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The prevalence and risk factors of GERD in the Kingdom of Saudi Arabia and the impact of Covid-19 pandemic

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Gastroesophageal reflux disease (GERD) develops when there is a backflow of stomach contents, which causes upsetting symptoms and complications. The purpose of this study encompassed determining the rate and risk factors of GERD disease in the Kingdom of Saudi Arabia, before and during the Covid-19 pandemic, and to find the predominance and risk aspects of gastroesophageal reflux illness amongst Saudi society. A national cross-sectional study was carried out in the Kingdom of Saudi Arabia from April to September 2021 using a GERD validated questionnaire GerdQ. The questionnaire was self-administered online across all the provinces. The sample was collected randomly among adults who were 18 years old and above and suffering from GERD symptoms. The prevalence of GERD was 34.2% during the pandemic compared to 24.8% before the pandemic. The symptoms were more pronounced during the pandemic than before the pandemic. 41.2% of the population needed to take painkillers frequently compared to 26.0% before the pandemic. Among the potential risk associated with an increase in GERD was the increase in BMI. Coffee consumption reduced during the pandemic to 73.3% from 76.9% before the pandemic. Smoking was slightly more during the pandemic at 14.5% compared to 14.0% before the pandemic. During the pandemic, there was no substantial association between potential risk factors and predominance in GERD (all $p > 0.05$). In conclusion, GERD and its symptoms were more prevalent during the pandemic than before the pandemic. There was no significant connection between the prospective risk factors and the prevalence of GERD during the pandemic. The majority of people exposed to the potential risk factors reported GERD symptoms compared to those who are not exposed.

Keywords: GERD , Covid 19 , KSA , pandemic , Saudi , heartburn , smoking

INTRODUCTION

Gastroesophageal Reflux is considered a typical physiological process that is defined as the movement of gastric contents from the stomach into the esophagus (Vandenplas and Hassall, 2002). About half of all adults experience reflux symptoms at some point in time (Locke and Talley 1997). Gastroesophageal reflux disease (GERD) develops when there is a backflow of contents of the

stomach, which results in upsetting symptoms and complications (Vakil and Zanten, 2006). Acid regurgitation and heartburn are regarded to be the typical symptoms of GERD (Hunt et al., 2017). Serious problems have been reported to develop in patients with GERD, which include esophagitis and Barrett's esophagus, which predisposes to adenocarcinoma if left untreated (Vakil and Zanten, 2006).

Lifestyle factors such as a high body mass index (BMI), insufficiency in regards to physical activity (PA), dietary habit, smoking and alcohol intake, in addition to the frequent utilization of non-steroidal anti-inflammatory drugs (NSAIDs) like aspirin and sleeping positions, have all been linked with an increased risk for GERD (Nilsson et al., 2004). Dietary factors include increased consumption of fatty food and some types of drinks like tea, coffee, and carbonated drinks (Alkhathami et al., 2017); (Arivan and Deepanjali, 2018).

It has been suggested that eating patterns can also contribute to GERD, especially in relation to sleep, including food acidity, portion size, and meal timing (Clarrett and Hachem, 2018).

GERD can interfere with patients' quality of life, affect work productivity, and cause sleep disturbances (Wiklund, 2004) (Wiklund And Talley, 2003) (Ofman et al., 2002).

Moreover, it has been shown to have significant economic consequences (DeVault and Castell, 2005).

Diagnosis of GERD depends on clinical symptoms and the response to treatment. The symptoms vary from mild to severe. However, the usual complaint regarding mild and moderate GERD is heartburn. If the heartburn improves while taking PPI (proton pump inhibitors), the diagnosis is confirmed most of the time. However, for severe GERD, we may need to do further investigations like barium radiographs and esophageal reflux monitoring (Badillo and Francis, 2014) (Lacy et al., 2010).

GERD symptoms usually improve with PPI once or twice a day as the first line of treatment. However, antacids, prokinetics, H2RA, mucoprotective drugs can also be used. For more severe symptoms, PPI can be prescribed in combination with prokinetic drugs. However, some cases may need more invasive treatment due to the severity and failure to respond to medication; it may necessitate surgical procedures (Badillo and Francis, 2014).

Several researches have focused on the possible association between obesity and GERD, where the results developing from these explorations have revealed that obesity is connected with an elevated threat of both GERD complication and symptoms, for instance, erosive esophagitis, BE, and esophageal adenocarcinoma in comparison to people with an average BMI (Hampel et al., 2005). There was also, to a certain degree, a dose-dependent association between BMI and these GERD-related conditions and, additionally, a latest big cohort emphasizing on adult females, that informed a probable dose-response elevation in the threat of GERD with an elevated BMI even if within the average range (Jacobson et al., 2006) (Barak et al., 2002) (Maddox et al., 1989) (O'Brien, 1980) (Orlando, 2001).

The predominance of episodic heartburn amid the adult populace in Europe and the United States was found to range from around 15% to 20% (Nebel et al., 1976). Genetics can play a significant role in the symptoms and complications of gastroesophageal reflux illness (Jochem et al., 1992). A small number of people with GERD visit gastroenterology clinics since the availability of antacid

medications over the counter, making the clinical-based studies an unreliable tool for estimating the total number of patients with gastroesophageal reflux disease (Graham and Smith, 1983). The prevalence of GERD among southern Indian residents was 22.2% (Wang et al., 2016). A study that was conducted in Moscow found that the risk factors of GERD among the participants were smoking, alcohol consumption, coffee consumption, family history, female gender, old individuals, and stressed participants (Bor et al., 2006).

This study aims to determine the incidence of GERD disease in the Kingdom of Saudi Arabia before and during the Covid-19 pandemic and to establish the predominance and risk factors of gastroesophageal reflux disease among Saudi society. The findings of this study will help in increasing the awareness of the risk factors of GERD and therefore decreasing the incidence of GERD.

RESEARCH METHODOLOGY

Study Design

Set to determine the incidence of GERD disease in the Kingdom of Saudi Arabia, before and during the Covid-19 pandemic and to establish the predominance and risk aspects of gastroesophageal reflux disease among Saudi society. A cross-section study was used during the 4 months of the study.

Study Setting

The study targeted all the main regions: Central, Eastern, Northern, Western and Southern.

Sample Size

Approximately more than 415 patients were enrolled to participate in the study, including patients from different regions in the kingdom of Saudi Arabia.

Sampling techniques

The sample was composed randomly throughout the period from April to July 2021. Through a validated GERD questionnaire (GerdQ). The study examined the sample of the population across all the provinces in Saudi. A sample of 415 participants was approved for the study.

Study subjects

Inclusion criteria

- Adult patients who have reached the age of 18 years and above.
- Patients diagnosed with gastroesophageal reflux disease.

Table 1. Demographic Characteristics

	N	%
Gender		
Females	286	68.9%
Males	129	31.1%
Age Group		
18-25	155	37.3%
26-30	48	11.6%
31-40	115	27.7%
41--40	63	15.2%
50 years & Above	34	8.2%
Marital Status		
Married	209	50.40%
Single	206	49.60%
Region		
Central Province	329	79.3%
Eastern Province	32	7.7%
Northern Province	14	3.4%
Southern Province	14	3.4%
Western Province	26	6.3%
Education		
Bachelor's/Postgraduate		
Studies	250	60.2%
High School/Diploma	147	35.4%
Primary/Intermediate	5	3.6%
Illiterate	3	0.7%
Work		
Do not work	118	28.4%
Employee	165	39.8%
Free business	15	3.6%
Student	117	28.2%
Total	415	100%

Exclusion criteria

- Any individual who did not have gastroesophageal reflux disease.
- GERD Patients who did not give their consent.

Data collection methods

The data was collected by using an online self-administered questionnaire that was randomly sent to the participants. The questionnaire was validated via a pilot study on 21 participants to identify any issues in the questionnaire; their answers were excluded from the study. The questionnaire assessed the GERD's threat factors in Saudi Arabia and the impact of covid19 on GERD's symptoms. For starters, the questionnaire included the following demographic items (age, gender, level of education, years of experience, area of expertise, private or public institution, and whether they have contracted COVID-19 or not. The other part included the participants' weight in Kgs and

height in meters which was used to calculate the body mass index by dividing weight and height in meters (Kgs/m). The other set of questions covered the potential risk factors and the symptoms of GERD. The predominance of GERD was calculated by taking the median of the reported symptoms both before and during the pandemic.

Data analysis plan

The data was first entered in excel and then transferred to statistical package IBM SPSS version 25.0 to be organized, tabulated, and analysed. Demographic and socio-status data was tabulated and expressed as frequency and percentage of the total participants. Bar graphs and pie charts were then used to illustrate the frequency distribution of the different variables to highlight the predominance of GERD, symptoms, and prospective risk aspects. Chi-square tests were used to test the significance of the association of the stated variables through crosstabulation. Statistical significance will be defined as p-values of less than 0.05.

Ethical considerations

The study sought approval from the institutional review board (IRB) of Imam Mohammad Ibn Saud Islamic University. All participants were aware of the study objective, and their consent was taken. The study does not require the participants to reveal their identity, and all responses will remain confidential. Also, the questionnaires administered were reviewed by the relevant experts before being administered to the participants. The data collected was used under strict confidentiality and was only used for the research purpose.

RESULTS AND FINDINGS

Out of the 415 participants, females were 68.9%, and males were 31.1% as shown in Table1. With regards to age group, the majority of the participants were between the ages of 18-25 years at 37.3%, followed by those between the ages of 31-40 years at 27.7%, 41-40 years, 15.2%, 26-30 years 11.6% and 50 years and above 8.2%. Based on marital or social status, those who were married accounted for 50.40%, and 49.6% were single. Most of the participants came from the Central Province, accounting for 79.3% of the total participants, while the rest, 7.7%, 3.4%, 3.4%, and 6.3%, came from Eastern, Northern, Southern and Western provinces, respectively. In regards to the level of education, only 0.7% were illiterate, 3.6% had reached Primary or intermediate level, 35.4% had a High school Diploma while the majority had a Bachelor's or Postgraduate degree at 60.2%. On the basis of their occupation, 28.4% do not work, 39.8% are employed, 3.6% are in free business and 28.2% are students.

In terms of their different scales of body mass index, the participants were categorized into four subgroups,

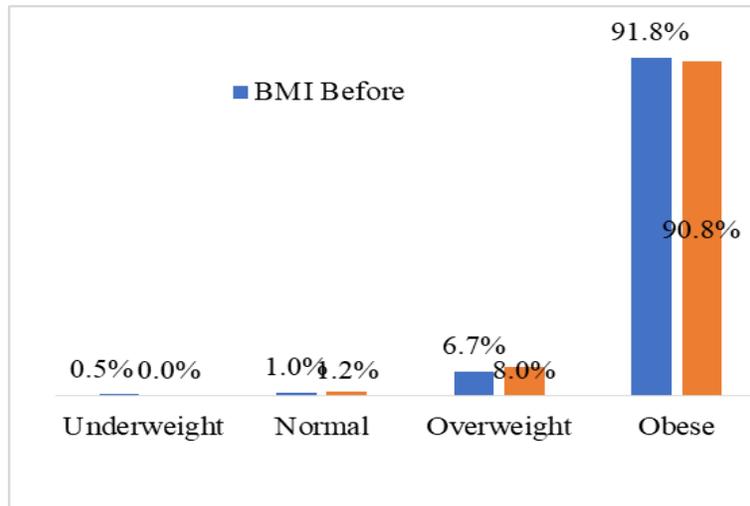


Figure 1: BMI Before and during Pandemic

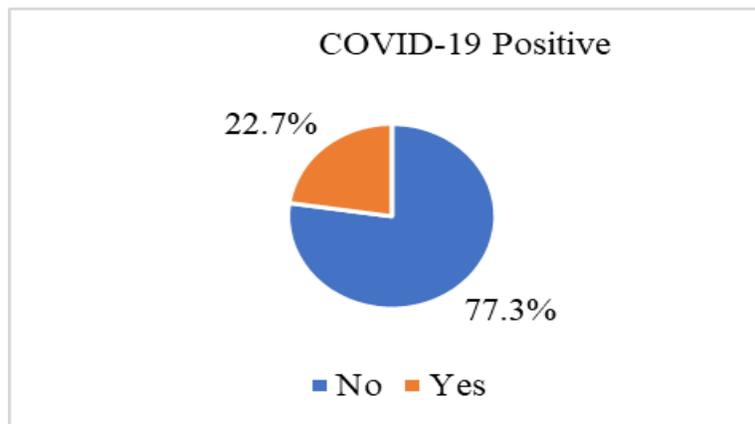


Figure 2: Tested positive for COVID-19

underweight BMI <18.5, normal BMI= 18.6-25.0, overweight BMI= 25.1-29.9, and obese BMI= ≥30. BMI was determined by the weight in kilograms divided by height in meters (kg/m²). According to Figure 1, the majority of the participants were obese before the pandemic accounting for 91.8%; these dropped slightly during the pandemic to 90.8%. Overweight participants before the pandemic were 6.7%, and during the pandemic, 8.0%. Normal and underweight were the minority accounting for 0.5% and 1.0% before the pandemic and 1.2% during the pandemic.

As seen in Figure 2, Out of the 415 participants, 22.7% tested positive for COVID-19, while 77.3% tested negative for COVID-19.

Symptoms and the rate of GERD before and during the pandemic

The study surveyed three items as illustrated in Figure 3 that were to define the presence of GERD before and during

the pandemic. The symptoms were burning sensation or reflux in the chest, needed to take painkillers frequently, and needed to take anti-reflux medications frequently. A median score from the Yes/No Likert scale was computed. Before the pandemic, as in Table 2, 40% of the participants reported having a burning sensation or influx in the chest compared to 49.6% of the participants during the pandemic. 26% needed to take painkillers frequently before compared to 41.2% during the pandemic, and 18.8% needed to take anti-reflux medications frequently before the pandemic compared to 34.2% during. The prevalence of GERD before the pandemic was 24.8% compared to 34.2% during the pandemic.

Potential Risk Factors Associated with the rate of GERD.

The study looked at three habitual activities that are interrelated with the predominance of GERD before and during the pandemic. The participants were assessed

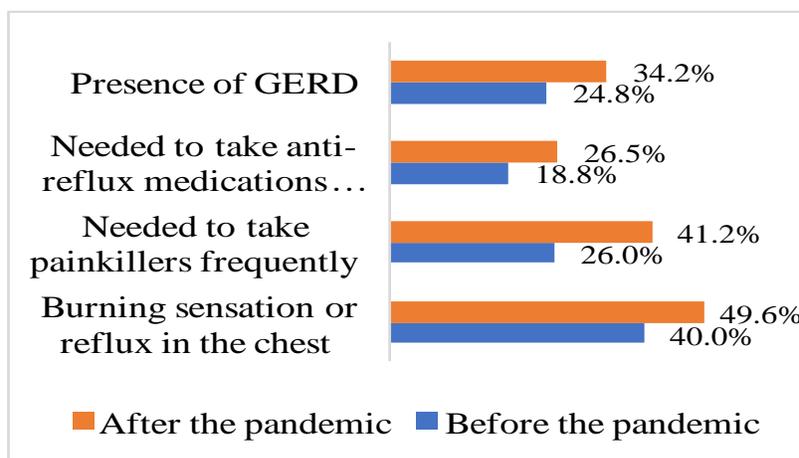


Figure 3: Symptoms and rate of GERD before and during the pandemic

Table 2. Symptoms and rate of GERD before and during the pandemic

	Before the pandemic	During the pandemic
Burning sensation or reflux in the chest	40.0%	49.6%
Needed to take painkillers frequently	26.0%	41.2%
Needed to take anti-reflux medications frequently	18.8%	26.5%
Presence of Gerd	24.8%	34.2%

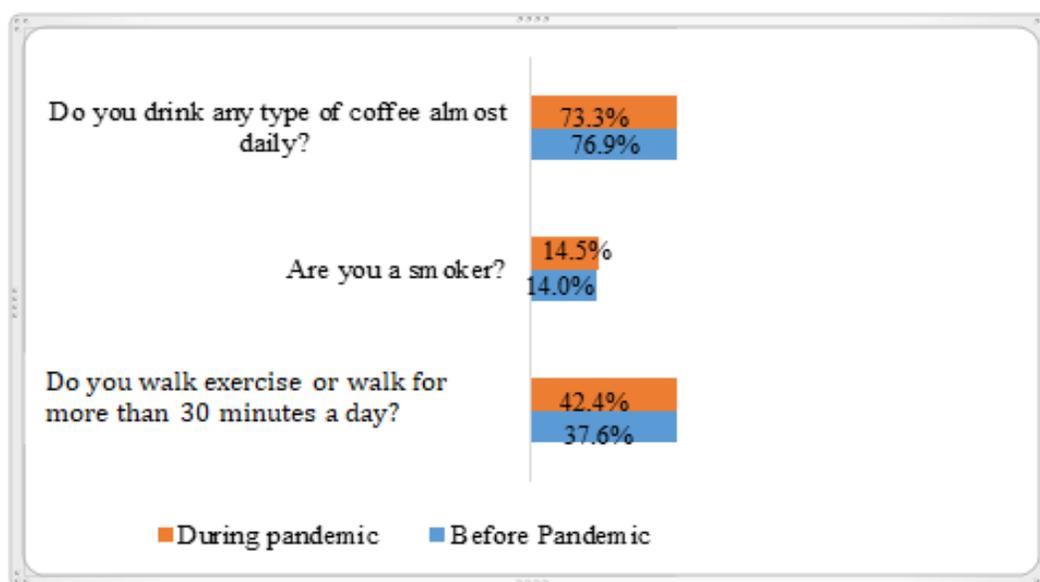


Figure 4: Potential Risk Factors Associated with the rate of GERD

whether they exercise or walk daily, smoke, or drink any type of coffee.

During the pandemic, Figure 4 shows 73.3% of the participants drank any type of coffee daily compared to 76.9% before the pandemic, while 14.5% smoked during the pandemic and 14% before the pandemic. More people

exercised during the pandemic (42.4%) compared to before the pandemic (37.6%).

Association of COVID-19 and rate of GERD

Table 3 shows the analysis between testing positive for

Table 3. Tested positive for COVID-19 cross the rate of GERD during the pandemic

		Rate of GERD 2 during the pandemic		P-Value
		Yes	No	
Tested positive for COVID-19?	No	31.8%	68.2%	0.053
	Yes	42.6%	57.4%	

Table 4. Potential risk factors associated with the rate of GERD before the pandemic

		GERD rate before the pandemic		P-Value
		Yes	No	
BMI before pandemic	Underweight	0.00%	100.00%	0.007
	Normal	0.00%	100.00%	
	Overweight	0.00%	100.00%	
	Obese	27.00%	73.00%	
Exercise or walk for more than 30 minutes a day	No	24.30%	75.70%	0.764
	Yes	25.60%	74.40%	
Are you a smoker?	No	23.50%	76.50%	0.131
	Yes	32.80%	67.20%	
Drink any type of coffee almost daily	No	20.80%	79.20%	0.302
	Yes	26.00%	74.00%	

COVID-19 and prevalence of GERD during the pandemic exhibited that there was no substantial correlation between COVID-19 and prevalence in GERD ($p=0.053>0.05$). From the analysis, those who tested negative for COVID-19 but reported symptoms of GERD were 31.8%, while 68.2% did not have the presence of GERD. On the other hand, those who tested positive for COVID-19 and reported symptoms of GERD were 42.6%, while 57.4% of those who tested positive did not have GERD symptoms.

Other potential risk factors associated with rate of GERD

A crosstab analysis between the potential risk factors before the pandemic and the prevalence of GERD before the pandemic showed that there was a significant association between BMI and prevalence in GERD ($p=0.007<0.05$). 27% of the participants who were considered obese reported having symptoms of GERD as seen in Table 4, while those who were overweight, normal, and underweight did not report any symptoms of GERD. There was no significant association between exercising, smoking, and drinking coffee and the prevalence of GERD before the pandemic (all $p>0.05$). Despite these, 26% of those who drink any type of coffee reported having symptoms of GERD compared to 20.8% who did not drink. The same was reported with smoking, as 32.8% of those who smoked reported to have GERD compared to 23.5% who did not smoke.

The cross-analysis in Table 5 shows the probable risk factors during the pandemic and the prevalence of GERD during the pandemic. Furthermore, there was no significant

correlation between the risk factors and GERD (all $p>0.05$). During the pandemic, however, 93% of those with GERD symptoms were obese, while only 7% were overweight. Furthermore, 35.0% of smokers reported having GERD, compared to 34.1% of nonsmokers.

DISCUSSION

The purpose of this study is to determine the incidence of GERD disease in the Kingdom of Saudi Arabia, before and during the Covid-19 pandemic, and to find the predominance and risk factors of gastroesophageal reflux disease among Saudi society. The study was conducted among 415 participants who reside in the Saudi provinces. The study found the prevalence of GERD during the pandemic to be more compared to before the pandemic. The majority of the participants were required to take pain killer during the pandemic than before, to take anti-reflux, and had a burning sensation and a reflux action on their chest. Only a minority of the participants tested for COVID-19, and there was no substantial correlation between COVID-19 and GERD. This study agrees with the study of Ianiro et al.(2020) where there were increased cases of gastrointestinal symptoms among COVID-19 patients.

The study assessed different scales of body mass index of the participants before and during the pandemic. There was a slight decrease in the number of people who were considered obese during the pandemic as compared to before the pandemic and a slight increase in participants with normal BMI and this could be attributed to low

Table 5. Potential risk factors associated with the rate of GERD during the pandemic

		GERD rate during the pandemic		P-Value
		Yes	No	
BMI during pandemic	Underweight	0.0%	0.0%	0.231
	Normal	0.0%	100.0%	
	Overweight	7.0%	69.7%	
	Obese	93.0%	65.0%	
Exercise or walk for more than 30 minutes a day	No	33.1%	66.9%	0.561
	Yes	35.8%	64.2%	
Are you a smoker?	No	34.1%	65.9%	0.890
	Yes	35.0%	65.0%	
Drink any type of coffee almost daily	No	34.2%	65.8%	0.996
	Yes	34.2%	65.8%	

physical activities and lockdown during the pandemic. However, there was a slight increase in the overweight participants during the pandemic compared to before the pandemic. The study also found a substantial association between BMI before the pandemic and the prevalence of GERD before the pandemic. Although the association was not significant during the pandemic, the majority of those who reported symptoms of GERD were considered to be obese. Obesity affects the anatomy and physiology of the gastroesophageal which may explain the association between GERD and obese individuals (Vaughan et al., 1995). These findings are in agreement with the study (Wang et al., 2016), (Ianiro et al., 2020). where there is a positive correlation between elevated BMI and the threat of getting GERD. Obesity is linked with increasing cases of GERD due to increasing esophageal acid exposure (Hampel et al., 2005).

In terms of lifestyle activities exposure, although there was an increase in the population of smokers, the study found that there was an incomparable difference between those who smoked during the pandemic and those who smoked before. Further, the study found that there was a substantial connection between those who smoked and the pervasiveness of GERD before and during the pandemic. This finding agrees with the study (El-Serag et al., 2007) as there was no correlation between cigarette smoking and the threat of GERD. These findings are different compared to other studies done in Spain, Sweden, and the United States (Locke and Talley, 1999) (Lagergren and Bergstrom, 1999) (Diaz-Rubio and Moreno-Elola-Olaso, 2004) where cigarette smoking is considered as one of the risk factors of GERD. These are in agreement with the current study as the majority of those who smoked before and during the pandemic reported to have GERD symptoms.

The study found that there was an increased rate of incidence of GERD in the population who Exercise or walk for more than 30 minutes a day during the pandemic, and in the population with low physical activity. In the population with low physical activity, the increased incidence of GERD

could be attributed to an increase in BMI, while the increase in rate of GERD in the population with high physical activity could be attributed to other known risk factors of GERD.

The present study established no substantial correlation between taking any type of coffee daily and symptoms of GERD. This finding agrees with the study (Lagergren and Bergstrom, 1999) meta-analysis revealed that there was no substantial connection between intake of coffee and GERD. Despite these findings, results from the current study showed a slight majority of those who drank any type of coffee daily reported symptoms of GERD compared to those who did not consume coffee before the pandemic. Also, the majority of people drank coffee daily before the pandemic compared to during the pandemic. These findings agree with the study of (Diaz-Rubio and Moreno-Elola-Olaso, 2004) where the consumption of tea and coffee had no significant association with GERD even though consumers reported symptoms of GERD.

In conclusion, GERD and its symptoms were more prevalent during the pandemic than before. The results of this study revealed a positive correlation between GERD and obesity. There was no significant correlation between the probable risk aspects and the prevalence of GERD during the pandemic. Despite this, the majority of people exposed to the potential risk factors reported GERD symptoms compared to those who are not exposed. This could be attributed to the potential lifestyle risks such as drinking any type of coffee daily, smoking, and exercising, which was more during the pandemic compared to before the pandemic. The study suggests increasing the awareness of GERD symptoms and the prospective risk factors correlated with the disease. It also recommends a change in lifestyle activities such as drinking less coffee, avoiding smoking, and increase exercises to reduce incidences of GERD. In this regard, the research recommends further studies to examine whether or not there is a significance awareness of GERD, its related symptoms and ways of managing the symptoms among the Saudi populations. A larger multiregional sample would be advantageous to

expand the knowledge of the pandemic effect on the risk factors of GERD, this expanded study can be conducted using randomized controlled study. Further research is needed to assess and confirm the result of this paper. Through this study, stakeholders would be able to identify areas that need focus in training and awareness campaigns.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this manuscript.

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