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Short communication

Combined eating behaviors and overweight: Eating quickly, late evening meals, and skipping breakfast

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ABSTRACT

Objective: Various eating behaviors have been linked with body weight management. However, combined effects of major eating behaviors are not fully understood. This study aimed to clarify the association of the combination of eating quickly (EQ), late evening meals (LEM), and skipping breakfast (SB) with being overweight.
Method: A cross-sectional study with standardized questions for EQ, LEM, and SB was conducted. Stratified random sampling of 5% of residents aged 20 to 80 years was surveyed in a city in northeast Japan in 2011, and 4249 (84.9%) residents were analyzed. Association of combinations of eating behaviors on being overweight (BMI ($kg/m^2 \geq 25.0$)) was estimated by using logistic analysis, and odds ratio (OR) and 95% confidential interval were calculated after adjustment for potential covariates.
Results: LEM, SB, or a combination of LEM and SB was not significantly associated with being overweight. However, the combination of EQ or only EQ was significantly associated with being overweight. As the number of eating behavior practices increased, there was a linear increase in OR for being overweight. The OR of all three combined eating behaviors was higher than that of any combined two behaviors or of each behavior.
Discussion: This study result supports the evidence that EQ increases the risk of being overweight whether by itself or in combinations with LEM and/or SB. However, only LEM or only SB did not increase the risk of being overweight.

1. Introduction

Overweight and/or obesity are major risk factors for noncommunicable diseases including diabetes, cardiovascular diseases, and cancer. Body weight (BW) management is one of the important strategies to prevent and treat those diseases. For BW management, energy balance is important, but restricting and maintaining energy intake are difficult in general (Del Corral, Chandler-Laney, Casazza, Gower, & Hunter, 2009). Developing strategies without purposeful energy restriction to promote healthy BW could be advantageous.

Various habitual eating behaviors have attracted attention and have been linked with numerous health issues, including BW management. Modifying and practicing eating behaviors have now been widely recommended in clinic and public health settings.

Skipping breakfast (SB) has been shown to be linked with overweight/obesity (Brown, Brown, & Allison, 2013; Deshmukh-Taskar, Nicklas, Radcliffe, O'Neil, & Liu, 2012; Horikawa et al., 2011), dyslipidemia (Farshchi, Taylor, & Macdonald, 2005; Jenkins et al., 1989), insulin sensitivity (Farshchi et al., 2005; Jenkins et al., 1989), type 2 diabetes mellitus (Mekary, Giovannucci, Willett, van Dam, & Hu, 2012; Odegaard et al., 2013), blood pressure (Odegaard et al., 2013; Stote et al., 2007), and coronary heart disease (Cahill et al., 2013). However, the supposed disadvantages of SB have not been supported in recent studies (Levitsky & Pacanowski, 2013; Dhurandhar et al., 2014; Betts et al., 2014), and the conclusion is still under discussion.

Eating during the late evening hours (late evening meals: LEM) has also been shown to be linked with difficulty of BW control (Baron, Reid, VanHorn, & Zee, 2012), obesity (Aronoff, Geliebter, & Zammit, 2001; Bo et al., 2014), postprandial hyperglycemia (Van Cauter, Désir, Decoster, Féry, & Balasse, 1989), and hypertriglycerides at night (Tsuchida, Hata, & Sone, 2013). LEM is more common in obese people (Tholin et al., 2009), and studies have conducted more among clinic patients than in the general population (Allison et al., 2008). However, a prospective epidemiological study in the USA showed no association between LEM and BW change (Kant, Schatzkin, & Ballard-Barbash, 1997).

As the criteria of night-eating syndrome (NES) encompasses SB (Stunkard, Grace, & Wolff, 1955), both have been studied together as a

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risk of overweight/obesity, unhealthy metabolic profiles (Cahill et al., 2013), and coronary heart disease (Cahill et al., 2013).

Another major eating behavior which has consistently associated with BW is self-rated speed of eating; eating quickly (EQ) influences satiety, meal size, energy intake, BW (Robinson et al., 2014), and metabolic profiles (Hsieh, Muto, Murase, Tsuji, & Arase, 2011; Ohkuma et al., 2013).

To our knowledge, however, no studies have been published on the effect of the combinations of those behaviors on being overweight/obese. The present study aimed to examine the association of the combination of practicing SB, LEM, and EQ with being overweight, while considering potential covariates, in a community representative sample of Japanese adults.

2. Methods

2.1. Study population

A cross-sectional survey was conducted in October 2011. The survey was carried out in cooperation with Tsuruoka-City authority in northeast Japan to monitor the citizens' health status and behaviors. Using a stratified random sampling method among residents aged 20 to 80 years by gender and a 5-year age strata, 5002 residents (5.0%) were selected on the basis of the Basic Resident Register on March 31, 2010.

A cover letter and a questionnaire were mailed to the residents. Introduction of the study and its aims, assurance of anonymity, and encouragement for participation were included in the cover letter. After 2 weeks, volunteers visited each home to collect the sealed envelopes; 4570 (91.4%) returned questionnaires.

The study procedures were reviewed and approved by the Review Board of Graduate School of Medicine, The University of Tokyo, Tokyo, Japan.

2.2. Measurements

SB, LEM, and EQ were queried with the following standardized questions developed by the Japanese Ministry of Health, Labour and Welfare to prevent metabolic syndrome in 2007 (Ministry of Health, Labour, and Welfare, 2008). SB, do you skip breakfast at least three days per week? LEM, do you have a late-evening meal within 2 h before bedtime at least three days per week? EQ, compared to other people, is your eating speed quicker? The response options were yes or no.

Smoking (current, past, or never), alcohol drinking (current, past, or never), and participating in sports/exercise (≥30 min/one time and ≥twice/week) were also queried. Socio-demographic variables of gender, age (years old), educational attainment (years), employment status (yes: full- or part-time work, or no), living with spouse (yes, or no), and visiting the hospital regularly due to chronic diseases and/or pain (yes, or no) were included.

Height (cm) and BW (kg) were obtained to one decimal place. To test the validity of the self-reports, 258 residents aged 20 to 80 years were invited to a health center one week later after self-reports, and height and BW were actually measured. Self-reported and measured

Table 1
Participants' characteristics according to eating behaviors: skipping breakfast, eating late evening meals, and eating quickly.

	Skipping breakfast		Eating late evening meal		Eating quickly	
	No	Yes	No	Yes	No	Yes
	n = 3541	n = 708	n = 3085	n = 1164	n = 2058	n = 2191
BMI, mean ± SD	23.0 ± 3.3	22.7 ± 3.8	22.9 ± 3.3	23.1 ± 3.6	22.3 ± 3.2	23.5 ± 3.5
<25.0, %	76.7	78.7	77.9	74.5	82.4	71.9
≥25.0, %	23.4	21.3	22.1	25.5	17.6	28.1
Gender						
Male, %	47.3	58.1	45.2	59.6	46.6	51.4
Female, %	52.7	41.9	54.9	40.4	53.4	48.6
Age, mean ± SD	54.5 ± 15.7	42.4 ± 13.9	53.5 ± 16.1	49.9 ± 15.6	53.7 ± 16.4	51.4 ± 15.6
20–39, %	20.1	47.4	22.5	30.1	23.2	26.0
40–59, %	34.0	40.9	34.0	38.2	32.4	37.7
60–80, %	45.9	11.7	43.5	31.7	44.4	36.3
Living with spouse						
Yes, %	73.3	54.6	70.6	69.2	69.7	70.7
No, %	26.7	45.4	29.4	30.8	30.3	29.3
Employment						
Yes, %	67.7	79.5	65.9	79.8	66.5	72.6
No, %	32.3	20.5	34.1	20.2	33.5	27.4
Education attainment						
≥13 years, %	27.3	31.9	27.6	29.4	26.7	29.4
<13 years, %	72.7	68.2	72.4	70.6	73.3	70.6
Visiting hospitals						
Yes, %	52.9	32.3	51.0	45.3	49.7	49.3
No, %	47.1	67.7	49.0	54.7	50.3	50.7
Regular exercise						
Yes, %	26.0	19.4	26.1	21.6	24.2	25.6
No, %	74.0	80.6	73.9	78.4	75.8	74.4
Smoking						
Currently, %	19.3	47.2	21.7	29.9	22.5	25.3
Past, %	26.3	21.1	24.0	29.0	24.9	25.8
Never, %	54.4	31.7	54.3	41.1	52.6	48.8
Alcohol drinking						
Currently, %	36.9	44.4	34.3	48.4	36.3	39.9
Past, %	19.3	15.6	19.4	16.6	18.2	19.1
Never, %	43.8	40.0	46.3	35.0	45.5	41.0

BMI, body weight (kg)/height $(m)^2$.
Living with spouse, yes: currently; no: divorced, widowed, or unmarried.
Employment, yes: currently employed with full or part time; no: not employed, students, or housewives.
Visiting hospital, yes: currently visiting hospitals regularly due to chronic diseases and/or chronic pain.
Regular exercise, yes: at least 30 min at once and at least 2 times per week through all year around.