

Assessment of Food Cravings, Food Intake, and Weight Status Among Saudi Adults in Central and Western Regions of Saudi Arabia: A Retrospective, Cross-Sectional Study

Mohammed Zaid Aljulifi¹, Atheer Ayed M Alshutayli², Ahmed Mohammed A Kaseb³, Faisal Mohammed Asiri⁴, Renad Ibrahim Alzahrani⁵, Nawaf Amer H Alharbi⁵, Ghadeer Yahya Almasabi⁵, Mudhawi Faisal Alsuliman⁶, Mohammad Shakil Ahmad¹, Riyaz Ahmed Shaik¹

¹Department of Family and Community Medicine, College of Medicine, Majmaah University, Majmaah, 11952, Saudi Arabia; ²College of Medicine, Qassim University, Qassim, Saudi Arabia; ³College of Medicine, Majmaah University, Majmaah, 11952, Saudi Arabia; ⁴College of Medicine, Prince Sattam bin Abdulaziz University, Al-kharj, Saudi Arabia; ⁵College of Medicine, Umm Alqura University, Makkah, Saudi Arabia; ⁶College of Medicine, King Faisal University, Al-Ahsa, Saudi Arabia

Correspondence: Mohammed Zaid Aljulifi, Department of Family and Community Medicine, College of Medicine, Majmaah University, P O Box: 11952, Majmaah, Saudi Arabia, Email m.aljulifi@mu.edu.sa

Purpose: The aim of this study was to assess the frequency and intensity of food cravings among adults in Central and Western Saudi Arabia.

Patients and Methods: This retrospective, cross-sectional study was conducted using online questionnaires. The collected data were analyzed using SPSS version 24.0.

Results: A sample of 432 individuals was investigated, which was almost evenly split between men (50.5%) and women (49.5%). Body mass index (BMI) of most participants fell within the normal (31.9%) and overweight (32.6%) categories, highlighting a fairly balanced distribution of these BMI ranges. The obesity category included 24.5% of participants, raising concerns about potential obesity-related health issues. A significant proportion of participants had irregular meal-taking patterns. Overall, snacks and fruits were most frequently consumed daily, whereas eating with family was the least frequent activity. Finally, *p*-values from an assessment of food cravings and their effects on BMI indicated various levels of significance. Cravings for salty foods (*p*=0.008), the influence of emotional factors on food cravings (*p*=0.03), eating due to sadness even when not hungry (*p*=0.01), challenges in resisting or controlling food cravings (*p*=0.04), and feelings of guilt or regret after indulging in cravings (*p*=0.000) were all significant factors, suggesting potential links with BMI.

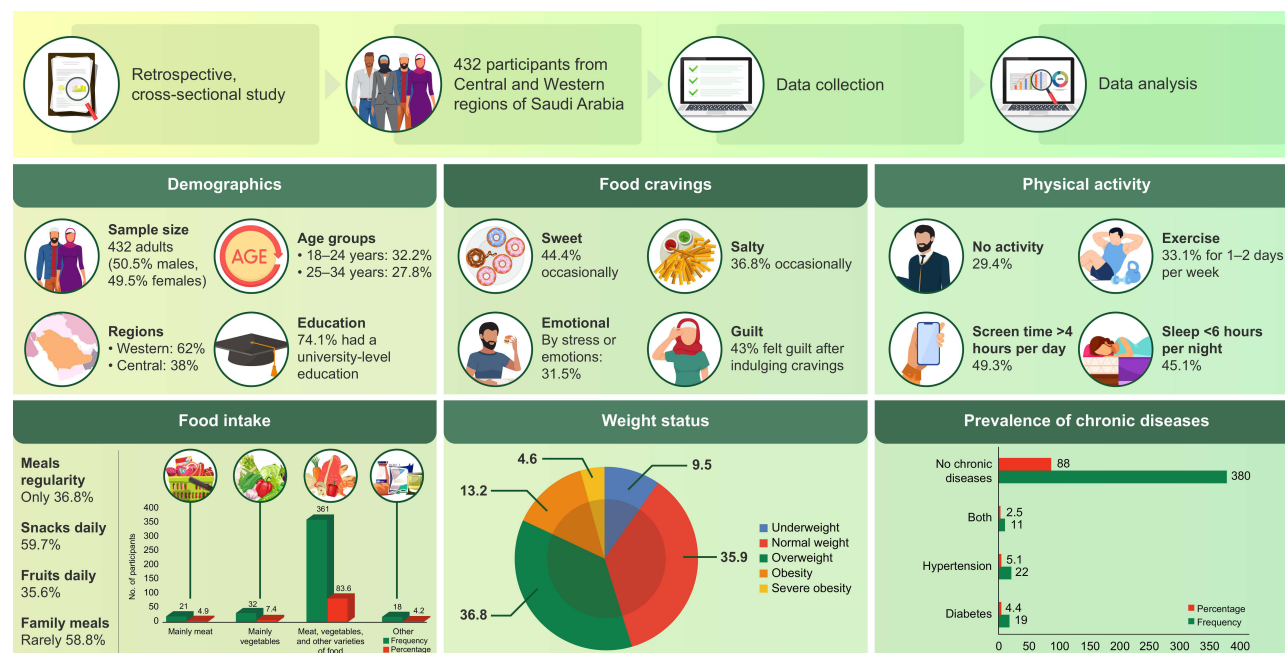
Conclusion: Food craving involves a complex interplay of different factors, including emotional states and social cues, with varying levels of self-control and associated guilt or regret.

Keywords: body mass index, obesity, meal-taking pattern, Food Cravings

Introduction

Eating behavior is driven not only by the basic need to alleviate hunger but also by cravings and the pursuit of pleasure from food.¹ Individuals commonly experience cravings for foods rich in calories but poor in nutrients.² The consumption of high-calorie foods has been linked to weight gain and obesity. Moreover, individuals with a higher body mass index (BMI) tend to be more responsive to the enjoyable and motivational aspects of consuming tasty foods than those with a lower BMI.³ Roefs et al showed that participants with excess weight reported experiencing cravings for high-calorie, high-fat (HCHP) foods more often during non-mealtimes than those with normal weight. In contrast, participants with

Graphical Abstract



normal weight expressed cravings for staple foods, particularly during mealtimes. Additionally, individuals who were overweight exhibited a broader range of cravings for HCHP foods than their counterparts with normal weight, both during meals and during random non-eating moments.¹ In a recent study by AlTamimi et al, 87.8% of the participants consumed fast food on a weekly basis, with 45.6% consuming it daily. Participant nationality emerged as a significant predictor of fast food consumption. Obesity was identified as another factor predicting fast food intake.² A study by Musaiger et al showed that, compared with individuals from Western cultures, Bahraini adults were generally shorter but heavier, with a higher mean BMI, indicating a tendency towards developing obesity.³ Kracht et al conducted a study involving 256 adolescents, aged 10–16 years, with complete data. They found that sleep efficiency was inversely associated with sweet cravings and the Food Craving Inventory-28 (FCI-28) score. Adequate sleep duration, adherence to sleep duration guidelines, and cravings for fruit and vegetables were positively correlated with dietary quality. Moreover, sleep duration was negatively associated with BMI z-scores. However, mediation models were not employed, as no sleep parameters demonstrated associations with both cravings and dietary intake/quality or BMI z-scores.⁴

According to the literature, personality qualities in an environment/subject binomial control how emotions are expressed. In other words, the sort of emotion expressed depends on the context. Every person experiences many emotional situations throughout their lives, which change with each phase.⁵ In this essay, we describe emotions as a collection of distinct experiences that, for simplicity's sake, shall be divided into two groups: negative (rejection, expressing discomfort or disgust) and positive (satisfying, reflecting favorable stimuli). Emotions are multifaceted, complicated, and instantaneous reactions that cause a person to change physically and psychologically. These changes can then have a big impact on how they think and act. They are an instantaneous reaction by the organism that tells it how favorable a stimulus or circumstance is. Contrarily, moods are said to be similar to emotions but are more ethereal states that last for a lengthy period of time and do not have a clear cause.⁶ A person's emotional state and their innate character or personality qualities must be distinguished. Being anxious over the outcome of a scholarship application, for instance, is not the same as being anxious in general. In the first instance, it is a short-term circumstance that ends as soon

as you learn of the scholarship. In the latter instance, it is a personality characteristic that follows you throughout your life and in various contexts.

The authors likely decided to conduct this research to address the growing public health concern surrounding obesity and unhealthy eating behaviors in Saudi Arabia, particularly in the Central and Western regions. With rising rates of overweight and obesity in the country, understanding the underlying factors such as food cravings, emotional eating, and irregular meal patterns is essential for developing targeted interventions. By examining the frequency and intensity of food cravings and their association with BMI, the study aims to shed light on the psychological and behavioral aspects of eating that may contribute to weight gain, ultimately supporting efforts to promote healthier lifestyles and reduce obesity-related health risks in the Saudi population.

This study aimed to assess the frequency and intensity of food cravings among adults in Central and Western Saudi Arabia. Additionally, this study evaluated the possible risk factors for food cravings among adults in Saudi Arabia.

Materials and Methods

Study Design

The study adopted a descriptive cross-sectional correlational design. The Majmaah University for Research Ethics Committee (MUREC) (H-01-R-088) reviewed the study proposal, and all ethical aspects were approved under Ethics Number MUREC-Mar.18/COI-2024 /9-4. The study complied with the code of ethics of the World Medical Association (Declaration of Helsinki).

Study Setting

This community-based study was conducted in the central and western regions of Saudi Arabia between January and April 2024.

Study Participants

Sample Size

The sample size was calculated using the Raosoft online survey size calculator; based on the average population of Saudi Arabia, the sample size was estimated to be approximately 385 with 95% confidence and 5% margin of error.

Sampling Technique

Participants were recruited using a convenience sampling technique and signed an informed consent form. The goals of the study were presented to the participants before obtaining written informed consent.

The following inclusion criteria were applied when selecting the participants: agreement to participate in the study, Saudi citizenship with residence in central and western regions, and age ≥ 18 years old. The following exclusion criteria were applied: non-agreement to participate in the study, lack of Saudi citizenship, and residence in other regions in the Kingdom of Saudi Arabia.

Study Tools

We created a questionnaire based on two studies published in the literature that met our study objectives.^{7,8} A panel of three consultants in family medicine evaluated the validity of the questionnaire, and a pilot study was conducted on 10–15% of the target population to evaluate the data collection tools, respondents' reactions, sampling technique, and proposed work plan. Those who participated in the pilot study were excluded from the study population. The Arabic version of the questionnaire was distributed and consisted of five sections (32 questions), the first of which covered demographic data. The second section assessed food cravings; the third assessed food intake; the fourth assessed weight status and habits; and the fifth assessed physical activity. The reliability test showed strong internal consistency across the items measured, with an overall Cronbach's alpha of 0.919. Therefore, the questionnaire variables were considered reliable in measuring the same underlying construct. An online questionnaire was created and distributed through social media applications (WhatsApp, Twitter, and Telegram) to invite the participants.

Data Analysis

After data collection, the data were analyzed using SPSS version 24.0 (IBM Corporation, Redmond, WA, USA) and were presented as frequencies, means, and standard deviations. The chi-square test was used to test associations.

Descriptive statistics, including frequency, percentage, and mean, were used, while analytical statistics such as chi-square test and one-way ANOVA, where applicable, were employed to determine if there were any statistical differences between the study variables.

Results

Table 1 presents the demographic characteristics of a sample of 432 individuals. The sample was almost evenly split between men (50.5%) and women (49.5%), with the majority of the participants comprising the 18–24 years age group (32.2%), followed by the 25–34 years age group (27.8%). The least represented age group was above 55 years, with only 2.6%. A greater proportion of individuals were from the western region (62.0%) than from the central region (38.0%). Approximately half of the sample comprised single individuals (50.0%), and a slightly lesser proportion of the sample consisted of married individuals (45.6%). Divorced and widowed individuals were less common, at 3.2% and 1.2%, respectively. A substantial majority had received a university-level education (74.1%). The next largest group had completed high school (16.9%). Very few participants had received no education (0.2%).

Table 1 Demographic Characteristics (N = 432)

Demographic Characteristic	Value	Number of Participants (n)	Percentage of Participants
Sex	Male	218	50.5
	Female	214	49.5
Age group	18–24 years	139	32.2
	25–34 years	120	27.8
	35–44 years	92	21.3
	45–54 years	57	13.2
	>55 years	24	5.6
Region	Central region	164	38.0
	Western region	268	62.0
Marital status	Married	197	45.6
	Single	216	50.0
	Divorced	14	3.2
	Widowed	5	1.2
Educational level	Not educated	1	0.2
	Primary school	8	1.9
	Intermediate school	5	1.2
	High school	73	16.9
	University	320	74.1
	Postgraduation	25	5.8
Smoking history	Current smoker	87	20.1
	Ex-smoker	44	10.2
	Never smoker	301	69.7

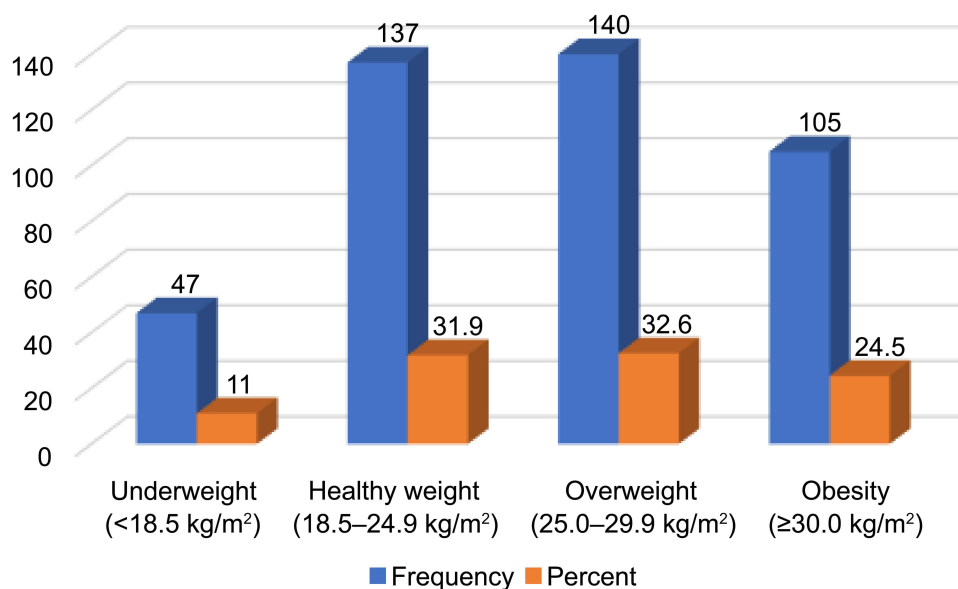


Figure 1 Distribution of participants according to body mass index (BMI).
Abbreviation: BMI, Body Mass Index.

Regarding smoking status, 20.1% of the participants currently smoked, 10.2% of the participants used to smoke but had since quit and were considered ex-smokers, and the majority (69.7%) of the participants had never smoked.

Figure 1 shows the distribution of 429 participants according to BMI, revealing that most fell within the normal (31.9%) and overweight (32.6%) categories, highlighting a fairly balanced distribution in these common BMI ranges. Notably, the obesity category included 24.5% of the participants, pointing to a potential public health concern regarding obesity-related health issues. Meanwhile, although the underweight category accounted for the smallest proportion, it still constituted 11.0% of the sample, which might necessitate the direction of attention towards underlying health issues, such as malnutrition. Overall, the distribution provides a comprehensive view of BMI categorization in the studied population, which will be useful for formulating health policies and targeted interventions.

Table 2 presents the results of the chi-square test examining the relationship between the age groups and BMI categories. The distribution of BMI categories varied significantly across different age groups. The largest proportion of underweight individuals (21.6%) was observed in the 18–24 years age group, and the proportion decreased in older age groups. Individuals with normal weight were most prevalent in the 25–34 years age group (34.5%), and the proportion decreased in older age groups. The proportion of individuals with overweight showed an increasing trend with age, peaking in the 35–44 years age group (40.2%), while the proportion of those with obesity was the largest in the 35–44 years age group (33.9%) and decreased in older age groups. The above 55 years age group had the smallest proportions of individuals in all BMI categories except for the overweight category, in which the proportion was similar to that in the 45–54 years age group. The overall distribution of BMI categories across all age groups was relatively balanced, with normal weight being the most prevalent, followed by overweight and obesity. Underweight individuals were the least prevalent.

Supplementary Table S1 provides an assessment of food cravings among participants based on frequency categories (never, rarely, occasionally, frequently, always) and includes the mean ranking of responses. Most participants occasionally experienced intense cravings (51.4%), with a mean rank of 3.35, making it the top-ranked type of craving. A significant proportion of participants rarely or occasionally craved sweet foods (15.5% and 44.4%, respectively), with a mean rank of 3.2, making it the second most common craving. Cravings for salty food were less common, with the majority reporting that they occurred occasionally (36.8%); with a mean rank of 3.11, this type of craving was the third most common craving.

Table 3 presents the *p*-values obtained in the assessment of food cravings and their effects on BMI, indicating various levels of significance. Notably, cravings for salty foods ($p=0.008$), the influence of emotional factors on food cravings

Table 2 Chi-Square Test Results Demonstrating the Association Between Age and BMI

Age Group		BMI Category				Total	p-value
		Underweight	Normal	Overweight	Obese		
18–24 years	n	30	59	35	15	139	0.0001
	% of age group	21.6%	42.4%	25.2%	10.8%	100.0%	
	% of total	7.0%	13.8%	8.2%	3.5%	32.4%	
25–34 years	n	12	41	32	34	119	
	% of age group	10.1%	34.5%	26.9%	28.6%	100.0%	
	% of total	2.8%	9.6%	7.5%	7.9%	27.7%	
35–44 years	n	3	21	37	31	92	
	% of age group	3.3%	22.8%	40.2%	33.7%	100.0%	
	% of total	0.7%	4.9%	8.6%	7.2%	21.4%	
45–54 years	n	0	10	27	19	56	
	% of age group	0.0%	17.9%	48.2%	33.9%	100.0%	
	% of total	0.0%	2.3%	6.3%	4.4%	13.1%	
>55 years	n	2	6	9	6	23	
	% of age group	9%	26%	39%	26%	100.0%	
	% of study population	0.5%	1%	2%	1%	4.5%	
Total	n	47	137	140	105	429	
	% of age group	11.0%	31.9%	32.6%	24.5%	100.0%	
	% of total	11.0%	31.9%	32.6%	24.5%	100.0%	

Notes: * $p < 0.0001$ indicates a significant association between age group and BMI category.

Table 3 Assessment of Food Intake and Chi-Square Test Results Demonstrating the Association Between Food Intake and BMI

		Daily	Three or Four Times Per Week	Once or Twice Per Week	Rarely	Mean	Rank	p-value
Do you have breakfast?	n	110	77	76	169	2.7	5	0.14
	%	25.5	17.8	17.6	39.1			
How often do you take snacks apart from regular meals?	n	258	0	108	66	1.96	1	0.02
	%	59.7	0	25	15.3			
How often do you eat green, red, or yellow vegetables per week?	n	151	107	86	88	2.26	3	0.19
	%	35	24.8	19.9	20.4			
How often do you eat fruits per week?	n	154	171	78	29	1.96	1	0.30
	%	35.6	39.6	18.1	6.7			

(Continued)

Table 3 (Continued).

		Daily	Three or Four Times Per Week	Once or Twice Per Week	Rarely	Mean	Rank	p-value
How often do you eat fried foods per week?	n	159	119	114	40	2.08	2	0.002
	%	36.8	27.5	26.4	9.3			
How often do you consume sugary food or beverages (soft drinks, candies, etc) per week?	n	109	169	71	83	2.3	4	0.74
	%	25.2	39.1	16.4	19.2			
How often do you eat with family?	n	0	94	84	254	3.37	6	0.84
	%	0	21.8	19.4	58.8			

Notes: n, number of participants; %, percentage of participants.

($p=0.03$), eating due to sadness even when not hungry ($p=0.01$), challenges in resisting or controlling food cravings ($p=0.04$), and feelings of guilt or regret after indulging in cravings ($p=0.000$) were all significant factors, suggesting potential links with BMI. These findings point towards emotional and specific cravings as influential factors in dietary behaviors that could affect BMI.

Table 4 provides information on the regularity of participants' meals. A total of 159 participants (36.8%) reported that they always ate their meals regularly, and the majority of the participants (273 participants, 63.2%) indicated that they did not eat their meals regularly, suggesting that irregular meal patterns were more common among the individuals surveyed. **Table 4** also illustrates the distribution of participants based on the number of times they ate meals in a day, excluding snacks. Approximately 72 participants (16.7%) ate meals only once a day, the majority (241 participants, 55.8%) had meals twice a day, 106 participants (24.5%) consumed meals three times daily, and a small number (13 participants, 3.0%) ate meals four times a day.

Figure 2 presents the dietary preferences of the participants in terms of their food choices. A small proportion (4.9%) primarily consumed meat in their diet. A slightly larger proportion (7.4%) favored a diet consisting mainly of vegetables, with the vast majority (83.6%) preferring a diverse diet including meat, vegetables, and other food varieties, indicating a preference for a more balanced diet. A small proportion of participants (4.2%) followed dietary patterns that do not fit into the specified categories of meat or vegetables, including vegan, pescatarian, or other specific dietary habits.

Figure 3 provides information on the prevalence of chronic diseases, specifically diabetes and hypertension, among the participants, along with the proportions of those without any chronic diseases. Only 4.4% of the individuals in the

Table 4 Distribution of Participants According to Regularity and Number of Meals per Day Excluding Snacks

	Value	n	%
Do you eat your meals regularly?	Always regular	159	36.8
	Irregular	273	63.2
How many times per day do you eat meals excluding snacks?	One time	72	16.7
	Two times	241	55.8
	Three times	106	24.5
	Four times	13	3.0

Notes: n, number of participants; %, percentage of participants.

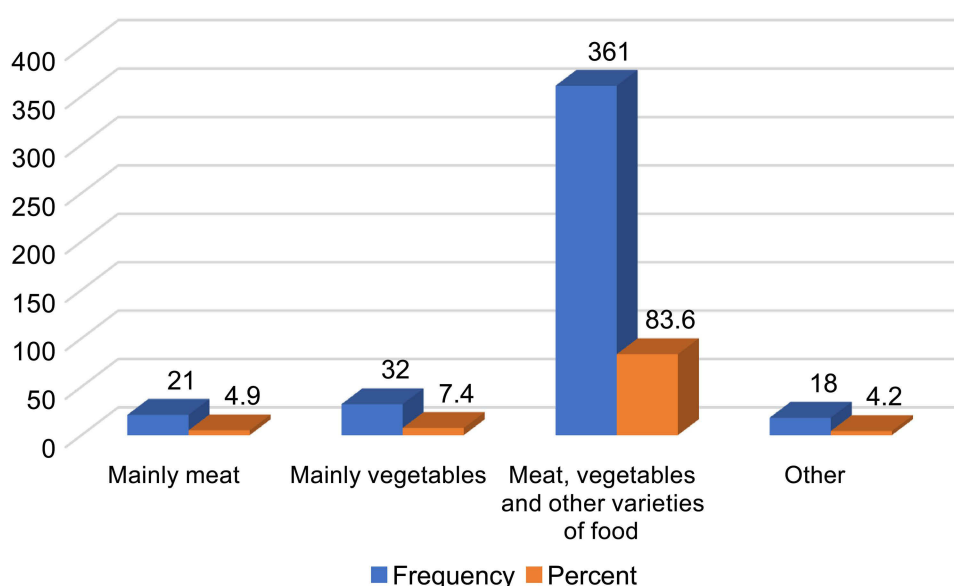


Figure 2 Type of food the participants think they should eat to have balanced nutrition.

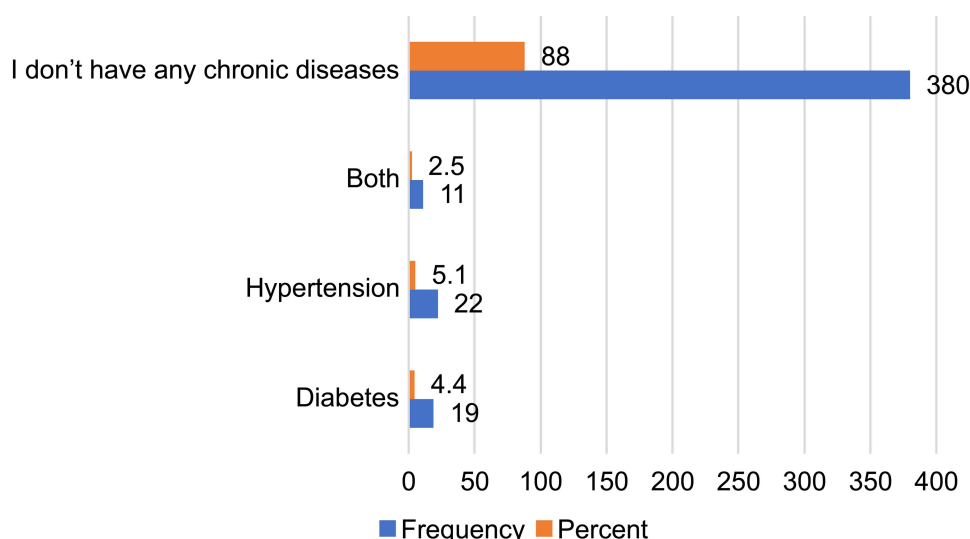


Figure 3 Chronic diseases (diabetes or high blood pressure) among the participants (n=432).

group had diabetes, and 5.1% reported hypertension, while a smaller subset (2.5%) suffered from both diabetes and hypertension. The majority (88.0%) indicated that they did not have any chronic diseases.

Figure 4 provides a breakdown of how participants described their current weight status: 9.5% of the participants considered themselves to be underweight; 35.9% described their weight as being within the normal range; 36.8% perceived themselves as being overweight, which was similar in proportion to those with normal weight; 13.2% classified themselves as having obesity; and a smaller proportion (4.6%) identified themselves as having severe obesity.

Table 5 provides data on self-reported sleeping patterns, electronic device usage, and exercise habits of the participants. Regarding sleeping patterns, a small proportion of the participants (2.8%, 12 participants) reported <4 h of sleep on average per night, a large proportion (45.1%, 195 participants) slept between 4 and 6 h per night; another significant proportion (40.5%, 175 participants) got between 6 and 8 h of sleep, which is typically considered a healthy sleep duration; and a smaller proportion (11.6%, 50 participants) reported sleeping for >8 h on average per night. In relation to electronic device usage,

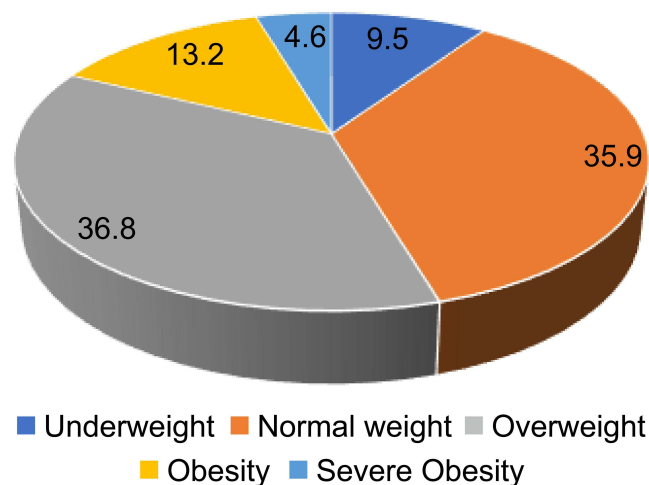


Figure 4 How the participant describes his current weight.

approximately 18.1% of participants (78 participants) spent 1 to 3 h per day on electronic devices; nearly half of the participants (49.3%, 213 participants) used electronic devices for 4 to 7 h daily; 23.8% (103 participants) used electronic devices between 8 and 12 h per day; and a smaller group (8.8%, 38 participants) spent more than 12 h per day on electronic devices. Regarding exercise habits, 29.4% of the participants (127 participants) did not engage in any physical activity for at least 30 min on any day of the week, 33.1% (143 participants) engaged in physical activity for at least 30 min on 1 to 2 days per week, A smaller percentage (22.9%, 99 participants) were active for 30 min on 3 to 4 days per week, and 14.6% (63 participants) exercised for at least 30 min on 5 or more days per week.

Table 6 shows that the mean BMI differs across smoking history groups, with current smokers having a mean BMI of 20.1, ex-smokers 25.97, and never smokers 27.52. The F-value was 26.29, and the *p*-value was 0.138, which was greater than the typical significance threshold of 0.05. This indicates no statistically significant difference in BMI between the

Table 5 Sleeping Patterns, Electronic Device Use, and Exercise Habits

	Value	n	%
How many hours of sleep do you typically get per night on average?	<4 h	12	2.8
	4–6 h	195	45.1
	6–8 h	175	40.5
	>8 h	50	11.6
What is the average time (in hours per day) you spend on using electronic devices (such as TV, smartphones, tablets, and computers)?	1–3 h per day	78	18.1
	4–7 h per day	213	49.3
	8–12 h per day	103	23.8
	>12 h per day	38	8.8
How many days per week do you engage in at least 30 min of physical activity?	None	127	29.4
	1–2 days	143	33.1
	3–4 days	99	22.9
	≥5 days	63	14.6

Notes: n, number of participants; %, percentage of participants.

Table 6 Results of One-Way Analysis of Variance to Compare BMI and Smoking History

		n	%	Mean BMI	p-value
Smoking history	Current smoker	87	20.1	26.29	0.138
	Ex-smoker	44	10.2	25.97	
	Never smoker	301	69.7	27.52	

Notes: n, number of participants; %, percentage of participants.

three groups based on smoking history. The *p*-value also indicates that the differences in the mean BMI may be due to random variation rather than a clear association between smoking status and BMI.

Table 7 demonstrates a significant relationship between smoking history and breakfast habits, with a *p*-value of 0.024, which was below the commonly used significance level of 0.05. The data show that current smokers, ex-smokers, and never smokers displayed different patterns of breakfast consumption. A higher percentage of current smokers and ex-smokers reported rarely having breakfast, while never smokers were more likely to have breakfast daily. These differences suggest that smoking history may influence breakfast habits, with smokers tending to skip breakfast more frequently compared to non-smokers.

Table 8 indicates a significant relationship between smoking history and the daily frequency of consuming meals (excluding snacks), with a *p*-value of 0.012, which was below the commonly used significance level of 0.05. The data show that current smokers tend to eat two meals daily (48.3%) but were also more likely to eat only one meal (26.4%). Ex-smokers showed a preference for consuming two meals (45.5%) and three meals daily (40.9%), with no one eating four meals. Never smokers predominantly ate two meals daily (59.5%) but also tended to eat three meals (23.3%) or one

Table 7 Chi-Square Test Results Demonstrating the Association Between Smoking History and Frequency of Breakfast Consumption

			How Often Do You Have Breakfast?				p-value
			Daily	Three or Four Times Per Week	Once or Twice Per Week	Rarely	
Smoking history	Current smoker	n	28	21	10	28	0.024
		% of current smokers	32.2%	24.1%	11.5%	32.2%	
		% of study population	6.5%	4.9%	2.3%	6.5%	
	Ex-smoker	n	5	12	8	19	
		% of ex-smokers	11.4%	27.3%	18.2%	43.2%	
		% of study population	1.2%	2.8%	1.9%	4.4%	
	Never smoker	n	77	44	58	122	
		% of never smokers	25.6%	14.6%	19.3%	40.5%	
		% of study population	17.8%	10.2%	13.4%	28.2%	
Total		n	110	77	76	169	
		% of study population	25.5%	17.8%	17.6%	39.1%	

Notes: n, number of participants.

Table 8 Chi-Square Test Results Demonstrating the Association Between Smoking History and Daily Frequency of Consuming Meals Excluding Snacks

			How Many Times Do You Eat Meals Excluding Snacks Daily?				p-value
			One Time	Two Times	Three Times	Four Times	
Smoking history	Current smoker	n	23	42	18	4	0.012
		% of current smokers	26.4%	48.3%	20.7%	4.6%	
		% of study population	5.3%	9.7%	4.2%	0.9%	
	Ex-smoker	n	6	20	18	0	
		% of ex-smokers	13.6%	45.5%	40.9%	0.0%	
		% of study population	1.4%	4.6%	4.2%	0.0%	
	Never smoker	n	43	179	70	9	
		% of never smokers	14.3%	59.5%	23.3%	3.0%	
		% of study population	10.0%	41.4%	16.2%	2.1%	
Total		n	72	241	106	13	
		% of study population	16.7%	55.8%	24.5%	3.0%	

Notes: n, number of participants.

meal (14.3%). These findings suggest that smoking history influences meal frequency, with current smokers more likely to eat fewer meals per day compared to ex-smokers and never smokers.

Table 9 reveals a significant relationship between smoking history and the weekly frequency of consuming snacks apart from regular meals, with a *p*-value of 0.020, which is below the statistical significance threshold of 0.05. Current

Table 9 Chi-Square Test Results Determining the Association Between Smoking History and Weekly Consumption of Snacks

			How Often Do You Have Snacks Apart from Regular Meals per Week?			p-value
			Daily	Once or Twice per Week	Rarely	
Smoking history	Current smoker	n	63	16	8	0.020
		% of current smokers	72.4%	18.4%	9.2%	
		% of study population	14.6%	3.7%	1.9%	
	Ex-smoker	n	22	17	5	
		% of ex-smokers	50.0%	38.6%	11.4%	
		% of study population	5.1%	3.9%	1.2%	
	Never smoker	n	173	75	53	
		% of never smokers	57.5%	24.9%	17.6%	
		% of study population	40.0%	17.4%	12.3%	
Total		n	258	108	66	
		% of study population	59.7%	25.0%	15.3%	

Notes: n, number of participants.

smokers were most likely to consume snacks daily (72.4%) or snack occasionally once or twice a week (18.4%). Ex-smokers showed a more balanced distribution, with 50% snacking daily and 38.6% snacking once or twice a week. Never smokers snacked less frequently, with 57.5% snacking daily, 24.9% once or twice a week, and 17.6% rarely. These findings suggest that smoking history influences snacking habits, with current smokers being the most frequent snackers, especially on a daily basis.

Table 10 shows a significant relationship between smoking history and the frequency of eating fried food, with a *p*-value of 0.009, which is below the statistical significance threshold of 0.05. Current smokers were most likely to eat fried food once or twice a week (34.5%) or daily (32.2%). Ex-smokers also preferred to eat fried food daily (40.9%), but a smaller percentage (29.5%) ate it once or twice a week. Never smokers tended to consume fried food less frequently, with 37.5% eating it daily and 31.9% eating fried food three or four times per week. These findings suggest that smoking history is associated with the frequency of consuming fried food, with current and ex-smokers more likely to consume it more frequently than never smokers.

Table 11 indicates a significant relationship between smoking history and the weekly frequency of consuming sugary beverages (such as soft drinks and candies), with a *p*-value of 0.000, which was well below the statistical significance threshold of 0.05. Current smokers were most likely to consume sugary beverages daily (31.0%) or rarely (32.2%), with a smaller percentage consuming them three or four times a week (21.8%). Ex-smokers showed a more balanced distribution, with 29.5% consuming sugary beverages once or twice a week and 25.0% rarely consuming them. Never smokers mostly consumed sugary beverages three or four times per week (46.5%), with 23.9% consuming them daily. These findings suggest that smoking history has a strong association with sugary beverage consumption, with current smokers being more likely to consume sugary beverages less frequently (either daily or rarely) compared to ex-smokers and never smokers.

Table 10 Chi-Square Test Results Demonstrating the Association Between Smoking History and Weekly Frequency of Consuming Fried Food

			How Often Do You Eat Fried Food per Week?				p-value
			Daily	Three or Four Times per Week	Once or Twice per Week	Rarely	
Smoking history	Current smoker	n	28	15	30	14	0.009
		% of current smokers	32.2%	17.2%	34.5%	16.1%	
		% of study population	6.5%	3.5%	6.9%	3.2%	
	Ex-smoker	n	18	8	13	5	
		% of ex-smokers	40.9%	18.2%	29.5%	11.4%	
		% of study population	4.2%	1.9%	3.0%	1.2%	
	Never smoker	n	113	96	71	21	
		% of never smokers	37.5%	31.9%	23.6%	7.0%	
		% of study population	26.2%	22.2%	16.4%	4.9%	
Total		n	159	119	114	40	
		% of study population	36.8%	27.5%	26.4%	9.3%	

Notes: n, number of participants.

Table 11 Chi-Square Test Demonstrating the Association Between Smoking History and Weekly Frequency of Consuming Sugary Beverages (Soft Drinks, Candies, Etc)

			How Often Do You Consume Sugary Beverages (Soft Drinks, Candies, etc) per Week?				p-value
			Daily	Three or Four Times per Week	Once or Twice per Week	Rarely	
Smoking history	Current smoker	n	27	19	13	28	0.000
		% of current smokers	31.0%	21.8%	14.9%	32.2%	
		% of study population	6.2%	4.4%	3.0%	6.5%	
	Ex-smoker	n	10	10	13	11	
		% of ex-smokers	22.7%	22.7%	29.5%	25.0%	
		% of study population	2.3%	2.3%	3.0%	2.5%	
	Never smoker	n	72	140	45	44	
		% of never smokers	23.9%	46.5%	15.0%	14.6%	
		% of study population	16.7%	32.4%	10.4%	10.2%	
	Total	n	109	169	71	83	
		% of study population	25.2%	39.1%	16.4%	19.2%	

Notes: n, number of participants.

Abbreviations: BMI, body mass index; HCHP, high-calorie, high-fat.

Discussion

This cross-sectional study assessed the frequency and intensity of food cravings among adults in Central and Western Saudi Arabia. The study sample comprised 432 individuals and was almost evenly divided between men and women. The majority of the sample fell within the 18–24 years age group, followed by the 25–34 years age group. The least represented age group was >55 years. A greater proportion of individuals was from the western region than from the central region. Approximately half of the individuals in the sample were single or married. Divorced and widowed individuals were less common. A substantial majority of the individuals had a university-level education, whereas the next largest group completed high school. Very few participants had received no education.

The demographic characteristics of the study sample, including the predominance of young adults aged 18–34 and the high percentage of participants with university-level education, reflect the natural outcome of using online, convenience-based data collection methods. Younger, more educated individuals are more likely to engage with online surveys due to greater digital literacy and access to technology, which can inadvertently exclude older adults or those from lower educational or socioeconomic backgrounds. Similarly, the reliance on internet and smartphone access may have limited participation from certain segments of the population, such as rural residents or individuals with limited connectivity. Despite these limitations, the sample still provides valuable insight into the eating behaviors and food cravings of a significant and influential demographic group within Saudi Arabia, offering a foundation for future studies with broader and more representative sampling strategies.

The current study indicates that the most common food cravings are for specific types of food, with occasional cravings reported most often. The least common behavior was eating out of sadness when not hungry. The findings provide significant insights into the patterns of food cravings and related behaviors among participants. The most prevalent type of craving reported was for specific types of food, with “occasional” cravings being the most commonly selected frequency. This observation suggests that, while intense cravings do occur, they are not a constant issue for most individuals, offering a more nuanced view of how cravings impact daily dietary habits. These findings are consistent with

those of previous studies.^{1,9–11} Moreover, the infrequent use of food to manage emotions, such as sadness, could be considered a positive sign of other coping mechanisms being more commonly employed by the participants. It would be beneficial to explore what alternative strategies people use to cope with negative emotions and how these strategies might influence overall mental and physical health.¹⁰

Eating practices are significantly shaped by social surroundings in addition to internal moods. Through processes such as interpersonal mood control and social modeling, social interactions have an impact on food intake.^{11,12} The relationship between food consumption and social setting seems to be heavily influenced by the particulars of the surroundings. On the one hand, the hormone oxytocin, which is associated with social interaction, decreases the response of neurons to food cues.¹³ Accordingly, it has been demonstrated that emotional eating and stress-induced food consumption can be reduced by positive social support.^{2,14} However, in some situations, social interactions might also encourage overeating.² In order to understand individual differences in eating behavior and guide customized therapies, it is essential to comprehend the complex influences of social surroundings on eating behaviors.

This study also indicated that approximately 31.9%, 32.6%, and 24.5% of the participants had normal weight, overweight, and obesity, respectively, consistent with the findings of many studies. For example, one study conducted in the Kingdom of Bahrain showed that the overall prevalence of overweight and obesity was 35.2% and 21.2% in men and 31% and 48.7% in women, respectively.³

In terms of sleeping patterns, a small proportion of participants (2.8%, 12 participants) reported getting <4 h of sleep on average per night. A large proportion (45.1%, 195 participants) slept between 4 and 6 h per night. Another significant proportion (40.5%, 175 participants) slept between 6 and 8 h, which is typically considered a healthy sleep duration. A smaller proportion (11.6%, 50 participants) reported sleeping for >8 h on average per night. These findings corroborate the findings of a study by Kracht et al, who reported that sleep efficiency was the only sleep metric related to food craving. Interestingly, this study was among the first studies to observe an association between poor sleep efficiency and increased cravings, particularly among adolescents.^{4,15}

Our study also assessed food craving and its impact on BMI and found various levels of significance. Notably, cravings for salty foods ($p=0.008$), the influence of emotional factors on food cravings ($p=0.03$), eating due to sadness even when not hungry ($p=0.01$), challenges in resisting or controlling food cravings ($p=0.04$), and feelings of guilt or regret after indulging the cravings ($p=0.000$) were all significant factors suggesting potential links with BMI. These findings point towards emotional and specific cravings as influential factors in dietary behaviors that could affect BMI. In contrast, cravings for sweet foods and the influence of others eating were not significant factors ($p=0.50$ and $p=0.70$, respectively), indicating a weaker or no association with BMI. The relatively high p -values for general food craving intensity ($p=0.12$) and loss of control when eating craved foods ($p=0.27$) also suggest that these factors did not significantly impact BMI in this study cohort. These findings were similar to those of studies by Chao et al¹¹ in 2014, Al-Jawaldeh et al¹⁶ in 2020, and Romero-Blanco et al⁹ in 2021, which revealed a significant positive relationship between BMI and food cravings. There were significantly positive associations between cravings for snacks, high fats, carbohydrates/starches, and fast-food fats and the intake of these types of foods; however, there were no significant interactions between food cravings and BMI on the respective type of food intake.

These findings are similar to those of previous studies that reported similar results.^{14,17} Cravings represent strong motivational states characterized by intense desires, typically related to the anticipation of consuming pleasure-producing substances or engaging in hedonic behaviors.¹⁸ These findings point towards emotional and specific cravings as influential factors in dietary behaviors that could affect BMI.

The results of our one-way analysis of variance suggest that while the mean BMI differs across smoking history groups (current smokers, ex-smokers, and never smokers), the difference is not statistically significant. The F -value of 26.29 and p -value of 0.138 indicate that the observed differences in BMI across these groups are not strong enough to reject the null hypothesis at the typical significance level of 0.05. Therefore, the differences in mean BMI could be attributed to random variability rather than a meaningful effect of smoking history on BMI. Several studies have explored the relationship between smoking and BMI with mixed findings. Some show a clear association between smoking and lower BMI, while others find that the relationship is less straightforward, especially when considering long-term effects or confounding factors. Jacobs et al¹⁹ and Jitnarin et al²⁰ found that smoking is typically associated with lower BMI, but

the relationship varies by sex, age, and other demographic factors. Specifically, smoking cessation tends to lead to weight gain, which might explain the higher BMI in ex-smokers in our study compared to current smokers. Another study shows that people who quit smoking often experience weight gain, likely due to changes in metabolism, dietary habits, and physical activity levels. Jeremias-Martins and Chatkin demonstrated that ex-smokers have a higher likelihood of having increased BMI after cessation, which aligns with our finding that ex-smokers have a mean BMI of 25.97, higher than both current smokers and never smokers.²¹ Additionally, current smokers also reported consuming more high-fat foods and fast-food fats.²²

The chi-square test results revealed significant relationships between smoking history and various eating habits. Current smokers, ex-smokers, and never smokers exhibited different patterns in breakfast habits, meal frequency, snacking, and consumption of specific foods. Current smokers were more likely to skip breakfast and eat fewer meals per day, with a tendency to snack daily and consume fried food more often compared to ex-smokers and never smokers. In contrast, never smokers were more likely to eat breakfast daily, have regular meal patterns, and consume fried food less frequently. Current smokers also showed distinct patterns in consuming sugary beverages, with a preference for consuming them daily or rarely, while ex-smokers and never smokers consumed sugary beverages more regularly. Overall, these findings suggest that smoking history significantly influences eating behaviors, with smokers generally exhibiting less healthy dietary habits compared to non-smokers.

These findings are consistent with recent research, such as the study by Lin et al, which found that smoking is linked to poorer dietary choices, including increased consumption of high-fat foods.²³ Additionally, Chao et al noted that smoking cessation is often associated with healthier eating habits; smokers tended to exhibit more irregular eating patterns and higher consumption of unhealthy foods.²² The association with sugary beverage consumption was also supported by studies like the one by Pan et al, which showed that smokers are more likely to consume sugary beverages due to cravings or lifestyle choices, whereas non-smokers tend to have more regular and balanced eating habits.²⁴ These studies collectively support the hypothesis that smoking history significantly influences eating behaviors, with smokers typically engaging in less nutritious eating patterns.

Study Strengths

With 432 participants, the study benefitted from a relatively large sample size, providing more robust statistical analyses and potentially enhancing the generalizability of the findings within the studied population. The study also achieved nearly equal representation of men and women, which enhanced the reliability of the results by reducing gender bias. Moreover, the identification of a significant proportion of the participants in the obesity category highlights the relevance of this study to public health concerns, potentially informing interventions or policies aimed at addressing obesity-related health issues. Another strength of this study is that it identified several significant factors related to food cravings and their potential impact on BMI, providing valuable insights that could aid in performing further research and developing potential interventions. Furthermore, this study's findings on the frequency of snack and fruit consumption versus the consumption of regular meals with family offer practical implications for dietary interventions and public health campaigns aimed at promoting healthy eating habits.

Limitations

The limitations identified in this study stem largely from practical and logistical constraints commonly faced in population-based research. Convenience sampling and the focus on only the central and western regions were chosen to enable efficient data collection within the available resources and timeframe, although they do limit the generalizability of findings. The use of online questionnaires allowed for broader reach and accessibility, especially during periods where in-person data collection may have been challenging; however, self-reporting naturally carries a risk of bias. The absence of advanced statistical analyses, such as multivariable-adjusted regression, and the lack of control for confounding variables like socioeconomic status or genetics, reflect the study's exploratory nature rather than its intent to establish causality. Furthermore, while the omission of effect sizes limits the interpretation of practical significance, the reporting of p-values still provides an initial indication of statistically significant relationships. These limitations highlight areas for improvement in future, more comprehensive studies.

Conclusion

The study sample primarily comprised young, single, highly educated individuals from the western region of Saudi Arabia. Food cravings were most frequent for specific foods, driven by emotional and social factors. Irregular meal patterns were common, with two meals per day being the most frequent. Snacking and fruit consumption were frequent, while family meals were less so. The majority had a balanced diet, but a significant proportion were overweight/obese. Smoking prevalence was notable. Sleep duration was often insufficient, and electronic device use was high. While most participants exercised, regular physical activity was lacking in nearly 30%. Notably, the study highlighted a strong association between irregular meal patterns and increased food cravings, suggesting a potential link between disrupted eating habits and heightened desire for specific foods. Additionally, the high prevalence of electronic device use raises concerns about its possible impact on sleep quality and subsequent influence on appetite regulation and food choices. Further research is needed on the interplay of age, social background, gut microbiome, brain function, and dietary patterns in influencing food cravings. Additionally, more research should investigate the role of technology in modulating food cravings and overall dietary behavior.

Data Sharing Statement

The data presented in this study are available on request from the corresponding author.

Acknowledgments

The authors express their appreciation to the Deanship of Postgraduate Studies and Scientific Research at Majmaah University for funding this research work through the project number R-2025-2044.

Author Contributions

All authors contributed to data analysis, drafting or revising the article, have agreed on the journal to which the article will be submitted, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Funding

This study was funded by the Deanship of Postgraduate Studies and Scientific Research at Majmaah University. The funder had no role in the study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Roefs A, Boh B, Spanakis G, Nederkoorn C, Lemmens LHJM, Jansen A. Food craving in daily life: comparison of overweight and normal-weight participants with ecological momentary assessment. *J Hum Nutr Diet.* 2019;32(6):765–774. doi:10.1111/jhn.12693
2. AlTamimi JZ, AlFaris NA, Alshwaiyat NM, et al. Prevalence of fast-food intake among a multi-ethnic population of middle-aged men and connection with sociodemographic factors and obesity. *Medicine.* 2023;102(15):e33555. doi:10.1097/MD.0000000000003355
3. Msaiger AO, Al-Mannai MA. Weight, height, body mass index and prevalence of obesity among the adult population in Bahrain. *Ann Hum Biol.* 2001;28(3):346–350. doi:10.1080/030144601300119151
4. Kracht CL, Chaput J-P, Martin CK, Champagne CM, Katzmarzyk PT, Staiano AE. Associations of sleep with food cravings, diet, and obesity in adolescence. *Nutrients.* 2019;11(12):2899. doi:10.3390/nu11122899
5. Matz SC. Personality-place transactions: mapping the relationships between Big Five personality traits, states, and daily places. *J Personal Soc Psychol.* 2021;120(5):1367–1385. doi:10.1037/pspp0000297
6. Ordóñez López A, González Barrón R, Montoya Castilla I, Schoeps K. Conciencia emocional, estados de Ánimo y rendimiento académico. *Int J Dev Educ Psychol.* 2017;6(1):229–236. doi:10.17060/ijodaep.2014.n1.v6.738
7. Meule A. Twenty years of the food cravings questionnaires: a comprehensive review. *Curr Addict Rep.* 2020;7(1):30–43. doi:10.1007/s40429-020-00294-z
8. Al-Rethaiaa AS, Fahmy A-EA, Al-Shwaiyat NM. Obesity and eating habits among college students in Saudi Arabia: a cross sectional study. *Nutr J.* 2010;9:39. doi:10.1186/1475-2891-9-39

9. Romero-Blanco C, Hernández-Martínez A, Parra-Fernández ML, Onieva-Zafra MD, Prado-Laguna MDC, Rodríguez-Almagro J. Food addiction and lifestyle habits among university students. *Nutrients*. 2021;13(4):1352. doi:10.3390/nu13041352
10. Goldstein SP, Dochat C, Schumacher LM, et al. Using ecological momentary assessment to better understand dietary lapse types. *Appetite*. 2018;129:198–206. doi:10.1016/j.appet.2018.07.003
11. Chao A, Grilo CM, White MA, Sinha R. Food cravings, food intake, and weight status in a community-based sample. *Eat Behav*. 2014;15(3):478–482. doi:10.1016/j.eatbeh.2014.06.003
12. Mumena WA, Ateek AA, Alamri RK, et al. Fast-food consumption, dietary quality, and dietary intake of adolescents in Saudi Arabia. *Int J Environ Res Public Health*. 2022;19(22):15083. doi:10.3390/ijerph192215083
13. Onaka T and Takayanagi Y. Role of oxytocin in the control of stress and food intake. *J Neuroendocrinol*. 2019;31(3). doi:10.1111/jne.12700
14. Khabaz MN, Bakarman MA, Baig M, et al. Dietary habits, lifestyle pattern and obesity among young Saudi university students. *J Pak Med Assoc*. 2017;67(10):1541–1546.
15. Alshammari E, Suneetha E, Adnan M, Khan S, Alazzeah A. Growth profile and its association with nutrient intake and dietary patterns among children and adolescents in Hail region of Saudi Arabia. *BioMed Res Int*. 2017;2017:5740851. doi:10.1155/2017/5740851
16. Al-Jawaldeh A, Taktouk M, Nasreddine L. Food consumption patterns and nutrient intakes of children and adolescents in the eastern Mediterranean Region: a call for policy action. *Nutrients*. 2020;12(11):3345. doi:10.3390/nu12113345
17. Al-Hazzaa HM, Albawardi NM. Obesity, lifestyle behaviors, and dietary habits of Saudi adolescents living in Riyadh (ATLS-2 project): revisited after a ten-year period. *Life*. 2021;11(10):1078. doi:10.3390/life11101078
18. Potenza MN, Grilo CM. How relevant is food craving to obesity and its treatment? *Front Psychiatry*. 2014;5:164. doi:10.3389/fpsy.2014.00164
19. Jacobs M. Adolescent smoking: the relationship between cigarette consumption and BMI. *Addict Behav Rep*. 2019;9:100153. doi:10.1016/j.abrep.2018.100153
20. Jitnarin N, Kosulwat V, Rojroongwasinkul N, Boonpradern A, Haddock CK, Poston WSC. The relationship between smoking, body weight, body mass index, and dietary intake among Thai adults: results of the national Thai Food Consumption Survey. *Asia Pac J Public Health*. 2014;26(5):481–493. doi:10.1177/1010539511426473
21. Jeremias-Martins E, Chatkin JM. Does everyone who quit smoking gain weight? A real-world prospective cohort study. *J Bras Pneumol*. 2019;45(1):e20180010. doi:10.1590/1806-3713/e20180010
22. Chao AM, White MA, Grilo CM, Sinha R. Examining the effects of cigarette smoking on food cravings and intake, depressive symptoms, and stress. *Eat Behav*. 2017;24:61–65. doi:10.1016/j.eatbeh.2016.12.009
23. Lin W, Alfheaid HA, Alasqah I, et al. Dietary patterns among smokers and non-smokers: findings from the National Health and Nutritional Examination Survey (NHANES) 2017–2018. *Nutrients*. 2024;16(13):2035. doi:10.3390/nu16132035
24. Pan D, Wang S, Su M, et al. Roles of drinking and diet in the U-shaped relationship between smoking and BMI in middle-aged and elderly Chinese rural adults. *Sci Rep*. 2020;10(1):17118. doi:10.1038/s41598-020-74414-0

Nutrition and Dietary Supplements

Publish your work in this journal

Nutrition and Dietary Supplements is an international, peer-reviewed, open access journal focusing on research into nutritional requirements in health and disease, impact on metabolism and the identification and optimal use of dietary strategies and supplements necessary for normal growth and development. The journal welcomes submitted papers covering original research, basic science, clinical & epidemiological studies, reviews and evaluations, guidelines, expert opinion and commentary, case reports and extended reports. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/nutrition-and-dietary-supplements-journal>

Dovepress
Taylor & Francis Group