

Factors Influencing Underweight and Overweight among Male and Female Adolescents from Multicultural Families

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Abstract

Purpose: The purpose of this study is to identify factors influencing underweight and overweight based on BMI criteria for analyzing the health status of male and female adolescents from multicultural families. **Methods:** Using the raw data of the 9th (2013) Korean Youth Health Risk Behavior Online Survey, this study analyzed 708 male and female adolescents from multicultural families including 65 whose father only was born in a foreign country, 584 whose mother only was born in a foreign country and 59 whose parents were not born in Korea. **Results:** The mean BMI of the male and female adolescents from multicultural families was 20.43.19 and 20.42.18, respectively. Male students' underweight was more frequent in middle school students than in high school ones (OR = 2.31, CI = 1.13 – 4.72, p = .021), and in those living together with mother than in those not (OR = 3.05, CI = 1.16 – 8.05, p = .024). Female students' underweight was more frequent in middle school students than in high school ones (OR = 1.91, CI = 1.05 – 3.47, p = .033), and in those whose economic status was high or middle than in those low (OR = 2.78, CI = 1.44 – 5.38, p = .002). **Conclusion:** In order to guide multicultural family adolescents to be concerned about their underweight and get out of it, it is necessary to provide them and their mothers with health education for changing their nutritional behavior and to support them economically.

Keywords: Body Mass Index, Multiculture, Overweight, Underweight

1. Introduction

Secondary school students in their adolescence are in a very important stage of growth and development, experiencing radical physical and psychological changes¹. During this developmental stage, adolescents' physical growth is active and their weight develops in a way of reinforcing or threatening their health, and these factors influence their future health during adulthood¹. Growth and development is often assessed with Body Mass Index (BMI), which is obtained by dividing weight (kg) by the square of height (meter). As a value reflecting health risk, BMI is a good measure for determining underweight and overweight². We can assess health risk based on BMI, and BMI and mortality show a J-shaped relationship between them³. Among Korean male adolescents,

the normal weight rate decreased from 82.8% in 1998 to 71.4% in 2008 and the overweight rate increased over twofold from 6.3% to 14.1%, and among female ones, the underweight increased significantly from 4.8% to 9.4%⁴. That is, recently Korean adolescents' weight was polarized markedly with increase in both obese and underweight students, and the underweight and overweight population increased conspicuously among those in the early school age and puberty⁵. Overweight during adolescence may cause psychosocial problems such as a sense of inferiority, depression, and eating disorder⁶, and it also affects health and may bring health problems like fatigue, low resistance to disease, retarded growth, and endocrine disturbance^{7,8}. Adolescents' overweight is likely to develop into chronic diseases in adulthood such as hypertension and diabetes mellitus, and compared to normal weight, underweight

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increases the risk of death and seizure^{9,30}. Accordingly, now we need to recognize the importance of controlling overweight and underweight in adolescents. Preventing adolescents' overweight and underweight early in consideration of their causes is very important not only for adolescents' health but also adults' health management.

As to factors related to Korean adolescents' underweight and overweight, previous studies reported that the risk of overweight was higher in male students based on difference in BMI between male and female students, in those with high academic performance, in smokers, in those not doing exercise, in those with insufficient sleeping, and in drinkers^{7,10,11}. Among female students, the risk of underweight was higher in those whose parents' academic qualification was high, in those whose parents' economic status was low, and in those with high-level stress^{10,12,13}.

The number of foreigners living in Korea is increasing every year due to the rapid inflow of foreign workers since the 1990s and more frequent international marriages including Korean rural bachelors' marriage to foreign women, and the number of marriage-based immigrants is expected to be 220,000 in 2020¹⁴. Along with the expansion of multicultural families, the number of children born of the families is also increasing. In particular, the number of secondary school students from multicultural families has increased by 39.4% in 2014 compared to that in 2012¹⁵. Adolescents from multicultural families may have difficulties arising from the foreigner parents' different language, culture, and lifestyle in addition to ordinary adolescents' typical difficulties experienced through the physical, psychological and social developmental stage. In order for children from multicultural families to play their roles as healthy society members, accordingly, there should be research on their state from different perspectives¹⁶.

Recently, children from multicultural families are studied actively¹⁷, but most of them dealt with variables such as school adaptation^{18,19}, psychosocial adaptation, mental health and subjective health status¹⁷. Only a few of them covered the health status of adolescents from multicultural families and almost none of them studied factors related to multicultural family adolescents' underweight and overweight by measuring their BMI as an indicator of their health status.

Thus, this study purposed to survey underweight and overweight in male and female adolescents from multicultural families, to identify factors influencing

their underweight and overweight based on BMI, and ultimately to provide information for developing and executing health promotion programs for multicultural adolescents and contribute to efficient improvement of health policies.

2. Methods

2.1 Design

This study was conducted as a descriptive survey for identifying demographic characteristics and health behavior factors influencing underweight and overweight in male and female adolescents from multicultural families.

2.2 Subjects and Data Collection Methods

This study used raw data from the 9th Korean Youth Health Risk Behavior Online Survey in 2013 conducted directly by the Center for Disease Control and Prevention, the Ministry of Education, Science and Technology, and the Ministry of Health and Welfare²¹. In order to assess the underweight and overweight of male and female adolescents from multicultural families, data from 708 students were analyzed including 65 students with only the father born overseas, 584 with only the mother born overseas, and 59 with both parents born overseas. Questionnaires with missing values or non-responses were excluded²¹.

2.3 Analyzed Variables

2.3.1 Multicultural Family

A multicultural family refers to a family in which differences in culture or value system exist among the generations, classes, or regions of the family members and in Korea, it means a family containing family members from the cultural background of a foreign country²². In this study, multicultural families were identified by answer "No" to the question "Was the father born in Korea?" or "Was the mother born in Korea?" The multicultural families surveyed in this study included cases that both parents were born overseas.

2.3.2 Underweight and Overweight

In this study, the subjects were classified into the underweight group ($\text{BMI} \leq 18.5 \text{ kg/m}^2$), normal weight group ($18.5 \text{ kg/m}^2 < \text{BMI} < 23.0 \text{ kg/m}^2$) and overweight group ($23.0 \text{ kg/m}^2 \leq \text{BMI}$) according to BMI based on

the criteria of the World Health Organization for the Asia-Pacific Region and the criteria of the Korean Society for the Study of Obesity²⁴.

2.4 Data Analysis Methods

The general characteristics and BMI of male and female adolescents from multicultural families were analyzed through frequencies and percentages. Differences in the subjects' general characteristics and related variables according to their BMI were tested through χ^2 -test. Factors influencing multicultural adolescents' underweight and overweight were identified through multivariate logistic regression using demographic characteristics and health behavior variables found to have a significant effect on underweight and overweight in univariate logistic regression. In the analysis, each of the demographic characteristics and health behavior variables was treated as a dummy variable based on the highest level. In all data analyses, complex sample weight was given, and collected data were processed using SPSS (Statistical Package Social Science) 21.0.

3. Results

3.1 General Characteristics and BMI of Male and Female Adolescents from Multicultural Families

Table 1 shows the multicultural adolescents' demographic and health behavior characteristics and BMI.

Table 1. Characteristics related to health factors
(N = 708)

Variable		Male	Female
		n(%)	n(%)
School type	Middle School	202(55.0)	225(61.9)
	High School	144(45.0)	137(38.1)
Academic recods	High	99(28.3)	96(25.8)
	Middle	86(24.0)	98(26.5)
	Low	161(47.7)	168(47.7)
Perceived health status	Healthy	232(66.8)	222(58.7)
	Average	82(24.3)	113(30.0)
	Unhealthy	32(8.9)	27(11.2)
Smoking experience	No	243(68.5)	319(84.4)
	Yes	103(31.5)	43(15.6)

(Continued)

Exercise frequency (time/week)		Above 3	136(36.6)	80(26.6)
		Between 1 to 2	104(30.7)	126(35.2)
		None	106(32.7)	156(38.2)
Sleeping hours		Enough	115(31.5)	87(24.8)
		Average	114(31.2)	138(34.9)
		No enough	117(37.3)	137(40.3)
Drinking experience		No	214(60.4)	238(63.0)
		Yes	132(39.6)	124(37.0)
Stress cognition		None	211(60.9)	197(53.5)
		Yes	135(39.1)	165(46.5)
Eating frequency (time/week)		Above 15	249(71.2)	263(69.5)
		Between 8 to 14	53(15.3)	60(20.5)
		Below 7	44(13.5)	39(9.9)
Drugs experience		No	337(91.5)	357(95.0)
		Yes	9(8.5)	5(5.0)
Economic status		High	82(26.1)	54(18.5)
		Moderate	142(38.2)	186(48.4)
		Low	122(35.7)	122(33.1)
Educational career	Father	Above college	68(32.7)	58(25.4)
		High school	110(42.3)	138(51.6)
		Below middle school	60(25.0)	69(23.0)
	Mother	Above college	103(44.9)	121(44.3)
		High school	98(41.3)	124(42.7)
		Below middle school	27(13.8)	34(12.9)
Family type	With father	Yes	288(85.8)	294(81.1)
		No	44(14.2)	48(18.9)
	With mother	Yes	300(88.9)	340(93.5)
		No	35(11.1)	19(6.5)
BMI (mean ±SD)			20.43 ±0.19	20.42 ±0.18
Under ≤ 18.5			99(28.5)	95(26.6)
Normal: 18.5~23			216(62.5)	242(66.5)
Over: ≥ 23			31(9.0)	25(6.9)

This study surveyed a total of 708 male and female adolescents from multicultural families, and 346 of them were male and 362 were female. By school level, 202 (55.0%) of them were male middle school students, 144 (45.0%) male high school students, 225 (61.9%) female middle school students and 137 (38.1%) male high school students. As to academic performance, 161 male students

(47.7%) and 168 female ones (47.7%) were included in the low group, and as to subjective health status, 232 male students (66.8%) and 222 female ones (58.7%) answered that their health status was good. In addition, 132 male students (39.6%) and 124 female ones (37.0%) experienced drinking, and 249 male students (71.2%) and 263 female ones (69.5%) answered that they had 15 or more meals a week. As to household economic status, 122 male students (35.7%) and 122 female ones (33.1%) were included in the low group. As to cohabitation with parents, 288 male students (85.8%) and 294 female ones (81.1%) were living with father, and 300 male students (88.9%) and 340 female ones (93.5%) were living with mother.

The mean BMI was 20.43.19 in the male students, and 20.42.18 in the female ones. Underweight was more frequent in the male students as found in 99 male students (28.5%) and 95 female ones (26.6%), and overweight was also more frequent in the male students as found in 31 male students (9.0%) and 25 female ones (6.9%).

3.2 Underweight and Overweight According to Multicultural Adolescents' General Characteristics

When the secondary school students were divided into the underweight, normal and overweight groups and compared according to different variables (Table 2), statistically significant difference was observed according to school level and cohabitation with mother among the male students, and according to school level, drinking, the number of meals per week, and economic status among the female ones.

Among the male middle school students, 71 (70.5%) were underweight, 117 (50.9%) were normal, and 14 (49.6%) were overweight, and among the male high school students were 28 (29.5%), 99 (49.1%), and 17 (50.4%), respectively. Thus, the underweight rate was higher in the male middle school students than in the male high school students, and the difference was statistically significant ($p = .026$). Depending on cohabitation with mother, 90 (95.2%) were underweight and 27 (92.1%) were overweight among those living with mother, and 6 (4.8%) and 2 (7.9%), respectively, among those not living with mother. Thus, the underweight rate was higher in those living with mother and the overweight rate was higher in those not living with mother, and the difference was statistically significant ($p = .021$).

Among the female middle school students, 74 (78.3%) were underweight, 139 (58.3%) were normal, and 12 (52.9%) were overweight, and among the female high school students were 21 (21.7%), 103 (41.7%), and 13 (47.1%), respectively. Thus, the underweight rate was higher in the female middle school students than in the female high school students, and the difference was statistically significant ($p = .005$). Among those with drinking experience, 22 (22.2%) were underweight and 8 (23.3%) were overweight ($p = .008$), among those having 15 or more meals a week were 76 (82.1%) and 18 (67.6%), respectively ($p = .029$), and among those with low economic status were 24 (18.0%) and 9 (33.2%), respectively ($p = .007$) and the differences were statistically significant.

3.3 Factors influencing multicultural adolescents' underweight and overweight

When multivariate logistic regression was conducted with variables showing significant difference (Table 3), male adolescents' underweight rate was higher in middle school students than in high school ones (OR = 2.31, CI = 1.13 – 4.72, $p = .021$), and in those living with mother than in those not (OR = 3.05, CI = 1.16 – 8.05, $p = .024$). Female adolescents' underweight rate was higher in middle school students than in high school ones (OR = 1.91, CI = 1.05 – 3.47, $p = .033$), and in those with middle or high economic status than in those with low economic status (OR = 2.78, CI = 1.44 – 5.38, $p = .002$).

4. Discussion

This study was conducted with raw data from the 9th Korean Youth Health Risk Behavior Online Survey in order to analyze the health status of male and female adolescents from multicultural families. In the 708 adolescents from multicultural families, the male adolescents' underweight, normal weight, and overweight rates were 28.5%, 62.5%, and 9.0%, respectively, and the female ones were 26.6%, 66.5%, and 6.9%, respectively. Compared to 23.6%, 56.2% and 20.2%, respectively, reported by a study with ordinary adolescents sampled throughout the country in 2009²⁵, multicultural secondary school students' underweight rate was higher than that of ordinary secondary school students, and their overweight rate was lower. In particular, male students' underweight rate was higher than female students' and this is consistent with the previous

Table 2. General Characteristics related to variables tafactors

(N = 708)

		Male			$\chi^2(p)$	Female			$\chi^2(p)$	
		BMI n(%)				BMI n(%)				
		Under	Normal	Over		Under	Normal	Over		
School type	Middle School	71(70.5)	117(50.9)	14(49.6)	11.18(.026)	74(78.3)	139(58.3)	12(52.9)	13.04(.005)	
	High School	28(29.5)	99(49.1)	17(50.4)		21(21.7)	103(41.7)	13(47.1)		
Academic Records	High	20(18.8)	71(33.1)	8(28.5)	6.94(.155)	20(21.2)	65(25.1)	11(42.8)	5.59(.368)	
	Middle	30(26.8)	47(23.9)	9(24.6)		29(28.1)	63(26.0)	6(26.7)		
	Low	49(54.4)	98(43.0)	14(46.9)		46(50.7)	114(48.9)	8(30.5)		
Perceived health status	Healthy	70(70.3)	147(69.1)	15(45.9)	8.07(.117)	63(66.0)	143(58.4)	16(50.9)	5.98(.317)	
	Average	21(22.1)	50(24.0)	11(37.4)		27(28.9)	80(33.4)	6(30.4)		
	Unhealthy	8(7.6)	19(6.9)	5(16.7)		5(5.1)	19(8.2)	3(18.7)		
Smoking experience	No	75(75.9)	147(67.5)	21(73.6)	2.46(.302)	89(93.1)	208(85.4)	22(84.0)	3.90(.147)	
	Yes	24(24.1)	69(32.5)	10(26.4)		6(6.9)	34(14.6)	3(16.0)		
Exercise frequency (time/week)	Above 3	35(34.4)	91(38.5)	10(32.1)	5.93(.251)	20(21.2)	57(24.9)	3(14.6)	7.03(.195)	
	Between 1 to 2	29(26.7)	62(30.3)	13(46.1)		34(32.5)	81(35.1)	11(58.4)		
	None	35(38.9)	63(31.2)	8(21.8)		41(46.3)	104(40.0)	11(27.0)		
Sleeping hours	Enough	38(40.9)	67(31.0)	10(27.5)	7.09(.151)	23(28.5)	57(24.8)	7(15.5)	8.77(.093)	
	Average	36(32.1)	71(33.6)	7(22.8)		41(43.6)	90(34.0)	7(28.5)		
	No enough	25(27.0)	78(35.4)	14(49.7)		31(27.9)	95(41.2)	11(56.0)		
Drinking experience	No	71(67.7)	125(57.4)	18(67.7)	3.60(.138)	73(77.8)	148(59.7)	17(76.7)	11.40(.008)	
	Yes	28(32.3)	91(42.6)	13(32.3)		22(22.2)	94(40.3)	8(23.3)		
Stress cognition	None	61(61.3)	135(64.5)	15(43.8)	4.95(.124)	56(57.2)	127(50.6)	14(45.0)	1.74(.494)	
	Yes	38(38.7)	81(35.5)	16(56.2)		39(42.8)	115(49.4)	11(55.0)		
Eating frequency (time/week)	Above 15	69(67.6)	158(75.4)	22(78.0)	6.68(.095)	76(82.1)	169(67.2)	18(67.6)	11.64(.029)	
	Between 8 to 14	15(15.1)	36(14.8)	2(4.3)		9(8.8)	46(23.2)	5(29.2)		
	Below 7	15(17.3)	22(9.8)	7(17.7)		10(9.1)	27(9.6)	2(3.2)		
Drugs experience	No	98(98.8)	209(96.0)	30(95.5)	1.82(.197)	94(99.0)	239(97.5)	24(93.9)	2.27(.382)	
	Yes	1(1.2)	7(4.0)	1(4.5)		1(1.0)	3(2.5)	1(6.1)		
Economic status	High	25(28.0)	54(26.0)	3(12.1)	8.41(.072)	19(18.6)	30(14.3)	5(28.8)	16.69(.007)	
	Moderate	39(39.9)	91(41.3)	12(30.5)		52(63.4)	123(47.0)	11(38.0)		
	Low	35(32.1)	71(32.6)	16(57.5)		24(18.0)	89(38.6)	9(33.2)		
Educational career	Father	Above college	20(32.1)	48(34.6)	5(33.6)	1.53(.768)	19(36.4)	36(22.1)	3(16.5)	6.60(.241)
		High school	34(48.7)	66(40.6)	10(44.7)		25(42.2)	102(55.4)	11(64.6)	
		Below middle school	16(19.2)	39(24.8)	5(21.7)		18(21.4)	46(22.5)	5(18.9)	
	Mother	Above college	28(47.7)	68(48.4)	7(46.3)	0.65(.944)	39(54.2)	74(40.6)	8(42.0)	4.40(.301)
		High school	24(40.8)	65(41.5)	9(48.3)		27(38.2)	86(46.7)	11(49.0)	
		Below middle school	9(11.5)	17(10.1)	1(5.4)		6(7.6)	27(12.7)	1(9.0)	
Family type	With father	Yes	86(93.8)	175(84.9)	27(89.4)	4.99(.056)	76(86.1)	198(81.9)	20(89.0)	1.41(.346)
		No	10(6.2)	30(15.1)	4(10.6)		12(13.9)	34(18.1)	2(11.0)	
	With mother	Yes	90(95.2)	183(86.0)	27(92.1)	6.02(.021)	94(97.8)	222(92.8)	24(98.7)	4.26(.146)
		No	6(4.8)	27(14.0)	2(7.9)		1(2.2)	17(7.2)	1(1.3)	

Table 3. Influencing factors on underweight and overweight by using logistic regression

(N = 708)

			Under weight				Over weight			
			OR	(95% CI for OR)		<i>p</i>	OR	(95% CI for OR)		<i>p</i>
				Lower	Upper			Lower	Upper	
Male	School type	Middle school vs High school	2.31	1.13	4.72	.021	1.10	0.52	2.33	.797
	Family type (With mother)	Yes vs No	3.05	1.16	8.05	.024	1.89	0.57	6.24	.294
Female	School type	Middle school vs High school	1.91	1.05	3.47	.033	.59	0.24	1.47	.258
	Eating frequency	Above 15 vs Below 7	1.00				4.70	0.85	25.96	.076
		Between 8 to 14 vs Below 7	0.38	.109	1.35	.135	4.74	0.81	27.81	.085
	Economic status	High vs Low	1.00				1.00			
		Moderate vs Low	2.78	1.44	5.38	.002	.95	0.38	2.36	.910

report that the underweight rate was higher in male students aged 11–14 than in female ones aged over 15⁷. What is more, multicultural family adolescents showed a higher underweight rate and lower overweight rate than ordinary family adolescents, and this suggests the influence of multicultural family adolescents' economic status considering the report that the underweight rate based on BMI was higher and the overweight and obesity rate was lower in poor class children than in ordinary family children²⁶. Accordingly, appropriate management should be applied to multicultural family adolescents' underweight, which may impede their growth and development or be accompanied with diseases such as anemia and endocrine disturbance.

With regard to cohabitation with mother, the underweight rate was higher in male students from multicultural families living with mother. This is probably because male students tend to rely on the mother's meal serving rather than eating by them, and they are not fed with food meeting their taste because of the mother's different lifestyle and cuisine. This result may vary according to the cohabiting

mother's level and tendency of acquisition, processing, and understanding of health-related information²⁷. The high underweight rate among adolescents living with mother suggests the need of further research with interest in adolescents' dietary habits and their mothers' dietary tendencies.

Among female students from multicultural families, those with drinking experience showed a high obesity rate, and this is consistent with the report that drinking brings forth obesity³¹. In addition, the underweight rate was high in female students having 15 or more meals a week, and the overweight rate was high in those having 7 or fewer meals a week, and this is consistent with Jang Hyeon-sook's report³² that the underweight group showed the best eating habits including high meal regularity, and the overweight group showed bad eating habits such as poor meal regularity, excessive snack intake, and mid-night snack eating.

Among female students from multicultural families, the underweight rate was higher and the overweight rate was lower in those with high economic status than in

those with low economic status. This is consistent with the report that the underweight rate was higher in the group of high economic status and the obesity rate was higher in the group of low economic status in previous studies on underweight and obese adolescents' eating habits, exercise, body image perception, and weight control and those on the risk and protective factors of overweight in poor children^{25,8}. However, the high underweight rate among multicultural family adolescents may not be like the high underweight rate in the high economic status group among ordinary Korean adolescents, but can be the consequence of inadequate feeding and poor eating habits due to the low income of multicultural families²⁹, and thus, attention should be paid to health management for underweight adolescents in multicultural families. Previous studies on adolescents' BMI and weight control behavior and underweight and obese adolescents' body image perception and weight control^{12,25} reported that female students were more sensitive to economic status than male students were and as a result they showed a higher overweight rate when the economic status is low. Among multicultural family adolescents as well, female students are considered to be influenced more by their economic status than male students are.

In order to find factors influencing multicultural family adolescents' underweight and overweight, regression analysis was conducted with statistically significant variables such as school level, diet, drinking, economic status, and cohabitation with mother, and according to the results, school level and cohabitation with mother had a significant effect on male students' underweight, and school level and economic status had a significant effect on female students' underweight. These findings suggest that interventions such as health education should be applied to multicultural family mothers for changing nutritional behavior and economic support should be provided so that multicultural family adolescents may get out of the underweight condition.

5. Conclusions and Suggestions

This study examined underweight and overweight in male and female adolescents from multicultural families, and found that factors such as school level, cohabitation with mother, and economic status influence multicultural family adolescents' underweight. Because these factors are beyond the students' control, they require the involvement of community and school for improvement. In order

to detect and control health problems in underweight adolescents from poor multicultural families as early as possible, it is most urgent to grasp their general health status and their parents' health management behavior. That is, for promoting multicultural family adolescents' growth and development, it is suggested to survey their physical condition, to apply interventions such as health education to multicultural family mothers for changing their nutritional behavior, to execute health policies such as health promotion programs, and to provide economic support.

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