

Effects of caffeine and peppermint consumption on GERD patients in Saudi Arabia

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ABSTRACT

Introduction: Dietary habits have a direct impact on the prevalence of GERD. There is convincing evidence that peppermint has a substantial pharmacodynamic impact on the gastrointestinal tract. It seems reasonable to adopt greater knowledge of dietary factors like peppermint and coffee in order to develop individualized dietary recommendations for GERD patients in order to improve the effectiveness of the environmental and dietary associated factors with therapy because studies have shown that they may influence the presence of some disease symptoms and to improve quality of life and morbidity of the disease. **Methodology:** This cross-sectional study examines the impact of caffeine and mint on the signs and symptoms of gastroesophageal reflux disease in Saudi Arabia. Study population is diagnosed GERD patients and people with GERD symptoms in Saudi Arabia. **Result:** There were a total of 382 people that responded to our survey. In terms of coffee consumption, the majority of diagnosed patients said they drank Arabic coffee fewer than three cups per day (n = 41, 33.3%) and 22 participants (17.9%) reported consumption of three to five times per day, with no significant difference noted between diagnosed and undiagnosed participants. **Conclusion:** According to the current study, the most often reported symptoms of GERD in patients were regurgitation sensation in the mouth, burning sensation in the stomach, epigastric burning sensation and regurgitation sensation in the esophagus.

Keyword: GERD, gastroenterology, caffeine, peppermint

1. INTRODUCTION

Gastroesophageal reflux disease (GERD) is a relatively prevalent condition. Relaxation of the lower esophageal sphincter (LES) is the primary mechanism of GERD and environmental factors and dietary practices can have an impact on this mechanism. This disorder leads to symptoms or difficulties because the stomach's contents flow into the esophagus (Vakil et al., 2006). Dietary habits have a direct impact on the prevalence of GERD. Two studies carried out in Saudi Arabia in the west region and Riyadh, which measured the prevalence of GERD employing the GERDQ questionnaire with a score of ≥ 8 as the diagnostic criteria of GERD indicate that its prevalence ranges from

23.47 to 45.4% for the west region and Riyadh, respectively (Alsuwat et al., 2018) esophagitis, ulcers, bleeding, strictures and more severe health problems like Barrett's esophagus and adenocarcinoma are all side effects of GERD that can have an impact on a person's quality of life (Johnson and Fennerty, 2004).

There is evidence that health-related factors including nutrition and lifestyle can significantly affect the course of this chronic disease, which has a complex etiology that is thought to involve both environmental and hereditary components (Shaheen and Ransohoff, 2002). Reasonable data suggests that peppermint has a major pharmacodynamic impact on the gastrointestinal system by improving gastrointestinal motility and having a spasmolytic effect on the smooth vasculature of the intestinal tract. While this may help individuals with functional gastrointestinal diseases, such as irritable bowel syndrome (Grigoleit and Grigoleit, 2005; Inamori et al., 2007), it will also relax the lower esophageal sphincter, which promotes reflux and the sensation of heartburn. Because of this, patients with GERD should refrain from consuming peppermint (Grigoleit and Grigoleit, 2005). Coffee use may cause GERD since it contains caffeine, which is currently the most popular beverage worldwide (Zhang and Chen, 2013). Foods including coffee, cola, cocoa and tea naturally contain the colorless, acidic chemical known as caffeine (Wendl et al., 1994). According to studies, coffee can induce peptic ulcers by irritating and disrupting the stomach's mucosal barrier. Numerous epidemiological studies have demonstrated that coffee can aggravate ulcers and cancer-causing gastroesophageal reflux by acting as an irritant in the stomach and esophagus (Terry et al., 2000).

Five of the 15 epidemiological studies that examined the relationship between coffee drinking and GERD symptoms came to the conclusion that it was associated with GERD symptoms (Zhang and Chen, 2013). Heartburn is the most frequent gastrointestinal symptom reported following coffee intake (Cohen, 1980). Strong evidence suggests that caffeine triggers heartburn in about 68% of those who suffer from it. Older studies also indicate that decaffeinated coffee may reduce the risk of gastroesophageal reflux disease (Feldman and Barnett, 1995; Wendl et al., 1994). However, for people who claim that drinking coffee gives them issues, it is possible to experience similarly severe gastrointestinal symptoms with decaffeinated coffee, so this may not be useful. As a result, it is advised to cut back or stop drinking coffee to help with symptom relief (Boekema et al., 1999). Given that studies have shown that dietary factors may affect the presence of some disease symptoms and to improve quality of life and disease morbidity, it seems reasonable to adopt greater knowledge about dietary factors like peppermint and coffee in order to develop individualized dietary recommendations for GERD patients to increase the effectiveness of the environmental and dietary associated factors with therapy.

2. METHODOLOGY

This cross-sectional study examined the impact of caffeine and mint on symptoms of gastroesophageal reflux disease in Saudi Arabia. Patients with GERD and those exhibiting GERD symptoms in Saudi Arabia were included in this study. Inclusion criteria is diagnosed GERD patients and people with GERD symptoms aged over 18 who completed the questionnaire and exclusion criteria is people who don't have symptoms of GERD, people younger than 18 and those who refused participating or didn't complete the questionnaire. Participants were from different areas of Saudi Arabia who had access to the survey.

The Raosoft sample size calculator produced a sample size of 382 with a 95.1% confidence level and a 4.97% margin of error. A self-administered online survey was used as the sampling method. It contained identification data about participants (age, region, weight, height and occupation), questions about symptoms based on RESQ-eD plus the degree of consumption of caffeine and peppermint and their effect on symptoms and risk factors of developing GERD; certain medications and surgeries.

Data was analyzed by a qualified data analyst. The study was conducted after ethical approval from Imam Mohammed Bin Saud Islamic University Institutionalized Review Board Ethical approval number: 137-2021. Data was used for research purposes only and no payment for participation was offered. The study started on August 2021 and ended on April 2022.

3. RESULTS

Characteristics of participants

A total of 382 participants responded to our survey, most participants were 40 to 50 years old (n = 121, 31.7%) and 18 to 30 years (n = 110, 28.8%). Female gender was predominated by 88% compared to 11% of males. Regarding the body mass index (BMI), around a third of the sample were between normal weight (31.4%) or overweight (31.7%) or obese (33.7%) compared to only 3.4% who were underweight. The majority of participants were employed (62.3%) versus 73 participants (19.1%) who were retired or unemployed (Table 1).

Table 1 Characteristics of participants.

Item	N	%
Age		
18 to 30	110	28.8
30 to 40	67	17.5
40 to 50	121	31.7
More than 50	84	22.0
Gender		
Male	44	11.5
Female	338	88.5
BMI		
Underweight	13	3.4
Normal	120	31.4
Overweight	121	31.7
Obese	128	33.5
Work status		
Retired/ Unemployed	73	19.1
Work from home	3	0.8
Student	22	5.8
Housewife	46	12
Employed	238	62.3

Frequencies of consumption of coffee, tea and mint

A total of 123 participants (32.2%) reported that they were diagnosed with GERD. Both consumption of mint and coffee was reported by 172 participants (45%) compared to 41.1% who reported only coffee consumption and 13.9% for mint; there was no significant difference between diagnosed and not diagnosed participants.

Regarding coffee consumption, the largest proportion of diagnosed patients reported consumption of Arabic coffee of less than three cups per day (n = 41, 33.3%) and 22 participants (17.9%) reported consumption of three to five times per day and there was no significant difference between diagnosed and undiagnosed participants. However, most diagnosed patients reported no consumption of American coffee and decaffeinated coffee; 38.2% and 66.4%, respectively compared to undiagnosed participants; 44.4% and 73.0%, respectively. There was no significant difference between the two groups. A total of 31.3% of diagnosed participants reported consumption of red tea less than three times per day and 21.3% less than 4 cups per week with no significant difference between diagnosed and undiagnosed participants. More than half of diagnosed patients and undiagnosed patients reported negative consumption of green tea; 52% and 55.6%. However, only 27.6% of diagnosed patients reported consumption of fewer than 4 cups per week compared to 19.7% of undiagnosed and there was no significant difference. The majority of diagnosed patients reported no consumption of mint (41.2%); however, the majority of undiagnosed participants reported consumption of fewer than 4 cups per week (32.2%) with no significant difference between both groups. The majority of diagnosed and undiagnosed participants reported undetermined time of tea intake (55.9% versus 60.1%), coffee (42.1% versus 41.4%) and mint (62.8% and 60.2%). No significant difference was also noted regarding BMI of the participant and GERD (Table 2).

Symptoms associated with GERD

Regurgitation sensation in the mouth was the most frequent reported symptoms by diagnosed patients (n = 92, 74.8%) followed by burning sensation at stomach area (n = 88, 71.5%) then epigastric burning sensation (n = 86, 69.9%) and regurgitation sensation in the esophagus (n = 81, 65.9%). Hoarseness of voice (n = 52, 42.3%), dysphagia (n = 52, 42.3%) and cough (n =56, 45.5%) were the least reported symptoms by diagnosed patients. Meanwhile, for undiagnosed participants, burning sensation at the stomach area was the most common reported symptom (n = 133, 51.4%) followed by epigastric burning sensation (n = 113, 43.6%) and retro sternum burning sensation (n = 101, 39%). Significant higher percentages of all symptoms were noted in diagnosed participants compared to undiagnosed $P < 0.001$ (Figure 1).

Table 2 Frequencies of consumption of coffee, tea and mint and BMI

Item	Diagnosed (n=123)		Not Diagnosed (n=259)		P value
	N	%	N	%	
Consumption					
Mint	15	12.2%	38	14.7%	0.8
Coffee	51	41.5%	106	40.9%	
Both	57	46.3%	115	44.4%	
BMI					
Underweight	6	4.9%	7	2.7%	0.499
Normal	37	30.1%	83	32.0%	
Overweight	35	28.5%	86	33.2%	
Obese	45	36.6%	83	32.0%	

Table 3 Degree of coffee consumption in diagnosed and non-diagnosed cases

Item	Diagnosed (n=123)		Not Diagnosed (n=259)		P value
	N	%	N	%	
Arabic Coffee consumption					
No consumption	24	19.5%	44	17.0%	0.7
Less than 4 cups per week	22	17.9%	50	19.3%	
4 to 7 cups per week	13	10.6%	34	13.1%	
Less than 3 times per day	41	33.3%	83	32.0%	
3 to 5 times per day	22	17.9%	48	18.5%	
More than 5 times per day	1	0.8%	0	0.0%	
American Coffee consumption					
No consumption	47	38.2%	115	44.4%	0.09
Less than 4 cups per week	30	24.4%	41	15.8%	
4 to 7 cups per week	18	14.6%	27	10.4%	
Less than 3 times per day	18	14.6%	54	20.8%	
3 to 5 times per day	9	7.3%	22	8.5%	
More than 5 times per day	1	0.8%	0	0%	
Decaffeinated Coffee consumption					
No consumption	81	66.4%	189	73.0%	0.48
Less than 4 cups per week	21	17.2%	38	14.7%	
4 to 7 cups per week	5	4.1%	6	2.3%	
Less than 3 times per day	11	9.0%	18	6.9%	
3 to 5 times per day	3	2.5%	8	3.1%	
More than 5 times per day	1	0.8%	0	0.0%	
Time of coffee intake					
After meals	30	24.8%	48	18.8%	0.291
Before meals	40	33.1%	102	39.8%	
Undermined	51	42.1%	106	41.4%	

Table 4 Degree of tea consumption in diagnosed and non-diagnosed cases

Item	Diagnosed (n=123)		Not Diagnosed (n=259)		P value
	N	%	N	%	
Red tea consumption					
No consumption	22	18.0%	56	21.6%	0.53

Less than 4 cups per week	26	21.3%	53	20.5%	
4 to 7 cups per week	13	10.7%	37	14.3%	
Less than 3 times per day	38	31.1%	73	28.2%	
3 to 5 times per day	22	18.0%	40	15.4%	
More than 5 times per day	1	0.8%	0	0%	
Green tea consumption					
No consumption	64	52.0%	144	55.6%	0.27
Less than 4 cups per week	34	27.6%	51	19.7%	
4 to 7 cups per week	9	7.3%	20	7.7%	
Less than 3 times per day	12	9.8%	31	12.0%	
3 to 5 times per day	3	2.4%	13	5.0%	
More than 5 times per day	1	0.8%	0	0%	
Time of tea intake					
After meals	49	41.5%	95	37.5%	0.75
Before meals	3	2.5%	6	2.4%	
Undetermined	66	55.9%	152	60.1%	

Table 5 Degree of mint consumption in diagnosed and non-diagnosed cases

Item	Diagnosed (n=123)		Not Diagnosed (n=259)		P value
	N	%	N	%	
Mint drink consumption					
No consumption	49	41.2%	79	30.6%	0.16
Less than 4 cups per week	35	29.4%	83	32.2%	
4 to 7 cups per week	10	8.4%	30	11.6%	
Less than 3 times per day	21	17.6%	45	17.4%	
3 to 5 times per day	4	3.4%	21	8.1%	
Time of mint intake					
After meals	40	35.4%	91	36.3%	0.62
Before meals	2	1.8%	9	3.6%	
Undermined	71	62.8%	151	60.2%	

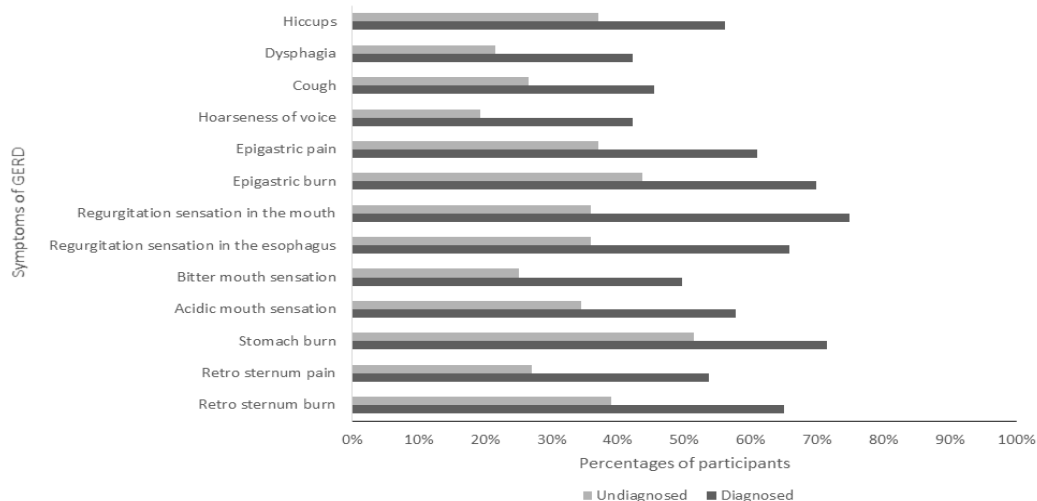


Figure 1 Bar chart showing the symptoms of GERD in the included population

4. DISCUSSION

Patients with GERD typically experience an uncomfortable sensation as a result of acidic stomach contents refluxing into the esophagus. Evidence from Saudi Arabia shows the high prevalence of GERD, being 23.47% and 45.4% in the West region and Riyadh, respectively, using the GERDQ questionnaire with a score of ≥ 8 (Alsuwat et al., 2018). Certain nutrients and dietary habits have been linked to this condition (Grigoleit & Grigoleit, 2005; Inamori et al., 2007; Zhang & Chen, 2013). There is evidence that coffee, tea and mint can decrease basal lower esophageal sphincter pressure, which can cause heartburn and gastro-esophageal reflux (Vakil et al., 2006; Cohen, 1980). It poses a substantial risk for developing adenocarcinoma and can have a significant impact on the quality of life of those who are affected (Johnson & Fennerty, 2004). However, the impact of these nutrients is not evidenced by all studies in the literature (Lien et al., 1995).

The purpose of the current study was to determine whether coffee, tea and mint consumption was linked to GERD and its symptoms. Our results show that rates and timing of coffee or tea consumption (whether caffeinated or decaffeinated) were comparable among identified and undiagnosed GERD patients, demonstrating that coffee has a neutral effect on the pathophysiology of this condition. This is in line with the meta-analysis by Kim et al., (2013), which analyzed the findings of 15 case-control studies, with an estimated odds ratio of 1.06. Additionally, the authors discovered no significant difference between groups that consumed coffee versus those who did not. Another meta-analysis by Chen et al., (2021) found no significant association between coffee consumption and GERD symptoms, with an estimated relative risk of 1.09 among 21 analyzed studies. Another meta-analysis by Cao et al., (2019) also demonstrated that tea consumption was not associated with GERD risk, based on 30 included studies, with an estimated odds ratio of 1.12.

It should be mentioned, nonetheless, that the included papers in this meta-analysis showed significant heterogeneity. For instance, prior research revealed that drinking coffee can exacerbate GERD symptoms by up to 40% (Park et al., 2014; Arivan & Deepanjali, 2018). Additionally, a prior study conducted in the US discovered that drinking at least six cups of both caffeinated and decaffeinated coffee was linked to a 23% and 48% worsening of GERD symptoms, respectively. The authors also demonstrated that when coffee was substituted for water, GERD symptoms returned to normal (Mehta et al., 2020). Another Taiwanese study revealed that drinking pure coffee or tea was not linked to erosive reflux disease or symptoms of the condition, regardless of whether sugar or milk was added (Wei et al., 2019).

On the other hand, prior research revealed a significant association between tea drinking and GERD symptoms (Arivan and Deepanjali, 2018; Gudjonsson et al., 1995; Bhatia et al., 2011; Chang et al., 1997). Further research revealed that the symptoms are unrelated to decaffeinated coffee (Wendl et al., 1994; Feldman & Barnett, 1995; Thomas et al., 1980; Festi et al., 2009), while caffeine is rarely associated (Lohsiriwat et al., 2006). These results may therefore imply that other elements in coffee may contribute to the symptoms of GERD. However, to relieve GERD symptoms, it has been recommended that coffee consumption be decreased (Boekema et al., 1999). Additionally, a prior study by Van Deventer et al., (1992) looked into the effects of several coffee varieties on GERD symptoms. They discovered that caffeinated ground coffee considerably enhanced acid secretion more so than decaffeinated ground coffee. The authors therefore proposed that depending on the type and evaluation method of coffee, acid production is often stimulated in varying degrees. We did, however, examine the consumption of various coffees and we found no correlation between the diagnosed and undiagnosed groups. The demographics of the patients could be one of several causes for this.

For instance, research indicates that GERD is also linked to other nutrients and eating patterns, such as high-fat and spicy foods, alcohol, wine, beer and soft drinks high in carbohydrates, high-salt diets, chocolate and citrus. Increased body mass index may also have a significant impact on the pathophysiology and symptoms of GERD (Surdea-Blaga et al., 2019). As a result, it has been proposed that losing weight might be a therapeutic option (Kaltenbach et al., 2006) however, our findings demonstrated an insignificant association between obesity and GERD diagnosis. This disparity could be explained by a variety of causes, such as differing demographics, concomitant morbidities, additional risk factors and the use of medications. Additionally, prior research demonstrated that obesity is neither a substantial risk factor for the development of GERD symptoms nor an independent risk factor (Elitsur et al., 2009; Anand and Katz, 2008; El-Serag et al., 2005). This suggests that additional factors could have an impact on this association.

We also found no significant differences between diagnosed and undiagnosed patients in this study regarding the frequency and timing of consuming mint drinks. On the other hand, a prior study by Jarosz and Taraszewska (2014) found that regular use of peppermint tea increases the chance of developing GERD. Mint may be a trigger for GERD patients, according to data from earlier studies (Newberry and Lynch, 2019). However, such an impact might account for a small portion of GERD patients. This has been reported by older studies that demonstrated the physiological effect of mint in inducing rapid esophageal sphincter relaxation. However, research has shown that only a small percentage of GERD patients often experience exacerbations (Benamouzig and

Airinei, 2007). Additionally, prior research on animals demonstrated that peppermint oil might calm the smooth muscles of the alimentary tract (Hills & Aaronson, 1991; Kahrilas, 2003). Additionally, Oliveria et al., (1999) noted that 8% of their heartburn patients complained after ingesting peppermint. On the other hand, prior research has shown that peppermint consumption was not linked to reflux episodes (Terry et al., 2000; Bulat et al., 1999). As a result, future investigations need to investigate this link more thoroughly.

The current study has some limitations that should be considered when interpreting the findings—first, the limited sample size and nature of data collection. Therefore, collected data might not be adequate representative of different population groups. Second, data collection was based on a survey, which collected data from patients based on self-reporting, which might represent a degree of bias. Third, GERD is usually impacted by different factors, such as age, physical activity, lifestyle and consumption of certain foods, which were not considered by the current study and could influence the results. Accordingly, future investigations are encouraged to overcome these limitations and enhance the current evidence.

5. CONCLUSION

In the current study, the most frequently reported symptoms in GERD patients were regurgitation sensation in the mouth, burning sensation in the stomach region, epigastric burning sensation and regurgitation sensation in the esophagus. In contrast, hoarseness of voice, dysphagia and cough were the least reported symptoms by diagnosed patients. We also found that neither the frequency nor timing of coffee, tea, or mint consumption is significantly associated with GERD. However, there are different factors to be considered before interpreting these results and future studies are required to address the current limitations.

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Author Contributions

Dr. Waleed Alhuzaim contributed as a principal investigator, Reema Muqrin contributed to divide tasks between other participants. Other co-authors obtained consent from participants, collected data needed and tasks were divided equally.

Informed consent

Written consent was obtained from all individual participants included in the study.

Ethical approval

The study was approved by from Imam Mohammed Bin Saud Islamic University Institutionalized Review Board Ethical approval number: (Ethical approval code: 137-2021).

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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