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# Skipping Breakfast Correlates with the Incidence of Overweight and Obesity Among Young Adults

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***ABSTRACT***

**Introduction:** It has been established that dietary habits are associated with nutritional status. However, few studies have evaluated dietary habits among young adults in college. College students represent a period of nutritional vulnerability due to dietary transition from home to college. This study evaluated the dietary habits, including breakfast habit, frequency of snacking, and frequency of meals, with the incidence of overweight and obesity among young adults. **Method:** This was a cross-sectional study conducted at the Faculty of Medicine, Universitas Sebelas Maret Surakarta from April to May, 2022. Male and female students were selected as subjects using simple random sampling. Weight and height were measured using digital scale and microtoise, respectively. Body mass index (BMI) was then calculated and classified based on the Indonesian cut-off points. Dietary habits were collected through a questionnaire. Chi-square test was performed using SPSS. **Results:** From the total 99 subjects aged 18-22 years old, 15.1% subjects were identified as overweight (BMI >25.0-27.0) and 17.2% as obese (BMI >27.0). Irregular breakfast habit <6x/week was associated with overweight and obesity among young adults (p=0.002), while frequency of snacking and meals were not associated with overweight and obesity (p>0.05). **Conclusion:** Overweight and obesity among young adults were associated with irregular breakfast habit, but not with frequency of snacking and meals. Our results suggested that young adults in college should regularly consume breakfast to avert the incidence of overweight and obesity.

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## INTRODUCTION

Global estimates reported that 39% or more than 1.9 billion adults worldwide aged 18 years and older were classified as overweight and obese in 2016. The prevalence has nearly tripled from 1975, indicating a worrying increase (WHO, 2021). In Indonesia, overweight and obesity are considered growing public health challenges as the country

experiencing rapid socio-economic transition. The prevalence of overweight and obesity has increased in the past two decades among all age groups (Rachmi, Li, & Alison Baur, 2017). Moreover, national surveys also suggested a sharp increase in prevalence among adults >18 years old, particularly from 28.9% in 2013, to 35.4% in 2018 (Kemenkes, 2013, 2018).

Adult defines as a phase of life where an individual aged >18 years (Kemenkes, 2014; Sawyer, Azzopardi, Wickremarathne, & Patton, 2018). Many research have shifted the discussion to the recently introduced terms young adulthood which spanned from 18 to 26 years of age (Bonnie, Stroud, & Breiner, 2015; Chau, Burgermaster, & Mamykina, 2018; Patton et al., 2016; WHO, 2023). The term has been used interchangeably with emerging adulthood and described as a period from the late adolescence to the late twenties when an individual acquires some of the characteristics of adulthood without having reached the milestones of matured adulthood. This period is accompanied by maturation of the prefrontal cortex which corresponds to improved reasoning, impulse control, and self-regulatory functions. People in this period often begin to adopt adult roles and responsibilities (Patton et al., 2016; Sawyer et al., 2018).

However, across different literatures and contexts, young adulthood is often inaccurately grouped with adults or adolescents (Bonnie et al., 2015; Hurlock, 2001). Whereas young adulthood is a time of adaptation to social, emotional, and cultural complexity. Young adulthood also marks the years in which an individual traditionally attending college and establish independent living (Patton et al., 2016).

College students experience certain lifestyles and dietary behaviors which differ from other adults in the general population. Uniquely, college students represent a period of nutritional vulnerability due to dietary transition from home to university. This transition might increase perceived stress levels and affect dietary behaviors and metabolism to promote overweight and obesity. The failure of college students to adjust to the new environment might lead to faulty dietary behaviors such as overeating (Choi, 2020). Another distinct dietary practice among college students was meal skipping, with breakfast being the most skipped meal (Bede et al., 2020).

Practices of overeating and meal skipping among college students might contribute to the incidence of overweight and obesity. Frequent occasions of eating, meals, and snacks were associated with an increased likelihood of overweight and obesity, as well as central obesity since eating frequency was positively associated with energy intake (Murakami & Livingstone, 2015, 2016). Moreover, some studies found that breakfast skipping increases the risk of overweight andobesity (Ma et al., 2020; Mansouri et al., 2020).

Studies that examined the association between dietary habits and overweight/obesity in Indonesian population were mostly performed on children and adolescents (Agustina et al., 2020; Harahap, Widodo, Sandjaja, Khouw, & Deurenberg, 2019; Rachmi, Jusril, Ariawan, Beal, & Sutrisna, 2021). To the best of our knowledge, there were limited studies in Indonesia which discussed breakfast habit, frequency of snacking, and frequency of meals among young adults in university. The purpose of this study was to investigate whether dietary habits, namely breakfast habit, frequency of snacking, and frequency of meals, contributed to the incidence of overweight and obesity among young adults in university.

## LITERATURE REVIEW

A study on dietary habits of medical school students in Cameroon, Africa reported that 66.5% students had ≤ 2 meals/day and only 33.5% consumed the recommended 3 meals/day. Snack was consumed by 40.8% subjects. Dinner was the most favored meal to

be consumed in a day by students, and breakfast being the least. The most frequently reported reason for skipping a meal was attributed to students being busy (Bede et al., 2020).

Evidence on relation between dietary habits and overweight/obesity were prevalent. Skipping breakfast increased the risk for overweight/obesity or weight gain, respectively, compared to regular consumption of breakfast (Mansouri et al., 2020). A meta-analysis reported that skipping breakfast increases the risk of overweight/obesity by 44% (Ma et al., 2020). The biological mechanism could be partly explained by the role of insulin secretion in regulation of energetic homeostasis. Skipping meals, namely breakfast, may induce greater blood glucose and insulin response due to the proportionally higher carbohydrate intakes during the remaining meals. Skipping breakfast particularly leads to higher postprandial insulin peaks which correlates to an increased absorption and oxidation of cellular glucose in the immediate postprandial phase, as well as to an increased accumulation of fat ingested through the diet in adipose tissue (Marangoni et al., 2019). Moreover, regular breakfast consumption may increase diet-induced thermogenesis and promote energy expenditure, thus reducing the risk of overweight/obesity (Deshmukh-Taskar, Nicklas, Radcliffe, O'Neil, & Liu, 2013).

Relevant research suggested that higher frequency of meal and snack consumption were positively associated with overweight/obesity in adolescents and adults (Murakami & Livingstone, 2015, 2016). The plausible mechanism was attributed to higher macronutrients intake. Increased meal and snack frequency might contribute to excess energy intake which result in fat mass deposition and consequently lead to weight gain (Murakami & Livingstone, 2016). The effects were greater for snack with high energy but low nutritional density, consumed excessively in the absence of hunger signal (Marangoni et al., 2019)). As unhealthy snack frequency increased, total energy intake in the form of carbohydrates and sugar also significantly increased (Azadbakht, Hajishafiee, Golshahi, & Esmaillzadeh, 2016).

In contrary, regular eating of meals (3 times/day) and snacking between meals (1-2 times/day) were protective factors for obesity with OR ranged from 0.42 to 0.79 (Marangoni et al., 2019; Musaiger, Hammad, Tayyem, & Qatatsheh, 2015). Distributing energy and nutrient intake into 4–5 eating events/day could lower the risk of digestive and metabolic overload caused by fewer heavier meals and thus contribute to meet dietary recommendations for food groups (such as fruits) and certain nutrients (such as vitamins, fibers) (Choi, 2020; Marangoni et al., 2019). Eating frequent but small portion of meals could prevent a rapid increase in hunger and had been associated with positive metabolic effects, i.e. weight loss (Marangoni et al., 2019; Murakami & Livingstone, 2015). In addition, frequent consumption of healthy snacks such as vegetables, fruits, nuts, and whole grain was associated with lower incidence of overweight, obesity, and abdominal obesity (Azadbakht et al., 2016).

## METHOD

This was an observational, descriptive research with a cross-sectional design conducted at the Faculty of Medicine, Universitas Sebelas Maret Surakarta. The study was conducted from April to May, 2022. Subjects were randomly selected based on the following inclusion criteria: male and female medical students at Universitas Sebelas Maret, aged 18-25 years at the time of data collection, and willing to participate in this study by signing an informed consent form. Subjects who were underweight were excluded from the study. A total of 99 subjects agreed to participate in this study.

Nutritional status was obtained from direct measurements of body weight and height, then compared with the latest Indonesian body mass index cut-off points (Kemenkes, 2014). Measurements were performed by a single research assistant to minimize risk of bias. The protocols for body measurements were as follow: subjects were weighted twice using a digital scale wearing minimal clothes and without shoes. Digital scale was placed on a flat, solid surface and calibrated prior to usage. The average value was reported as weight in kg. Subjects' height was also measured twice using a microtoise and the average value was reported as height in cm. Subjects were asked to remove their shoes and headwear accessories, such as hats and caps. Microtoise were mounted to a wall and calibrated prior to usage.

Data on subjects' characteristics and dietary habits were collected through a questionnaire. Prior to the study, the questionnaire was distributed to 30 respondents outside study population to assess validity and reliability. The questionnaire was thus considered valid and reliable.

Subjects were guided by research assistant during data collection process to ensure reliability of data. Dietary habits surveyed in this study including breakfast habit, frequency of snacking, and frequency of meals. Subjects were asked on how many days per week they had breakfast, ranging from 0 to a maximum intake of 7 days/week. Breakfast habit was then classified as: irregular (0-5 days/week) and regular (6-7 days/week). Subjects were also asked on how many times a day they had meal, ranging from 0 to >3/day. Frequency of meals was then classified as: 0-2 times/day and >2 times/day. Meals were specified by self-reported names such as 'breakfast', 'lunch', and 'dinner'. Any other reported eating between meals were considered as snacks, as subjects were asked to report on how many times a day they had snack, ranging from 0 to >3/day. Frequency of snacking was then classified as: 0-2 times/day and >2 times/day.

Signed informed consent as proof of agreement to participate in the study were collected from all subjects. This research has been ethically approved by the Health Research Ethics Committee Faculty of Medicine, Universitas Sebelas Maret: 55/UN27.06.3.1/PT.01.04/2022.

After data from all subjects were obtained, they were then processed and analyzed. Statistical analysis was performed in univariate to display descriptive data and in bivariate with Chi-square test to display association among variables. Statistical analysis was performed using SPSS version 25. Our study considered a *p-value* of less than 0.05 as statistically significant.

## RESULT AND DISCUSSION

Table 1 shows basic characteristics of participants. The total number included in this study were 99 subjects. The age of the participants ranged from 18 to 22 years old at the time of the study. The majority of the participants were 19 years old (44.5%), were female (72.7%), and had a monthly allowance of less than IDR 2,000,000 (60.6%). A small number of participants admitted they were currently on a weight-loss diet. Regarding the quality of rest, more than 70% participants reported to have less than 7 hours of sleep each day. It could also be inferred from Table 1 that most of the participants were living away from home in dormitories/lodging houses/rental rooms.

In Table 2, we presented the nutritional status distribution of subjects in this study. Nutritional status was classified by the Indonesian body mass index (BMI) cut-off values. Subjects with BMI 18.5-25.0 were classified as normal weight, BMI >25.0-27.0 were classified as overweight, and BMI >27.0 were classified as obese (Kemenkes, 2014). From the total participants, 67 were classified as normal, 15 as overweight, and 17 as obese.

Table 1. Basic Characteristics of Participants

| Subject Characteristics | n | % |
|---|---|---|
| **Age (years)** | | |
| 18 | 8 | 8.1 |
| 19 | 44 | 44.5 |
| 20 | 20 | 20.2 |
| 21 | 24 | 24.2 |
| 22 | 3 | 3.0 |
| **Gender** | | |
| Male | 27 | 27.3 |
| Female | 72 | 72.7 |
| **On a Weight-Loss Diet** | | |
| Yes | 16 | 16.2 |
| No | 83 | 83.8 |
| **Sleep Pattern** | | |
| ≤7 hours/day | 70 | 70.7 |
| >7 hours/day | 29 | 29.3 |
| **Monthly Allowance** | | |
| ≤IDR 2,000,000 | 60 | 60.6 |
| >IDR 2,000,000 | 39 | 39.4 |
| **Current Living Arrangement** | | |
| At home | 23 | 23.2 |
| Away from home (dorm/lodging/rental) | 76 | 76.8 |
| **Total** | **99** | **100** |

Although we found a greater number of subjects with normal BMI, 32.3% subjects were identified as overweight and obese in this study. Our result demonstrated an increase from the total prevalence found by a national population-based survey in 2014–2015 which was 31% (Pengpid & Peltzer, 2017). The trend was consistent with a global increase of overweight and obesity over the past couple of decades, highlighting the urgency for health improvements (WHO, 2021).

Table 2. Distribution of Nutritional Status

| | n (%) | Mean ± SD | Min – Max |
|---|---|---|---|
| **Nutritional Status** | | | |
| Normal | 67 (67.7) | 23.58 ± 4.52 | 17.3 – 38.3 |
| Overweight | 15 (15.1) | | |
| Obese | 17 (17.2) | | |

Chi-square analysis was used to find association among breakfast habit, frequency of snacking, and frequency of meals with nutritional status. From Table 3, it was concluded that breakfast habit was significantly associated with the incidence of overweight and obesity among young adults aged 18-22 years old ($p$=0.002). Meanwhile, there was no significant association between frequency of snacking and meals with the incidence of overweight and obesity ($p$>0.05).

Our results which indicated that irregular breakfast habit of less than 6 times per week was associated with overweight and obesity among young adults in college were in line with previous studies. Skipping breakfast increased the risk for overweight/obesity or weight gain, respectively, compared to regular consumption of breakfast (Mansouri et al., 2020; Wicherski, Schlesinger, & Fischer, 2021). College students with regular breakfast

habits were more likely to have normal nutritional status (Ningrum et al., 2019). Moreover, a recent meta-analysis concluded that skipping breakfast is associated with overweight/obesity. Since the analysis included cohort studies, it can prove causal relationship, in which skipping breakfast increases the risk of overweight/obesity by 44% (Ma et al., 2020).

Table 3. Bivariate Analysis of Factors Associated with Overweight and Obesity

| Variables | Nutritional Status | | *p-value* |
|---|---|---|---|
| | Normal (n=67) | Overweight/Obese (n=32) | |
| **Breakfast Habit** | | | |
| Irregular (<6x/week) | 12 | 15 | 0.002* |
| Regular (≥6x/week) | 55 | 17 | |
| **Frequency of Snacking** | | | |
| ≤ 2x/day | 50 | 18 | 0.065 |
| >2x/day | 17 | 14 | |
| **Frequency of Meals** | | | |
| ≤ 2x/day | 28 | 17 | 0.289 |
| >2x/day | 39 | 15 | |

*Chi-square analysis*
**Statistically significant at p<0.05*

Previous studies have discussed several possibilities regarding the association of breakfast and overweight/obesity. Eating breakfast may result in a more even distribution of energy and nutrient intake during the day, hence reducing the risk of overweight and obesity (Choi, 2020). Eating breakfast is also associated with better regulation of blood glucose and appetite which may possibly lead to decrease energy intake throughout the day (Dhurandhar, 2016). Another suggested explanation is that eating breakfast contributes to a greater total daily meal frequency which may increase diet-induced thermogenesis and promote energy expenditure (Deshmukh-Taskar et al., 2013). Moreover, a study confirmed that regular breakfast eaters are more likely associated with healthy behaviors, such as better food choices, regular sleep pattern, and being non-smoker than breakfast skippers (Mansouri et al., 2020).

It is a familiar practice for college students to relocate to temporary housing close to campus during the period of study. Previous studies have discussed the association between living arrangements with breakfast habit among young adults in college. Skipping breakfast is a common practice among college students, particularly those living away from home in dormitories (Mansouri et al., 2020). For most students, this is their first time away from home, hence lack the time and cooking ability to prepare meals on their owns. Conversely, those who live at home with parents or guardians were more likely to have regular breakfast compared to those living away from home (Ningrum et al., 2019).

However, data from Table 1 and Table 3 showed that most of the subjects in our study were living away from home in dormitories/lodging houses/rental rooms and had a regular breakfast habit. The difference between our study with previous studies may possibly related to differences of cities surveyed and college study major.

This study found absent correlation between frequency of snacking and meals with overweight and obesity among young adults. In contrary with our findings, positive associations were observed between frequency of snacking and meals with overweight in US adolescents aged 12-19 years. The study also indicated that eating frequency (meals and snacks) were positively associated with abdominal obesity since frequent unhealthy

snacking might cause an excess in energy intake and consequently lead to weight gain (Murakami & Livingstone, 2016). The difference between our study with previous studies may possibly related to differences in age group, dietary assessment methods, and potential bias, namely underreporting of snacking and meal frequency by overweight/obese subjects.

Our study has some limitations. Due to its cross-sectional design of this study, we were unable to identify causal relationship. Another limitation was regarding the accuracy of self-reported dietary habits. Moreover, this study only investigated the frequencies of food intakes, whereas neither the amount of consumed food nor caloric information was considered to further strengthen the association.

However, the considerable number of subjects in our study was representative of young adults in Surakarta. Our study was among the first to investigate dietary habits, namely breakfast habit, frequency of snacking, and frequency of meals, among young adults in Indonesian college setting. Further studies are needed to elucidate the biological mechanisms involved in the relations between dietary habits, especially regular breakfast consumption, with overweight and obesity.

## CONCLUSION

This study found that irregular breakfast habit of less than 6 times per week was significantly associated with overweight and obesity among young adults in college ($p=0.002$). However, frequency of snacking and meals were not associated with overweight and obesity among young adults in college ($p>0.05$). Our study confirms previous findings on association of skipping breakfast with overweight and obesity.

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