



Correlations between suicide rates and the prevalence of suicide risk factors among Korean adolescents

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KYRBS, Youth Risk Behavior Web-based Survey

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ABSTRACT

We examined whether annual changes in the prevalence of suicide risk factors are related to annual changes in suicide rates among male and female adolescents in South Korea. Data from the Korean Youth Risk Behavior Web-based Survey (2005–2015) were used to obtain the annual prevalence of psychological and health-related risk factors among Korean adolescents. Mortality data from the Korean National Statistical Office (NSO) were used to obtain annual suicide rates among Korean adolescents aged 15–19 years. For male adolescents, there were significant positive correlations between suicide rate and the rate of depressive mood, suicidal ideation, suicide attempt, drinking, and smoking and negative correlations between suicide rate and the rate of self-perceived healthiness, obesity, and being physically active. For female adolescents, suicide rates were positively correlated with rate of being sexually active and negatively correlated with rate of obesity. Overall, our study showed that annual rates of suicide are associated with annual prevalence of suicide risk factors in Korean adolescents, particularly in male adolescents.

1. Introduction

Though the suicide rates of adolescents are lower than those of adults (Bridge et al., 2006), according to the World Health Organization (WHO), suicide was the third leading cause of death of adolescents globally in 2012, following road injury and human immunodeficiency virus. South Korea has the highest suicide rate among Organization for Economic Co-operation and Development (OECD) countries, reaching 28.7 deaths per 100,000 persons in 2013 (OECD, 2017). The adolescent suicide rate in South Korea (9.4 people per 100,000 people) is higher than the average for OECD countries (6.5 people per 100,000 people) in 2011, and suicide has been the leading cause of death among Korean adolescents from 2007 to the latest reports on the causes of death in 2015 (OECD, 2015; Korea National Statistical Office, 2017).

Previous studies have reported several risk factors associated with suicide among adolescents. First, important psychological risk factors reported for completed suicide among adolescents include history of suicidal ideation or suicide attempt(s) (Russell, 1985; Bukstein et al., 1993; Yoshimasu et al., 2008); psychiatric disorders or history of psychopathology (Beautrais, 2000; Yoshimasu et al., 2008), especially depression (Brent et al., 1999; Spirito and Esposito-Smythers, 2006); experience of stressful life events (Rich and Warsrad, 1991; Brent et al., 1993; Marttunen et al., 1993); and sleep problems (Bernert and Joiner, 2007; Goldstein et al., 2008). In terms of factors related to physical

health, chronic physical illness (Tang and Crane, 2006), substance use disorder (Gould et al., 1996; Brent et al., 1999), obesity and disturbed weight status (Pompili et al., 2006), being sexually active (King et al., 2001; Rector et al., 2003), and lack of physical activity (Brosnahan et al., 2004; Brown, 2005) have been found to be critical risk factors for suicide behaviors.

Furthermore, it has been reported that substantial gender differences exist in suicidal behavior among adolescents (Johnson et al., 2000). Data indicate that even though women attempt suicide significantly more often than men, men complete suicide more often than women, which is called the gender paradox in suicide (Canetto and Sakinofsky, 1998). Risk factors associated with suicidal behavior are also known to be different in male and female adolescents (Langhinrichsen-Rohling et al., 1998, 2009; Handwerk et al., 2006). The relationship between body weight and suicidal tendencies was also found to be different for males and females: among females, a 10-unit increase in the body mass index (BMI) “increased” the risk of suicidal ideation and attempts by 22%, whereas among males, a 10-unit increase in the BMI “reduced” the risk of suicidal ideation and suicide attempt by 26% and 55%, respectively (Carpenter et al., 2000). Moreover, psychiatric problems could differently affect suicide risk in male and female adolescents. For example, female adolescents with conduct disorder had elevated rates of suicidal behavior compared to male adolescents with conduct disorder (Mazza and Reynolds, 2001), while

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male adolescents with depression or internalizing problems were suggested to be at a greater risk of suicide than female adolescents with the same risk factors (Handwerk et al., 2006). Such findings suggest gender disparity in suicidal behaviors in adolescents; however, relatively less research has focused on understanding gender-specific differences in suicidal risk factors (Langhinrichsen-Rohling et al., 2009).

Given the importance of understanding the suicidal behaviors of adolescents and also given the paucity of studies on gender-specific suicide risk factors, we aimed to investigate the correlations between annual suicide rates in South Korea and annual rates of suggested risk factors from 2005 to 2015, separately in male and female adolescents.

2. Methods

2.1. Data and procedures

Data on the suicide rates of South Korean adolescents aged 15–19 years were obtained from the Korea National Statistical Office (2015). We analyzed the annual data on adolescent suicide rates from 2005 to 2015 examine trends.

Data from the Korea Youth Risk Behavior Web-based Survey (KYRBS) between 2005 and 2015 were used to obtain the annual prevalence of psychological and health-related risk factors among Korean adolescents. The KYRBS is an online self-report survey that has been conducted annually since 2005 to identify health behaviors among middle and high school students. The KYRBS was conducted with random stratified samples representative of middle and high school students in South Korea. The survey annually included about 800 schools and 65,000 participants, representative of about 3,000,000 middle and high school students (Kim et al., 2016). The study protocol was approved by the institutional review board of the Korea Centers for Disease Control and Prevention (2014-06EXP-02-P-A).

2.2. Measurement

The suicide rate was calculated as the number of completed suicides per ten thousand adolescents. Risk factors were categorized into psychological risk factors, which include self-perceived healthiness, perceived sleep satisfaction, perceived severe stress, depressive mood, suicidal ideation, and suicide attempt, and health-related risk factors, including obesity, being physically active, being sexually active, current drinking, heavy (current) drinking, and current smoking.

The rate of self-perceived healthiness indicates the percentage of respondents who answered “good” or “very good” to the question “In general, how would you rate your health?” on a five-point Likert-type scale (“very poor,” “poor,” “fair,” “good,” or “very good”). The rate of perceived sleep satisfaction indicates the percentage of respondents who answered “satisfied” or “very satisfied” to the question “In the past seven days, what is your level of satisfaction with fatigue recovery after sleep?” on a five-point Likert-type scale (“very dissatisfied,” “dissatisfied,” “neutral,” “satisfied,” or “very satisfied”). The rate of perceived severe stress indicates the percentage of respondents who answered “fairly often” or “very often” to the question “In general, how often have you felt stressed?” on a five-point Likert-type scale (“never,” “almost never,” “sometimes,” “fairly often,” or “very often”). The rate of depressive mood indicates the percentage of respondents who had felt depressed about having trouble concentrating in daily life for more than two weeks in the past 12 months. The rates of suicidal ideation and suicide attempt indicate the percentage of respondents who had thought about or attempted to kill themselves respectively during the past 12 months.

The rate of obesity was calculated as the percentage of adolescents whose BMI was at or above the 95th percentile for their age on the Korean National Growth Charts from 2007 or whose BMI was equal to or more than 25 (Moon et al., 2008). The rate of being physically active indicated the percentage of respondents who had performed any

physical activity that increased their heart rate and breathing for at least 20 min for more than three days in the past seven days. The rate of being sexually active indicates the percentage of respondents who have had sexual relationships with a person. The rate of current drinking indicates the percentage of respondents who consumed more than one drink of alcohol in the past 30 days. The rate of heavy drinking indicates the percentage of respondents who consumed more than either five to six glasses (50 ml) of soju (10% to 20% alcohol by volume) or three cans of beer on a typical day when they drank alcohol. The rate of current smoking indicates the percentage of respondents who had smoked on one or more of the past 30 days.

2.3. Statistical analysis

We examined the correlations between the rate of specific risk factors and suicide rates for each year between 2005 and 2015 using Spearman correlation analyses. All statistical analyses were performed using SPSS (version 21.0; SPSS Inc., Chicago, IL), with a statistical significance of $\alpha = 0.05$.

3. Results

During the study period, the suicide rate of Korean adolescents decreased from 27.2 to 17.3 suicides per 100,000 individuals for male adolescents and from 13.0 to 8.6 suicides per 100,000 individuals for female adolescents.

As shown in Table 1, male adolescents showed significant positive correlations between suicide rate and rate of depressive mood ($r = 0.72$), suicidal ideation ($r = 0.65$), suicide attempt ($r = 0.68$), heavy drinking ($r = 0.71$), current drinking ($r = 0.76$), and smoking ($r = 0.76$), along with negative correlations between suicide rate and rate of self-perceived healthiness ($r = -0.72$), obesity ($r = -0.96$) and being physically active ($r = -0.81$). For female adolescents, suicide rate was positively correlated with the rate of being sexually active ($r = 0.65$) and negatively correlated with the rate of obesity ($r = -0.68$). Annual trends in suicide rate and the rates of psychological and health-related risk factors among Korean adolescents from 2005 to 2015 are shown in Figs. 1 and 2 respectively.

4. Discussion

The present study investigated gender-specific correlations between the annual rates of completed suicide and suicide risk factors among South Korean adolescents from 2005 to 2015. For Korean male adolescents, suicide rate showed significant correlations with the rate of several risk factors identified in previous studies, including depressive mood, suicidal ideation, suicide attempt, drinking, smoking, self-

Table 1
Results of Spearman correlation analyses between the rates of suicidal risk factors and suicidal deaths.

	Male suicidal deaths		Female suicidal deaths	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Self-perceived healthiness	-0.72	0.013	-0.52	0.102
Perceived sleep satisfaction	-0.60	0.051	0.20	0.555
Perceived severe stress	0.60	0.051	0.47	0.142
Depressive mood	0.72	0.013	0.25	0.467
Suicidal ideation	0.65	0.030	0.46	0.158
Suicide attempt	0.68	0.022	0.49	0.123
Obesity	-0.96	< 0.001	-0.68	< 0.021
Physically active	-0.81	0.003	-0.55	0.082
Sexually active	-0.12	0.728	0.65	< 0.029
Heavy drinking	0.71	0.015	0.45	0.170
Current drinking	0.76	0.007	0.46	0.151
Current smoking	0.76	0.007	0.56	0.071

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