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Household food insecurity and breakfast skipping: Their association with depressive symptoms

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ABSTRACT

Household food insecurity limits families' access to sufficient and varied safe foods, which may result in problems such as insufficient food intake and nutritional imbalance. This may lead to health issues such as obesity, chronic illness, mental health problems, and even poor quality of life. Breakfast skipping is a risk factor for eating disorders which is related to diseases such as metabolic disorder and depressive symptoms. This study examined household food insecurity and breakfast skipping and their association with depressive symptoms. In this study, we used data from the 2015 Korean Community Health Survey. Study participants were a total of 225,965 people aged 18 years or older who answered questions related to eating habits. Multiple logistic regression analyses were used to identify factors associated with depressive symptoms. Those in households with low food security and very low food security were more likely to experience depressive symptoms. Individuals that skip breakfast 2 days or more per week were more likely to experience depressive symptoms. Our study suggests that those living in households with lower food security and who skip breakfast often should pay more attention to their mental health.

1. Introduction

Mental illness is a major component of the worldwide burden of disease and plays a role in public concern regarding socioeconomic disparities and economic burden to society (Prince et al., 2007; Kim et al., 2017). In Korea, mental illness—such as depression and suicidal ideation—is a particularly serious problem because it is the main cause of death among Koreans. According to a government epidemiological survey of mental illnesses, the proportion of individuals experiencing one or more episodes of depression throughout life increased from 4.0% in 2001 to 6.7% in 2011 (National Center for Mental Health, 2016), and the mortality rate from suicide in 2013 was nearly 30 deaths per 100,000 population, which represents the highest suicide rate among Organization for Economic Co-operation and Development (OECD) countries (OECD, 2015). As such, mental health is an important part of public health.

There are many factors that cause depression in Koreans, but socioeconomic factors are likely to be a significant determinant, as can be seen in several previous studies (Back and Lee, 2011; Imai et al., 2015; Lee et al., 2017; Han et al., 2018). In modern societies, socioeconomic factors, particularly economic ones, are most fundamental to meeting our basic needs, and mental suffering results when economic hardship occurs. Among the causes of stress in Koreans, relationships with other people such as in work or school life was the most common cause, and the causes of suicide attempts were economic difficulty, family disagreement, loneliness, and solitude (Statistics Korea, 2016). This socioeconomic factor had the greatest impact on depressive symptom among Koreans.

However, it is difficult to address mental health issues in Korea because Koreans are reluctant to let others know that they have a mental illness, and they tend to refrain from consulting psychiatrists. According to statistics from the Ministry of Health and Welfare in Korea, the rate of mental health service use in Korea is 15.0%, which is significantly lower than the 30–40% reported in other countries, and the period from the onset of mental disorders to the use of mental health services is about 84 weeks, which is considerably longer than the 52 weeks reported in the United States (National Center for Mental Health, 2016). It is therefore necessary to explore and manage the various factors that affect mental health. Here, we investigated the relationship between depression and two factors which are particularly

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important in relation to diet. The two variables selected in the study are not only dietary but also socioeconomic factors, so management is arguably needed at the social level rather than the individual level.

Food security is a term defined by the United States Department of Agriculture (USDA) as relating to the quantity and variety of foods available (Anderson, 1990; Coleman-Jensen et al., 2014). Household food insecurity limits the family's access to suitable quantities and varieties of safe foods, which may result in problems such as insufficient food intake and nutritional imbalances (Campbell, 1991; Health Canada, 2007; Gundersen et al., 2011). This may lead to health issues such as obesity, chronic illnesses, and mental health problems, and even lower quality of life (Cook et al., 2004; Stuff et al., 2004; Casey et al., 2005; Dinour et al., 2007; Seligman et al., 2010). In particular, the depression caused by food insecurity is a barrier to improving health equity, which is one of the major health policies in Korea that requires countermeasures against (Lee and Yu, 2016). According to a survey by the Ministry of Health and Welfare in Korea in 2011, average food security in Korea—at 92.0%—was good (Ministry of Health and Welfare, 2011; Lee and Yu, 2016). However, food security varies significantly by household income; food security for the top 25% income group was 99.5% while that for the bottom 25% is 80.5%. In the US, one in seven people experience food insecurity, especially in low income households (Leung et al., 2015). To solve these problems, various policies have been implemented. However, these represent temporary solutions, not a fundamental way to address the issue.

Not eating breakfast limits the amount of energy consumed by humans during the day. This behavior is seen in groups that lack dietary knowledge, and especially in those experiencing food insecurity. Previous studies have shown that children from food-insecure households are more likely to have nutritional deficiencies or poor eating habits, such as higher intake of added sugars or foods of low nutritional quality. Skipping meals, especially breakfast, may lead to binge-eating caused by a lack of satiety, which may cause diseases such as obesity and diabetes, and an increased likelihood of experiencing depressive symptoms. Studies have reported associations between eating-related problems and depressive symptoms, and it is widely known that depressive symptoms are more likely to be experienced in people of low-socioeconomic status (Scott et al., 2008; Oddy et al., 2009; German et al., 2011; Medina-RemÓn et al., 2016; Kwak and Kim, 2017; Lee et al., 2017). That is why the problem of eating habits should be considered not only in terms of public health but also in social terms. Therefore, this study investigated the effect of food insecurity and skipping breakfast on depressive symptoms among a representative sample of the Korean adult population.

2. Methods

2.1. Study data

This study used data obtained from the Community Health Survey (CHS) conducted in Korea in 2015. The CHS is a nationwide, community-based survey that has been conducted since 2008 by the Korean Centers for Disease Control and Prevention (KCDC) and the Ministry of Health and Welfare to produce health statistics that may be compared among regions to evaluate community health promotions (Kim et al., 2012). The CHS, the community-based cross-sectional survey, was disseminated to adults aged 19 years or older living in residential homes and stratified by 253 local districts and housing units (apartments and houses). The stratified data were sampled in the second stage. Probability proportional to size sampling was used in the first stage by region and systematic sampling was used in the second stage according to housing units. The CHS was administered by trained surveyors who visited survey participants and conducted the questionnaire using an electronic survey via notebook computer. The interviews took almost 30 min per person. The CHS contents included health behavior, medical care utilization, quality of life, health and medical institution utilization, education and economic activity, and questions related to eating habits (Kang et al., 2015).

2.2. Study variables

The dependent variable was the experience of depressive symptoms, which was classified as “yes” or “no.” Depressive symptoms were defined as the experience of sorrowful or despairing emotions that affected daily life for more than 2 weeks over the past year.

The independent variables were related to food security and skipping breakfast. Food security was measured by the CHS question “Which of the following best describes your household eating habits over the past year?” Answers were classified as describing high food security, marginal food security, low food security, or very low food security, according to ranges defined by the USDA. Skipping breakfast was divided into three categories: 0–1 days, 2–4 days, or over 5 days. This variable was also measured using the following question: “On how many days did you have breakfast in the previous week?”

Control variables included characteristics of both the individual and their socioeconomic status (SES). Among the individual characteristics were age, gender, residence (urban/rural), presence of chronic disease, alcohol consumption, smoking status, exercise regime, and sleep duration. We examined body mass index (BMI; self-reported) variables according to the WHO International Classification system, where BMI is divided into four groups: $<18.5\,kg/m^2$ (underweight), 19–24.9 kg/m^2 (normal weight), 25–29.9 kg/m^2 (overweight), and $\geq 30\,kg/m^2$ (obese). Additionally, we included variables related to SES: income, education, marriage status (married, unmarried, never married), work status, and social network status. Family income per month, which was defined as income from all sources, such as salary, property income, pensions, interest, subsidies, and allowances, was divided into five income-groups. Social network status was measured using the CHS question “How often do you see or contact your family, neighbors, or friends?” We divided answers to this question into three categories: good (more than once a week), normal (more than twice a month), and bad (less than once a month).

2.3. Statistical analysis

For all categorical variables, we used chi-square tests to assess the distribution of characteristics according to depressive symptoms. We used multivariable logistic regression to analyze the association between eating habits and outcome. From this analysis, we conducted subgroup analyses to compare the association between depression and food security, skipping breakfast, and other socioeconomic variables according to age, after adjusting for covariates. Statistical significance was established at $P < 0.05$. SAS software (ver. 9.4; SAS Institute, Cary, NC, USA) was used for all calculations and analyses.

3. Results

Table 1 shows the characteristics of study participants associated with experience of depressive symptoms. Of those experiencing depressive symptoms, 5.0% rated food security as high, 7.1% as marginal, 16.1% as low, and 28.2% as very low. Skipping breakfast 5 days or more was reported by 8.2% of those who had experienced depressive symptoms, 2–4 days by 7.5% of such individuals, and 0–1 days by 6.0%. Of those not experiencing depressive symptoms, food security was high in 95.0% of cases, marginal in 92.9%, low in 83.9%, and very low in 71.8%. The proportions skipping breakfast were 91.8% (5 days and over), 92.5% (2–4 days), and 94.0% (0–1 days).

We performed a logistic regression analysis to examine the association between depressive symptoms and the various characteristics (Table 2). Food insecurity was associated with depressive symptoms. Depressive symptoms were more likely in individuals living in households with low food security (OR: 2.23; 95% CI: 2.08–2.38) and very

Table 1
General characteristics of study participants.

		Depressive symptom				*P*-value
		Yes		No		
		N	%	*N*	%	
Total		14,773	6.5%	211,192	93.5%	
Food security	High	6181	5.0%	116,603	95.0%	<0.0001
	Marginal	6569	7.1%	85,398	92.9%	
	Low	1523	16.1%	7916	83.9%	
	Very low	500	28.2%	1275	71.8%	
Breakfast skipping	≥5 days	2,957	8.2%	32,953	91.8%	<0.0001
	2–4 days	1840	7.5%	22,603	92.5%	
	0–1 days	9976	6.0%	155,636	94.0%	
Age	18–39	3488	6.2%	53,110	93.8%	<0.0001
	40–64	6508	6.1%	99,683	93.9%	
	65–74	2649	7.3%	33,488	92.7%	
	≥75	2,128	7.9%	24,911	92.1%	
Sex	Male	4667	4.6%	97,058	95.4%	<0.0001
	Female	10,106	8.1%	114,134	91.9%	
Residence	Urban	8466	6.7%	118,374	93.3%	0.0030
	Rural	6307	6.4%	92,818	93.6%	
Income (per month)	<$900	5051	10.3%	43,944	89.7%	<0.0001
	$900–$1,800	2735	7.1%	35,555	92.9%	
	$1,800–$3,600	4197	5.3%	74,314	94.7%	
	$3,600–$5,400	1799	4.6%	37,423	95.4%	
	≥$5400	991	4.7%	19,956	95.3%	
Education	≤Elementary	4773	8.4%	51,735	91.6%	<0.0001
	≤Middle school	1759	6.9%	23,751	93.1%	
	≤High school	4045	6.3%	60,400	93.7%	
	≥College	4196	5.3%	75,306	94.7%	
Marital status	Married	8436	5.5%	145,709	94.5%	<0.0001
	Non-partnered	4165	11.0%	33,637	89.0%	
	Never married	2172	6.4%	31,846	93.6%	
Chronic disease	0	7295	5.4%	128,586	94.6%	<0.0001
	1	3672	7.3%	46,735	92.7%	
	2	2352	8.5%	25,166	91.5%	
	≥3	1454	12.0%	10,705	88.0%	
Economic activity	Y	7436	5.2%	136,223	94.8%	<0.0001
	N	7337	8.9%	74,969	91.1%	
Drinking status	Heavy drinker	2931	5.8%	47,474	94.2%	<0.0001
	Normal	6367	6.1%	98,089	93.9%	
	Not a drinker	5475	7.7%	65,629	92.3%	
Smoking status	Y	4901	5.9%	77,664	94.1%	<0.0001
	N	9872	6.9%	133,528	93.1%	
Exercise	Y	12,383	6.7%	172,921	93.3%	<0.0001
	N	2390	5.9%	38,271	94.1%	
Sleep Duration	<5 h	1646	15.5%	9007	84.5%	<0.0001
	5–8 h	12,353	6.0%	194,683	94.0%	
	≥9 h	774	9.4%	7502	90.6%	
Social network	Good	10,725	7.1%	139,571	92.9%	<0.0001
	Normal	2524	5.3%	44,809	94.7%	
	Bad	1524	5.4%	26,812	94.6%	
BMI	<18.5	1018	9.3%	9957	90.7%	<0.0001
	19–24.9	9417	6.3%	139,096	93.7%	
	25–29.9	2972	5.9%	47,194	94.1%	
	≥30	492	8.7%	5156	91.3%	
	N/A	874	8.2%	9789	91.8%	

low security (OR: 3.95; 95% CI: 3.52–4.44). Similarly, depressive symptoms were more likely in those who skipped breakfast for more than 5 days (OR: 1.56; 95% CI: 1.49–1.64) or 2–4 days (OR: 1.41; 95% CI: 1.34–1.49). Younger participants were more likely to experience depressive symptoms. Of the socioeconomic characteristics, household income and marriage status were associated with depressive symptoms, while education was not related to depressive symptoms.

Tables 3 and 4 show the results of the subgroup analysis comparing depressive symptoms, food security, and skipping breakfast. Most socioeconomic (SES) variables were significantly associated with food

Table 2
Logistic regression analysis of the association with depressive symptoms and various characteristics.

		Depressive symptoms					
		β	SE	*P*-value	OR	95% CI	
Food security	High	Ref.			1.00		
	Marginal	−0.39	0.02	<0.0001	1.22	1.18	1.27
	Low	0.20	0.03	<0.0001	2.23	2.08	2.38
	Very low	0.78	0.04	<0.0001	3.95	3.52	4.44
Breakfast skipping	≥5 days	0.18	0.02	<0.0001	1.56	1.49	1.64
	2–4 days	0.08	0.02	<0.0001	1.41	1.34	1.49
	0–1 days	Ref.			1.00		
Age	18–39	Ref.			1.00		
	40–64	0.18	0.02	<0.0001	0.87	0.82	0.92
	65–74	−0.13	0.02	<0.0001	0.63	0.58	0.69
	≥75	−0.36	0.02	<0.0001	0.51	0.46	0.55
Sex	Male	−0.41	0.01	<0.0001	0.44	0.42	0.47
	Female	Ref.			1.00		
Residence	Urban	Ref.			1.00		
	Rural	−0.03	0.01	0.0006	0.93	0.90	0.97
Income	<100	0.31	0.02	<0.0001	1.58	1.45	1.71
	100–200	0.13	0.02	<0.0001	1.31	1.21	1.42
	200–400	−0.10	0.02	<0.0001	1.05	0.97	1.13
	400–600	−0.20	0.02	<0.0001	0.95	0.87	1.03
	≥600	Ref.			1.00		
Education	≤Elementary	−0.02	0.02	0.4358	1.01	0.94	1.08
	≤Middle school	0.01	0.02	0.6442	1.04	0.97	1.11
	≤High school	0.04	0.02	0.0224	1.07	1.01	1.12
	≥College	Ref.			1.00		
Marriage status	Married	Ref.			1.00		
	Non-partnered	0.20	0.02	<0.0001	1.35	1.29	1.41
	Never married	−0.11	0.02	<0.0001	0.98	0.92	1.05
Chronic disease	0	Ref.			1.00		
	1	−0.03	0.02	0.1051	1.43	1.36	1.50
	2	0.07	0.02	0.0008	1.56	1.48	1.66
	≥3	0.35	0.02	<0.0001	2.07	1.93	2.22
Economic activity	Y	−0.16	0.01	<0.0001	0.73	0.70	0.76
	N	Ref.			1.00		
Drinking status	Heavy drinker	0.08	0.02	<0.0001	1.11	1.06	1.18
	Normal	−0.05	0.01	0.0002	0.98	0.94	1.03
	Not a drinker	Ref.			1.00		
Smoking status	Y	0.23	0.01	<0.0001	1.59	1.51	1.68
	N	Ref.			1.00		
Exercise	Y	−0.07	0.01	<0.0001	0.86	0.82	0.91
	N	Ref.			1.00		
Sleep duration	<5 h	0.40	0.02	<0.0001	2.13	2.01	2.26
	5–8 h	Ref.			1.00		
	≥9 h	−0.04	0.03	0.1100	1.36	1.26	1.48
Social network	Good	Ref.			1.00		
	Normal	0.16	0.01	<0.0001	1.05	0.98	1.12
	Bad	−0.06	0.02	0.0008	1.30	1.23	1.38
BMI	<18.5	0.19	0.03	<0.0001	1.25	1.17	1.34
	19–24.9	Ref.			1.00		
	25–29.9	−0.12	0.02	<0.0001	0.91	0.87	0.95
	≥30	0.12	0.04	0.0047	1.16	1.05	1.28
	N/A	−0.16	0.03	<0.0001	0.88	0.81	0.95

security and depressive symptoms. Interestingly, those with low food security and high household-income were more likely to experience depressive symptoms than any other income group (OR: 4.56, 95% CI: 1.53–13.58).

4. Discussion

This study examined the relationship between food security and not eating breakfast with depressive symptoms via a public survey in Korea. A subgroup analysis was conducted with respect to age and socioeconomic factors. The low food-security group was more likely to have experienced depressive symptoms, consistent with previous studies. There have been many studies on the relationship between food security and depressive symptoms in children, adolescents, and pregnant women (Gundersen and Oliveira, 2001; Dunifon and Kowaleski-Jones,

Table 3
Subgroup analysis comparing with depressive symptoms and food security.

		Depressive symptoms									
		High food security		Marginal food security			Low food security			Very low food security		
		OR	95% CI	OR	95% CI		OR	95% CI		OR	95% CI	
Age	18–39	1.00		1.16	1.07	1.25	2.11	1.74	2.56	2.83	1.85	4.33
	40–64	1.00		1.22	1.15	1.29	2.46	2.20	2.75	3.67	3.03	4.46
	65–74	1.00		1.27	1.15	1.40	2.24	1.94	2.58	4.04	3.20	5.10
	≥75	1.00		1.28	1.14	1.44	1.91	1.63	2.24	4.29	3.42	5.37
Income	<$900	1.00		1.26	1.16	1.37	2.16	1.96	2.38	3.88	3.38	4.45
(per month)	$900–$1800	1.00		1.19	1.09	1.29	2.03	1.72	2.39	3.90	2.75	5.53
	$1800–$3600	1.00		1.25	1.17	1.33	3.19	2.61	3.89	3.26	1.55	6.87
	$3600–$5400	1.00		1.14	1.03	1.27	2.30	1.25	4.22	N/A[†]		
	≥$5400	1.00		1.12	0.95	1.32	4.56	1.53	13.58	3.34	0.37	30.46
Education	≤Elementary	1.00		1.23	1.14	1.32	2.07	1.87	2.30	3.84	3.28	4.51
	≤Middle school	1.00		1.16	1.03	1.30	2.22	1.84	2.68	4.41	3.23	6.01
	≤High school	1.00		1.24	1.16	1.33	2.44	2.11	2.81	3.87	2.99	5.01
	≥College	1.00		1.22	1.14	1.30	2.12	1.73	2.59	2.70	1.75	4.17
Marital status	Married	1.00		1.29	1.23	1.36	2.45	2.21	2.72	4.65	3.79	5.69
	Non-partnered	1.00		1.09	1.00	1.18	1.86	1.66	2.08	3.33	2.83	3.93
	Never married	1.00		1.10	1.00	1.22	2.10	1.73	2.54	3.00	2.13	4.22
Economic activity	Y	1.00		1.15	1.09	1.21	2.14	1.91	2.40	3.53	2.80	4.44
	N	1.00		1.33	1.25	1.41	2.31	2.11	2.52	4.15	3.61	4.77

*Adjusted for sex, residence, chronic disease, drinking status, smoking status, exercise, sleep duration, social network and BMI.
[†] The population in this group is zero, so it is indicated by N/A (OR: <0.0001, 95% CI: <0.0001, >999.999).

2003; Cook et al., 2004; Casey et al., 2005; Laraia et al., 2006). The commonality among these subjects is that they are groups of people whose health is controlled by environmental factors. These populations require good eating habits, such as eating good-quality food, as much as they require physical activity (Fall et al., 2003; King, 2003; Mitchell et al., 2004; Laraia et al., 2006). However, children and adolescents with food insecurity often eat unhealthy food, which fosters a high risk of obesity and metabolic disorders (Bowman et al., 2004; Powell and Nguyen, 2013; Cutumisu et al., 2017; Dalton et al., 2017). Additionally, the health of a pregnant woman and her fetus are mutually dependent. It is therefore necessary to provide national programs to control food-related issues and enact relevant policies regarding food security.

Based on an analysis of food security, we carried out a subgroup analysis according to age and SES variables. Notably, we found that high-income households were more likely to have experienced depressive symptoms if they were in the low food-security group. Generally, to solve the problem of food security in a country, it is common to suggest policies that address low-income households (Smith et al., 2004; Herman et al., 2006; Seligman et al., 2010; Coleman-Jensen et al., 2014; Leung et al., 2015). However, low food security in the high-income class is likely to be attributed to eating low-quality food even though these individuals could buy high-quality food, because they are too busy to eat well-balanced meals or do not have adequate nutritional education. Recently, pre-cooked foods have become popular in Korea due to their convenience. However, these foods have uncertain nutritional composition, may not be cooked using fresh ingredients, may contain more sodium than necessary, or may cause food-borne illnesses such as food poisoning (Food and Administration, 2009; Takachi et al., 2014; Aung et al., 2016). For example, studies showing that food-poisoning bacteria in convenience store food exceed acceptable levels are common in Korea (Kim et al., 2011; Moon et al., 2013; Yu et al., 2014); accordingly, the government has implemented measures to address the issue. However, it is of fundamental importance to improve food education related to manufacturers and those who eat such foods.

We found that the greater the frequency of skipping breakfast, the

Table 4
Subgroup analysis comparing with depressive symptoms and breakfast skipping.

		Depressive symptoms									
		Breakfast skipping 0–1 days a week		Breakfast skipping 2–4 days a week			Breakfast skipping over 5 days a week				
		OR	95% CI	OR	95% CI		OR	95% CI			
Age	18–39	1.00		1.19	1.09	1.31	1.36	1.25	1.47		
	40–64	1.00		1.43	1.31	1.55	1.61	1.50	1.72		
	65–74	1.00		1.75	1.46	2.10	1.76	1.45	2.14		
	≥75	1.00		2.22	1.82	2.71	1.80	1.39	2.35		
Income	<$900	1.00		1.68	1.50	1.88	1.75	1.57	1.96		
(per month)	$900–$1800	1.00		1.37	1.20	1.57	1.57	1.39	1.76		
	$1800–$3600	1.00		1.31	1.19	1.44	1.50	1.39	1.63		
	$3600–$5400	1.00		1.29	1.12	1.49	1.49	1.32	1.68		
	≥$5400	1.00		1.48	1.24	1.77	1.36	1.15	1.60		
Education	≤Elementary	1.00		2.00	1.76	2.27	1.75	1.53	2.01		
	≤Middle school	1.00		1.66	1.38	1.99	1.82	1.55	2.14		
	≤High school	1.00		1.34	1.21	1.49	1.59	1.46	1.72		
	≥College	1.00		1.21	1.11	1.32	1.35	1.25	1.45		
Marital status	Married	1.00		1.42	1.32	1.54	1.65	1.54	1.76		
	Non-partnered	1.00		1.58	1.41	1.77	1.54	1.38	1.71		
	Never married	1.00		1.20	1.06	1.36	1.32	1.19	1.47		
Economic activity	Y	1.00		1.36	1.26	1.46	1.54	1.45	1.65		
	N	1.00		1.50	1.38	1.64	1.57	1.45	1.71		

*Adjusted for sex, residence, chronic disease, drinking status, smoking status, exercise, sleep duration, social network and BMI.

greater the probability of experiencing depressive symptoms. Research on failing to eat meals and mental health is a topic of global interest, whereby most studies have shown that skipping meals such as breakfast can have an adverse effect on mental and physical health (Oddy et al., 2009; Smith et al., 2010; Huang et al., 2014; Medina-RemÓn et al., 2016; Lee et al., 2017). Humans live by generating energy through food consumption. If breakfast is omitted, too few nutrients are consumed and it is difficult to generate sufficient energy for daily activities (Martin et al., 2000; Clayton and James, 2016). As a result, individuals may feel helpless or depressed (Kwak and Kim, 2017). Further, omitting breakfast may cause weight gain due to excessive food intake at other mealtimes, and individuals who omit breakfast are more likely to experience diseases such as obesity, type 2 diabetes, and cardiovascular diseases than those who consume breakfast (Keski-Rahkonen et al., 2003; Heijden et al., 2007; Moreno and Rodríguez, 2007; Smith et al., 2010; Hallström et al., 2013; Mekary et al., 2013; Huang et al., 2014). A Japanese 5-year follow-up study of food intake and body changes in adults showed that skipping breakfast in males results in an increase in BMI and waist circumference (Sakurai et al., 2017). Therefore, it is important that proper meals are consumed at appropriate times, and it is also necessary for individuals to be educated regarding what constitutes high-quality meals, which includes the provision of accurate information regarding appropriate food amounts and meal times.

Furthermore, we studied the association between skipping breakfast and depressive symptoms according to age and socioeconomic conditions. We found that those who were older, had lower household income, were less educated, or were not engaged in economic activity, had a higher probability of experiencing depression if failing to eat breakfast. Previous studies have reported that elderly individuals skip meals due to restricted mobility or loneliness, and the number of meals and quantity of food are small even when eating (Chou and Chi, 2000; Gustafsson and Sidenvall, 2002; Kim, 2015). Other studies have shown that a low frequency of eating meals with one's family is associated with depression or suicidal ideation (Bae et al., 2007; Sirey et al., 2008; Kang, 2014; Kwak and Kim, 2017). The results of previous studies and the current study indicate that individuals are particularly at risk of mental-health issues if they are not eating meals and are of low SES and/or socially isolated elderly. Therefore, along with education of the elderly and those of low SES regarding appropriate eating habits, there should be an institutional strategy that engenders food consumption in these people by promoting social eating, that is, consuming meals together with others in a group setting.

Limitations of this study are as follows: this study was based on a population sample survey in Korea. Although this did not include the entire Korean population, the results may be generalized because of the large sample size. Second, response accuracy could potentially be low because the CHS is a self-report instrument. However, the CHS is a generally accepted governmental survey, which was conducted by qualified researchers; thus, potential bias was reduced to some extent. Finally, this study could not confirm clinical results related to food security and skipping breakfast. Clinical outcomes would ideally be assessed in order to accurately determine the causes of nutrition-related disease outbreaks; self-reported questionnaires are not ideal in this respect. Therefore, it would be necessary to study how food security and meal-skipping actually affect health status.

In this study, we investigated the association between depressive symptoms, and food security and skipping breakfast. We found that food insecurity was deeply associated with depressive symptoms, especially for individuals with very low food security. Additionally, the frequency with which breakfast was omitted was associated with depression. In particular, SES was important with respect to depressive symptoms when people did not eat breakfast. These findings emphasize the importance of understanding the factors that are associated with depressive symptoms and healthy eating habits. Our study suggests that those living in households with lower food security who skip breakfast often should pay particular attention to their mental health. Further, it is necessary to evaluate and improve current policies and programs regarding food security and eating habits.

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