends (114 participants, 0.6%), or in a foster home (77 participants, 0.5%). There were 5230 (31.1%) participants who reported experience drinking alcohol.

A total of 7229 (42.9%), 6743 (40.0%), and 2867 (17.1%) participants felt “a little stress,” “high stress,” and “low stress,” respectively in Table 2. In the past 12 months, 5230 (31.1%) participants had experienced depressive mood, while 11,609 (68.9%) had not. Additionally, 7376 (43.8%), 6366 (37.8%), and 3097 (18.4%) participants responded that they “rarely felt lonely,” were “a little lonely,” and were often or always “lonely,” respectively. More than half of the participants did not have generalized anxiety (10,162, 60.3%); 4203 (25.0%), 1662 (9.9%), and 812 (4.8%) participants had responses indicating they had mild, moderate, and severe generalized anxiety, respectively. For perceived happiness, more than half of the participants (9858, 58.6%) expressed they were mostly happy, followed by 5004 (29.7%) and 1977 (11.7%) participants expressing that they were moderately happy and unhappy, respectively. A total of 2385 (14.2%) students reportedly had suicidal ideation in the last 12 months. Additionally, 825 (4.9%) had a suicide plan, and 508 (3.0%) had attempted suicide (Table 2).

### 3.2. Differences in suicide attempts according to the general characteristics, emotional state, and suicidal tendencies of the participants

There were differences in suicide attempts according to sex (*male* or *female* options only), academic achievement, subjective health status, subjective economic status, economic support status, sleep, residence type, and drinking experience (Table 1). Female students (4.2%) and those with “low” academic achievement (44.9%) had significantly higher suicide attempts than male students (2.2%) ( $\chi^2 = 69.90, P < .001$ ) and those with “high” (2.5%) and “middle” (2.6%) academic achievement ( $\chi^2 = 77.22, P < .001$ ), respectively. Suicide

attempt was higher in those with “poor” subjective health status (129 participants, 8.0%) than in those with “high” (217 participants, 1.9%) and “middle” (162 participants, 4.0%) subjective health status ( $\chi^2 = 194.31, P < .001$ ). Those with “low” subjective economic status (61 participants, 7.7%) had more suicide attempts than those with “high” (34 participants, 3.1%) and “middle” (413 participants, 2.8%) subjective economic status ( $\chi^2 = 63.52, P < .001$ ). Approximately 4.5% (122 participants) of the participants who had received economic support in the last 12 months responded that they had made suicide attempts. The rate of “suicide attempts” was higher among participants who had economic support than those who did not have economic support (386 participants, 2.7%) ( $\chi^2 = 23.87, P < .001$ ). About 4.8% (312) of those participants who did not have enough sleep to recover from fatigue in the last 7 days had attempted suicide. This percentage was higher than in those with moderate (127 participants, 2.2%) and enough (69 participants, 1.5%) sleep ( $\chi^2 = 115.47, P < .001$ ). Among those who lived in foster homes, 19.5% (15 participants) responded that they attempted suicide while 12.1% (14 participants) of those who lived with “other” relatives reported suicide attempts. The rate of attempted suicide was higher in those 2 groups than in those who lived with friends (9.6%), in a dormitory (2.9%), and with families (2.8%) ( $\chi^2 = 122.95, P < .001$ ). In addition, the rate of attempted suicide was higher in those with experience drinking alcohol (306 participants, 4.9%) than in those who did not (202 participants, 1.9%) ( $\chi^2 = 116.25, P < .001$ ).

There were significant differences in suicide attempts of the participants according to emotional state including perceived stress, depressive mood (sadness/desperation), loneliness, generalized anxiety disorder, and perceived happiness (Table 2). The rate of suicide attempt was higher in those who were “high stressed” (5.9%) than in those who were “a little stressed” (1.3%) and “low/rare stressed” (0.6%) ( $\chi^2 = 322.99, P < .001$ ). The rate of suicide attempt was significantly higher in those with depressive mood (8.2%) than in those without ( $\chi^2 = 685.06, P < .001$ ) and also significantly higher in those who were “lonely” (9.9%) than in those who were “a little lonely”

**Table 2**

**Differences in suicide attempts by emotional state and suicidal tendencies of participants (N = 16,839).**

Variables	Categories	n (%)	Suicide attempts		$\chi^2$ (P)
			No (n = 16,331, 97.0%)	Yes (n = 508, 3.0%)	
			n (%)	n (%)	
Emotional state					
Perceived stress	High stress	6743 (40.0)	6345 (94.1)	398 (5.9)	322.99 (<.001)
	A little stress	7229 (42.9)	7137 (98.7)	92 (1.3)	
	Low/rare stress	2867 (17.1)	2849 (99.4)	18 (0.6)	
Depressive mood	Yes	5230 (31.1)	4803 (91.8)	427 (8.2)	685.06 (<.001)
	No	11,609 (68.9)	11,528 (99.3)	81 (0.7)	
Loneliness	Lonely	3097 (18.4)	2789 (90.1)	308 (9.9)	655.51 (<.001)
	A little lonely	6366 (37.8)	6216 (97.6)	150 (2.4)	
	Rarely felt lonely	7376 (43.8)	7326 (99.3)	50 (0.7)	
Generalized anxiety disorder	None/normal (0–4)	10,162 (60.3)	10,066 (99.1)	96 (0.9)	1028.45 (<.001)
	Light/mild (5–9)	4203 (25.0)	4070 (96.8)	133 (3.2)	
	Moderate (10–14)	1662 (9.9)	1544 (92.9)	118 (7.1)	
	Severe (15–21)	812 (4.8)	651 (80.2)	161 (19.8)	
Perceived happiness	Happy	9858 (58.6)	9765 (99.1)	93 (0.9)	832.12 (<.001)
	Moderately happy	5004 (29.7)	4848 (96.9)	156 (3.1)	
	Unhappy	1977 (11.7)	1718 (86.9)	259 (13.1)	
Suicidal tendencies					
Suicidal ideation	Yes	2385 (14.2)	1934 (81.5)	442 (18.5)	2286.20 (<.001)
	No	14,454 (85.8)	14,388 (99.5)	66 (0.5)	
Suicidal plan	Yes	825 (4.9)	516 (62.5)	309 (37.5)	3516.38 (<.001)
	No	16,014 (95.1)	15,815 (98.8)	199 (1.2)	



**Table 3**  
**Influencing factors of suicide attempts among Korean adolescents with household financial difficulties caused by COVID-19 (N = 16,839).**

Variables	Categories	Model 1			Model 2			Model 3			
		OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	
General characteristics	Age	0.89	0.81–0.99	.023	0.90	0.81–0.99	.033	0.91	0.81–1.01	.085	
	Sex										
		Female	2.06	1.69–2.51	<.001	1.38	1.12–1.70	.003	1.33	1.05–1.68	.016
		Male*									
	Grade										
		High school	0.90	0.65–1.27	.553	0.97	0.68–1.38	.852	1.12	0.75–1.65	.582
		Middle school*									
	Academic achievement										
		Middle	1.03	1.03–0.73	.861	0.91	0.63–1.30	.599	1.03	0.69–1.54	.887
		Low	1.88	1.88–1.29	.001	1.20	0.80–1.80	.385	1.31	0.83–2.06	.251
		High*									
	Subjective health status										
		Middle	1.75	1.42–2.17	<.001	1.09	0.87–1.37	.470	1.20	0.93–1.55	.163
		Poor	2.92	2.29–3.72	<.001	1.14	0.87–1.49	.334	0.95	0.70–1.29	.774
		Healthy*									
	Subjective economic status										
		Middle	0.78	0.52–1.16	.213	0.70	0.45–1.07	.100	0.74	0.45–1.21	.229
		Low	1.32	0.80–2.17	.272	0.85	0.50–1.44	.544	0.89	0.48–1.62	.696
		High*									
Economic support status											
	Yes	1.16	1.16–0.92	.209	1.04	0.82–1.33	.737	1.00	0.76–1.32	.994	
	No*										
Sleep satisfaction											
	Mild	1.28	1.28–0.94	.111	0.87	0.63–1.20	.392	0.88	0.62–1.26	.489	
	Enough*	2.24	2.24–1.69	<.001	0.94	0.70–1.27	.705	0.94	0.68–1.32	.734	
Residence type											
	Living with relatives	4.22	2.27–7.83	<.001	5.28	2.64–10.54	<.001	5.34	2.40–11.89	<.001	
	Living with families*										
	Living with friends	2.60	1.21–5.60	.015	2.24	0.99–5.07	.053	2.35	0.91–6.04	.076	
	In a dormitory	1.22	0.76–1.95	.412	1.27	0.78–2.07	.343	1.82	0.69–2.04	.547	
	In a foster home	4.27	2.01–9.08	<.001	3.89	1.69–8.92	.001	3.24	1.21–8.71	.020	
Drinking experience											
	Yes	2.57	2.12–3.12	<.001	4.64	3.51–6.15	<.001	1.67	1.33–2.09	<.001	
	No*										
Emotional state	Perceived stress										
		A little stress			0.92	0.70–1.20	.530	1.19	0.88–1.60	.254	
		High stress*			0.87	0.48–1.55	.626	1.03	0.55–1.93	.956	
	Depressive mood										
		Yes			4.64	3.51–6.15	<.001	3.16	2.34–1.78	<.001	
		No*									
	Loneliness										
		A little lonely			1.52	1.07–2.16	.019	1.36	0.93–1.97	.113	
		Rarely felt lonely*			2.11	1.47–3.03	<.001	1.39	0.94–2.05	.098	
	Generalized anxiety disorder										
		Mild			1.33	0.99–1.81	.061	0.96	0.72–1.39	.976	
	Moderate			1.65	1.18–2.31	.003	0.94	0.65–1.36	.756		
	Not at all*			3.43	2.42–4.87	<.001	1.46	0.99–2.15	.059		
Perceived happiness											
	Moderately happy			1.84	1.38–2.44	<.001	1.49	1.09–2.02	.012		
	Unhappy			3.48	2.56–4.72	<.001	1.99	1.42–2.78	<.001		
	Happy*										
Suicidal tendencies	Suicidal ideation										
		Yes						9.98	7.15–13.93	<.001	
	No*										
	Suicidal plan										
	Yes							7.08	5.60–8.95	<.001	
	No*										

CI = confidence interval, OR = odds ratio.

\*Reference group.

(2.4%) and “rarely felt lonely” (0.7%) ( $\chi^2 = 655.51, P < .001$ ). Participants who had severe generalized anxiety disorder had a higher rate of suicide attempt (19.8%) than those who had moderate (7.1%) and light/mild (3.2%) anxiety disorder and those without (0.9%) ( $\chi^2 = 1028.45, P < .001$ ). Additionally, the rate of suicide attempt was higher in those who were “unhappy” (13.1%) than in those who were “happy” (0.9%) and “moderately happy” (3.1%) ( $\chi^2 = 832.12, P < .001$ ). Those with suicidal ideation (18.5%) and plans (37.5%) also had a higher rate of suicide attempt than those without suicidal ideation (0.5%) and plans (1.2%), respectively ( $\chi^2 = 3516.38, P < .001$ ).

### 3.3. Factors affecting suicide attempt

Table 3 shows the results of hierarchical logistic regression analysis to identify factors that affect suicide attempts of the study participants. In model 1, in which general characteristics were treated as independent variables, age, sex, academic achievement, subjective health status, sleep, residence type, and drinking experience had significant effects on suicide attempts. Younger age, female students, low academic achievement, poor subjective health status; insufficient sleep; living with relatives, friends, or in a foster home; and drinking alcohol were more likely to attempt suicide. Nagelkerke’s  $R^2$  or coefficient of determination ( $R^2$ ) of model 1 showed these factors had an explanatory power of 12%.

In Model 2, emotional state variables were treated as additional independent variables, and as a result, age, sex, residence type, drinking experience, depressive mood, loneliness, generalized anxiety disorder, and perceived happiness were factors with significant effects on suicide attempt. Age increased the odds of suicide attempt by 0.90 times. Female students were 1.38 times (95% CI: 1.12–1.70) more likely to attempt suicide than male students, and those who lived with relatives or in a foster home were 5.28 times (95% CI: 2.64–10.54) and 3.89 times (95% CI: 1.69–8.92) more likely to attempt suicide than those who lived with their families, respectively. Drinking experience increased the odds for suicide attempt by 4.64 times (95% CI: 3.51–6.15). Furthermore, depressive mood (sadness/desperation) increased the odds for suicide attempt by 4.64 times (95% CI: 3.51–6.15), and those who were “lonely” and “a little lonely” were 1.52 (95% CI: 1.07–2.16) and 2.11 (95% CI: 1.47–3.03) times more likely to attempt suicide, respectively, than those who were not lonely. Students with moderate and severe generalized anxiety had 1.65 (95% CI: 1.18–2.31) and 3.43 (95% CI: 2.42–4.87) times higher odds of suicide attempts, respectively, than those without any anxiety disorder. “Unhappy” and “moderate” perceived happiness increased the likelihood of suicide attempts by 3.48 (95% CI: 2.56–4.72) and 1.84 (95% CI: 1.38–2.44) times, respectively, compared to “happy” perceived happiness. Nagelkerke’s  $R^2$  of Model 2 was 0.28%.

Model 3, the final model, included general characteristics, emotional state, and suicidal tendencies as independent variables. Sex, residence type, drinking experience, depressive mood, perceived happiness, suicidal ideation, and suicidal plan were significant factors affecting suicide attempts. Female students were 1.33 (95% CI: 1.05–1.68) times more likely to attempt suicide than male students, and those who lived with relatives or in a foster home had 5.34 (95% CI: 2.40–11.89) and 3.24 (95% CI: 1.21–8.71) times higher odds of suicide attempt, respectively, than those who lived families. Those with drinking experience were also 1.67 (95% CI: 1.33–2.09) times more likely to attempt suicide than those without. The odds of suicide attempt were 3.16 (95% CI: 2.34–1.78) times higher in those with depressive mood than others. In addition, those with “unhappy” and “moderate” perceived happiness were 1.99 (95% CI: 1.42–2.78) and 1.49 (95% CI: 1.09–2.02) times more likely to attempt suicide, respectively, than those with “happy” perceived happiness. Those with suicidal ideation had 9.98 (95% CI: 7.15–13.93) times more odds to attempt suicide than those without suicidal ideation, while those with suicidal plans had 7.08 (95% CI: 5.60–8.95) times higher likelihood of attempting suicide compared to those without plans. Nagelkerke’s  $R^2$  of model 3 was 47%, indicating a significantly higher explanatory power of model 3 than model 1 or model 2. Hosmer–Lemeshow Goodness-of-Fit test showed a significance level of above 0.05 (Model 1:  $P = .128$ , Model 2:  $P = .068$ , Model 3:  $P = .155$ ), suggesting that the regression models of this study were suitable.

#### 4. Discussion

The COVID-19 pandemic has led to growing concerns about various mental health problems caused by rapid household financial difficulties. In particular, adolescents with household financial difficulties are more likely to develop mental health problems due to potential risk factors such as emotional vulnerability. Therefore, this study assessed the effects of emotional state and suicidal tendencies on suicide attempts in adolescents with household financial difficulties, and the following results were observed.

In our study, 42.9% of the participants felt “a little stress,” while approximately 40.0% of the participants felt “high stress,” suggesting that four out of 10 middle and high school students had experienced a substantial amount of stress. Consistent with our findings, a previous study also reported that adolescents

with household financial difficulties had higher stress levels than those without household financial difficulties.<sup>[17]</sup> Therefore, future studies are needed to perform in-depth explorations of social and situational characteristics and mental health affecting stress in adolescents with household financial difficulties due to COVID-19.

Approximately 31.1% of the participants in this study had experienced depressive moods or loneliness in the last 12 months. Specifically, 56.2% of the participants felt “lonely” or “a little lonely” while 4.8% and 11.7% had severe generalized anxiety and felt “unhappy,” respectively. These statistics suggest that emotional crisis intervention is urgently needed for adolescents during the COVID-19 pandemic. Stress is a factor that can increase the risk of suicidal ideation, plan, and attempts.<sup>[10]</sup> Therefore, it is necessary to establish a professional counseling system in schools and further build a network of community expert groups for early detection of those adolescents who require emotional help during the COVID-19 pandemic. On the other hand, 58.6%, in other words, more than half of the participants, responded that they perceived themselves as “happy.” A detailed assessment of factors that can affect the happiness of adolescents may also help support students in maintaining positive mental health during the COVID-19 pandemic.

In the last 12 months, 14.2%, 4.9%, and 3.0% of adolescents with household financial difficulties had suicidal ideation, plans, and attempts, respectively. It is consistent with the results of previous study that economic deterioration after COVID-19 was significantly related to suicidal behavior.<sup>[21]</sup> According to the 2020 KYRBS statistical data,<sup>[18]</sup> 10.9% of middle and high school students had suicidal ideation in the last 12 months, 3.6% had suicidal plans, and 2.0% had attempted suicide. Compared to other surveys conducted simultaneously using the same method, suicide risk indicators were higher in adolescents with household financial difficulties than for other students in general middle schools and high schools. Similarly, previous studies have shown that unemployment or reduced income due to COVID-19 increased negative psychological effects such as suicidal tendencies and attempts<sup>[21]</sup>; they also reported that the happiness of children and adolescents in low-income households with economic difficulties was significantly lower than in those without changes in economic status.<sup>[22]</sup> In particular, female students in relatively unstable family situations, such as single-parent and grandchild families, tend to experience increased economic difficulties during the COVID-19 pandemic.<sup>[17]</sup> Therefore, a multi-dimensional safety network should be established to support the provision of social, economic, and health care for families with financial difficulties and limited access to mental health care. Reduced access to mental care services during the COVID-19 is another factor that hinders overcoming the psychological impact of COVID-19.<sup>[22]</sup> Active screening tests must be conducted for mental health crisis management groups. Moreover, community mental health teams centered on school nurses must provide mental health interventions for suicidal prevention considering the correlation between suicidal tendencies and attempt indicators in adolescents. In particular, active interventions must be prepared to prevent suicidal tendencies leading to suicide attempts in adolescents with household financial difficulties.

Suicide attempts varied according to sex, academic achievement, subjective health status, subjective economic status, economic support status, sleep satisfaction, residence type, and drinking experience. Those with low academic achievement, economic level, and health level, who lived with relatives or in a foster home, had drinking experiences, and were deprived of sleep had higher suicide attempt rates. This finding is in an agreement with a previous study which showed that suicide attempts were higher in female students, those who lived in foster homes and had increased number of health-risk behaviors such as smoking, drinking, drug use, violence, risky behavior, and excessive Internet use.<sup>[10]</sup> In particular, the rate of suicide

attempt was higher in female students who received economic support in the last 12 months due to COVID-19. Also, adolescents who perceive themselves as having lower household socioeconomic levels have more negative mental health outcomes, and social withdrawal has partial mediating effects in the relationship between socioeconomic level and negative mental health.<sup>[23]</sup> Therefore, social interventions may be necessary, rather than emotional interventions, to improve the relative feeling of loss in adolescents with household financial difficulties due to COVID-19. Additionally, health behavior improvement programs for proper sleep and drinking must be included in school-based health care support projects linked with local community health center in order to reduce the rate of suicide attempt in adolescents with household financial difficulties due to COVID-19. An economic support program with early screening of high-risk adolescents and increased accessibility would be effective in preventing suicide attempts.

All of perceived stress, depressive mood, loneliness, generalized anxiety disorder, perceived happiness, suicidal ideation, and suicidal plans were factors related to suicide attempt. Those with high level of perceived stress, depressive mood, loneliness, anxiety, low perceived happiness, suicidal ideation, and suicidal plans had high rates of suicide attempt. In general, emotional states such as stress, depressive mood, and anxiety are factors related to psychiatric crisis and are significantly correlated with suicidal risk.<sup>[2]</sup> In our study, suicidal ideation and plans led to suicide attempts in 2.0% and 4.0% of male and female adolescents with household financial difficulties due to COVID-19, respectively. Further studies are needed to evaluate emotional states that are closely related to suicide attempts of female students with household financial difficulties due to COVID-19.

In the final model of hierarchical logistic regression analysis, sex, residence type, drinking experience, depressive mood, perceived happiness, suicidal ideation, and suicidal plan were factors with significant effects on “suicide attempt.” Model 3 had higher explanatory power than models 1 and 2. When “emotional state” was included as independent variables, academic achievement, subjective health status, and sleep satisfaction no longer had significant effects on “suicide attempt,” indicating that emotional interventions for depressive mood, loneliness, generalized anxiety disorder, and perceived happiness are necessary to prevent suicide attempts in adolescents with household financial difficulties due to COVID-19. Home quarantine due to the COVID-19 pandemic may cause mental health problems in adolescents; however, open communication between the parents and children can lead to resilience.<sup>[24]</sup> Thus, the parents must be encouraged to function as the primary emotional support of their children at home. When suicidal tendency was included as an independent variable, age, loneliness, and generalized anxiety disorder did not have significant effects on suicide attempt. This finding is consistent with that of a previous study in which suicidal ideation increased the risk of suicidal plans by 50.66 times, and suicidal plans increased the risk of suicide attempts by 23.86 times in adolescents.<sup>[10]</sup> These findings, along with the results of our study, indicate the importance of early interventions to prevent the effects of suicidal tendencies on “suicide attempt.” Suicide attempts cannot be prevented through only the effort of family members in adolescents with household financial difficulties due to COVID-19. Thus, it is important to understand their suicidal tendencies in socio-cultural aspects, and active and specific screening tests and factual surveys must be conducted for the early detection of suicidal tendencies.

This study is meaningful as it showed the effects of emotional states and suicidal tendencies on adolescents’ suicide attempts for those in households with financial difficulties after the onset of the COVID-19 pandemic. The early pandemic of 2020 was a period of strong social distancing, which brought many changes to people’s daily lives. Therefore, it is necessary to identify the impact of the early life changes of the new infectious disease on the mental health of adolescents.

However, there are some limitations. As this was a cross-sectional study, it is difficult to understand changes in the participants in response to changes in the COVID-19 pandemic. In addition, suicidal ideation and attempts may arise from various causes before the COVID-19 pandemic other than household financial difficulties. In our study, such other variables were not controlled. However, COVID-19 may further aggregate the mental health of adolescents with poor mental health before the pandemic.<sup>[25]</sup> Thus, an in-depth analysis is needed to correctly identify the adolescents with high suicidal tendencies and suicide attempts whose households have financial difficulties specifically caused by COVID-19. These studies may provide empirical evidence to estimate the complex factors affecting suicide attempts of economically vulnerable adolescents as the COVID-19 pandemic continues as a long-term situation.

## 5. Conclusion

The purpose of this study was to assess the emotional state and series of suicidal tendencies from suicidal ideation to plans and identify factors affecting suicide attempts in adolescents with household financial difficulties. In the 16th (2020) 16th KYRBS, 30.6% of adolescents (3 out of 10 middle and high school students) experienced household financial difficulties due to COVID-19. Among these adolescents, approximately 3.0% had attempted suicide in the last 12 months. Regression analysis showed that sex, residence type, drinking experience, depressive mood, perceived happiness, suicidal ideation, and suicidal plans were factors affecting suicide attempts in adolescents with household financial difficulties. During the COVID-19 pandemic, screening programs for high-suicidal risk groups among vulnerable adolescents and emotional interventions for suicide prevention are required. In particular, a multi-dimensional safety network for social, economic, and health care support is needed for adolescents with household financial difficulties. Moreover, community mental health teams centered on school nurses must provide mental health interventions for suicidal prevention in the COVID-19 pandemic situation considering the correlation between suicidal tendencies and attempt indicators in adolescents. In particular, active interventions must be prepared to prevent suicidal tendencies leading to suicide attempts among adolescents with household financial difficulties.

## Author contributions

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