ORIGINAL ARTICLE

Prevalence of Gastroesophageal Reflux Disease and its Associated Risk Factors, including Coffee Consumption Habits, among the Adult Population in Saudi Arabia

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Abstract

Introduction: Gastroesophageal reflux disease (GERD) is a prevalent condition worldwide that affects people of all ages. It is defined as a disorder in which the stomach acid moves up into the lower portion of the esophagus, causing a wide range of symptoms as well as various complications. The condition has several risk factors including dietary habits, body weight, and the use of certain medications. Several studies have been conducted to assess the prevalence of GERD and its associated risk factors in various parts of the world. **Objective:** The study aims to assess the prevalence of GERD and to identify its associated risk factors, with a particular focus on coffee consumption among the adult population of Saudi Arabia. **Materials and Methods:** This was a cross-sectional study conducted among adults living in Saudi Arabia. Participants were recruited through popular social media platforms, including WhatsApp, Snapchat, and X (formerly Twitter). Participants were provided with electronic self-administered questionnaires, and their responses were used to meet the study objectives. The minimum sample size was 384, calculated using the Raosoft calculator with a 95% confidence level and a 5% margin of error. **Results:** A total of 533 participants were analyzed; mean age was 39.0 years and 61.0% were female. The prevalence of GERD was 38.6%, while 61.4% did not meet the GERDQ threshold. Age and residential area were significantly associated with GERD, and married and widowed participants had a higher prevalence than single individuals. GERD symptoms were frequent, with heartburn (80.5%), epigastric pain (69.4%), food regurgitation (65.3%), and reflux-related sleep disturbance (56.1%) commonly reported. Coffee consumption was highly prevalent (70.9% drank coffee more than three times per week); however, coffee habits showed no clear independent association with GERD status, whereas physical inactivity, unhealthy diet, and frequent intake of fatty and spicy foods showed stronger associations. **Conclusion:** GERD is highly prevalent among adult coffee drinkers in Saudi Arabia, with demographic factors and lifestyle behaviors emerging as important correlates, while coffee consumption alone does not appear to be a dominant determinant of GERD symptoms.

Key words: Coffee consumption, gastroesophageal reflux disease, prevalence, Saudi Arabia

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INTRODUCTION

Gastroesophageal reflux disease (GERD) is one of the most prevalent conditions affecting the upper portion of the gastrointestinal tract, and it occurs when stomach contents flow back into the esophagus, potentially leading to chronic symptoms and various complications.[1,2] This condition is characterized by a wide range of symptoms that adversely affect patients' quality of life and occupational productivity, while also imposing significant economic burdens.[3] Furthermore, the development of GERD is influenced by several risk factors, which include non-modifiable factors such as age, gender, high body mass index, and family history, in addition to modifiable factors like the intake of specific foods and beverages, use of non-steroidal anti-inflammatory drugs (NSAIDs), cigarette smoking, and lack of physical activity.[4,5]

GERD is a prevalent condition influenced by various risk factors that, if left untreated, could lead to esophageal stricture, gastrointestinal hemorrhage, Barrett's esophagus, and esophageal adenocarcinoma, among other consequences.[6] While gender does not appear to influence the overall incidence of GERD, men are more prone to developing complications. Research indicates that males are twice as likely as females to develop esophagitis and have a higher likelihood of progressing to Barrett's esophagus. Conversely, some studies suggest that women may be more susceptible to experiencing GERD symptoms, reflecting inconsistencies in findings across different populations.[7] According to Iranian research, smoking, pickle eating, and NASID use are more detrimental factors.[8]

The association between coffee consumption and GERD is still debated. In 2019, studies in Malaysia found functional dyspepsia rates of 15% in rural and 25% in urban populations, with limited evidence linking coffee intake to GERD symptoms. Experimental studies have identified caffeine and chlorogenic acid as possible triggers of gastric acid secretion, but meta-analyses have generally found no significant correlation between coffee consumption and GERD incidence. Some compounds in coffee may even have protective effects on the gastric mucosa.[9] Other study conducted in 2024, a cross-sectional study on 195 coffee drinkers aged 18–65 years in Jakarta and Bekasi found that 52.8% of mixed coffee drinkers and 47.2% of black coffee drinkers experienced GERD symptoms, with no significant difference between the two groups ($P = 0.790$).[10] In 2024, a meta-analysis of 21 studies found no significant association between coffee consumption and GERD risk, with a pooled odds ratio of 1.06. Subgroup analysis by geography and study design confirmed similar findings, and dose–response analysis showed no correlation between coffee intake amount and GERD incidence.[11]

Although GERD is becoming more prevalent, little is known about its prevalence and risk factors among Saudi Arabian adults. Despite its widespread consumption, limited information is known about how coffee affects the symptoms of acid reflux. The purpose of this study is to close this knowledge gap and ascertain whether coffee consumption has a role, which can aid in raising awareness and promoting prevention.

Objectives

The main objective of this study was to determine the prevalence of GERD and to identify its associated risk factors, with a particular focus on coffee consumption, among adult coffee drinkers in Saudi Arabia.

MATERIALS AND METHODS

Study design, setting, and participants

An observational cross-sectional study was conducted between July 2025 and December 2025 among the adult population in Saudi Arabia. A self-administered questionnaire was used. Adults living in Saudi Arabia who were 18 years of age or older constituted the study population.

Sample size

Calculation of sample size was done to ensure the minimum number of respondents needed to be a representative sample of the whole population. The sample size was determined using the Raosoft sample size calculator. Keeping an indicator percentage of 0.50, a margin of error of 5%, and a confidence interval (CI) of 95%, the calculated sample size was 384. The sample size was calculated by Raosoft, Inc. (Seattle, WA, USA) (22) at 384 individuals using the following formula and applying means and standard deviation. Considering the standard deviation (=1.96) for the 95% CI and the maximum acceptable marginal error (=0.05). Therefore, the calculated minimum sample size required for this study is $n = (1.96)^2 \times 0.50 \times 0.50/(0.50)^2 = 384$ participants.

Inclusion and exclusion criteria

This study targeted adult individuals aged 18 years and older who were residing in Saudi Arabia at the time of data collection. Participants were eligible if they reported regular coffee intake, defined as consuming at least one cup per day during the preceding 30 days. Inclusion also required the ability to read and understand the survey language (Arabic or English) and to independently complete the self-administered questionnaire. Both male and female participants from diverse educational and occupational backgrounds were invited to participate, provided they gave informed consent.

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Participants were excluded from the study if they were under 18 years of age or did not meet the defined criteria for regular coffee consumption (one cup of coffee per day for the past 30 days). Individuals with a history of chronic gastrointestinal conditions unrelated to GERD, such as peptic ulcer disease, inflammatory bowel disease, or gastrointestinal malignancies, as well as those with a prior medical diagnosis of GERD, were also excluded. In addition, those who were pregnant, currently using medications that could affect gastric acidity or esophageal function (e.g., proton pump inhibitors, H2-receptor antagonists, antacids, or specific antidepressants), or unable to independently complete the questionnaire were not eligible. Incomplete, inconsistent, or duplicate responses were also excluded from the final analysis.

Method for data collection and instrument (data collection technique and tools)

An anonymous, self-administered questionnaire in Arabic served as the primary tool for data collection. The questionnaire was divided into five main sections: Part 1 included a brief introduction outlining the purpose of the study, followed by a consent item to confirm voluntary participation. Part 2 collected sociodemographic information such as age, gender, height, weight, smoking status, and the presence of chronic diseases, including asthma, hypertension, diabetes, and dyslipidemia. Part 3 focused on GERD symptoms. Participants were asked about the frequency of symptoms, including heartburn, epigastric pain, regurgitation, nausea, sleep disturbances related to reflux, and the use of antacid medications. This section was adapted from the validated GerdQ questionnaire.[12] Each symptom item was scored from 0 to 4 based on frequency, and the total score was used to estimate the likelihood of GERD. The GerdQ was validated as a patient-centered self-assessment tool and is commonly used to diagnose GERD. Individuals with a total score of 8 or more were classified as having GERD, while those with a score below 8 were considered not to have the condition.[13] Part 4 assessed dietary and lifestyle habits. Items covered eating behaviors, physical activity, the timing of meals in relation to sleep or exercise, sleep duration, and post-meal behavior. In addition, two original questions were added by the research team to assess coffee-related risk factors – specifically, the type of coffee usually consumed and the typical timing of coffee intake**.** Part 5 explored family history by asking participants whether any family members experienced symptoms similar to GERD.

Pilot test

To evaluate the clarity of the questionnaire and determine the practicality of the research design, a pilot test was carried out with a sample of 20 participants. This preliminary step helped ensure that the questions were easily understood and the study was feasible. The data collected during this phase were not included in the final analysis.

Analysis and entry method

The collected data was first entered using Microsoft Excel (2016) for Windows. Subsequently, the dataset was transferred to IBM Statistical Package for the Social Sciences Statistics, version 20 (IBM Corp., Armonk, NY), for statistical analysis. Descriptive statistics were used to summarize the numerical variables for baseline characteristics. For categorical variables, frequencies and percentages were calculated. The Chi-square test was used to identify associations between GERD and associated risk factors particular focus on coffee consumption.

RESULTS

Table 1 displays various demographic parameters of the participants with a total number of 533. Most participants were aged between 31 and 50 years (32.1%), with 26.3% of them being 51 years and above. The sample comprised 61.0% of females. There were equal distributions of height and weight, 30.6% of 161–170 cm, and 30.0% of 81kg and above. A very large percentage (49.3%) of the respondents were in the Western Region, with 45.4% in the Central Region. The overwhelming majority were not smokers (81.8%), and the majority (51.0%) were married. In the history of chronic disease, 70.2% have not been diagnosed while hypertension (11.8%), diabetes (9.6%), and asthma (5.4%) were the most frequent chronic diseases.

As shown in Figure 1, food regurgitation was a frequent complaint among participants, with 65.3% reporting symptoms at varying frequencies. The largest group experienced regurgitation less than once a week (171), followed by those with no symptoms (185). Smaller proportions reported it once weekly (67), 2–3 times weekly (50), or more than three times weekly (60).

Table 2 shows that GERD symptoms were prevalent in the case of participants. The incidence of heartburn at different

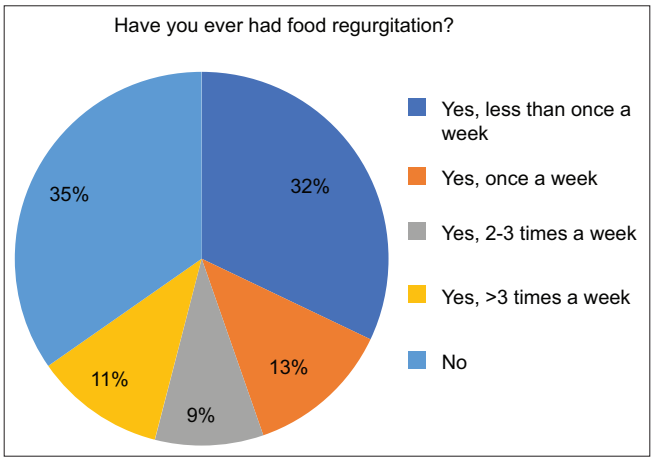

Figure 1: Illustrates food regurgitation among participants

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Table 1: Sociodemographic characteristics of participants (*n*=533)

Parameter	No.	Percentage
Age (Mean: 39.0, STD: 14.7)		
23 or less	109	20.5
24–30	113	21.2
31–50	171	32.1
51 or more	140	26.3
Gender		
Female	325	61.0
Male	208	39.0
Height in cm (Mean: 163.7, STD: 9.3)		
155 or less	111	20.8
156–160	133	25.0
161–170	163	30.6
171 or more	126	23.6
Weight in kg (Mean: 73.8, STD: 18.2)		
59 kg or less	118	22.1
60–69	114	21.4
70–80	141	26.5
81 kg or more	160	30.0
Residential area		
Northern Region	7	1.3
Southern Region	11	2.1
Central region	242	45.4
Eastern region	10	1.9
Western region	263	49.3
Marital status		
Single	221	41.5
Married	272	51.0
Divorced	23	4.3
Widowed	17	3.2
Smoking status		
No	436	81.8
Yes	69	12.9
Ex-smoker	28	5.3
Diagnosed with any chronic disease*		
Asthma	29	5.4
Hypertension	63	11.8
Diabetes	51	9.6
Kidney disease	7	1.3
Dyslipidemia	11	2.1
Other	58	10.9
No	374	70.2

*Results may overlap. STD: Standard deviation

Table 2: Parameters related to gastroesophageal reflux disease symptoms (*n*=533)

Parameter	No.	Percentage
Have you ever had heartburn?		
Yes, less than once a week	206	38.6
Yes, once a week	84	15.8
Yes, 2–3 times a week	84	15.8
Yes, >3 times a week	55	10.3
No	104	19.5
Have you ever had epigastric pain?		
Yes, less than once a week	185	34.7
Yes, once a week	91	17.1
Yes, 2–3 times a week	41	7.7
Yes, >3 times a week	53	9.9
No	163	30.6
Have you ever had food regurgitation?		
Yes, less than once a week	171	32.1
Yes, once a week	67	12.6
Yes, 2–3 times a week	50	9.4
Yes, >3 times a week	60	11.3
No	185	34.7
Have you ever had nausea?		
Yes, less than once a week	188	35.3
Yes, once a week	66	12.4
Yes, 2–3 times a week	49	9.2
Yes, >3 times a week	37	6.9
No	193	36.2
Have you ever had sleep disturbance from heartburn?		
Yes, less than once a week	149	28.0
Yes, once a week	62	11.6
Yes, 2–3 times a week	40	7.5
Yes, >3 times a week	48	9.0
No	234	43.9
Do you use antacid medications to relieve your symptoms?		
Yes, less than once a week	104	19.5
Yes, once a week	38	7.1
Yes, 2–3 times a week	31	5.8
Yes, >3 times a week	45	8.4
No	315	59.1

frequencies was 80.5% with 38.6% reporting the condition less than once a week and 15.8% once a week. Sixty-nine point four per cent (69.4%) had epigastric pain, with less than once a week the most frequent (34.7%). Regurgitation of food was also common with 65.3 reporting and 35.3 reporting

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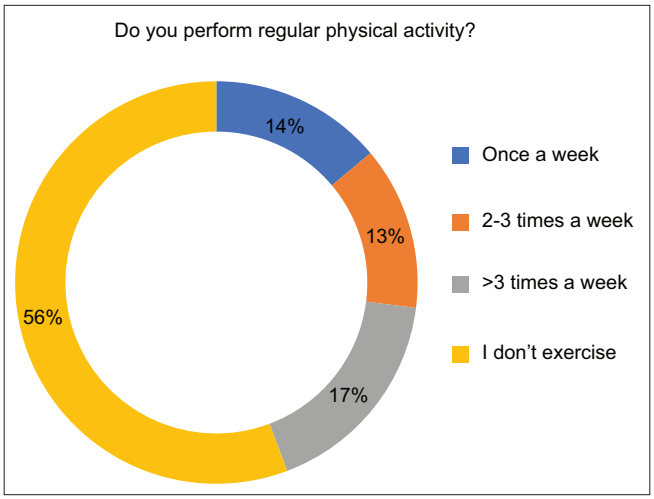

Figure 2: Illustrates physical activity among participants

less than once weekly and none, respectively. Cardiac sleep disturbance (heartburn) was noted in 56.1%. Heartburn was a cause of sleep disturbance in 56.1% of participants (28.0% less than once per week). However, most of them (59.1%) did not take antacid drugs and only 8.4% took them more than 3 days a week.

As shown in Figure 2, most participants reported low physical activity, with 55.7% not exercising. Regular activity was limited, as only 13.9% exercised once weekly, 13.1% exercised 2–3 times weekly, and 17.3% exceeded three sessions per week. Table 3 reveals that most of the population did not have a healthy balanced diet (67.4%), and more than half (51.24) did not have sufficient fiber. Forty percent and 35.3% of people ate fatty and spicy foods regularly. Abnormal eating habits existed: 53.3% of them said that sometimes they snack in the middle of the night, 38.8% of them said that they do not eat breakfast, 48.2% of them said that they do not eat to the full. By 61.6%, it was always or sometimes reported that they ate rapidly. There were high levels of sedentary habits after meals, in terms of 68.1% sitting immediately after eating and 41.5% lying down. Most of the respondents (67.5%) did not walk following meals. There was also a significant amount of physical inactivity, 55.7% of them did not exercise. The consumption of coffee was also high where 70.9% consume it more than three times a week. Furthermore, 38.1% had 3 to 5 hours of sleep, and 59.8% had the same symptoms in the family members.

Table 4 displays the score results of GERD symptoms according to participants. Most participants showed no GERD symptoms (61.4%), while 38.6% were considered GERD patients.

Table 5 shows that GERD symptoms has statistically significant relation to age (P = 0.028), residential area (P = 0.017), and marital status (P = 0.002). It also shows a statistically insignificant relation to gender, height, weight, and smoking status. Participants aged 51 or more and residing

Table 3: Participants' dietary and lifestyle habits and family history (n=533)

Parameter	No.	Percentage
Do you follow a healthy diet consisting of balanced protein, vegetables, and fruits?		
No	359	67.4
Yes	174	32.6
Do you eat moderate amounts of fiber regularly?		
No	273	51.2
Yes	260	48.8
Do you eat fatty food regularly?		
No	318	59.7
Yes	215	40.3
Do you eat spicy food regularly?		
No	346	64.9
Yes	187	35.1
Do you usually eat midnight snacks?		
No	161	30.2
Yes	88	16.5
Sometimes	284	53.3
Do you usually skip breakfast?		
No	141	26.5
Yes	207	38.8
Sometimes	185	34.7
Do you usually eat quickly?		
No	205	38.5
Yes	189	35.5
Sometimes	139	26.1
Do you usually eat beyond fullness?		
No	257	48.2
Yes	101	18.9
Sometimes	175	32.8
Do you usually have frequent liquid food consumption?		
No	215	40.3
Yes	70	13.1
Sometimes	248	46.5
Do you usually sit soon after eating?		
No	34	6.4
Yes	363	68.1
Sometimes	136	25.5
Do you usually lie down soon after eating?		
No	228	42.8
Yes	84	15.8
Sometimes	221	41.5
Do you usually walk soon after eating?		
No	360	67.5
Yes	26	4.9
Sometimes	147	27.6

(Contd...)

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Table 3: *(Continued)*

Parameter	No.	Percentage
Do you usually have <3 h between dinner and sleep?		
No	148	27.8
Yes	168	31.5
Sometimes	217	40.7
Do you usually have <3 h between dinner and physical exercise?		
No	64	12.0
Sometimes	104	19.5
Yes	81	15.2
I do not exercise	284	53.3
Do you perform regular physical activity?		
Once a week	74	13.9
2–3 times a week	70	13.1
>3 times a week	92	17.3
I don't exercise	297	55.7
How many times do you drink coffee per week?		
Once a week	35	6.6
2–3 times a week	71	13.3
>3 times a week	378	70.9
I do not drink coffee	49	9.2
When do you usually drink coffee?		
In the morning	157	29.5
After meals	44	8.3
Before bedtime	3	0.6
Random times throughout the day	329	61.7
How many hours do you usually sleep?		
<3 h	6	1.1
3–5 h	203	38.1
6–8 h	282	52.9
>8 h	42	7.9
Is there anyone in your family who complains of symptoms similar to yours?		
No	214	40.2
Yes	319	59.8

in the western region were considered to be GERD patients according to the reported symptoms.

DISCUSSION

The present study assessed the prevalence of GERD and its associated risk factors, with particular emphasis on coffee consumption habits, among the adult population in Saudi Arabia. Among 533 participants, we found that 38.6% met criteria for GERD, with the remaining 61.4% showing no GERD symptoms. This prevalence aligns with previously

Table 4: GERD symptoms score results

???	Frequency	Percentage
No GERD	327	61.4
GERD patient	206	38.6
Total	533	100.0

GERD: Gastroesophageal reflux disease

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published estimates from the Middle Eastern region and Saudi Arabia specifically, where GERD has been consistently identified as a significant public health burden.

Our findings regarding GERD prevalence are comparable to recent studies conducted in Saudi Arabia. A recent cross-sectional study by Alatawi *et al*. among 960 Saudi adults reported GERD symptom prevalence rates of 56.8% for heartburn, 50.7% for regurgitation, and 61.1% for bloating.[14] Similarly, another study conducted at Imam Mohammad Ibn Saud Islamic University (IMSIU) among 1,533 college students reported a GERD prevalence of 34.6%, which closely aligns with our 38.6% finding.[15] A comprehensive meta-analysis by Nirwan *et al*. involving 102 studies across 37 countries reported a global pooled GERD prevalence of 13.98%, with the Middle East showing notably higher rates compared to other regions.[16] The higher prevalence observed in our Saudi Arabian cohort may reflect the increasing burden of GERD in this region, potentially driven by rapid urbanization, dietary pattern changes, and lifestyle modifications.

Regarding demographic associations, our study found that age and residential area were significantly associated with GERD ($P = 0.028$ and $P = 0.017$, respectively), while gender, height, weight, and smoking status showed no significant association. Participants aged 51 years and above exhibited a higher prevalence of GERD symptoms compared to younger age groups. These findings are consistent with the global literature. The meta-analysis by Nirwan *et al*. demonstrated that GERD prevalence increased with age, with those aged 35–59 years showing an odds ratio of 1.17 (95% CI 1.11–1.24) compared to those aged 18–34 years, and those aged ≥60 years showing an odds ratio of 1.20 (95% CI 1.12–1.28).[16] The age-related increase in GERD prevalence has been attributed to age-related changes in esophageal motility, gastric acid production, and lower esophageal sphincter function. Female predominance in our cohort (61.0%) may reflect greater willingness to report symptoms rather than true gender differences. Alatawi *et al*. reported similar prevalence between males (49.0%) and females (47.8%), demonstrating that GERD affects both genders substantially.[14]

The symptom presentation in our study revealed that heartburn was the most frequent GERD symptom, occurring in 80.5% of participants at varying frequencies, with 38.6% reporting it less than once weekly. Epigastric pain was reported by 69.4% of participants, food regurgitation by 65.3%, and sleep disturbance due to heartburn by 56.1%. These

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Table 5: Relation between GERD symptoms and sociodemographic characteristics

Parameters	GERD		Total (*n*=533)	*P*-value*
	No GERD (%)	GERD patient (%)		
Gender				
Female	192 (58.7)	133 (64.6)	325 (61.0)	0.178
Male	135 (41.3)	73 (35.4)	208 (39.0)	
Age				
23 or less	71 (21.7)	38 (18.4)	109 (20.5)	0.028
24–30	73 (22.3)	40 (19.4)	113 (21.2)	
31–50	112 (34.3)	59 (28.6)	171 (32.1)	
51 or more	71 (21.7)	69 (33.5)	140 (26.3)	
Height				
155 or less	58 (17.7)	53 (25.7)	111 (20.8)	0.108
156–160	80 (24.5)	53 (25.7)	133 (25.0)	
161–170	108 (33.0)	55 (26.7)	163 (30.6)	
171 or more	81 (24.8)	45 (21.8)	126 (23.6)	
Weight				
59 kg or less	71 (21.7)	47 (22.8)	118 (22.1)	0.847
60–69	74 (22.6)	40 (19.4)	114 (21.4)	
70–80	86 (26.3)	55 (26.7)	141 (26.5)	
81 kg or more	96 (29.4)	64 (31.1)	160 (30.0)	
Residential area				
Northern region	3 (0.9)	4 (1.9)	7 (1.3)	0.017
Southern region	8 (2.4)	3 (1.5)	11 (2.1)	
Central region	164 (50.2)	78 (37.9)	242 (45.4)	
Eastern region	8 (2.4)	2 (1.0)	10 (1.9)	
Western region	144 (44.0)	119 (57.8)	263 (49.3)	
Marital status				
Single	143 (43.7)	78 (37.9)	221 (41.5)	0.002
Married	167 (51.1)	105 (51.0)	272 (51.0)	
Divorced	14 (4.3)	9 (4.4)	23 (4.3)	
Widowed	3 (0.9)	14 (6.8)	17 (3.2)	
Smoking status				
No	276 (84.4)	160 (77.7)	436 (81.8)	0.145
Yes	36 (11.0)	33 (16.00	69 (12.9)	
Ex-smoker	15 (4.6)	13 (6.3)	28 (5.3)	

**P*-value was considered significant if ≤0.05. GERD: Gastroesophageal reflux disease

symptom profiles correspond closely with existing literature. The study by Bin Abdulrahman *et al*. at IMSIU found that heartburn was the predominant symptom recognized by 76.2% of respondents, confirming heartburn as the cardinal manifestation of GERD across diverse populations.[15]

Regarding dietary and lifestyle factors, our study identified substantial proportions of participants engaging in behaviors associated with GERD risk. Notably, 70.9% of participants consumed coffee more than 3 times per week, with 61.6% eating rapidly and 68.1% sitting immediately after meals. These behaviors represent significant modifiable risk factors that warrant public health intervention. The high prevalence of coffee consumption in our study population is noteworthy, particularly given the ongoing debate regarding coffee's role in GERD pathogenesis.

Concerning coffee consumption and GERD specifically, our findings warrant careful interpretation in light of recent evidence. While 70.9% of our participants consumed coffee more than three times weekly, the relationship between this consumption pattern and GERD prevalence requires nuanced

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discussion. Recent evidence suggests the association between coffee consumption and GERD may be less robust than previously believed. A 2024 cross-sectional study by Arsanti *et al*. in Jakarta and Bekasi involving 195 coffee drinkers found that 52.8% of mixed coffee drinkers and 47.2% of black coffee drinkers experienced GERD symptoms, with no significant difference between the two groups ($P = 0.790$).[17] This finding is significant because it suggests that coffee type may not be the critical determinant of GERD symptoms in this population. Meanwhile, the global meta-analysis by Nirwan *et al*. demonstrated that subjects with a moderate to high intake of coffee/tea had an odds ratio of 1.47 (95% CI 1.36–1.59) compared to those with low or no intake, suggesting that while coffee consumption shows an association with GERD, the magnitude of effect varies across populations.[16] These conflicting findings underscore the complexity of coffee-GERD associations and suggest that individual susceptibility, as opposed to universal effects, may predominate. The high prevalence of coffee consumption in our Saudi Arabian cohort, combined with our GERD prevalence findings, suggests that coffee consumption alone may not be a primary determinant of GERD in this population, though individual-level associations may exist.

Other dietary habits demonstrated clearer associations with GERD risk. Physical inactivity emerged as a significant risk factor, with 55.7% of participants reporting no regular exercise. In addition, 67.4% of participants did not follow a healthy, balanced diet, 51.2% did not consume adequate fiber, 40.3% consumed fatty foods regularly, and 35.1% consumed spicy foods regularly. These dietary patterns are consistent with GERD risk factors identified in recent research. Alatawi *et al*. found that consumption of spicy food five or more times per week was associated with GERD symptoms in 61.2% of participants ($P = 0.0001$), fatty foods in 55.4% ($P = 0.0005$), and caffeine in 61.8% ($P = 0.0001$). The same study demonstrated that regular physical activity (3 or more times per week) was inversely associated with GERD symptoms, occurring in only 46.1% of those with regular exercise compared to higher rates in sedentary individuals ($P = 0.0001$).[14] The meta-analysis by Nirwan *et al*. confirmed that moderate to high intake of carbonated drinks carried an odds ratio of 1.29 (95% CI 1.14–1.46).[16]

Several limitations warrant consideration when interpreting these findings. First, the cross-sectional study design precludes the establishment of causality; the associations identified represent correlations that may or may not be causal. Second, symptom assessment relied upon self-report without confirmatory endoscopic or pH-monitoring studies, which are the diagnostic gold standards for GERD. The GERDQ questionnaire, while validated, is less sensitive than these objective measures. Third, the sociodemographic characteristics of our study population may limit generalizability to other regions or populations. Fourth, recall bias regarding dietary and lifestyle behaviors may have introduced measurement error. Fifth, the study did not assess comprehensive medication use beyond antacids and NSAIDs, which could influence GERD symptom reporting. Sixth, unmeasured confounders such as stress levels, anxiety, or depression may have influenced GERD symptom prevalence. Finally, given the high prevalence of coffee consumption in our population, the lack of detection of a strong coffee-GERD association may reflect survivor bias or population-specific factors that warrant further investigation.

CONCLUSION

This study identified a GERD prevalence of 38.6% in a Saudi Arabian population, consistent with recent regional data suggesting high GERD burden in the Middle East. Age and residential area emerged as significant demographic predictors, while comprehensive lifestyle and dietary factors demonstrated important associations with GERD symptoms. Coffee consumption, while highly prevalent in our cohort, showed complex associations with GERD that align with recent evidence suggesting coffee's role in GERD may be less universal than previously believed, with substantial individual variation. The findings underscore the multifactorial nature of GERD and emphasize the importance of comprehensive lifestyle interventions addressing modifiable factors, including physical activity, dietary composition, postprandial behaviors, and sleep quality. Future research should employ longitudinal designs with objective diagnostic confirmation to establish causality and clarify mechanisms underlying these associations in Saudi Arabian and Middle Eastern populations.

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ETHICAL APPROVAL

The study was fully explained to all participants, and it was emphasized that participation was voluntary. Written informed consent was obtained from each participant before enrollment. All collected information was securely stored and used exclusively for research purposes.

INFORMED CONSENT

Written informed consent was obtained from all study participants.

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DATA AND MATERIALS AVAILABILITY

All data generated or analyzed during this study are included in this published article.

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