Association of eating speed and rate with adult obesity: an exploratory review

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Introduction

Obesity is a complex multifactorial chronic disorder that is associated with comorbid metabolic diseases e.g., cardiovascular disease, insulin resistance, sleep apnea, and osteoarthritis1, and thus an increased mortality risk. Obesity is excessive accumulation of fat, and it could be defined by using anthropometric measures such as Body Mass Index (BMI; weight in kilograms divided by square of height in meters), waist circumference (WC), hip circumference (HC), waist-to-hip ratio (WHR; WC to HC ratio), waist-to-stature ratio (WSR; WC to height ratio).

Obesity stems from multiple factors including lifestyle factors (increased caloric intake, decreased physical activity, poor sleep patterns), social determinants (cultural eating habits, food deserts, affordability of food options), biological and physiological factors (genetics, endocrine disorders, medication side effects). Over the years there has been an increased prevalence of obesity mainly due to increased availability and intake of energy-dense foods, increased urbanization, and increased sedentary nature of work and transportation[2]. Nationally, the prevalence of obesity among adults aged 20-49 has increased from 30.5% (1999-2000) to 42.4% (2017-2018)[3].

Obesity has become a growing public health concern given the rising its prevalence and the associated adverse health outcomes. Therefore, it would be clinically and epidemiologically beneficial to study how various lifestyle factors contribute to obesity. The evidence on the association of eating rate and speed with adult obesity has been growing.

The objective of this study is to review and analyze recently published epidemiological studies to better understand the association of eating rate and speed with adult obesity.

Methods

- PubMed was the sole database used to identify the studies.
- To search the literature, eating rate, eating speed, and obesity were used as keywords, and one Boolean operator ('and') was used to link eating speed/rate to obesity.
- Exclusion criteria included studies published after August 31st, 2023, and publications included in previous systematic reviews published within the past 15 years.
- Sample size, demographics, exposure component and outcome were recorded (Table 1)

Results

- The 3 cross-sectional and used questionnaires to collect subjective data on eating rate and speed as exposure, of which one also included an objective evaluation of eating rate measured as chews per bite.
- All studies collected data on body mass index and waist circumference to define outcomes, including general and central obesity, respectively.
- These studies differed in statistical methods and reported significant relations between the exposure and outcomes (Table 2).
- However, after adjusting for confounding factors, the strength of the associations between exposure and outcomes differed among the studies.

Table 1	Sample Size and Demographics	Exposure	Outcome
Study 1 **Hamada et al., 2017, Tokyo, Japan**	N = 84 Age: 19 +/- 1 years Gender: Female	Eating speed: -Subjective: self-reported -Objective: total number of chews, number of chews/bites, total meal duration, number of bites, chewing rate.	Body mass, BMI, WC, AC, HC
Study 2 **Wuren et al., 2019, Japan**	N = 6888 Age: 35-69 years Gender: Male & Female	Eating rate: Subjective: self-reported	BMI Obesity, WC obesity
Study 3 **Sonoda et al., 2018, Japan**	N = 683 Age: 55-80 years Gender: Male	Eating Rate: -subjective: self-reported and reported by partner	BMI Obesity, WC obesity

Table 2	Analysis Method	Major Findings
Study 1 **Hamada et al., 2017, Tokyo, Japan**	Pearson's correlation	Significant weak Pearson's correlation between: -total number of chews, total meal duration, number of bites and body mass (R=- 0.22, -0.24, -0.25, all p <0.05) -total number of chews, total meal duration, and BMI (R=-0.24, -0.27, all p<0.05) - total number of chews, total meal duration and WC (R=-0.26, -0.24, all p<0.05) -total number of chews, total meal duration and AC (R=-0.25, -0.27, all p<0.05) -total number of chews, total meal duration and HC (R=-0.24, -0.22, all p<0.05)
Study 2 **Wuren et al., 2019, Japan**	Logistic Regression Analysis	Multivariate adjusted ORs and corresponding 95% *Confidence Intervals*: -Eating Fast and BMI [Male 1.48 (*1.25-1.76*); Female 1.78 (*1.39-2.26*), p<0.001] -Eating Fast and WC [Male 1.45 (*1.21-1.74*), p<0.001; Female 1.34 (*1.11-1.61*), p<0.01] -Eating Normally and BMI/WC [Male 1.00; Female 1.00] -Eating Fast and BMI and WC positively correlated in both genders
Study 3 **Sonoda et al., 2018, Japan**	Cox Regression Model	Multivariate adjusted ORs and corresponding 95% *Confidence Intervals*: -Eating Fast, Very Fast and BMI ≥25 [2.65 (*1.52-4.65*), p<0.01], [5.04 (*1.95-13.07*), p<0.01] -Eating Normally and BMI >25 [1.40 (*0.80–2.46*), p=0.24] -Eating Fast, Very Fast and WC ≥85 [3.13 (*1.74-5.64*), p<0.01], [6.59 (*2.37-18.48*), p<0.01] -Eating Normally and WC ≥85 [1.72 (*0.96–3.11*), p=0.070]

Conclusion

- Subjective evaluation of eating speed and rate was common.
- **Prior studies were inconsistent** in the association of eating speed and rate with obesity after adjustment for confounding factors.

Future Study

- A comprehensive updated scope review will be conducted to synthesize recent evidence on the association using:
  - A comprehensive keyword list of eating rate and eating speed
  - A comprehensive keyword list of obesity and overweight
  - PRISMA-Scope Review checklist and protocol

References

1. Lim Y, Boster J. Obesity and Comorbid Conditions. 2023 Feb 8. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 34662049.
2. World Health Organization: WHO. (2021, June 9). Obesity and overweight. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight
3. Hales CM., Carroll MD, Fryar CD., and Ogden CL. Prevalence of Obesity and Severe Obesity Among Adults: United States, 2017–2018. NCHS Data Brief No. 360, February 2020.
4. Hamada Y, Miyaji A, Hayashi Y, Matsumoto N, Nishiwaki M, Hayashi N. Objective and Subjective Eating Speeds Are Related to Body Composition and Shape in Female College Students. J Nutr Sci Vitaminol (Tokyo). 2017;63(3):174-179.
5. Wuren, M. A., Endoh, K., PhD., & Kuriki, K., PhD. (2019). Eating rate as risk for body mass index and waist circumference obesity with appropriate confounding factors: A cross-sectional analysis of the shizuoka-sakuragaoka J-MICC study. Asia Pacific Journal of Clinical Nutrition, 28(1), 79-91.
6. Sonoda C, Fukuda H, Kitamura M, Hayashida H, Kawashita Y, Furugen R, Koyama Z, Saito T. Associations among Obesity, Eating Speed, and Oral Health. Obes Facts. 2018;11(2):165-175.

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