Hindawi
Advances in Public Health
Volume 2023, Article ID 3932024, 8 pages
https://doi.org/10.1155/2023/3932024

*Research Article*

# Meal Timing Habits among Adults in Saudi Arabia: A Cross-Sectional Study

**Sarah AlMuammar, Abeer Ahmed Algarni, Ftoon Badroun, Hanan Hassan Mushaeb, Raneem Khalid Abu Sadi, and Areej Algarni**

*Department of Family Medicine, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia*

Correspondence should be addressed to Sarah AlMuammar; muammar.sarah@gmail.com

Received 15 June 2023; Revised 4 October 2023; Accepted 5 October 2023; Published 25 October 2023

Academic Editor: António Raposo



*Background*. The global rise in noncommunicable diseases, such as obesity, diabetes, and cardiovascular conditions, is a growing concern worldwide. Unhealthy dietary behaviors, specifically the habits of skipping breakfast and consuming late dinners, have emerged as key dietary behaviors with significant health implications. *Methods*. This cross-sectional survey-based study aimed to investigate meal-timing habits among adults in Saudi Arabia, with a particular focus on breakfast skipping. *Results*. The study included 2,262 participants, of whom 58.0% were women and 42.0% were men. It found that 31.4% of participants had less than three meals per day, and 74.2% reported snacking. Moreover, 16.8% of participants skipped breakfast and 18.9% of participants had late dinner. Females were found to be 1.3 times more likely to skip breakfast than males (OR = 1.3, 95% CI 1.0–1.6, $P = 0.04$), while unemployed individuals were three times more likely to skip breakfast than those with full-time jobs (OR = 3.0, 95% CI 1.3–7.1, $P = 0.01$). *Conclusion*. The study highlights a high prevalence of breakfast skipping and late evening dinners among adults in Saudi Arabia, particularly among females and unemployed individuals. Targeted interventions to promote healthy eating habits are needed to improve nutritional status and prevent chronic diseases in this population.

## 1. Background

The prevalence of noncommunicable diseases, such as obesity, diabetes, and cardiovascular diseases, has been increasing globally, impacting 35% of the population in Saudi Arabia, as indicated by a recent survey [1]. The high prevalence of obesity and other noncommunicable diseases can be attributed to various lifestyle factors, including unhealthy eating habits.

The timing and pattern of meals have a significant impact on our health and well-being. Evidence has shown that regular meal times and balanced nutritional intake are associated with a lower risk of chronic diseases, including obesity, diabetes, and cardiovascular disease [2, 3]. Conversely, irregular or skipped meals and high-calorie snacking are linked to a higher risk of weight gain and metabolic disorders [4]. Therefore, understanding the factors that influence meal and snack times are crucial for promoting healthy eating behaviors and preventing adverse health outcomes.

Breakfast skipping, late dinner consumption, and snacking are dietary behaviors that have garnered attention due to their potential impact on health outcomes. Specifically, breakfast skipping has been associated with disturbances in glucose metabolism and insulin sensitivity [5]. Late dinner eating has the potential to disrupt circadian rhythms and affect metabolic processes, potentially contributing to insulin resistance [6]. Snacking, especially on high-calorie, low-nutrient foods, can lead to excessive calorie intake and weight gain, further exacerbating metabolic health issues. Additionally, breakfast skipping has been linked to increased body weight and an elevated risk of obesity [7]. This behavior can disrupt the daily energy balance by promoting overeating later in the day and reducing physical activity [8]. Late dinner consumption may also contribute to weight gain by surpassing daily calorie requirements and interfering with the body's natural fasting and resting periods [9].

The literature on eating habits among Saudis, particularly young adults, reveals several key findings. While previous

studies have mainly focused on specific populations or patients with particular health conditions [1, 10–12], there is a paucity of research examining the eating habits of adults in the general Saudi Arabian population. Existing studies suggest that Saudis often exhibit irregular meal patterns, including the common practice of skipping breakfast [13]. However, these studies are characterized by limited sample sizes and regional specificity. Recent research highlights the effects of sociocultural changes on Saudi eating habits, with a shift toward more "Westernized" diets, contributing to the rising rates of overweight and obesity among the Saudi population [13]. Furthermore, Saudi college students frequently have irregular meal timings and engage in late dinner consumption [1]. A substantial portion of Saudi female university students is prone to obesity due to the timing of their energy intake, particularly an increased energy intake at dinner [11]. This previous research underscores the imperative to delve into the precise timing of meals and snacks using a 24-hr clock format, as it promises to offer more precise and comprehensive insights into eating patterns among the Saudi population.

Therefore, there is a critical need for a large-scale study that examines the meal timing habits of adults in Saudi Arabia and explores the relationship between demographic variables and these meal patterns. Such a study could provide valuable insights into the factors that influence eating habits and inform public health policies and interventions aimed at reducing the prevalence of obesity and other noncommunicable diseases.

## 2. Materials and Methods

*2.1. Study Design and Setting.* This cross-sectional, survey-based study was primarily designed to elucidate meal timing patterns among adults in Saudi Arabia, with a specific focus on the practice of skipping breakfast, and to examine the relationships and differences between demographic variables and their dietary behaviors. The study was conducted online, and the participants were aged 18 years or older.

*2.2. Study Participants.* We employed various social media platforms, such as Facebook, WhatsApp, and Twitter, to distribute the survey. Interested individuals were directed to an online survey platform where they could complete the questionnaire.

The survey was conducted online from January 1, 2023 to February 28, 2023. Participants were given assurances that their responses would be kept confidential and that their personal information would be used exclusively for the study's purposes. To ensure data quality, we implemented several strategies, including pilot testing of survey questions, regular checks of survey responses, and data cleaning procedures to identify and address incomplete or inconsistent responses.

*2.3. Sample Size Calculation.* The minimum required sample size of 383 was calculated using the following formula:

$$n = \text{DEFF} \times \frac{N \cdot p \cdot (1-p)}{\frac{d^2}{Z^2_{1-\alpha/2}} \times (N-1) + p(1-p)}, \quad (1)$$

where $n$ = sample size DEFF = design effect, $N$ = population size, $p$ = the estimated proportion, $d$ = margin of error, $Z$ = Z score corresponding to the desired confidence level, and $\alpha$ = significance level.

The sample size calculation was performed based on the assumption of a total population size of 35 million inhabitants in Saudi Arabia. We estimated the frequency of breakfast skipping at 52.8% from a previous study and aimed for a margin of error of ±5%. We set the significance level at 0.05 to achieve a 95% confidence level, corresponding to a $Z$ score of approximately 1.96. This calculation was carried out using OpenEpi software.

*2.4. Survey Instrument.* The survey instrument employed in this study consisted of two distinct sections: demographics and eating habits. The demographic section aimed to gather essential information concerning participants, including their age group, gender, marital status, educational level, nationality, place of residence, work status, working schedule, and monthly income.

The eating habits section included four questions pertaining to meal timing and snack consumption patterns. To ensure accurate categorization of meal timing, we classified breakfast, lunch, and dinner into three categories each: early, mid, and late. For instance, breakfast was categorized as early if consumed before 7 AM, mid if between 7 AM and 10 AM, and late if after 10 AM. Similarly, lunch was considered early if eaten before 2 PM, mid if eaten between 2 PM and 4 PM, and late if eaten after 4 PM. Last, dinner was classified as early if consumed before 8 PM, mid if consumed between 8 PM and 10 PM, and late if consumed after 10 PM.

The survey instrument underwent a pilot study to ensure face and content validity, during which it was tested with a small group of individuals to assess its clarity, relevance, and completeness. Face validity was addressed to confirm that the questions appeared relevant and appropriate for the study's objectives. Content validity was established through a comprehensive review by experts in the field of nutrition and dietary behavior, who confirmed the relevance and completeness of the instrument in capturing the intended constructs.

*2.5. Data Analysis.* The data analysis process commenced with the summary of demographic characteristics and meal time patterns of the study sample through descriptive statistics. Data are presented using frequency tables and percentages. To explore associations between variables, $\chi^2$ tests or Fisher's exact tests were utilized. Additionally, Cramer's $V$ coefficient was calculated to quantify the strength of associations for certain variables. All analyses were conducted using the statistical software SPSS version 27, with statistical significance defined as a $P$ value less than 0.05.

*2.6. Ethical Considerations.* This study received approval from the Institutional Review Board at King Abdulaziz University, with approval number 575-22. Participants provided informed consent electronically before participating in the study, and they were made aware that their participation was entirely voluntary, with the option to withdraw at any time. To ensure the confidentiality and anonymity of the

participants, rigorous measures were implemented throughout the study. Additionally, all necessary permissions were obtained for the collection and analysis of personal data.

## 3. Results

*3.1. Demographic Characteristics.* The study included 2,262 participants, of whom 58.0% were women and 42.0% were men. The majority of participants was in the 18–29 age group (56.4%) and single (54.8%). Regarding education, 72.7% had a diploma or bachelor's degree. Moreover, 93.3% of participants were citizens, and the western province had the highest representation among the regions, at 34.0% (Table 1).

*3.2. Meal Times and Frequency among Study Participants.* Figure 1 illustrates the meal times of the study population. Overall, 56.1% of participants ate breakfast between 7 AM and 10 AM, while 16.8% skipped breakfast. For lunch, 44.7% of participants had it before 2 PM, and 7.6% skipped lunch. Dinner was most commonly consumed between 8 PM and 10 PM (48.0%), and 8.9% of participants skipped dinner. In total, 710 (31.4%) of the participants had fewer than three meals per day. The study also found that 74.2% of participants reported snacking.

*3.3. Breakfast Skipping Habits among Study Participants.* Overall, 16.8% of participants skipped breakfast. The highest proportion of breakfast skippers was in the 18–29 age group (22.3%), followed by those aged ≥50 (19.3%). Females (22.4%) were more likely to skip breakfast than males (15.4%) ($P < 0.01$). Single participants had the highest proportion of breakfast skippers (21.8%), followed by divorced (19.4%), married (18.4%), and widowed (18.1%) participants ($P = 0.01$). Unemployed individuals (34.1%) and those with no working or studying schedule (30.4%) had the highest proportion of breakfast skippers ($P < 0.01$). Those earning less than SAR 4,000 had the highest proportion of breakfast skippers (23.9%) ($P < 0.01$) (Table 2).

The multivariable analysis showed that females were 1.3 times more likely to skip breakfast than males (OR = 1.3, 95% CI 1.0–1.6, $P = 0.04$). Unemployed individuals were three times more likely to skip breakfast than those with a full-time job (OR = 3.0, 95% CI 1.3–7.1, $P = 0.01$). All other associations, including age group, marital status, and monthly income, were not statistically significant (Table 3).

*3.4. Late Dinner Behavior among Study Participants.* Overall, 18.9% of participants had late dinner. Notably, age appears to play a significant role, with a statistically significant association ($P = 0.01$). The highest proportion of late dinner consumers was observed in the 18–29 age group (20.8%), followed by the 30–39 age group (18.8%). Furthermore, educational level also demonstrated a statistically significant relationship ($P = 0.02$) with individuals holding a diploma or bachelor's degree exhibiting the highest rate of late dinner intake (20.3%). Region of residence displays substantial disparities, with respondents from the Western Province having the highest prevalence of late dinner consumption (26.2%) compared to the other regions ($P < 0.01$). Work schedule also exhibited a significant association ($P < 0.01$), with respondents engaged in rotating shift work reporting the highest proportion of late dinner intake (27.9%) (Table 2).

The multivariable analysis indicated that individuals aged 40–49 were less likely to have late dinners compared to the reference group (18–29 years) (OR = 0.5, 95% CI 0.3–0.8, $P < 0.01$). Residents had a reduced likelihood of late dinner intake compared to citizens (OR = 0.6, 95% CI 0.3–1.0, $P = 0.04$). In the Western Province, individuals were 1.7 times more likely to have late dinners than those in the

Table 1: Demographic characteristics of the study population.

| Variable | *n* (%) |
|---|---|
| Age groups (years) | |
| 18–29 | 1,276 (56.4) |
| 30–39 | 410 (18.1) |
| 40–49 | 358 (15.8) |
| ≥50 | 218 (9.6) |
| Gender | |
| Male | 950 (42.0) |
| Female | 1,312 (58.0) |
| Marital status | |
| Single | 1,240 (54.8) |
| Married | 947 (41.9) |
| Divorced | 57 (2.5) |
| Widowed | 18 (0.8) |
| Educational level | |
| Below high-school | 38 (1.7) |
| High-school diploma | 405 (17.9) |
| Diploma or bachelor | 1,830 (72.7) |
| Masters or Ph.D. | 175 (7.7) |
| Nationality | |
| Citizen | 2,111 (93.3) |
| Resident | 151 (6.7) |
| Region | |
| Central province | 496 (21.9) |
| Eastern province | 384 (17.0) |
| Northern province | 239 (10.6) |
| Southern province | 373 (16.5) |
| Western province | 770 (34.0) |
| Work status | |
| Full-time job | 774 (34.2) |
| Part-time job | 102 (4.5) |
| Student | 909 (40.2) |
| Retired | 119 (5.3) |
| Unemployed | 358 (15.8) |
| Working schedule | |
| Traditional hours | 1,518 (67.1) |
| Fixed-shift work | 130 (5.7) |
| Rotating-shift Work | 140 (6.2) |
| Not working or studying | 474 (21.0) |
| Monthly income (SAR) | |
| <4,000 | 1,052 (46.5) |
| 4,000–14,000 | 763 (33.7) |
| >14,000 | 447 (19.8) |

*Note*: Some percentages may not add up to 100% due to rounding.

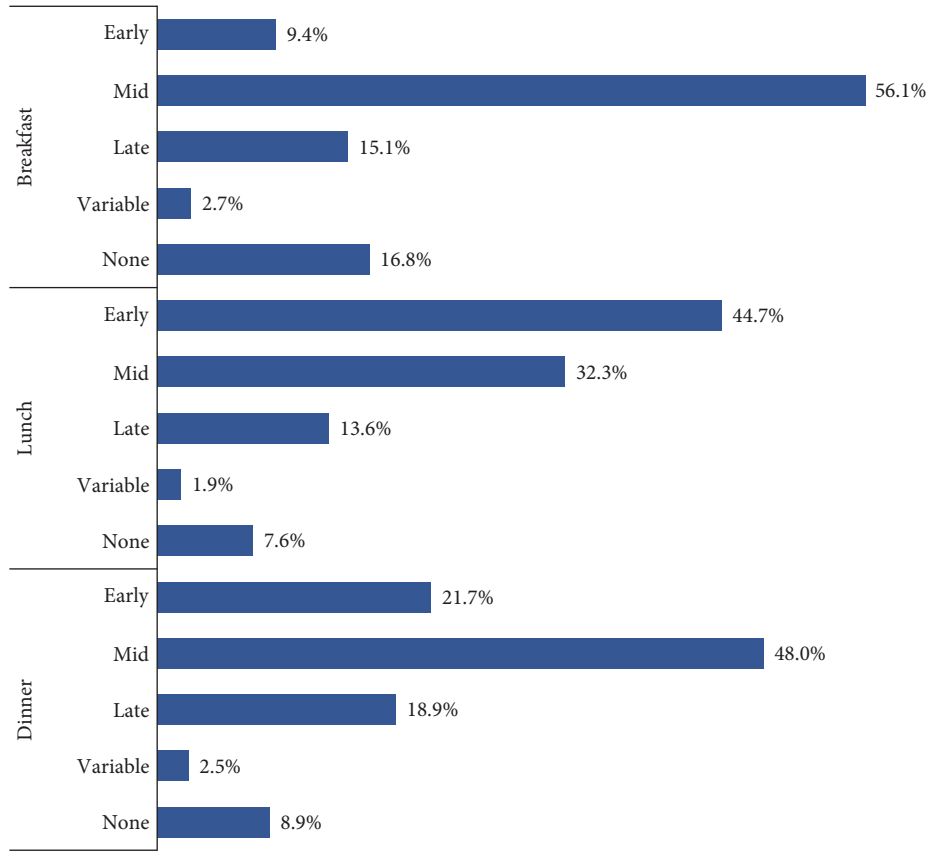


Figure 1: Meal timing habits of the study population.

Central Province (OR = 1.7, 95% CI 1.3–2.3, $P < 0.01$). Rotating shift workers exhibited a higher likelihood of late dinner consumption (OR = 2.0, 95% CI 1.3–3.1, $P < 0.01$) (Table 4).

*3.5. Association of Breakfast Skipping and Late Dinner Timing.* A significant difference in the frequency of breakfast skipping was observed between individuals who have late dinners and those who do not. Among those who have late dinners, 30.1% skip breakfast, while only 17.0% skip breakfast among those who do not have late dinners ($P < 0.01$).

## 4. Discussion

The findings of this study provide valuable insights into meal and snack habits in Saudi Arabia, which have been relatively understudied compared to the other countries. The study found that a considerable proportion of participants had fewer than three meals per day, with 31.4% reporting this behavior. Breakfast was the most commonly skipped meal, with 16.8% of participants reporting that they regularly skip breakfast. Although this prevalence is somewhat lower than that reported in the previous studies among Saudi adults [13], it remains a significant concern.

These findings underscore the relevance of ongoing public health campaigns, such as the Saudi Food and Drug Authority's Healthy Food Strategy, aimed at promoting healthier lifestyles and reducing the intake of substances such as salt, sugar, saturated fatty acids, and trans fatty acids. Initiatives within the healthy food strategy, such as displaying nutrition information in food establishments, allergen labeling on food menus, and promoting front-of-pack nutrient labels on food products, constitute vital steps toward improving dietary habits [14]. Nevertheless, our study emphasizes the need to incorporate specific interventions targeting breakfast consumption into these initiatives. This is especially important, given that skipping breakfast has been associated with adverse health outcomes, including an increased risk of coronary heart disease [15]. Addressing this aspect allows the healthy food strategy and similar public health campaigns to comprehensively tackle dietary habits and contribute to better health outcomes in Saudi Arabia.

The high proportion of breakfast skippers in this study may have several possible explanations. First, busy schedules and lack of time may contribute to breakfast skipping, especially among young adults who are often rushing to get to school or work in the morning. Previous studies have indicated that time constraints are a major barrier to breakfast consumption [16, 17]. Second, cultural factors may play a role, as some individuals in Saudi Arabia may prefer to eat a light breakfast or skip breakfast altogether due to cultural norms. Last, socioeconomic factors such as income and employment status may also contribute to breakfast skipping, as individuals with lower income or irregular work schedules may find it difficult to prioritize breakfast. It is worth noting that the study did not investigate whether

Table 2: Proportion of respondents skipping breakfast and having late dinner across demographic characteristics.

| Variable | Skipping breakfast $n$ (%) | $P$ value ($\varphi$c) | Having late dinner $n$ (%) | $P$ value ($\varphi$c) |
|---|---|---|---|---|
| Age groups (years) | | | | |
| 18–29 | 284 (22.3) | <0.01 (0.09) | 266 (20.8) | 0.01 (0.01) |
| 30–39 | 66 (16.1) | | 77 (18.8) | |
| 40–49 | 48 (13.4) | | 48 (13.4) | |
| ≥50 | 42 (19.3) | | 37 (17.0) | |
| Gender | | | | |
| Male | 146 (15.4) | <0.01 (0.09) | 182 (19.2) | 0.81 (0.01) |
| Female | 294 (22.4) | | 246 (18.8) | |
| Marital status | | | | |
| Single | 270 (21.8) | 0.01 (0.07) | 247 (19.9) | 0.31 (0.04) |
| Married | 158 (16.7) | | 169 (17.8) | |
| Divorced | 7 (12.3) | | 11 (19.3) | |
| Widowed | 5 (27.8) | | 1 (5.6) | |
| Educational level | | | | |
| Below high-school | 8 (21.1) | 0.29 (0.04) | 4 (10.5) | 0.02 (0.07) |
| High-school diploma | 88 (21.7) | | 68 (16.8) | |
| Diploma or bachelor | 318 (19.3) | | 334 (20.3) | |
| Masters or Ph.D. | 26 (14.9) | | 22 (12.6) | |
| Nationality | | | | |
| Citizen | 412 (19.5) | 0.77 (0.01) | 409 (19.4) | 0.04 (0.04) |
| Resident | 28 (18.5) | | 19 (12.6) | |
| Region | | | | |
| Central province | 102 (20.6) | 0.15 (0.06) | 92 (18.5) | <0.01 (0.15) |
| Eastern province | 62 (16.1) | | 51 (13.3) | |
| Northern province | 45 (18.8) | | 38 (15.9) | |
| Southern province | 64 (17.2) | | 45 (12.1) | |
| Western province | 167 (21.7) | | 202 (26.2) | |
| Work status | | | | |
| Full-time job | 90 (11.6) | <0.01 (0.19) | 126 (16.3) | 0.01 (0.08) |
| Part-time job | 21 (20.6) | | 25 (24.5) | |
| Student | 185 (20.4) | | 168 (18.5) | |
| Retired | 22 (18.5) | | 21 (17.6) | |
| Unemployed | 122 (34.1) | | 88 (24.6) | |
| Working schedule | | | | |
| Traditional hours | 235 (15.5) | <0.01 (0.15) | 255 (16.8) | <0.01 (0.08) |
| Fixed-shift work | 29 (22.3) | | 29 (22.3) | |
| Rotating-shift work | 32 (22.9) | | 39 (27.9) | |
| Not working or studying | 144 (30.4) | | 105 (22.2) | |
| Monthly income (SAR) | | | | |
| <4,000 | 251 (23.9) | <0.01 (0.11) | 197 | 0.58 (0.02) |
| 4,000–14,000 | 124 (16.3) | | 139 (18.2) | |
| >14,000 | 65 (14.5) | | 92 (20.6) | |

*Note:* $\varphi$c, Cramer $V$ coefficient.

individuals who skipped breakfast due to time constraints subsequently consumed their morning meal later in the day, which might be a relevant factor in understanding breakfast skipping.

Our study also found that females were more likely to skip breakfast than males, and unemployed individuals were more likely to skip breakfast than those with full-time jobs. These findings are consistent with the previous studies conducted in Saudi Arabia [18] and other countries [19]. Possible explanations for these gender and employment-related differences could be related to cultural and social factors, such as traditional gender roles and differences in work schedules and demands. Further research is needed to explore these factors and identify effective strategies to promote breakfast consumption among females and unemployed individuals.

Table 3: Multivariable analysis of factors associated with breakfast skipping.

| Variable | Univariable analysis | Multivariable analysis | |
|---|---|---|---|
| | Crude OR (95% CI) | Adjusted OR (95% CI) | *P* value |
| Age groups (years) | | | |
| 18–29 | | Reference group | |
| 30–39 | 0.7 (0.5–0.9) | 0.7 (0.5–1.1) | 0.14 |
| 40–49 | 0.5 (0.4–0.8) | 0.6 (0.4–1.0) | 0.07 |
| ≥50 | 0.8 (0.6–1.2) | 0.9 (0.5–1.6) | 0.67 |
| Gender | | | |
| Male | | Reference group | |
| Female | 1.6 (1.3–2.0) | 1.3 (1.0–1.6) | 0.04 |
| Marital status | | | |
| Single | | Reference group | |
| Married | 0.7 (0.6–0.9) | 0.9 (0.6–1.2) | 0.41 |
| Divorced | 0.5 (0.2–1.1) | 0.6 (0.2–1.4) | 0.22 |
| Widowed | 1.4 (0.5–3.9) | 1.1 (0.4–3.5) | 0.84 |
| Work status | | | |
| Full-time job | | Reference group | |
| Part-time job | 2.0 (1.2–3.3) | 1.7 (1.0–2.9) | 0.06 |
| Student | 1.9 (1.5–2.6) | 1.3 (0.9–2.0) | 0.15 |
| Retired | 1.7 (1.0–2.9) | 1.6 (0.7–3.7) | 0.28 |
| Unemployed | 3.9 (2.9–5.4) | 3.0 (1.3–7.1) | 0.01 |
| Working schedule | | | |
| Traditional hours | | Reference group | |
| Fixed-shift work | 1.6 (1.0–2.4) | 1.8 (1.1–2.8) | 0.01 |
| Rotating-shift work | 1.6 (1.1–2.5) | 2.1 (1.3–3.2) | <0.01 |
| Not working or studying | 2.4 (1.9–3.0) | 1.2 (0.6–2.6) | 0.63 |
| Monthly income (SAR) | | | |
| <4,000 | | Reference group | |
| 4,000–14,000 | 0.6 (0.5–0.8) | 0.9 (0.7–1.2) | 0.48 |
| >14,000 | 0.5 (0.4–0.7) | 0.9 (0.7–1.4) | 0.75 |

*Note*: OR, odds ratio; CI, confidence interval; SAR, Saudi Riyal.

In the context of health maintenance and the prevention of chronic diseases, late-night eating is closely linked to adverse health outcomes, encompassing disruptions in circadian rhythms, impaired glucose metabolism, and weight gain [6]. The practice of consuming dinner after 10 PM can be influenced by a multitude of factors, including cultural norms, work schedules, and lifestyle choices. Notably, our analysis reveals a distinct age-related pattern, indicating that younger individuals exhibit a higher inclination toward late dinner consumption. This observation alludes to generational disparities in mealtime behaviors, potentially driven by evolving lifestyles. Moreover, we discern regional disparities, with residents displaying a reduced likelihood of late dinner intake compared to their urban counterparts, implying a significant influence of local cultural and social norms on eating patterns. Additionally, residents had a lower likelihood of late dinner intake than citizens, reinforcing the notion of a potential regional impact on dietary habits. Furthermore, our findings underscore the role of occupational factors, as rotating shift workers display a heightened tendency toward late dinners, emphasizing the profound impact of work schedules on dietary choices.

Our findings indicate a significant association between late dinner eating and an increased likelihood of breakfast skipping among study participants. This finding aligns with previous research demonstrating a connection between late-night eating and alterations in meal patterns [20]. Late dinner consumption may disrupt the body's natural fasting and feeding cycles, making individuals less inclined to eat breakfast in the morning. Understanding the potential interplay between late dinner eating and breakfast skipping has implications for public health interventions. Initiatives aimed at promoting healthier eating habits should consider addressing both behaviors simultaneously. Strategies may include promoting regular meal times, providing education on the importance of breakfast, and raising awareness about the potential consequences of late-night eating.

While this study offers valuable insights into dietary habits, it is essential to recognize several limitations. The age distribution of participants, with a significant proportion falling within the 18–29 age group and limited representation of individuals over 50, may restrict the generalizability of our findings to the broader Saudi Arabian population, emphasizing their relevance primarily to younger adults. Moreover, conducting the study

Table 4: Multivariable analysis of factors associated with late dinners.

| Variable | Univariable analysis | Multivariable analysis | |
|---|---|---|---|
| | Crude OR (95% CI) | Adjusted OR (95% CI) | *P* value |
| Age groups (years) | | | |
| 18–29 | | Reference group | |
| 30–39 | 0.9 (0.7–1.2) | 0.7 (0.5–1.0) | 0.07 |
| 40–49 | 0.6 (0.4–0.8) | 0.5 (0.3–0.8) | <0.01 |
| ≥50 | 0.8 (0.5–1.1) | 0.6 (0.4–1.1) | 0.09 |
| Educational level | | | |
| Below high-school | | Reference group | |
| High-school diploma | 1.7 (0.6–5.0) | 1.5 (0.5–4.5) | 0.47 |
| Diploma or bachelor | 2.1 (0.8–6.2) | 2.0 (0.7–5.9) | 0.21 |
| Masters or Ph.D. | 1.2 (0.4–3.8) | 1.2 (0.4–3.8) | 0.78 |
| Nationality | | | |
| Citizen | | Reference group | |
| Resident | 0.6 (0.4–1.0) | 0.6 (0.3–1.0) | 0.04 |
| Region | | | |
| Central province | | Reference group | |
| Eastern province | 0.7 (0.5–1.0) | 0.7 (0.5–1.1) | 0.13 |
| Northern province | 0.8 (0.5–1.3) | 0.9 (0.6–1.4) | 0.68 |
| Southern province | 0.6 (0.4–0.9) | 0.6 (0.4–1.0) | 0.03 |
| Western province | 1.5 (1.2–2.1) | 1.7 (1.3–2.3) | <0.01 |
| Work status | | | |
| Full-time job | | Reference group | |
| Part-time job | 1.7 (1.0–2.7) | 1.5 (0.9–2.5) | 0.13 |
| Student | 1.2 (0.9–1.5) | 0.9 (0.6–1.3) | 0.62 |
| Retired | 1.1 (0.7–1.8) | 1.9 (0.8–4.7) | 0.14 |
| Unemployed | 1.7 (1.2–2.3) | 2.6 (1.0–6.5) | 0.04 |
| Working schedule | | | |
| Traditional hours | | Reference group | |
| Fixed-shift work | 1.4 (0.9–2.2) | 1.5 (0.9–2.3) | 0.09 |
| Rotating-shift work | 1.9 (1.3–2.8) | 2.0 (1.3–3.1) | <0.01 |
| Not working or studying | 1.4 (1.1–1.8) | 0.7 (0.3–1.7) | 0.41 |

*Note*: OR, odds ratio; CI, confidence interval; SAR, Saudi Riyal.

online might have attracted participants with higher digital literacy skills, potentially influencing the applicability of the results to a more tech-savvy subset of the population. Despite the substantial sample size, caution should be exercised when extrapolating these results. Additionally, the absence of body mass index (BMI) data for participants is another constraint, as BMI plays a crucial role in understanding dietary habits, including snacking patterns. Last, the use of self-reported data, without detailed information on snack types or exploration of underlying reasons behind meal and snack habits, introduce potential sources of recall and social desirability bias, limiting the precision of our dietary assessments. Future research should address these limitations to develop more comprehensive and targeted interventions aimed at promoting healthy eating habits in Saudi Arabia.

The findings of this study have several implications for public health. Given the high proportion of breakfast skippers and snack consumers in the study population, interventions aimed at promoting healthy eating habits may be necessary. Such interventions could include educational campaigns targeting young adults and women, as well as policies aimed at improving access to healthy foods. Additionally, strategies to promote regular meal times, especially breakfast, may be effective in reducing the prevalence of breakfast skipping.

## 5. Conclusion

In conclusion, this study sheds light on the meal timing habits of a Saudi Arabian population, revealing a high prevalence of breakfast skipping and late evening dinners. Notably, we observed that females and unemployed individuals had a particularly high prevalence of breakfast skipping in our study, underscoring the significance of targeted interventions for these demographic groups. Despite some limitations, this study provides a crucial foundation for future research on the factors influencing meal and snack habits in Saudi Arabia. Ultimately, public health initiatives that prioritize nutrition and chronic disease prevention are vital for improving the health outcomes of this population. Therefore, policymakers, healthcare professionals, and educators should work together

to develop effective strategies to improve the nutritional status of the Saudi Arabian population.

## Data Availability

The data of this study will be furnished upon a reasonable request from the corresponding author.

## Conflicts of Interest

The authors declare that they have no conflicts of interest.

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