Original Article

Suicidal Inclination and Lifestyle Factors in Miyazaki City Junior High School Students

Keiko Aoishi[*], Hiroki Tanoue[*] and Yuko Shiraishi[**]

[*]School of Nursing, Faculty of Medicine, University of Miyazaki
5200 Kihara, Kiyotake, Miyazaki city, Miyazaki, 889-1692
keiko_aoishi@med.miyazaki-u.ac.jp
[**]Faculty of Nursing, International University of Health and Welfare
1-7-4 Momochihama, Sawara, Fukuoka city, Fukuoka, 814-0001

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Purpose: The present study aims to explore relationships between suicidal inclination and lifestyle and behavioral factors in junior high school students (aged 12–15 years).

Methods: A total of approximately 3,000 junior high school students (grades 7-9) living in the city of Miyazaki, Miyazaki Prefecture, were recruited by random sampling from a citywide total of 10,642 students. A questionnaire was mailed to 2,996 students. The questionnaire covered personal and lifestyle factors including sex, eating habits, sleep habits, chronic diseases, Internet use, illicit substance use, and menstruation. Suicidal inclination was measured using the Scale of Suicidal Inclination for junior high school students and its subscales. Scores of the subscales were compared between males and females. Students were divided into low and high groups for each subscale, and the association of personal and lifestyle factors with each subscale was examined using logistic regression.

Results: Responses were obtained from 537 students out of 2,996 (17.9%). Out of the 537 students, 54 were excluded from the analysis due to invalid, missing, or implausible data. A total of 213 boys (44.1%) and 270 girls (55.9%) were studied. Most students (42.9%) reported less than 7–8 hours of sleep per night, with girls reporting shorter sleep duration than boys (p=0.001). A sex difference in suicidal inclination was observed for *depressive mood*, which was stronger in girls. Multivariate analysis showed that suicidal inclination was mostly associated with sleep duration in boys, and sleep duration, interest in illicit substances, and menstruation in girls. The multivariate analysis of lifestyle factors and high subscale scores found that "bedtime," "sleep duration/quality of sleep," "chronic diseases," "interest in illicit substances," and "time using the Internet" showed some association with suicidal inclination in both boys and girls.

Conclusions: In addition to confirming previously identified risk factors, the present study suggests that additional risk factors are "whether dinner is eaten alone" for boys, and "grades," "experience of dieting," and "irregularity of menstrual cycle" for girls. To identify high-risk individuals effectively, screening for suicide prevention in junior high school students should consider sex-based characteristics. The present study also demonstrated relationships between suicide and lifestyle factors that should be considered by the government when developing public health policy and suicide prevention interventions.

Keywords: suicide, suicidal inclination, gender/sex, lifestyle

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I. Introduction

According to a report by the World Health Organization[1], suicide has become the second leading cause of death in youth globally. However, there is uncertainty about how it is best to intervene. In South Korea, suicide was the leading cause of death in youth aged 15–19 years from 2001 to 2010[2]. According to statistics collected by the National Police Agency[3], over 30,000 people committed suicide annually over the 13 years from 1998 to 2012 in Japan. Although this number fell below 30,000 in 2012, the number of suicides nevertheless remains high. According to an overview of comprehensive measures to prevent suicide[4], mental stability is more easily disrupted during puberty. Additionally, emotional damage sustained during adolescence can have lifelong effects. Although suicide rates in recent years have been declining overall, suicide

among young people has been increasing, reflecting the seriousness of the problem of youth suicide; globally, suicide is the second most common cause of death in young people[1]. Changes in the social circumstances of young people has been highlighted as an underlying issue. In addition, in the United States, suicide is the third leading cause of death among 10–24 year olds[5]. In those aged 15–24 years, there are approximately 100–200 suicide attempts for every completed suicide[6].

In Japan, the suicide rate has shown a decreasing trend in recent years, although the rate of youth suicide is increasing and suicide problems in youth are of considerable concern. The Japanese Cabinet Office has aimed a target of reducing the suicide rate to 19.4 people in 2016 per 100,000 people per year, compared with a suicide rate of 24.2 people in 2005 . However, specific measures have not yet been implemented[4]. There is a body of research on suicide prevention, and various measures to prevent suicide in youth have been attempted. The literature includes suicide prevention research with youth, cohort studies, studies with administrative claims data for children and young people aged 6–18 years[7], studies focusing on sex differences in youth suicidal behavior[8], and studies focusing on lifestyle habits such as sleep duration[2][9] and Internet use[10]. To date, there have been eight randomized controlled trials of treatment for youth who have attempted suicide that targeted reduction in reattempts as the primary outcome[11]. There are limited studies available, and even fewer studies aimed at preventing youth suicides in Asian countries with effective suicide prevention measures for adults[12]. However, there has been an awareness program carried out across Europe as part of the Saving and Empowering Young Lives in Europe (SEYLE) campaign funded by the European Union. This involved an intervention program for youth mental health improvement carried out across 11 European countries[13]. In addition, from 1994, initiatives to prevent youth suicide have been implemented in schools in Western countries, such as “gatekeeper training” (the Yellow Ribbon Suicide Prevention Program)[14].

However, no youth suicide prevention measures or programs have been implemented in Japan, and education on mental health is limited or inconsistent in schools[15]. Therefore, in Japan, despite a common perception of the risk factors for suicide, cultural perspectives of death mean that suicide is a social taboo and is perceived to be caused by personal problems, and suicide is therefore not publically discussed[1]. During the 2000s, however, research on suicide intended for university students[16] and research on the views of elementary and junior high school students on life and death were published[17]. This suggests that people are beginning to understand the concept of suicide, particularly perspectives about suicide prevention and risk factors associated with children aged 10–15 years[18]. In Japan, studies have been done on junior and senior high school students’ suicide attempts and suicidal ideation[19–22], but completed suicide has become harder to investigate due to constraints related to the protection of personal information and the possibility of promoting suicide.Therefore, the present study is aimed at youth and explores the relationships between suicidal inclination and lifestyle and behavioral factors in junior high school students (aged 12–15 years).

II. Methods

1. Subjects and Methods

In total, 3,000 first- through third-year junior high school students living in the city of Miyazaki, Miyazaki Prefecture, were selected by random sampling from a citywide total of 10,642 students. Only data on the students was received, and the authors did not participate in extraction of the subjects.

A paper questionnaire was mailed to 2,996 students between January and March 2014. The anonymous, self-administered questionnaire was sent to students with the cooperation of the Miyazaki City Board of Education and the Miyazaki City Public Health Center. Questionnaires were returned by mail after being filled out. Responses were received from 537 students (17.9%). After excluding questionnaires with incomplete responses or missing or implausible responses, the present study used the responses of 496 students (16.6%) for analysis.

2. Questionnaire Items

(1) Self-report questionnaire on attributes and lifestyle

The questionnaire was based on the findings of previous studies[2-9], and included items covering sex, school grade, family structure, eating habits (breakfast, lunch, dinner, between meals, after dinner), whether dinner was eaten with family or alone, and experience with dieting. Questions on bedtime, waking time, and duration of sleep on school nights were asked. Quality of sleep (sleep well, difficulty falling asleep, wake up in the middle of the night, feeling like not having slept), presence or absence of chronic diseases (asthma, atopic

dermatitis, irritable bowel syndrome), interest in illicit substances (alcohol, cigarettes, drugs), having a cell phone or not, average time using the Internet including e-mail and social media (none, less than 1 hour, 1-2 hours, 2–3 hours, more than 3 hours), and for girls, the presence or absence of menstruation and the menstrual cycle regularity.

(2) Scale of Suicidal Inclination for Junior high school Students

A scale that can be easily used during periodic health check-ups at school and indicates early signs of suicide inclination was applied.The scale was made for junior high students by Otsuka et al[23]. In addition, we measured whether students had attempted suicide, physical symptoms, and lifestyle. This was to confirm whether there were indications that students were in a dangerous "suicide affinity state." Internal consistency had a slightly low Cronbach's alpha coefficient in "suicidal inclination" and "good mental and physical health." Reliability is attained in our examination. In addition, the scale by Otsuka et al.[23] was judged to have validity, and we examined convergent and discriminant validity. Few studies have used this scale; however, its contents were relevant to students' lives, and there were no excess or deficiency quantitatively. Based on the foregoing, we adopted this scale.

The scale of suicidal inclination was created from 33 items ranked from "completely disagree" (1 point) to "completely agree" (4 points) across six subscales: *resistance to suicide* (e.g., I have no desire to commit suicide even if I want to die: 6 items), with scores ranging from 6 to 24; *depressive behavior* (e.g., I can't get any studying done: 7 items), with scores ranging from 7 to 28; *depressive mood* (e.g., I want to cry sometimes and am filled with tears: 5 items), with scores ranging from 5 to 20; *suicidal inclination* (e.g., I can understand how people I see on the news who committed suicide feel: 7 items), with scores ranging from 7 to 28; *desire to be alone* (e.g., I want to leave the house: 4 items), with scores ranging from 4 to 16; and *good mental and physical health* (e.g., I can sleep well: 4 items), with scores ranging from 4 to 16. *Resistance to suicide* and *good mental and physical health* are reverse-scored; higher scores indicate higher suicidal inclination.

3. Statistical analyses

The scores for general attributes and lifestyle factors were simply totaled. Bedtime, waking time, and duration of sleep on school nights were rounded up in increments of one hour. A t-test was performed for comparison between the sexes. Simple tabulation and a univariate analysis demonstrated differences in lifestyle habits by sex. Differences between the sexes were analyzed because of the high rate of suicide in teenage girls in Miyazaki City. Subjects were divided into two groups for each subscale. The average of the subscale was used as the cutoff, with respondents classified into low and high groups. The odds ratios and confidence intervals were calculated for the independent variables of general attributes and lifestyle factors which determined significant in univariate analysis. Logistic regression analysis was conducted. All statistical analyses were performed with SPSS Version 22 (IBM SPSS Statistics for Windows, Version 22.0, IBM Corp., Armonk, NY), and the significance levels were set at 5% or less.

4. Ethical considerations

The present study was approved by the Research Ethics Committee of the University of Miyazaki, Faculty of Medicine (Approval no. 2013-070). The study aim and concepts were also approved by the Miyazaki Board of Education and the Junior High School Principals Association. Aim, method, intent, participant confidentiality, the voluntary nature of the questionnaire, and handling of materials after the study's conclusion were explicitly explained to the subjects using a research request form. Return of the completed questionnaire was considered consent to participate in the study.

III. Results

1. Subjects' general attributes and lifestyle factors

A total of 213 (44.1%) boys and 270 (55.9%) girls participated in the present study. Of the participants, 42.9% reported that they slept more than 7 hours but less than 8 hours per night (p=0.001). Meanwhile, 43.1% reported that they went to bed between 11 p.m. and 12 a.m. (p<0.05). Most participants reported that they woke up "sometime between 6:00 and 7:00 a.m." Over 70% of participants reported that they slept well, while 13.0% of girls and 11.7% of boys reported "I don't feel like I slept well." Approximately one out of four participants indicated symptoms related to sleep problems.

Of participants, 97.5% reported that they ate three meals a day, and 71.8% reported snacking between meals.

Table 1 Participants' general attributes and lifestyle factors

		Total n=483		Boys n=213		Girls n=270		*p*-Value
		n	%	n	%	n	%	
Grade								
	1st year	160	33.1	72	33.8	88	32.6	
	2nd year	160	33.1	66	31.0	94	34.8	n.s.
	3rd year	152	31.5	69	32.4	83	30.7	
Parents								
	Father	406	84.1	177	83.1	229	84.8	a
	Mother	471	97.5	205	96.2	266	98.5	
Sleep time								
	Less than 5 hours	5	1	0	0.0	5	1.9	
	5–6 hours	22	4.6	6	2.8	16	5.9	
	6–7 hours	101	20.9	37	17.4	64	23.7	p=0.001
	7–8 hours	207	42.9	86	40.4	121	44.8	
	8–9 hours	107	22.2	63	29.6	44	16.3	
	Over 9 hours	26	5.4	15	7.0	11	4.1	
Bedtime								
	Before 21:00	3	0.6	0	0.0	3	1.1	
	21:00–22:00	15	3.1	11	5.2	4	1.5	
	22:00–23:00	104	21.5	53	24.9	51	18.9	p<0.05
	23:00–24:00	208	43.1	92	43.2	116	43.0	
	24:00–1:00	123	25.5	47	22.1	76	28.1	
	After 1:00	22	4.6	9	4.2	13	4.8	
Time waking up								
	4:00–5:00	2	0	1	0.5	1	0.4	
	5:00–6:00	16	3.3	4	1.9	12	4.4	
	6:00–7:00	351	72.7	147	69.0	204	75.6	n.s.
	7:00–8:00	98	20.3	55	25.8	43	15.9	
	8:00–9:00	5	1	2	0.9	3	1.1	
Quality of sleep								
	Sleep well	365	75.6	159	74.6	206	76.3	
	Difficulty falling asleep	36	7.5	16	7.5	20	7.4	
	Wake up in the middle of the night	18	3.7	7	3.3	11	4.1	a
	Wake up early	10	2.1	5	2.3	5	1.9	
	I don't feel like I slept	60	12.4	25	11.7	35	13.0	
Eating Habits								
	Breakfast	471	97.5	210	98.6	261	96.7	
	Lunch	471	97.5	208	97.7	263	97.4	
	Dinner	480	99.4	212	99.5	268	99.3	a
	Eat between meals	347	71.8	150	70.4	197	73.0	
	Eat after dinner	67	13.9	33	15.5	34	12.6	
Whether dinner is eaten alone								
	With family	458	94.8	205	96.2	253	93.7	n.s.
	Alone	20	4.1	8	3.8	12	4.4	
Experience dieting								
	Yes	40	8.3	7	3.4	33	12.5	p<0.001
	No	429	88.8	199	96.6	230	87.5	
Presence or absence of chronic diseases								
	Asthma	85	17.6	47	22.1	38	14.1	
	Atopic dermatitis	57	11.8	23	10.8	34	12.6	a
	Irritable bowel syndrome	20	4.1	8	3.9	12	4.6	
Interest in illicit substances								
	Strong	3	0.6	1	0.5	2	0.7	
	A little	14	2.9	8	3.8	6	2.2	
	Neither	21	4.3	11	5.2	10	3.7	n.s.
	Almost no	59	12.2	30	14.1	29	10.7	
	Absolutely no	382	79.1	162	76.1	220	81.5	
Cell phone (includes smartphones)								
	Have cell phone	137	28.4	43	20.4	94	34.9	p<0.001
	No cell phone	343	71	168	79.6	175	65.1	
Time using Internet (including email and social media)								
	None at all	136	28.2	63	29.6	73	27.0	
	Less than 1 hour	166	34.4	69	32.4	97	35.9	
	1–2 hours	109	22.6	48	22.5	61	22.6	n.s.
	2–3 hours	46	9.5	23	10.8	23	8.5	
	More than 3 hours	24	5	8	3.8	16	5.9	
Presence or absence of menstruation (girls only)								
	Yes					246	91.1	a
	No					22	8.1	
Menstrual cycles (for those girls who menstruate)								
	Regular					142	52.6	a
	Irregular					108	40.0	

Note. Excludes missing values

Chi-squared test, n.s.: not significant, a: no analysis

Meanwhile, 3.8% of boys and 4.4% of girls ate dinner by themselves. Significantly more girls than boys reported experience with dieting (3.4% of boys and 12.5% of girls) (p<0.001), and 14.1% of boys and 22.1% of girls reported having asthma. Regarding interest in illicit substances, 91.3% of participants reported "absolutely no" or "almost no" interest, while 4.3% of boys and 2.9% of girls reported that they had "a little" or "strong" interest. Among participants, 20.4% of boys, 34.9% of girls had a cell phone (p<0.001), while 34.4% used the Internet for less than 1 hour a day, and 28.2% did not use it at all; however, 3.8% of boys and 5.9% of girls used the Internet for more than 3 hours a day. Of girls, 91.1% were menstruating, and 40.0% of them reported having an irregular menstrual cycle (**Table 1**).

2. Scale of Suicidal Inclination for junior high school students: sex differences

The mean for *depressive mood* was significantly higher in girls (8.5±3.5 points) than in boys (7.1±2.5 points) (p<0.001). The mean for *resistance to suicide* was 19.6±4.3 points for boys and 19.6±4.5 points for girls. The mean for *depressive behavior* was 14.3±4.5 points for boys and 15.0±4.8 points for girls. The mean for *suicidal inclination* was 13.3±4.3 points for boys and 13.7±4.5 points for girls. The mean for *desire to be alone* was 6.1±2.6 points for boys and 6.1±2.3 points for girls. The mean for *good mental and physical health* was 13.2±2.5 points for boys and 13.2±2.6 points for girls. There were no significant differences between the sexes (**Table 2**).

3. Lifestyle factors and the Scale of Suicidal Inclination for junior high school student subscales

The results for boys are presented in **Table 3**. Shorter or longer duration of sleep than the average was associated with *resistance to suicide* (OR=0.49; 95% CI=0.17–1.40). There was also an association between sleep problems and *depressive mood* (OR=2.43; 95%

Table 2 Sex comparisons for the Scale of Suicidal Inclination for junior high school students, subscales

	Resistance to Suicide[a]		Depressive Behavior		Depressive Mood		Suicidal Inclination		Desire to be Alone		Good Mental and Physical Health[a]	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Score Range (points)	6–24		7–28		5–20		7–28		4–16		4–16	
Mean Value (points)±SD	19.6±4.3	19.6±4.5	14.3±4.5	15.0±4.8	7.1±2.5	8.5±3.5	13.3±4.3	13.7±4.5	6.1±2.6	6.1±2.3	13.2±2.5	13.2±2.6
Median (points)	21	21	14	14	6	8	13	13	5	5	14	14
Mode (points)	24	24	10	11	5	5	13	12	4	4	16	16
P value	n.s.		n.s.		***		n.s.		n.s.		n.s.	

Note. Student's t-test
*** P<0.001; n.s.: not significant; SD: standard deviation
[a]: reverse scoring applied (higher points indicate weaker result)

Table 3 Association between lifestyle factors and Scale of Suicidal Inclination for junior high school students (boys)

	Resistance to Suicide			Depressive Behaviors			Depressive Mood			Suicidal Inclination			Desire to be Alone			Good Mental and Physical Health		
	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*
Whether dinner is eaten alone																		
With Family	1			1			1			1			1			1		
Alone	2.26	0.46–11.20	n.s.	8.09	0.92–71.51	†	1.60	0.31–8.31	n.s.	7.52	0.81–70.04	†	1.31	0.26–6.48	n.s.	0.30	0.05–1.92	n.s.
Bedtime																		
Before 24:00	1			1			1			1			1			1		
After 24:00	0.62	0.31–1.26	n.s.	1.08	0.54–2.17	n.s.	1.90	0.91–3.99	†	2.19	1.09–4.43	*	2.27	1.11–4.62	*	2.54	1.26–5.13	**
Sleep time																		
Normal	1			1			1			1			1			1		
Short or Long	2.10	0.72–5.86	n.s.	0.93	0.33–2.65	n.s.	0.39	0.10–1.55	n.s.	0.52	0.15–1.79	n.s.	2.41	0.86–6.78	†	2.18	0.75–6.32	n.s.
Quality of sleep																		
Sleep well	1			1			1			1			1			1		
Symptoms Present	0.90	0.44–1.81	n.s.	2.02	1.00–4.08	†	2.43	1.17–5.05	**	1.49	0.73–3.06	n.s.	1.39	0.67–2.90	n.s.	2.96	1.43–6.13	**
Chronic diseases (irritable bowel syndrome)																		
No	1			1			1			1			1			1		
Yes	1.10	0.21–5.65	n.s.	5.74	0.62–52.99	n.s.	3.03	0.48–19.18	n.s.	5.13	0.55–48.12	n.s.	2.05	0.31–13.41	n.s.	1.12	0.18–6.94	n.s.
Interest in illicit substances																		
No Interest	1			1			1			1			1			1		
Interest	1.05	0.52–2.10	n.s.	1.71	0.85–3.42	n.s.	2.10	0.99–4.46	†	2.04	1.00–4.19	†	2.02	0.99–4.15	†	1.72	0.85–3.50	n.s.
Time using the Internet																		
Less than 2 hours	1			1			1			1			1			1		
More than 2 hours	2.23	0.99–5.05	†	1.38	0.58–3.29	n.s.	1.69	0.70–4.07	n.s.	0.95	0.40–2.23	n.s.	1.73	0.73–4.11	n.s.	1.57	0.65–3.75	n.s.

Note. Logistic regression analysis ** P<0.01, * P<0.05, † P<0.1, n.s.: not significant
Times between 6 and 9 hours were considered normal sleeptimes.
"Difficulty falling asleep", "Wake up in the middle of the night", and "Wake up early" were considered "Symptoms present" for quality of sleep.
"Strong", "A little", "Neither", and "Almost no" were considered "Interest" and "Absolutely no" was considered "No Interest" in regards to interest in illicit substances.
OR: odds ratio; CI: confidence interval

Table 4 Associations between lifestyle factors and Scale of Suicidal Inclination for junior high school students (girls)

	Resistance to Suicide			Depressive Behaviors			Depressive Mood			Suicidal Inclination			Desire to be Alone			Good Mental and Physical Health		
	OR	95%Cl	*P*	OR	95%Cl	*P*	OR	95%Cl	*P*	OR	95%Cl	*P*	OR	95%Cl	*P*	OR	95%Cl	*P*
Grade																		
1st year	1			1			1			1			1			1		
2nd year	1.09	0.51–2.32	n.s.	0.50	0.23–1.12	†	2.83	1.25–6.38	*	1.17	0.53–2.54	n.s	1.05	0.47–2.31	n.s.	1.08	0.48–2.41	n.s.
3rd year	0.72	0.35–1.51		0.71	0.34–1.50		0.63	0.28–1.41		0.76	0.36–1.61		0.70	0.33–1.50		1.06	0.50–2.26	
Experience dieting																		
No	1			1			1			1			1			1		
Yes	1.14	0.46–2.85	n.s.	1.27	0.49–3.31	n.s.	0.90	0.34–2.42	n.s.	0.45	0.17–1.16	†	1.63	0.62–4.31	n.s.	1.00	0.38–2.63	n.s.
Bedtime																		
Before 24:00	1			1			1			1			1			1		
After 24:00	1.18	0.61–2.25	n.s.	1.09	0.55–2.14	n.s.	0.82	0.41–1.63	n.s.	1.17	0.60–2.28	n.s.	0.94	0.48–1.84	n.s.	0.94	0.48–1.86	n.s.
Sleeptime																		
Normal	1			1			1			1			1			1		
Short or Long	2.41	0.92–6.31	†	1.16	0.41–3.28	n.s.	2.17	0.70–6.74	n.s.	1.16	0.43–3.18	n.s.	3.57	1.32–9.63	*	2.10	0.73–6.06	n.s.
Quality of sleep																		
Sleep well	1			1			1			1			1			1		
Symptoms present	2.09	1.05–4.17	*	4.98	2.23–11.14	***	4.38	1.98–9.70	***	3.59	1.71–7.54	**	2.40	1.19–4.83	*	6.06	2.80–13.11	***
Chronic diseases (irritable bowel syndrome)																		
No	1			1			1			1			1			1		
Yes	0.89	0.22–3.65	n.s.	6.46	0.73–57.11	†	1.15	0.22–5.84	n.s.	1.72	0.38–7.75	n.s.	2.12	0.53–8.48	n.s.	3.91	0.72–21.20	n.s.
Interest in illicit substances																		
No Interest	1			1			1			1			1			1		
Interest	2.17	1.02–4.60	*	3.07	1.28–7.34	*	5.30	2.13–13.23	***	3.72	1.66–8.37	**	2.28	1.06–4.89	*	2.71	1.21–6.07	*
Time using the Internet																		
Less than 2 hours	1			1			1			1			1			1		
More than 2 hours	1.31	0.50–2.94	n.s.	2.43	0.99–5.99	†	1.02	0.42–2.53	n.s.	0.68	0.29–1.61	n.s.	1.87	0.82–4.30	n.s.	1.10	0.46–2.60	n.s.
Menstrual cycle																		
Regular	1			1			1			1			1			1		
Irregular	1.45	0.80-2.62	n.s.	1.63	0.88–3.01	n.s.	2.39	1.24–4.60	**	1.77	0.96–3.27	†	1.65	0.89–3.06	n.s.	2.38	1.27–4.44	**

Note. Logistic regression analysis *** $p<0.001$, ** $P<0.01$, * $P<0.05$, † $P<0.1$, n.s.: not significant

Times between 6 and 9 hours were considered normal sleep times.

"Difficulty falling asleep", "Wake up in the middle of the night", and "Wake up early" were considered "Symptoms present" for quality of sleep.

"Strong", "A little", "Neither", and "Almost no" were considered "Interest" and "Absolutely no" was considered "No Interest" in regards to interest in illicit substances.

OR: odds ratio; CI: confidence interval

CI=1.17–5.05) compared with boys who reported that they slept well. *Suicidal inclination* (OR=2.19; 95% CI=1.09–4.43) and *desire to be alone* (OR=2.27; 95% CI=1.11–4.62) were associated with going to sleep after 12 a.m. compared with an earlier sleep time. *Good mental and physical health* was associated with boys who went to sleep after 12 a.m. compared with those who went to sleep earlier (OR=2.54; 95% CI=1.26–5.13), and with boys who had symptoms of sleep difficulties compared with those who reported that they slept well (OR=2.96; 95% CI=1.43–6.13).

The results for girls are shown in **Table 4**. *Resistance to suicide* was associated with sleep disturbances (OR=0.48; 95% CI=0.24–0.95) and interest in illicit substances (OR=0.46; 95% CI=0.22–0.98). *Depressive behavior* was associated with symptoms of sleep difficulties (OR=4.98; 95% CI=2.23–11.14) and interest in illicit substances (OR=3.07; 95% CI=1.28–7.34). *Depressive mood* was associated with second-year students more than third-year students (OR=2.83; 95% CI=1.25–6.38), and with sleep difficulties (OR=4.38; 95% CI=1.98–9.70), interest in illicit substances (OR=5.30; 95% CI=2.13–13.23), and an irregular menstrual cycle (OR=2.39; 95% CI=1.24–4.60). *Suicidal inclination* was associated with sleep difficulties (OR=3.59; 95% CI=1.71–7.54) and interest in illicit substances (OR=3.72; 95% CI=1.66–8.37). *Desire to be alone* was associated with sleep duration shorter or longer than the average (OR=3.57; 95% CI=1.32–9.63), sleep difficulties (OR=2.40; 95% CI=1.19–4.83), and interest in illicit substances (OR=2.28; 95% CI=1.06–4.89). *Good mental and physical health* was associated with sleep difficulties (OR=6.06; 95% CI=2.80–13.11), interest in illicit substances (OR=2.71; 95% CI=1.21–6.07), and an irregular menstrual cycle (OR=2.38; 95% CI=1.27–4.44).

IV. Discussion

Over the six subscales, the only difference found in the mean values between girls and boys was for *depressive mood*, where girls had significantly higher scores. In a previous study by Takeuchi et al.[24] on suicide countermeasures for college students, the rating for *depressive mood* was significantly higher in female students than in male students. Although the average values for college students were higher than those for junior high school students, *resistance to suicide* was weaker in girls in junior high school, suggesting that there is a risk of even small instances of depressive mood manifesting as actions such as a suicide attempt. Satterthwaite et al.[25] reported that the left amygdala is larger in girls, which may make girls more susceptible to anxiety or depression. This suggests that such neurological differences may also be relevant in suicide.

Most associations found in our multivariate analysis of lifestyle factors and high subscale scores for boys

were related to bedtime. Boys who went to bed after 12 a.m. were approximately twice as often affected by *suicidal inclination*, *desire to be alone*, and *good mental and physical health* factors than boys who went to sleep earlier. With regard to quality of sleep, boys who reported experiencing sleep difficulties were more affected by *depressive mood* and *good mental and physical health* than those who slept well.

For girls, sleep quality and interest in illicit substances were related to high scores on all subscales. Girls who had sleep difficulties were more affected by factors on all subscales than those who slept well. Girls who slept for shorter or longer durations than the average were about 3.5 times more affected by *desire to be alone*. In the present study, girls reported shorter sleep durations; going to bed later and waking up earlier than boys. In terms of quality of sleep, girls tended to experience insomnia more often than boys. In a study of junior high and high school students by Kataoka et al.[26], it was suggested that there is a trend in girls sleeping for shorter durations, a finding consistent with our results. A health status surveillance report on students[27] found that Internet and e-mail use was a reason for poor sleep duration and quality in girls. In addition, the average Internet use duration of junior high school students was 1 hour and 30 minutes[27]. As the participants in the present study used the Internet for short durations, this suggests that Internet use duration has an effect on sleep.

A study by Matamura et al.[28] found that while there were no significant differences in the time students woke up, sleep time became later (in increments of 30 minutes) as students became older, with first-year junior high school students going to bed at around 10:30 p.m., second-year students going to bed at around 11 p.m., and third-year students going to bed at around 11:30 p.m. As these sleep times become later over time, it was suggested that there is a trend of students also experiencing higher levels of anxiety and depression as they grow older. Mayfield et al.[29] conducted a study on sleep and suicide with 30 young people aged 11–18 years, and reported higher suicidal trends in young people who went to bed late compared with those who went to bed earlier, but found no association with depression. Liu[9] suggested that there is a relationship between sleep duration of less than 8 hours and depressive behaviors. Our finding that bedtime in boys and quality of sleep and sleep duration in girls had an effect on *desire to be alone* suggests that there is a relationship between sleep and *suicidal inclination* in junior high school students. Kataoka et al.[26] suggested that there may be similar background factors that are common danger factors, such as short sleep duration and self-harm behaviors. Our study suggested similar possibilities, as we found that quality of sleep and sleep duration had an effect on suicide-related factors for girls.

With regard to interest in illicit substances such as alcohol, tobacco, and drugs, about 90% of participants in our study indicated they had "almost no" or "absolutely no" interest, and overall, girls were less interested than boys. However, the multivariate analysis identified a relationship between interest in illicit substances and suicidal inclination for girls, with all subscales affected about two to five times more in girls who expressed interest in illicit substances than girls who expressed no such interest. In a study[18] of young people, the risk of suicide was reported to be 2.7–5.1 times higher in young boys who had experienced consuming alcohol, tobacco, and/or illegal drugs compared with those with no experience. Alcohol use among adolescents, particularly preteen alcohol use, is an important risk factor for both suicide ideation and suicide attempts in boys and girls[30]. It has also been reported that lifetime recreational drug use (OR=7.56) is associated with suicide attempts[31]. However, it can be suggested that interest in things that are "forbidden" may signify inappropriate behaviors not limited to suicide. While the overall interest in illicit substances was lower in girls than in boys, our findings highlight that it is important to keep a cautious eye on female students who show interest in illicit substances.

In addition, about 40% of menstruating girls indicated that their menstrual cycle was irregular. An irregular menstrual cycle was found to have about double the effect on *depressive mood* and *good mental and physical health* compared with girls with regular cycles. Dorn et al.[32] reported that compared with female students with regular menstrual cycles, those with irregular cycles had a significantly higher rate of total body symptoms, gastrointestinal symptoms, skin symptoms, and other such complaints, as well as a significantly higher rate of complaints in multiple areas. Our findings were consistent with the findings of this study, which also had reports of symptoms such as stomachaches and irritability. In addition, non-fatal suicidal behavior and suicidal ideation have been found to be more frequent when estrogen levels are lowest during the menstrual cycle, in particular the late luteal and follicular phases[33) 34]. These findings suggest that attention should be directed to symptoms relevant to the menstrual cycle as well as to interventions that help to regulate the menstrual cycle and support maintenance of mental and physical balance, potentially

leading to suicide prevention.

Our results showed that girls experienced three times higher the effect of *depressive mood* in the second year of junior high compared with the third year. In a study using the Depression Self-Rating Scale for Children, significantly higher rates of depressive state were found in girls than in boys, and this significantly increased with each school grade[35]. It has also been reported that the psychological well-being of third-year junior high school students was generally low, and when sex differences were considered, second-year boys had lower psychological well-being[36]. In the present study, second-year girls showed higher risk characteristics for *depressive mood*, but the specific factors could not be identified.

The results of a national study conducted in Japan in 2012[27] showed that boys ate alone more than girls, whereas our findings showed a trend of more girls eating alone. One previous study suggested that the frequency of family dinners was an external developmental asset or protective factor that may curtail high-risk behaviors among youth[37]. Furthermore, Dwyer et al.[38] reported that families that frequently dined together with all members present had better psychological health. Kawasaki[39] reported that suicidal ideation was suppressed in families that frequently dined together in a relaxed setting, as this strengthened the sense of integration. It has also been found that fewer girls that frequently eat with their family had the desire to be thin. In families where dinner was considered a fun experience, there were lower numbers of girls who had the desire to be thin. This suggests that while "eating dinner alone" and "dieting"[40] can be understood as isolated items, they create physical risks as well as potentially being factors that can decrease psychological well-being.

Bedtime[40], sleep time[2) 9) 28], quality of sleep[41], chronic diseases[42], interest in illicit substances[30-32], and time using the Internet[10] were items that showed some association with suicidal inclination in both boys and girls, following the multivariate analysis of lifestyle factors and high scores on the subscales. These items were also previously pointed out as risk factors. The findings of the present study suggest that in boys, "whether dinner is eaten alone," and in girls, "grade," "experience dieting," and "irregularity of menstrual cycle" were additional risk factors. It can therefore be suggested that efficient screening for suicide prevention in junior high school students should consider sex-based characteristics to identify high-risk individuals.

V. Limitations

The present study concerned a research topic that is difficult to discuss in Japan. Our study was the first survey on suicide to be conducted with junior high school students in Miyazaki City. This investigation was commissioned by Miyazaki City and intended to be a census survey. However, the questionnaire was distributed to few students for various reasons. Our study sample was not necessarily representative of the entire junior high school student population in Japan, meaning that our findings may not be able to be generalized to the wider population. Future research should include study samples that are representative of the Japanese population.

VI. Conclusion

The findings of the present study suggest that additional risk factors for suicide are "whether dinner is eaten alone" for boys, and "grade," "experience of dieting," and "irregularity of menstrual cycles" for girls. Efficient screening for suicide prevention in junior high school students should therefore consider sex-based characteristics to identify high-risk individuals. The present study highlights some relationships between suicide and lifestyle factors that should be provided to the government for consideration in the development of public health policy and suicide prevention interventions.

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References

1) World Health Organization: Preventing suicide. In: A global imperative. 1-89, 2014
2) Jang SI, Lee KS, Park EC: Relationship between current sleep duration and past suicidal ideation or attempt among Korean adolescents. Journal of Preventive Medicine and Public Health 46: 329-335, 2013
3) Office for Suicide Countermeasures, Cabinet Office of Japan: Awareness Survey regarding Suicide Prevention, 2012 May 2. Available at: http://www8.cao.go.jp/jisatsutaisaku/survey/report_h23/pdf. Accessed February 17, 2015 (In Japanese)
4) Office for Suicide Countermeasures, Cabinet Office of Japan:

Overview for comprehensive measures to prevent suicide. 2012. Available at: http://www8.cao.go.jp/jisatutaisaku/taikou/pdf/20120828/honnbunn/pdf. Accessed Jun 29, 2015 (in Japanese)
5) Office for Suicide Countermeasures, Cabinet Office of Japan: Overview for Comprehensive Measures to Prevent Suicide —To make a society where nobody feels like their only choice is suicide a reality—. 2012 August 13. Available at: http://www8.cao.go.jp/jisatutaisaku/taikou/pdf/20120828/honnbunn/pdf. Accessed February 17, 2015 (in Japanese)
6) Goldsmith SK, Pellmar TC, Kleinman AM et al.: Reducing suicide: A national imperative. National Academies Press, Washington DC, USA, 2002
7) Callahan ST, Fuchs DC, Shelton RC et al.: Identifying suicidal behavior among adolescents using Administrative Claims Data. Pharmacoepidemiology and Drug Safety 22: 769-75, 2013
8) Rhodes AE, Boyle MH, Bridge JA et al.: Antecedent and sex/gender differences in youth suicidal behavior. World Journal of Psychiatry 4: 120-32, 2014
9) Liu X: Sleep and adolescent suicidal behavior. SLEEP 27: 1351-1358, 2004
10) Kaess M, Durkee T, Brunner R et al.: Pathological Internet use among European adolescents: psychopathology and self-destructive behavior. European Child & Adolescent Psychiatry 23: 1093-102, 2014
11) Berk M, Adrian M, McCauley E, Asarnow J et al.: Conducting research on Adolescent Suicide Attempters: Dilemmas and Decisions. The Behavior Therapist 37: 65-69, 2014
12) Amitai M, Apter A: Social aspects of suicidal behavior and prevention in early life: a review. International Journal of Environmental Research and Public Health 9: 985-994, 2012
13) Carli V, Wasserman C, Wasserman D et al.: The saving and empowering young lives in Europe (SEYLE) randomized controlled trial (RCT): methodological issues and participant characteristics. BMC Public Health 13: 479, 2013
14) Freedenthal S: Adolescent help-seeking and the Yellow Ribbon Suicide Prevention Program: an evaluation. Suicide and Life-Threatening Behavior 40: 628-39, 2014
15) Matsuda O: Survey of educational practice to understand mental illness in public junior high schools of the metropolitan area. Japanese Journal of Public Health 57: 571-576, 2010 (in Japanese)
16) Adachi T, Furuhashi T, Kono S: Risk Factors for suicide in university students with suicidal ideation: Individuals' level of empathy towards the suicide of others and persons they will confide in, considered using a hypothetical scenario method. Clinical Psychiatry 56: 941-950, 2014 (in Japanese with English abstract)
17) Akazawa M:Suicidal behaviors in adolescents: Association between suicide attempt and death attitude. The Japanese Journal of Clinical Research on Death and Dying 35: 90-94, 2012 (in Japanese English abstract)
18) Mattos Souza LD, Silva RA, Jansen K et al.: Suicidal ideation in adolescents aged 11 to 15 years: prevalence and associated factors. Revista Brasileira de Psiquiatria 32: 37-41, 2010
19) Katsumata Y, Matsumoto T, Kitani M et al.: Current status and features of the Japanese adolescents who have accessed information about suicide-related behaviors on the Internet. Japanese Bulletin of Social Psychiatry 18: 186-198, 2009 (in Japanese with English abstract)
20) Sasazawa Y, Atsumi J, Tanaka H et al.: Comparison of mental health index among short, middle and long sleepers in Japanese senior and junior high school students. Bulletin of Takasaki University of Health and Welfare 5: 25-32, 2006 (in Japanese with English abstract)
21) Katsumata Y, Matsumoto T, Kitani M et al.: Electronic media use and suicidal ideation in Japanese adolescents. Psychiatry and Clinical Neurosciences 62: 744-746, 2008
22) Matsumoto T, Imamura F, Chiba Y et al.: Prevalences of lifetime histories of self-cutting and suicidal ideation in Japanese adolescents: differences by age. Psychiatry and Clinical Neurosciences 62: 362-364, 2008
23) Otsuka A, Kumano H, Seto M et al.: Attempt to develop the Scale of Suicidal Inclination (SSI) for junior high school student. Japanese Journal of Counseling Science 34: 21-30, 2001 (in Japanese with English abstract)
24) Takeuchi A, Kodama K: An attempt to develop a scale of suicidal inclination for college students. Bulletin of Training and Research Center for Clinical Psychology, Hiroshima University 10: 73-85, 2011 (in Japanese with English abstract)
25) Satterthwaite TD, Vanderkar S, Wolf DH et al.: Sex differences in the effect of puberty on hippocampal morphology. Journal of the American Academy of Child & Adolescent Psychiatry 53: 341-350, 2014
26) Kataoka C, Nozu Y, Kudo M et al.: Relationships between prevalence of youth risk behaviors and sleep duration among Japanese high school students. Japanese Journal of Public Health 61: 535-544, 2014 (in Japanese with English abstract)
27) Japanese Society of School Health: 2012 Health Status Surveillance Report of School Children. 2014. Available at: http://www.gakkohoken.jp/book/ebook/ebook_H250060/index.html. Accessed February 17, 2015 (in Japanese)
28) Matamura M, Usami S, Fukushima M et al.: Longitudinal relationship between sleep habits and mental health status in adolescents. Japanese Journal of School Health 55: 186-196, 2013 (in Japanese with English abstract)
29) Mayfield EA, McCall VW, Anderson A et al.: Sleep problems, suicidality and depression among American Indian youth. Journal of Sleep Disorders: Treatment and Care 2: 119-132, 2013
30) Swahn MH, Bossarte MB: Gender, early alcohol use, and suicide ideation and attempts: findings from the 2005 youth risk behavior survey. Journal of Adolescent Health 41: 175-181, 2007
31) Watanabe N, Nishida A, Shimodera S et al.: Deliberate self-harm in adolescents aged 12-18: A cross-sectional survey of 18,104 students. Suicide and Life-Threatening Behavior 42: 550-60, 2012
32) Dorn LD, Negriff S, Huang B et al.: Menstrual symptoms in adolescent girls: association with smoking, depressive symptoms, and anxiety. Journal of Adolescent Health 44: 237-43, 2009
33) Baca-Garcia E, Diaz-Sastre C, Ceverino A et al.: Premenstrual symptoms and luteal suicide attempts. European Archives of Psychiatry and Clinical Neuroscience 254: 326-329, 2004
34) Saunders KA, Hawton K: Suicidal behavior and the menstrual cycle. Psychological Medicine 36: 901-912, 2006
35) Watanabe T, Takataya K, Ebihara T et al.: Coping and social support for Junior high school students with depression: A Comparison between urban and rural areas. Yamanashi Nursing Journal 8: 37-42, 2009 (in Japanese)
36) Okubo C, Ichiki Y, Imura T et al.: Examination of effectiveness of mental health literacy on mental health of

junior high school students. Bulletin of Center for Educational Research and Development 22: 123-130, 2013 (in Japanese)
37) Fulkerson JA, Story M, Mellin A et al.: Family dinner meal frequency and adolescent development: relationships with developmental assets and high-risk behaviors. Journal of Adolescent Health 39: 337-345, 2006
38) Dwyer L, Oh A, Patrick H et al.: Promoting family meals: a review of existing interventions and opportunities for future research. Adolescent Health, Medicine and Therapeutics 6: 115-31, 2015
39) Kawasaki S: Effect of the quality of diet, the frequency of co-eating, and the atmosphere at dining table on the mental health of junior high school students. Journal of Home Economics of Japan. 52: 923-935, 2001 (in Japanese with English abstract)
40) Braussch AM, Gutierrez PM: The role of body image and disordered eating as risk factors for depression and suicidal ideation in adolescents. Suicide and Life-Threatening Behavior 39: 58-71, 2009
41) Urrila AS, Paunio T, Palomaki E et al.: Sleep in adolescent depression: physiological perspectives. Acta Physiologica 213: 758-777, 2015
42) Crawford AA, Galobardes B, Jeffreys M: Risk of suicide for individuals reporting asthma and atopy in young adulthood: Findings from the Glasgow Alumni study. Psychiatry Research 225: 364-367, 2015

Name:
Keiko Aoishi

Affiliation:
School of Nursing, Faculty of Medicine, University of Miyazaki

Address:
5200 Kihara, Kiyotake, Miyazaki city, Miyazaki

Brief Biographical History:
2012- Associate professor, University of Miyazaki

Main Works:
- Aoishi K, Sakakibara H: Possible criteria for obesity based on insulin resistance in Japanese college athletes. Obesity Research & Clinical Practice 6:e129-e137, 2012
- Aoishi K, Eto T, Fujimaru I: Factor of the Effective Support Method to Students having the Developmental Disability. Med Biol 157:1361-1366, 2013

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- Japanese Association of School Health
- Japanese Society of Public Health
- Japanese Academy of Community Health Nursing
- Japan Epidemiological Association