Original Article

Prevalence of Obesity in Adolescents with History of Pregnancy and Associated Factors in Korea

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Abstract

Background: The pregnancy was a risk factor for excessive weight gain for women. However, there is no information about the prevalence of obesity and its relationship with a history of pregnancy in girls. Therefore, the purpose of this study was to investigate differences in the prevalence of obesity in adolescent females with a history of pregnancy and factors associated with it, in Korea.

Methods: In 2009, 69 of 34,247 female students revealed that they had experienced pregnancy in response to the 5th Korea Youth Risk Behavior Web-based Survey (KYRBWS-V) project by the Korea Centers for Disease Control and Prevention (KCDCP). The body mass index (BMI) and experienced pregnancy categories of the KYRBWS-V were assessed, and, for data analysis, the independent *t*-test, chi-square test, and multivariate logistic regression were used.

Results: The risk of pregnancy was increased by approximately 47% per unit increase in age, and 331% per unit increase in depression, respectively. Conversely, the risk decreased by 19% per unit increase in BMI and 33% per unit increase (ranged from 1: very rich to 5: very poor) in the family economic state.

Conclusion: Obesity in adolescent females is minimally affected by a history of pregnancy, if at all, despite the fact that pregnancy was a risk factor for excessive weight gain in women. However, adolescent females with a history of pregnancy have higher levels of depression than do normal peers in Korea.

Keywords: *Youth risk behavior, Obesity, Pregnancy, Adolescent, Korea*

Introduction

Obesity and overweight are becoming a serious problem in Korea, and it is also a significant problem in adolescence. According to the Korea National Health and Nutrition Examination Survey (KNHANES) in 2009, 5.0% and 11.3% of adolescents aged 12-18 yr are already overweight and obese in Korea (1). Because approximately 80% of obese adolescents become obese adults, it is important to prevent obesity in adolescence (2-3).

It is certain that a sedentary lifestyle and unhealthy eating habits have contributed to the rise in obesity (4-5). Besides, smoking, drinking, and drug use affect obesity, so a great deal of research is being carried out to discover the harmful results of those risk factors (6).

Interestingly, for women, pregnancy was also a risk factor for excessive weight gain. Many studies reported that high weight gain during the gestation period is the strongest determinant of weight retention in the postpartum time period (7-9). Moreover, it is definitely associated with long-term weight gain (10) and obesity (11-12).

Although it is very unusual, girls also become pregnant during adolescence. However, there is no

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information about the prevalence of obesity and its relationship with a history of pregnancy in girls. Therefore, the purpose of this study was to investigate the differences in the prevalence of obesity according to a history of pregnancy in Korean girls and factors associated with it. Thus, we will provide information about whether pregnancy is a risk factor to increase obesity in teenage girls or not.

Materials and Methods

Subjects

The 2009 5th Korea Youth Risk Behavior Web-based Survey (KYRBWS-V) was a national school-based survey, a retrospective cohort study, conducted using a complex sample design, clustering, involving stratification, and multistage sampling by the Korea Centers for Disease Control and Prevention (KCDCP) to evaluate the prevalence of health risk behavior among adolescent students in grades 7-12 in Korea (13) as well as the questionnaires has valid and reliable (14, 15).

This survey was conducted to understand the current health level and state of adolescent health risk behavior, to calculate an index for a health promotion project plan, and to compare the results with those of other countries. Examples of similar surveys are Youth Risk Behavioral Surveillance (YRBS) (16) and Global School-based Student Health Survey (GSHS) (17) of Centers for Disease Control and Prevention (CDC) in the United States, and Monitor Health Behavior in School-aged Children study (HBSC) (18) of the World Health Organization (WHO) Europe.

The KYRBWS uses a sixteen-city-cluster sample strategy and the survey-sampling frame covers all of Korea. In total, 400 middle and 400 high schools were sampled for this study. All 34, 247 girls participated with the exception of illiterate students and those with extended absences. Overall, 69 of 34,247 female students revealed that they had experienced pregnancy. The characteristics of subjects are shown in Table 1.

Independent variables

Subjects' height and weight were self-recorded, and body mass index (BMI) (kg/m^2) was calculated

using each participant's height and weight. According to WHO's Asia-Pacific standard of obesity, BMI <23, ≥23–<25 and ≥25 were defined normal, overweight, and obese, respectively (19).

Dependent variables

One of the KYRBWS questions was used to measure experienced pregnancy in the subsample of adolescents, respectively: 'Q1) Have you experienced a pregnancy?' with the response options of "①Yes," "②No."

Covariate variables

① The age variable created by the KYRBWS was used without modification.

② Father and mother education was used, and possible responses ranged from 1 (middle school or lower) to 3 (college or higher).

③ Family economic state was used, and possible responses ranged from 1 (very rich) to 5 (very poor).

④ Frequency of vigorous physical activity, like heavy lifting, digging, aerobics, or fast bicycling during week was assessed. ACSM recommends at least three times per week (20). Based on this recommendation, participants were divided into two groups (1: yes, 2: no)

⑤ Frequency of moderate physical activity, like carrying light loads, bicycling at a regular pace, or doubles tennis during week was assessed. ACSM recommends at least five times per week (20). Based on this recommendation, participants were divided into two groups (1: yes, 2: no).

⑥ Frequency of muscular strength exercise, like push-ups, sit-ups, or weight lifting during the week was assessed. ACSM recommends at least two times per week (20). On the basis of this recommendation, participants were divided into two groups (1: yes, 2: no)

⑦ Sedentary lifestyle time like watching TV, playing computer games, and using the internet during weekdays was assessed. YRBS recommends at under 3 h per day (16). Based on this recommendation, participants were divided into two groups

(1: yes, 2: no).

⑧ Depression was assessed by asking if their daily activities were ever disrupted for 2 consecutive weeks from sadness or despair with the past year, and the possible responses were 1 (yes) or 2 (no).

⑨ Mental stress was assessed, and possible responses ranged from 1 (very much) to 5 (not at all).

⑩ Sleep duration was assessed, and the possible responses ranged from 1 (≤4 h) to 6 (≥8 h).

Statistical analysis
Descriptive data are presented as mean±standard deviation. Independent t-test or chi-square test was used to verify the differences in the normal group and experienced pregnancy group. If the expected frequency counts in the chi-square test were under 5, the Fisher's exact test was conducted. Multivariate logistic regression analyses were conducted to evaluate if pregnancy history was related with BMI after adjusting for factors that may affect the outcome. Statistical significance was set

at $P< 0.05*$, $P< 0.01**$, and $P< 0.001***$, and all analyses were performed using SPSS ver. 12.0 (SPSS, Chicago, IL, USA).

Results

The multivariate logistic regression analysis
The multivariate logistic regression analysis for the experienced pregnancy group according to the BMI of Korean girls is shown in Table 2. It demonstrates the experienced pregnancy group BMI after controlling for the covariates like age, father and mother's education, family economic state, frequency of vigorous and moderate physical activity per week, frequency of exercise for muscular strength per week, sedentary lifestyle during weekdays, depression, mental stress, and sleep duration. The risk of pregnancy was increased by approximately 47% per unit increase in age and 331% per unit increase in depression, respectively. Conversely, the risk decreased by 19% per unit increase in BMI and 33% per unit increase in the family economic state.

Table 1: Characteristics of subjects (Mean± SD)

Variables	Normal girls (n = 34178)	Experienced pregnancy girls (n = 69)	t or F value	P-value
Age (years)	15.12 ± 1.77	15.97 ± 1.80	-3.993	<0.001***
Height (cm)	160.08 ± 5.39	162.80 ± 6.86	-3.292	0.002**
Weight (kg)	51.47 ± 7.67	51.70 ± 7.50	-0.251	0.802
BMI (kg/m^2)	20.05 ± 2.58	19.46 ± 2.09	2.339	0.022*
Weight state				
Normal weight (BMI < 23)	29602 (86.6)	65 (94.2)	4.404	0.106
Overweight (23≤ BMI < 25)	2963 (8.7)	4 (5.8)		
Obesity (25 ≤ BMI)	1613 (4.7)	0 (0.0)		
Family economic state				
High	1325 (3.9)	12 (17.4)		
Middle high	6704 (19.6)	15 (21.7)	28.240	<0.001***
Average	17238 (50.5)	21 (30.5)		
Middle low	6812 (19.9)	13 (18.8)		
Low	2099 (6.1)	8 (11.6)		
City size				
Large	17590 (51.6)	33 (47.8)		
Middle	12130 (35.6)	23 (33.4)	2.252	0.318
Small	4373 (12.8)	13 (18.8)		
Grade				
Middle 1st	5611 (16.4)	4 (5.8)		
Middle 2nd	5715 (16.7)	12 (17.4)		
Middle 3rd	5609 (16.4)	6 (8.7)	17.575	0.003**
High 1st	5361 (15.7)	8 (11.6)		
High 2nd	6084 (17.8)	18 (26.1)		
High 3rd	5798 (17.0)	21 (30.4)		

*P<0.05 **P<0.01 ***P<0.001 by independent test or chi-square test

Table 2: The multivariate logistic regression analysis for experienced pregnancy according the BMI in Korean girls

Correlate	ß	S.E.	OR	95% CI	P-value
BMI	-0.207	0.068	0.813	0.712-0.928	0.002**
Age	0.383	0.102	1.466	1.199-1.792	<0.001***
Father's education	-0.316	0.287	0.729	0.416-1.278	0270
Mother's education	-0.084	0.312	0.919	0.499-1.694	0.787
Family economic state	-0.393	0.177	0.675	0.477-0.954	0.026*
Frequency of vigorous physical activity per week	-0.128	0.444	0.880	0.368-2.102	0.773
Frequency of moderate physical activity per week	-0.573	0.536	0.564	0.197-1.612	0.285
Frequency of exercise for muscular strength per week	-0.415	0.386	0.660	0.310-1.407	0.282
Sedentary lifestyle during weekdays	0.256	0.331	1.291	0.675-2.469	0.440
Depression	1.196	0.356	3.308	1.648-6.641	0.001**
Mental stress	-0.070	0.179	0.932	0.656-1.324	0.694
Sleep duration	-0.079	0.130	0.924	0.716-1.192	0.544

BMI; Body Mass Index,S.E; Standard Error, OR; Odd Ratio, CI; Confidence Interval
*$P< 0.05$ **$P< 0.01$ ***$P< 0.001$, tested by multivariate logistic regression analysis

Discussion

The aim of this study was to investigate the relationship between pregnancy history and the prevalence of obesity in Korean girls. The results of this study, interestingly, showed that lower levels of BMI tended to be associated with a history of pregnancy.

Seol & Choi (2010) reported that the girls who have a boyfriend have a good sense of appearance, dynamic personality, better body management, and better beauty regimens than the girls who do not have a boyfriend in Korea (21). This means girls with a history of pregnancy have a better sense of physical characteristics like BMI. Furthermore, the adolescent period is a time of rapid physical growth and psychological changes, culminating in sexual maturity (22). This may explain why our study results indicated that obesity in girls was affected minimally or not at all by a history of pregnancy, although the pregnancy was a risk factor for excessive weight gain in women (7-12).

However, our results showed that the experienced pregnancy girls have higher levels of depression (OR= 3.308) than their normal peers. Mollborn & Morningstar (2009) reported that teenage mothers were more distressed than their normal peers were in a longitudinal data set. However, their in-

creased psychological distress did not appear to be caused by experiencing motherhood. Rather, their distress levels were already higher than their peers were before they became pregnant (23). Our results supported previous results that because adolescent pregnancy was not socially acceptable in Korea, and they also face social prejudices, pregnant girls seem to suffer higher levels of depression than their peers do. We hope that further well-designed studies are investigated.

Interestingly, this study shows girls with a history of pregnancy have a higher pregnancy frequency if their parent's family economic state is higher. Kim (2002) reported that 99 of 136 (72.8%) participants who experienced pregnancy in a single mother's sheltered housing in Korea had an above average family economic state (24). We did not verify this information; however, our results also have similar results. Therefore, we suggest that better designed studies about the relationship between pregnancy in adolescents and family economic state are necessary.

The limitations of this study are as follows: First, this survey did not address information about the pregnancy period, such as whether the participant delivered the child or underwent an abortion, though it is very important since that the information can affect obesity. Second, this study was

conducted online and, therefore, the height and weight of the participants were not measured directly, but were recorded by the participants themselves. It is possible that the level of obesity that is measured would be relatively low because adolescents have a tendency to increase in height and decrease in weight (15). Third, family economic state was not determined by their parents but by adolescents; so, it would be inaccurate. Fourth, this study did not include that the smoking frequency, cigarette consumption, frequency of alcohol consumption and the amount of alcohol consumed, and eating habit are related with obesity. Therefore, a more accurately designed study is needed. Fifth, this study could not examine the cause and effect but could only examine the interrelationship, as it was cross-sectional study. However, this study is different from the previous regional small case study since it investigated the whole country and the examined 34, 247 subjects. Therefore, it would be one of the representative studies dealing with the prevalence of obesity in adolescent females with a history of pregnancy in Korea.

In conclusion, we concluded that obesity is minimally affected by a history of pregnancy, if at all, despite the fact that pregnancy was a risk factor for excessive weight gain in women. However, girls with a history of pregnancy tend to have higher levels of depression than their peers in Korea have.

Ethical Considerations

Acknowledgements

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