

Association between weight status and recreational drug abuse in Korean adolescents

Research Article

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Received 11 July 2011; Accepted 7 December 2011

Abstract: The purpose of this study was to investigate the relationship between weight status and recreational drug use in Korean adolescents. A total of 72,399 adolescent students (38,152 boys and 34,247 girls) from the middle first to high third grade participated in the 5th Korea Youth Risk Behaviour Web-based Survey (KYRBWS-V) project in 2009. They were assessed for body mass index (BMI) and recreational drug abuse. The associations between BMI and recreational drug use were examined using multivariable logistic regression analysis after adjusting for the covariate variables of age, smoking frequency and cigarette consumption, frequency of alcohol consumption and severe alcohol intoxication, amount of alcohol consumed, parents' education level, economic status, sedentary activities during the week, mental stress, sleep duration, frequency of vigorous and moderate physical activities, and muscular strength exercises during the week. For boys, the odds ratio (OR) (95% confidence interval [CI]) between overweight and drug use were 0.990 (0.723–1.356; $p = 0.950$) for almost none, 0.939 (0.521–1.693; $p = 0.834$) for past use, and 0.791 (0.385–1.624; $p = 0.523$) for present use. The OR (95% CI) between obesity and drug use was 0.731 (0.508–1.052; $p = 0.091$) for almost none, 0.755 (0.389–1.465; $p = 0.407$) for past use, and 0.701 (0.314–1.565; $p = 0.386$) for present use. For girls, the OR (95% CI) between overweight and drug use was 1.112 (0.702–1.763; $p = 0.650$) for almost none, 1.103 (0.464–2.619; $p = 0.825$) for past use, and 0.927 (0.267–3.218; $p = 0.905$) for present use. The OR (95% CI) between obesity and drug abuse was 0.594 (0.261–1.352; $p = 0.215$) for almost none, 1.318 (0.462–3.764; $p = 0.606$) for past use, and <0.001 (<0.001 – <0.001 ; $p = 0.998$) for present use. We concluded that recreational drug use had no correlation with overweight and obesity in Korean adolescents.

Keywords: Adolescent • Body mass index • Obesity • Recreational drug abuse

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1. Introduction

In 2008, the World Health Organization (WHO) reported that 3.5%–5.7% of the world's population, or 155 to 250 million people aged 15–64 years, used psychoactive substances such as cannabis, opioids, amphetamines, cocaine, and nonprescribed psychoactive prescription medication [1]. WHO estimated that 0.7% of the global burden of disease was due to cocaine and opioid use in 2004.

Recreational drug use is most likely to begin during adolescence. According to the Centers for Disease Control (CDC) in the United States, 21% of high school students have taken prescription drugs without a prescription [2]. A nationwide study shows that 47%

of high-school third grade students report having used an illegal substance [3]. Recreational drug abuse can lead to adverse health effects such as chronic inflammatory disease [4], chronic obstructive pulmonary disease (COPD) [5], cancer [6], psychiatric problems [7], physical dependence [8], cognitive dysfunction [9], cardiovascular disease, and other toxicities [10].

Excess weight is also associated with serious health problems worldwide. According to the 2008 WHO report, more than 1.5 billion adults aged 20 and above are overweight and more than 300 million women and 200 million men are obese. Almost 43 million children of less than 5 years old were found to be overweight [11]. Obesity also can induce adverse health effects such as cardiac disease, stroke, type II diabetes,

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musculoskeletal disorders, and some cancers such as endometrial, breast, and colon cancers [11].

Drug abuse stimulates the release of dopamine and receptor reactivity in the brain, either indirectly or directly by neurotransmitters, creating a subjective feeling of pleasure, euphoria, and satisfaction [12]. The dopamine receptor is associated with eating behaviour, so blocking dopamine receptors is associated with weight gain and increased appetite [13]. However, only a few international epidemiological studies have linked recreational drug use to BMI or obesity since these relationships are difficult to characterize [14]. No study thus far has assessed the relationship between drug use and obesity in Korean adolescents. This study was conducted to determine whether recreational drug abuse is related to obesity in Korean adolescents.

2. Material and Methods

2.1. Subjects

The 2009 5th Korea Youth Risk Behaviour Web-based Survey (KYRBWS-V) is a retrospective cohort study that involves the use of a complex sample design that includes stratification, clustering, and multistage sampling. It is a national school-based survey conducted by the Korea Centers for Disease Control and Prevention (KCDCP) to estimate the prevalence of health-risk behaviour among adolescent students from middle first grade to high-school third grade in Korea [15]. The study used a sample of 400 middle schools and 400 high schools to evaluate the association between drug abuse and obesity in adolescents, taking into account potential covariate variables. The KYRBWS was used for a nationally representative group. The subjects were not identified individually, and the survey did not collect private information; therefore, ethical approval was not required. The KYRBWS is considered a valid and reliable method [16,17].

The students were assigned unique identification numbers by classroom teachers. They accessed the survey page on the Web using those numbers and were asked if they were willing to participate. The students who chose to join the study completed the questionnaire anonymously at their school. The response rate was 97.6% (N = 75,066). Students who had dyslexia or dysgraphia and 2,667 students who were absent for an extended period were excluded. After exclusions, a group of 72,399 adolescents participated in the study.

2.2. Independent variables

Each subject measured and recorded his or her own height and weight. The body mass index (BMI; kg/m²) was then calculated from the recorded data. According to the World Health Organization's Asia-Pacific standard of obesity, individuals with BMIs of <23, ≥23–<25, and ≥25kg/m² were defined as normal-weight, overweight, and obese, respectively [18].

2.3. Dependent variables

The self-reported recreational drug use was evaluated using the following questions.

Have you ever used recreational drugs? If the answer was yes, the student went on to the second question.

How often have you used recreational drugs such as butane gas or glue (sniffed), stimulants, methamphetamine, amphetamine, narcotics, or tranquilizers? The available responses were

1. Almost never, perhaps 1 or 2 times
2. Used in the past but not at present
3. Currently using recreational drugs

2.4. Covariate variables

Age: The students were asked their ages, and their responses fell within the specified KYRBWS parameters.

Smoking frequency: The 6 available responses ranged from none to 20–30 cigarettes per month. Students who smoked were asked their cigarette consumption. The available responses ranged from less than 1 cigarette per day to 20 cigarettes per day.

Frequency of alcohol consumption: The available responses ranged from less than 1 bottle of beer to 4 or more bottles of beer per day.

Severe alcohol intoxication: The 4 available responses ranged from none to more than 5 times per month.

Amount of alcohol consumed: The 7 available responses ranged from none to every day.

Parents' education level: The 3 available responses ranged from middle school or lower to college or higher.

Economic status: The 5 available responses ranged from very wealthy to very poor.

Sedentary activities: Examples were playing computer games, watching television, and using the Internet on weekdays and weekends. The Youth Risk Behaviour Surveillance (YRBS) recommends that such activities be limited to less than 3 hours per day [19]. On the basis of this recommendation, the participants were divided into 2 groups: 3 hours or less and more than 3 hours.

Table 1. Characteristics of subjects (Mean ± SD).

Variables	Boys (n = 38,152)	Girls (n = 34,247)	Total (n = 72,399)	
Age (years)	15.00 ± 1.73	15.12 ± 1.77	15.06 ± 1.75	
Height (cm)	169.58 ± 8.19	160.08 ± 5.39	165.09 ± 8.46	
Weight (kg)	60.14 ± 11.72	51.47 ± 7.67	56.04 ± 10.91	
BMI (kg/m ²)	20.80 ± 3.21	20.05 ± 2.58	20.45 ± 2.95	
Weight state	Normal weight (BMI < 23)	29,404 (77.1)	29,667 (86.6)	59,071 (81.6)
N (%)	Over weight (23 ≤ BMI < 25)	4,382 (11.5)	2,967 (8.7)	7,349 (10.2)
	Obese (25 ≤ BMI)	4,366 (11.4)	1,613 (4.7)	5,979 (8.3)
Economic status	Very wealthy	2,691 (07.1)	1,337 (03.9)	4,028 (05.6)
N (%)	Wealthy	8,768 (23.0)	6,719 (19.6)	15,487 (21.4)
	Average	17,229 (45.2)	17,259 (50.4)	34,488 (47.6)
	Poor	6,890 (18.1)	6,825 (19.9)	13,715 (18.9)
	Very poor	2,574 (06.7)	2,107 (06.2)	4,681 (06.5)
City size	Large cities	20,252 (53.1)	17,708 (51.7)	37,960 (52.4)
N (%)	Middle-sized cities	13,303 (34.9)	12,153 (35.5)	25,456 (35.2)
	small-sized cities	4,597 (12.0)	4,386 (12.8)	8,983 (12.4)
Grade	Middle 1 st grade	6,711 (17.6)	5,615 (16.4)	12,326 (17.0)
N (%)	Middle 2 nd grade	6,722 (17.6)	5,727 (16.7)	12,449 (17.2)
	Middle 3 rd grade	6,767 (17.7)	5,615 (16.4)	12,382 (17.1)
	High 1 st grade	6,626 (17.4)	5,369 (15.7)	11,995 (16.6)
	High 2 nd grade	5,889 (15.4)	6,102 (17.8)	11,991 (16.6)
	High 3 rd grade	5,437 (14.3)	5,819 (17.0)	11,256 (15.5)
Recreational drug use	No	37,528 (98.4)	33,934 (99.1)	71,462 (98.6)
N (%)	Almost never, perhaps 1 or 2 times	410 (01.1)	218 (00.6)	628 (00.9)
	Used in the past used bit not at present	124 (00.3)	61 (00.2)	185 (00.3)
	Currently using recreational drugs	90 (00.2)	34 (00.1)	124 (00.2)

BMI, Body Mass Index

Mental stress: The 5 available responses ranged from very high to none.

Sleep duration: The 6 available responses ranged from 4 hours per day or less to 8 hours per day or more.

Frequency of vigorous physical activities: Examples were digging, aerobics, heavy lifting, and fast cycling. The American College of Sports Medicine (ACSM) recommends that such activities be performed at least 3 times per week [20]. On the basis of this recommendation, the participants were divided into 2 groups: those who were vigorously active 3 times per week or more and those who were vigorously active less than 3 times per week.

Frequency of moderate physical activities: Examples were bicycling at a regular pace, carrying light loads, and playing doubles tennis. The ACSM recommends that such activities be performed at least 5 times per week. On the basis of this recommendation, the participants were divided into 2 groups: those who performed moderate activity 5 times a week or more and those who performed moderate activity less than 5 times a week.

Frequency of strength exercises: Examples were sit-ups, push-ups, and weight lifting. The ACSM recommends that such exercises be performed at least twice a week. On the basis of this recommendation, the participants were divided into 2 groups: those who performed strength exercises twice a week or more and those who performed strength exercises less than twice a week.

2.5. Statistical analysis

The descriptive data are presented in terms of mean ± SD values. Multivariable logistic regression analyses were conducted to evaluate whether the subjects' recreational drug abuse correlated with BMI after adjusting for covariate variables. Statistical significance was set at $\alpha < 0.05$. SPSS ver. 12.0 (Chicago, IL, USA) was used.

Table 2. The multivariable logistic regression analyses of recreational drug use for the overweight and normal-weight groups in Korean adolescents.

Category		Overweight Vs. normal-weight					
		Case	β	S.E.	OR	95% CI	p-value
Boys	No	33,212	Ref				
	Almost never, perhaps 1 or 2 times	377	-0.010	0.161	0.990	0.723-1.356	0.950
	Used in the past but not at present	114	-0.063	0.301	0.939	0.521-1.693	0.834
	Currently using recreational drugs	83	-0.235	0.367	0.791	0.385-1.624	0.523
Girls	No	32,331	Ref				
	Almost never, perhaps 1 or 2 times	212	0.107	0.235	1.112	0.702-1.763	0.650
	Used in the past but not at present	57	0.098	0.441	1.103	0.464-2.619	0.825
	Currently using recreational drugs	34	-0.076	0.635	0.927	0.267-3.218	0.905

S.E; Standard Error, OR; Odd Ratio, CI; Confidence Interval Tested by multivariable logistic regression analysis (adjusting for the covariate variables of age, smoking frequency and cigarette consumption, frequency of alcohol consumption and severe alcohol intoxication, amount of alcohol consumed, parents' education level, economic status, sedentary activities during the week, mental stress, sleep duration, frequency of vigorous and moderate physical activities, and muscular strength exercises during the week).

Table 3. The multivariable logistic regression analyses of recreational drug use for the obese and normal-weight groups in Korean adolescents.

Category		Obese Vs. normal-weight					
		Case	β	S.E.	OR	95% CI	p-value
Boys	No	33,214	Ref				
	Almost never, perhaps 1 or 2 times	364	-0.314	0.186	0.731	0.508-1.052	0.091
	Used in the past but not at present	111	-0.280	0.338	0.755	0.389-1.465	0.407
	Currently using recreational drugs	81	-0.356	0.410	0.701	0.314-1.565	0.386
Girls	No	30,997	Ref				
	Almost never, perhaps 1 or 2 times	197	-0.521	0.420	0.594	0.261-1.352	0.215
	Used in the past but not at present	55	0.276	0.535	1.318	0.462-3.764	0.606
	Currently using recreational drugs	31	-17.965	6789.549	<0.001	<0.001-<0.001	0.998

S.E; Standard Error, OR; Odd Ratio, CI; Confidence Interval Tested by multivariable logistic regression analysis (adjusting for the covariate variables of age, smoking frequency and cigarette consumption, frequency of alcohol consumption and severe alcohol intoxication, amount of alcohol consumed, parents' education level, economic status, sedentary activities during the week, mental stress, sleep duration, frequency of vigorous and moderate physical activities, and muscular strength exercises during the week).

3. Results

The characteristics of subjects are shown in Table 1. The multivariable logistic regression analyses of recreational drug use for the overweight and normal-weight groups and for the obese and normal-weight groups in Korean adolescents are shown in Tables 2 and 3 respectively. The results show the prevalence of overweight and obesity compared with that of normal weight in Korean adolescents after adjusting for covariate variables such as age, smoking frequency and cigarette consumption, frequency of alcohol consumption and severe alcohol intoxication, amount of alcohol consumed, parents' education level, economic status, sedentary activities during the week, mental stress, sleep duration, frequency of vigorous and moderate physical activities, and muscular strength exercises during the week.

For boys, the odds ratio (OR) (95% confidence interval [CI]) between overweight and drug use was

0.990 (0.723–1.356; $p = 0.950$) for almost none, 0.939 (0.521–1.693; $p = 0.834$) for past use, and 0.791 (0.385–1.624; $p = 0.523$) for current use (Table 2). The OR (95% CI) between obesity and drug use was 0.731 (0.508–1.052; $p = 0.091$) for almost none, 0.755 (0.389–1.465; $p = 0.407$) for past use, and 0.701 (0.314–1.565; $p = 0.386$) for current use (Table 3).

For girls, the OR (95% CI) between overweight and drug use was 1.112 (0.702–1.763; $p = 0.650$) for almost none, 1.103 (0.464–2.619; $p = 0.825$) for past use, and 0.927 (0.267–3.218; $p = 0.905$) for current use (Table 2). The OR (95% CI) between obesity and drug use was 0.594 (0.261–1.352; $p = 0.215$) for almost none, 1.318 (0.462–3.764) for past use, and <0.001 (<0.001–<0.001; $p = 0.998$) for current use (Table 3).

4. Discussion

The dopamine receptor is associated with weight gain and increased appetite [13]. Therefore, we might expect to find a positive association between weight status and recreational drug abuse in Korean adolescents. The study indicated that drug abuse had no relationship with weight status in adolescents even after controlling for covariate variables related to weight control. However, the study did not examine the effects of recreational drugs on appetite.

Adolescence is a period of rapid physical growth, increased hormone levels, and psychological change, culminating in sexual maturity [21]. We believe that no relationship was found between weight status and recreational drug use in adolescents because the rates of metabolism, fat oxidation, and substrate oxidation during adolescence are higher than the rates of those during adulthood [21,22].

A report by Pickering et al. (2007) using data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), controlling for life stressors and medical conditions, found that obesity was associated with a lower OR when accompanied by drug use [23]. However, analysis of the same data without controlling for life stress and medical conditions showed no relationship between body weight and drug use [24]. Barry & Petry (2009) reported that BMI was not associated with drug abuse in general, but there was an inverse association between BMI and alcohol use [25]. The topic is still controversial, but our results support the

conclusion that drug use has no correlation with BMI or weight status.

The study has some limitations. First, it did not include the duration, amount, type, or frequency of drug use. Second, the students reported their height and weight online; these parameters were not directly measured. Therefore, the incidence of obesity might be lower, because adolescents tend to grow in height and decrease in weight [15]. Third, the survey was a retrospective cohort study. Therefore, we did not evaluate the cause and effect but only assessed the correlation. We studied 72,399 subjects from all of Korea; previous research has consisted only of limited regional case studies. Therefore, we believe that the KYRBWS can be considered indicative of the relationship between recreational drug abuse and obesity in Korean adolescents.

5. Conclusion

We concluded that recreational drug abuse had no correlation with overweight and obesity in Korean adolescents.

Acknowledgement

This work was supported by a special research grant from Seoul Women's University (2012).

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