Lifestyle Factors and Obesity among Korean Adults

*Wi-Young SO [1], * Dong-il SEO [2]*

1. Dept. of Human Movement Science, Seoul Women's University, Seoul, Korea
2. Dept. of Social Athletics, Dongguk University, Gyeong-Ju, Korea

Corresponding Author: Email: seodi74@dongguk.ac.kr

Abstract

Background: The purpose of this study was to examine whether lifestyle-related factors, such as frequency of drinking and smoking, mental stress, sleep duration, economic status, and education level, are associated with obesity (as defined given by the WHO report on Asia) in a selected sample of Korean adults.

Methods: The subjects were 1,566 adults (505 men, 1,061 women) aged over 20 years who visited a public health center for medical checkups in Seoul, Korea, between November 1, 2010, and October 30, 2011. The association between lifestyle-related factors and obesity was assessed by using multivariate logistic regression analysis after adjusting for gender, age, frequency of drinking and smoking, mental stress, sleep duration, economic status, and education level.

Results: Only economic status and education level significantly predicted obesity; very rich people and people who completed high school, college, or higher were less likely to be obese.

Conclusion: Therefore, frequency of smoking and drinking, sleep duration, and level of stress were not associated with obesity but economic status and educational level significantly predicted obesity.

Keywords: Smoking, Sleep duration, Mental stress, Education, Economy, Obesity

Introduction

According to WHO report, the worldwide prevalence of obesity has been more than doubled since 1980. Furthermore, more than 1.4 billion adults over 20 years of age were overweight in 2008, and of these, over 200 million men and nearly 300 million women were obese (1). Additionally, according to the Centers for Disease Control and Prevention (CDC), approximately 35.7% of adults in the United States of America were obese in 2010 (2). Based on the Fifth Korea National Health and Nutrition Examination Survey (KNHANES-V) in 2010, the prevalence of obesity was 36.3% in men and 24.8% in women aged over 19 years, and this prevalence is increasing (3). This means that, as in the United States of America, obesity has become a serious public health problem in Korea.

Obesity is an independent risk factor for cardiac diseases, some types of cancer, and type-2 diabetes and leads to a high mortality rate (4–7).

Moreover, it aggravates chronic diseases such as cholelithiasis, hypertension, hypercholesterolemia, and arthritis (4–7).

Obesity is mainly caused by a mismatch between caloric intake and energy expenditure (1–4). The factors related to the nature of energy imbalance are numerous and complex; they include the socioeconomic environment, smoking, drinking, mental stress, sleep duration, sedentary lifestyle, eating habits, and the interactions between these factors (8–13). For this reason, many obese people attempt to balance energy intake and expenditure or promote energy expenditure through diverse efforts in order to reduce and control their obesity. Furthermore, many previous studies have provided evidence that lifestyle-related factors that promote health are associated with decreased obesity (13–15). However, to the best of our knowledge, few, if any, studies have assessed the effects

of these factors among only obese Korean adults. The purpose of this study was to examine whether lifestyle-related factors were related to obesity in a sample of Korean adults.

Methods

Subjects

Totally, 1,566 adults (505 men, 1,061 women) aged over 20 years who visited a public health center for medical checkups in Seoul, Korea, be-

tween November 1, 2010, and October 30, 2011, participated in this cross-sectional study. The subjects completed a self-reported questionnaire related to lifestyle-related factors and were considered to be physically and psychologically healthy. All gave written consent before participating in this study. All study procedures were approved by the Human Care and Use Committee of the S-gu Community Health Center. Participant characteristics are shown in Table 1.

Table 1: The life style characteristics of the subjects

Variable		Male (n = 505)	Female (n = 1,061)	Total (n = 1,566)
		Mean (SD)	Mean (SD)	Mean (SD)
Age (years)		50.89 ± 11.96	51.15 ± 10.63	51.06 ± 11.07
Height (cm)		169.96 ±5.74	157.47 ± 5.31	161.50 ± 7.99
Weight (kg)		71.43 ± 9.29	57.23 ± 7.61	61.81 ± 10.54
Body mass index (kg/m²)		24.70 ± 2.78	23.10 ± 3.01	23.61 ± 3.03
		n (%)	n (%)	n (%)
Healthy-weight (normal/overweight) (body mass index < 25)		288 (57.0)	820 (77.3)	1,108 (70.8)
Obese (body mass index ≥ 25)		217 (43.0)	241 (22.7)	458 (29.2)
		n (%)	n (%)	n (%)
Frequency of drinking	No drinking	412 (81.6)	900 (84.8)	1,312 (83.8)
	Once a month	21 (4.2)	106 (10.0)	127 (8.1)
	2–3 times per month	38 (7.5)	40 (3.8)	78 (5.0)
	4 times or more per month	34 (6.7)	15 (1.4)	49 (3.1)
Frequency of smoking	Non-smoker	416 (82.4)	1,049 (98.9)	1,465 (93.6)
	Ex-smoker	51 (10.1)	3 (0.3)	54 (3.4)
	Current smoker	38 (7.5)	9 (0.8)	47 (3.0)
Mental stress	Very low	422 (83.6)	794 (74.8)	1,216 (77.7)
	Low	50 (9.9)	177 (16.7)	227 (14.5)
	High	31 (6.1)	77 (7.3)	108 (6.9)
	Very high	2 (0.4)	13 (1.2)	15 (1.0)
Sleep duration	5 hours or less	13 (2.6)	50 (4.7)	63 (4.0)
	6 hours	30 (5.9)	97 (9.1)	127 (8.1)
	7 hours	22 (4.4)	82 (7.7)	104 (6.6)
	8 hours or more	440 (87.1)	832 (78.4)	1,272 (81.2)
Economic status	Very poor	89 (17.6)	276 (26.0)	365 (23.3)
	Poor	58 (11.5)	133 (12.5)	191 (12.2)
	Rich	336 (66.5)	567 (53.4)	903 (57.7)
	Very rich	22 (4.4)	85 (8.0)	107 (6.8)
Education level	Elementary school or lower	31 (6.1)	79 (7.4)	110 (7.0)
	Middle school	19 (3.8)	102 (9.6)	121 (7.7)
	High school	111 (22.0)	288 (27.1)	399 (25.5)
	College or higher	344 (68.1)	592 (55.8)	936 (59.8)

Data are presented as mean ± SD or N (%)

Independent and covariate variables

The lifestyle-related factors were assessed for each participant through 6 questions selected from the self-reported questionnaire. The questions and their response scales are provided below:

[Q1] "In the past month, on how many occasions have you consumed more than 1 glass of alcohol?" Response: [1] no drinking, [2] once a month, [3] 2–3 times per month, and [4] 4 times or more per month.

[Q2] "Are you a non-smoker, ex-smoker, or current smoker?" Response: [1] non-smoker, [2] ex-smoker, and [3] current smoker.

[Q3] "How would you describe the level of stress that you generally experience?" Response: [1] very low mental stress, [2] low mental stress, [3] high mental stress, and [4] very high mental stress.

[Q4] "In the past week, how many hours did you sleep per night on average?" Response: [1] 5 hours or less, [2] 6 hours, [3] 7 hours, and [4] 8 hours or more.

[Q5] "What do you perceive your economic status to be?" Response: [1] very poor, [2] poor, [3] rich, and [4] very rich.

[Q6] "What is your education level?" Response: [1] elementary school or lower, [2] middle school, [3] high school, and [4] college or higher.

Dependent variables

The subjects' heights and weights were assessed by using InBody-720 (Biospace, Seoul, Korea) in order to calculate their body mass indices (BMI; kg/m^2). According to the WHO Asia-Pacific standard, people with BMIs of <25 kg/m^2 and ≥25 kg/m^2 are defined as healthy-weight (normal/overweight) and obese, respectively (16).

Statistical analysis

All results are presented as mean ± standard deviation. Multivariate logistic regression analyses (method: *"enter"*) were conducted to determine whether lifestyle-related factors were related to obesity after adjusting for gender, age, frequency of drinking and smoking, mental stress, sleep duration, economic status, and education level. The threshold for statistical significance was set at *P<*

0.05, and all analyses were performed with SPSS ver. 18.0 (SPSS, Inc., Chicago, IL, USA).

Results

The characteristics of the subjects are shown in Table 1. The average ages of the males and females are 50.89 ± 11.96 years and 51.15 ± 10.63 years respectively; their average heights are 169.96 ± 5.74 cm and 157.47 ± 5.31 cm respectively; their average weights are 71.43 ± 9.29 kg and 57.23 ± 7.61 kg respectively; and their average BMIs are 24.70 ± 2.78 kg/m^2 and 23.10 ± 3.01 kg/m^2 respectively.

As can be observed from the BMIs of the male and female participants, 288 (57.0%) and 820 (77.3%) have healthy weights and 217 (43.0%) and 241 (22.7%) are obese, respectively. According to the males' and females' frequency of drinking, 412 (81.6%) and 900 (84.8%) are no drinking, 21 (4.2%) and 106 (10.0%) are once a month, 38 (7.5%) and 40 (3.8%) are 2-3 times per month, and 34 (6.7%) and 15 (1.4%) are 4 times or more per month. According to the males' and females' frequency of smoking, 416 (82.4%) and 1,049 (98.9%) are non-smoker, 51 (10.1%) and 3 (0.3%) are ex-smoker, and 38 (7.5%) and 9 (0.8%) are current smoker.

With regard to mental stress, 422 (83.6%) male and 794 (74.8%) female experience very low stress, 50 (9.9%) male and 177 (16.7%) female experience low stress, 31 (6.1%) male and 77 (7.3%) female experience high stress, and 2 (0.4%) male and 13 (1.2%) female experience very high stress. Regarding male and female's sleep duration, 13 (2.6%) and 50 (4.7%) sleep for 5 hours or less, 30 (5.9%) and 97 (9.1%) sleep for 6 hours, 22 (4.4%) and 82 (7.7%) sleep for 7 hours, and 440 (87.1%) and 832 (78.4%) sleep for 8 hours or more. In addition, 89 (17.6%) male and 276 (26.0%) female are very poor, 58 (11.5%) male and 133 (12.5%) female are poor, 336 (66.5%) male and 567 (53.4%) female are rich, and 22 (4.4%) male and 85 (8.0%) female are very rich. With regard to male's and female's education level, 31 (6.1%) and 79 (7.4%) are elementary school or lower, 19

(3.8%) and 102 (9.6%) are middle school, 111 (22.0%) and 288 (27.1%) are high school, and 344 (68.1%) and 592 (55.8%) are college or higher.

The results of the multivariate logistic regression analyses of lifestyle-related factors among healthy weight and obese groups of Korean adults are shown in Table 2. Drinking, smoking, stress level, and sleep duration did not predict obesity. On the other hand, economic status and education level significantly predicted obesity. Specifically, very rich people (Odd Ratio [OR] = 0.499, P = 0.036, 95% confidence intervals [CI]: 0.260–0.955) were less likely to be obese when compared with very poor people. People who completed high school (OR = 0.576, P = 0.026, 95% CI: 0.355–0.935) and people who completed college or higher (OR = 0.568, P = 0.041, 95% CI: 0.331–0.977) were also less likely to be obese when compared with people who elementary school or lower.

Table 2: The results of the multivariate logistic regression analyses of lifestyle-related factors for the healthy-weight and obese groups of Korean adults (n = 1,566)

Prevalence of Obesity as compared to healthy-weight		Case	OR	95% CI	*P*
Frequency of drinking	No drinking	1,312	1.000	Reference	
	1 time per month	127	1.453	0.883-2.392	0.141
	2–3 times per month	78	1.450	0.793-2.649	0.227
	4 times or more per month	49	1.380	0.661-2.883	0.391
Frequency of smoking	Non-smoker	1,465	1.000	Reference	
	Ex-smoker	54	0.831	0.423-1.629	0.589
	Current smoker	47	0.532	0.254-1.113	0.094
Mental stress	Very low	1,216	1.000	Reference	
	Low	227	1.140	0.701-1.852	0.598
	High	108	1.249	0.699-2.235	0.453
	Very high	15	1.128	0.319-3.993	0.852
Sleep duration	5 hours or fewer	63	1.000	Reference	
	6 hours	127	0.923	0.467-1.824	0.817
	7 hours	104	0.735	0.359-1.506	0.400
	8 hours or more	1,272	0.897	0.467-1.724	0.745
Economic status	Very poor	365	1.000	Reference	
	Poor	191	0.912	0.608-1.367	0.654
	Rich	903	0.817	0.558-1.197	0.300
	Very rich	107	0.499	0.260-0.955	0.036*
Education level	Elementary school or lower	110	1.000	Reference	
	Middle school	121	0.681	0.391-1.187	0.175
	High school	399	0.576	0.355-0.935	0.026*
	College or higher	936	0.568	0.331-0.977	0.041*

OR, odds ratio; CI, confidence interval

*P < 0.05, adjusted for gender, age, frequency of drinking and smoking, mental stress, sleep duration, economic status, and education level

Discussion

The aim of this study was to examine the relationship between lifestyle-related factors and obesity in a sample of Korean adults. Our results showed that drinking and smoking are not associated with obesity in Korean adults. Even though many previous studies have reported that drinking and smoking are strongly associated with obesity (17–20), our results might be explained by the fact that we did not examine the duration, amount, or type of drinking and smoking.

In the case of Korean adolescents, previous studies have shown that mental stress and sleep duration were associated with obesity (21–23). However, our results did not find such an association. This might be because psychological and physical conditions are more stable in adulthood; thus, mental stress and sleep duration did not affect obesity more than the other factors in our sample, which consisted entirely of adults. Therefore, further well-designed studies on this topic are necessary.

Interestingly, this study showed that economic status and educational level are associated with obesity. The review of McLaren on 333 studies through some search engine inc. CINAHL, ERIC, MEDLINE, and Social Science Abstracts showed that low educational level is strongly associated with obesity (24). Furthermore, low socioeconomic status has also been found to be strongly associated with obesity (25–26). Therefore, our study supported the idea that obese people have lower socioeconomic status and educational level compared to people with healthy weights. Future studies should determine the extent to which levels of lifestyle-related factors affect obesity in Korea.

This study has several limitations. Firstly, this study did not investigate the amount, quality, or variety of dietary pattern or the type, intensity, duration, or frequency of physical activity, all of which might predict obesity. Therefore, further well-designed studies should be performed in the future to determine the effects of these variables on obese Korean adults. Secondly, because the subjects of this study were recruited from a public health center where they were receiving medical checkups in Seoul, Korea, the subjects do not represent the entire Korean adult population. Therefore, further well-designed studies are needed in order to generalize these results in the future. However, the large number of subjects (n = 1,566) was one of the strengths of this study.

Conclusion

We therefore conclude that frequency of smoking and drinking, sleep duration, and mental stress are not associated with obesity. However, economic status and educational level are associated with obesity regardless of gender and age in a sample of Korean adults.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

Acknowledgements

References

1. World Health Organization (2012). *Obesity and Overweight*. World Health Organization. *http://www.who.int/mediacentre/factsheets/fs311/en/*.
2. Centers for Disease Control and Prevention (2012). *Adult Obesity Facts*. Centers for Disease Control and Prevention. *http://www.cdc.gov/obesity/data/adult.html*.
3. Korea Centers for Disease Control and Prevention (2012). *Korea Health Statistics 2010: Korea National Health and Nutrition Examination Survey (KNHANES V-1)*. Korea Centers for Disease Control and Prevention.
4. Wadden TA, Stunkard AJ (2002). *Handbook of obesity treatment (3rd ed.)*. New York: Guilford Press.

5. Ligibel J (2011). Obesity and breast cancer. *Oncology (Williston Park).* 25 (11): 994-1000.
6. Poliakova N, Després JP, Bergeron J, Alméras N, Tremblay A, Poirier P (2012). Influence of obesity indices, metabolic parameters and age on cardiac autonomic function in abdominally obese men. *Metabolism,* 61 (9): 1270-1279.
7. Nguyen NT, Magno CP, Lane KT, Hinojosa MW, Lane JS (2008). Association of hypertension, diabetes, dyslipidemia, and metabolic syndrome with obesity: findings from the National Health and Nutrition Examination Survey, 1999 to 2004. *J Am Coll Surg,* 207 (6): 928-934.
8. Clair C, Chiolero A, Faeh D, Cornuz J, Marques-Vidal P, Paccaud F, Mooser V, Waeber G, Vollenweider P (2011). Dose-dependent positive association between cigarette smoking, abdominal obesity and body fat: cross-sectional data from a population-based survey. *BMC Public Health,* 11: 23.
9. Bautista-Castaño I, Serra-Majem L (2012). Relationship between bread consumption, body weight, and abdominal fat distribution: evidence from epidemiological studies. *Nutr Rev,* 70 (4): 218-233.
10. Arif AA, Rohrer JE (2005). Patterns of alcohol drinking and its association with obesity: data from the Third National Health and Nutrition Examination Survey, 1988-1994. *BMC Public Health,* 5: 126.
11. Patel SR, Hu FB (2008). Short sleep duration and weight gain: a systematic review. *Obesity (Silver Spring),* 16 (3): 643-653.
12. Bose M, Oliván B, Laferrère B (2009). Stress and obesity: the role of the hypothalamic-pituitary-adrenal axis in metabolic disease. *Curr Opin Endocrinol Diabetes Obes,* 16 (5): 340-346.
13. Kelishadi R, Alikhani S, Delavari A, Alaedini F, Safaie A, Hojatzadeh E (2008). Obesity and associated lifestyle behaviours in Iran: findings from the First National Non-communicable Disease Risk Factor Surveillance Survey. *Public Health Nutr,* 11 (3): 246-251.
14. Tovar A, Chui K, Hyatt RR, Kuder J, Kraak VI, Choumenkovitch SF, Hastings A, Bloom J, Economos CD (2012). Healthy-lifestyle behaviors associated with overweight and obesity in US rural children. *BMC Pediatr,* 12: 102.
15. Al-Hazzaa HM, Abahussain NA, Al-Sobayel HI, Qahwaji DM, Musaiger AO (2012). Lifestyle factors associated with overweight and obesity among Saudi adolescents. *BMC Public Health,* 12: 354.
16. WHO/IASO/IOTF (2000). *The Asia-Pacific perspective: redefining obesity and its treatment.* Health Communications Australia: Melbourne.
17. Shiraishi H, Une H (2009). The effect of the interaction between obesity and drinking on hyperuricemia in Japanese male office workers. *J Epidemiol,* 19 (1): 12-16.
18. Xu F, Yin XM, Wang Y (2007). The association between amount of cigarettes smoked and overweight, central obesity among Chinese adults in Nanjing, China. *Asia Pac J Clin Nutr,* 16 (2): 240-247.
19. John U, Hanke M, Rumpf HJ, Thyrian JR (2005). Smoking status, cigarettes per day, and their relationship to overweight and obesity among former and current smokers in a national adult general population sample. *Int J Obes (Lond),* 29 (10): 1289-1294.
20. Tsugane S (2012). Alcohol, smoking, and obesity epidemiology in Japan. *J Gastroenterol Hepatol,* 27 (Suppl 2): 121-126.
21. Baek SI, So WY (2011). The Relationship between Weight Status and Self-reported Mental Health Outcomes in Korean Adolescents. *HealthMED*, 5 (6): 1435-1439.
22. Park S (2012). The Association between Short Sleep Duration and Body Mass Index among South Korean Children and Adolescents. *J Sch Nurs,* 2012 Jun 25. [Epub ahead of print].
23. Park S (2011). Association between short sleep duration and obesity among South Korean adolescents. *West J Nurs Res,* 33 (2): 207-223.
24. McLaren L (2007). Socioeconomic status and obesity. *Epidemiol Rev,* 29: 29-48.
25. Ulijaszek SJ (2012). Socio-economic status, forms of capital and obesity. *J Gastrointest Cancer,* 43 (1): 3-7.
26. Wang Y, Lim H (2012). The global childhood obesity epidemic and the association between socio-economic status and childhood obesity. *Int Rev Psychiatry,* 24 (3): 176-188.