Association between Gastroesophageal Reflux Disease symptoms and dietary factors among adult males and females in District Mardan

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ABSTRACT:

Gastroesophageal reflux disease (GERD) refers to the symptoms and complications caused by the back flow of gastric content into the esophagus, mouth (including the throat). The purpose of the present cross-sectional study was to determine the association between dietary factors and Gastroesophageal reflux disease symptoms among adult males and females in District Mardan. Data was collected from Mardan Medical Complex and Shah medical complex located in district Mardan. Data was collected through a well-structured food frequency questionnaire, which included information about physical activity, height, weight, basal metabolic index, and diet history of the individual. Results of the study showed that majority of the foods such as fast foods, soft drinks, spicy foods, fried foods, chicken and poultry, and meat consumption showed a high significance with that of GERD symptoms. Foods such as vegetables, fruits showed a negative significance with incidence of GERD symptoms. Similarly consumption of roti, tea, and coffee showed no significance with that of GERD symptoms among the individuals.

Keywords: GERD, Food frequency questionnaire, BMI

INTRODUCTION:

Gastroesophageal reflux disease (GERD) refers to the symptoms and complications caused by the back flow of gastric content into the oesophagus, mouth (including the throat) (Sharma *et al*., 2022). Gastro-esophageal reflux disease (GERD) is a common gastrointestinal disorder that occurs when backflow of the gastric contents into the esophagus results in troublesome symptoms (Marhabi *et al*., 2022). Gastroesophageal reflux disease (GERD) is one of the most common diseases of the upper gastrointestinal tract which develops as a result of the reflux of gastric contents into the esophagus (Taraszewska, 2021). Gastro-esophageal reflux disease occurs when gastric contents flow back into the esophagus (Wang *et al*., 2021). Gastroesophageal reflux disease (GERD) is a type of chronic gastrointestinal disease in which heartburn and regurgitation are the main clinical manifestations and esophageal and pulmonary symptoms may occur (Zhang *et al*., 2021).GERD is a multifactorial disease with a number of contributing factors including reduced lower esophageal sphincter (LES) pressure, frequent transient lower esophageal sphincter relaxation(TLESR), acid pocket, hiatal hernia, impaired esophageal clearance, and increased abdominal pressure. In addition to psychological factors , Meals are the major aggravating factor for GERD symptoms (Marhabi *et al*., 2022). GERD is a disease constituting symptoms or complications developed due to reflux of stomach contents back into the esophagus (Domakunti & Lamture, 2022). Lower esophageal sphincter (LES) dysfunction is the leading cause of gastroesophageal reflux (Chhabra & Ingole, 2022). A major role in the pathogenesis of GERD is the abnormal incidence of reflux, which contains bile, pepsin, acid, and duodenal contents coming into contactwith esophageal mucosa resulting in troublesome symptoms (Boulton & Dettmar, 2022). GERD is multifactorial disorder and lifestyle, and environment may contribute to its development (Vasmehjani et al., 2022).

Characteristic symptoms commonly found and suggestive of GERD are acid regurgitation and heartburn (Domakunti & Lamture, 2022). GERD is a common chronic and relapsing condition characterized by the presence of troubling symptoms caused by the abnormal reflux of stomach contents into the esophagus (Polese et al., 2022). GERD causes troublesome symptoms or complications such as acid regurgitation, heartburn, and chronic cough (Boulton & Dettmar, 2022). Gastroesophageal reflux disease (GERD) is a common gastrointestinal illness with symptoms of heartburn, chest pain, and regurgitation (Guadagnoli et al., 2022). The symptoms of

GERD include Heartburn that usually happens 30 to 60 minutes after eating, trouble swallowing, chest pain, cough, sore throat, and a feeling of lump in the throat (Challoub & Yahia, 2022).

Body mass index (BMI), family history, energy drinks, and fried meals are considered to be statistically significant risk variables for GERD (Bakri & Hemdi, 2022). Many risk factors have been associated with GERD, including consumption of alcohol or analgesics, family history, nutritional factors, high body mass index (BMI), lack of physical activities, and cigarette smoking (Otayf *et al*., 2022). Epidemiological studies have revealed excess adiposity, diabetes, smoking, alcohol consumption , and coffee and caffeine consumption as possible risk factors for GERD(Yuan & Larsson, 2022). Stress, coffee use, spicy foods, long-term use of NSAIDs, smoking, and fatty meals were identified as risk factors for GERD (Anwar *et al*., 2022). Habits associated risk factors for GERD were smoking, high-salt intake, poor consumption of herbs, and hand hygiene (Zein et al., 2022).

Advancements in the quality of life, such as decreased physical affliction, greater vigour, increased physical and social role, and mental well-being, have been linked to the effective treatment of GERD symptoms. Similarly consumption of fiber-rich diets often proves to be advantageous for the prevention and management of GERD (Chhabra & Ingole, 2022). After failure of lifestyle changes, acid-lowering drugs have played important role in the management of gastroesophageal reflux disease (GERD) (Scarpignato Carmelo, 2022). Lifestyle modifications, such as raising the head end of the bed and avoiding meals 2–3 h before bedtime, can be very effective for the treatment of GERD (Schuitenmaker et al., 2022). Diet might play an important role in the development and management of GERD (Vasmehjani *et al*., 2022). The multifactorial pathology of GERD renders a comprehensive and individualized treatment approach that consists of medication, lifestyle modifications and, in severe cases, surgery (Guadagnoli *et al*., 2022).

The incidence of GERD is high in the general population, it is estimated to affect up to 20% of the population worldwide. It is also estimated that 40% of the USA population experience GERD symptoms with 10–20% of people being affected on a weekly basis. A reported prevalence from 2017 in adults within western populations was at 30%. In Asia there is an increase in smoking. Studies in Japan reported cigarette smoking as one of the main causes of GERD. A recent study has estimated 7.8% of the population in East Asia are diagnosed with GERD. China has around 5.2% of its population experiencing heartburn and/or regurgitation on a weekly basis (Boulton & Dettmar, 2022). In Pakistan, prevalence of GERD in general population was reported to be 24-

26.6% (Nisar et al., 2020).

MATERIALS AND METHODS:

STUDY LOCATION:

This cross-sectional study was conducted in Government hospital Mardan Medical complex and Shah medical complex located in district Mardan, under the strict supervision of medical superintendents of the respective hospitals.

SAMPLE SIZE:

The sample size included in the study was 100 and data was collected from February 2022 to July 2022. Data was collected from different patients including males and females experiencing typical symptoms of Gastroesophageal reflux disease (GERD). GERD was defined as the presence of heartburn and regurgitation twice a week for two or three months.

DATA COLLECTION:

The data for the study was collected using a validated food frequency questionnaire approved by the supervisor of the project. The questionnaire was designed to collect information about the patient's general data including age, sex, height and weight, occupation, clinical manifestations, signs and symptoms, physical activity, and dietary habits.

ANTHROPOMETRIC DATA:

Anthropometric data including weight and height was measured by using standard procedures.

HEIGHT:

Height of an individual was measured by using an instrument known as stadiometer.

STADIOMETER:

A stadiometer is an instrument used to measure human height. It is constructed out of a ruler and a sliding horizontal headpiece which is adjusted to rest on the top of the head. The subject whose height is to be measured will be asked to remove his/her shoes and socks, stand straight over the stadiometer and it will be ensured that they are standing perfectly straight with their head and back forward and against the wall, directly under the drop-down measuring device. The nose and ears

of the individual will be parallel to the floor and after ensuring that the individual is all set for his/her height measurement the horizontal head piece will be gently placed on the top of the head and height will be measured.

WEIGHT:

The weight of an individual was measured using a weighing scale or weight machine.

WEIGHT MACHINE:

Weight machine or weighing scale is an instrument used to measure weight or mass. It is also known as mass scale, balance scale or weight balance. The weight of an individual to be measure on the weighing scale will be asked to remove any heavy extra clothing, shoes, and accessories in order to avoid extra weight and then person the individual will be asked to stand still on the weight machine and his/her weight will be recorded in kgs.

BODY MASS INDEX (BMI) :

BMI was calculated according to the criteria approved by WHO, which is calculated by taking weight in kilograms divided by height in meter square (kg/m2). The BMI of less than 18kg/m2 was considered as underweight, BMI ranging from 18.5-24.9 kg/m2 was considered as normal while BMI ranging from 25.0-29.9 kg/m2 was considered as overweight. BMI of greater than 30kg/m2 was considered as Obese. (WHO, 1998).

RESULTS AND DISCUSSION:

BURNING SENSATION AND FRIED FOODS

Consumption of fried foods had a strong significance with that of causing heart burn in an individual as its p value was less than 0.05

Table 4.1 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.967[a]	12	.031
Likelihood Ratio	14.945	12	.024
Linear-by-linear Association	.875	1	
N of valid cases	100		.350

Kubo et al. (2014), Asl et al. (2015), Kim et al. (2019), and Atta et al. (2019) found that consumption of high fat diet such as fried foods are associated with increased risk of acid reflux. Al rashed et al. (2018), found a significant association between consumption of fast foods & fried foods and increased risk for GERD symptoms. Similarly the results of the present study also showed a positive significance of chest burning which is a symptom of GERD with that of intake of fast foods.

BURNING SENSATION AND SOFTDRINKS

Consumption of soft drinks showed a high significance with burning sensation felt by an individual as its P value came out to be less than 0.01

Table 4.2 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.141[a]	9	.001
Likelihood Ratio	6.031	9	.003
Linear-by-Linear Association	.014	1	.010
N of Valid Cases	100		

Kubo et al. (2014), Asl et al. (2015), Alkhathami et al. (2017), Atta et al. (2019), and Kariri et al.(2020) found a significant association between acid reflux and consumption of carbonated beverages, including soda, and soft drinks. Similar findings of the current study showed a positive association of acid reflux with that of soft drinks intake.

BURNING SENSATION AND SPICY FOODS

Spicy foods consumption among individuals showed a strong significance with that of burning sensation because its P value is less than 0.05.

Table 4.3 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.294[a]	15	.030
Likelihood Ratio	16.647	15	.030
Linear-by-Linear Association	.475	1	.040
N of Valid Cases	100		

According to the study conducted by Asl et al. (2015), Alkhathami et al., (2017) and Kariri et al., (2020) consumption of spicy foods was associated with an increased risk of GERD symptoms. Similarly in another study conducted by Shah et al., (2018), consumption of spicy foods was associated with an increased risk of GERD symptoms. The present study also showed similar

results with a p-value of less than 0.05 that revealed a strong significance of GERD symptoms i.e. heartburn with that of spicy foods intake.

BURNING SENSATION AND FASTFOODS

Fast foods consumption showed a very high significance with that of burning sensation among individuals as its P-value was less than 0.01

Table 4.4 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.379[a]	9	.001
Likelihood Ratio	5.611	9	.002
Linear-by-Linear Association	2.923	1	.004
N of Valid Cases	100		

Fast food is a possible risk factor for causing Gastroesophageal reflux disease as discussed by Alkhathami et al. (2017), and Kariri et al. (2020). Similarly a study carried out by Al rashed et al. (2018), found a significant association between consumption of fast foods and increased risk for GERD symptoms. Similarly the results of the present study also showed a positive significance of chest burning which is a symptom of GERD with that of intake of fast foods.

REGURGITATION AND FAST FOODS

Fast foods consumption showed strong significance with consumption of fast foods among individuals as its P-value is less than 0.05.

Table 4.5 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.003[a]	12	.010
Likelihood Ratio	15.419	12	.020
Linear-by-Linear Association	.175	1	.676
N of Valid Cases	100		

Al rashed et al. (2018), found a significant association between consumption of fast foods and increased risk for GERD symptoms. Similarly the results of the present study also showed a positive significance of chest burning which is a symptom of GERD with that of intake of fast foods.

REGURGITATION AND FRIED FOODS

Fried foods consumption showed a very high significant relation with that of regurgitation among individuals as its P-value is less 0.01.

Table 4.6 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.738[a]	16	.004
Likelihood Ratio	10.822	16	.002
Linear-by-Linear Association	.992	1	.003
N of Valid Cases	100		

Kubo et al. (2014), Asl et al. (2015), Kim et al. (2019), and Atta et al. (2019) found that consumption of high fat diet such as fried foods are associated with increased risk of acid reflux. Al rashed et al. (2018), found a significant association between consumption of fast foods & fried foods and increased risk for GERD symptoms. Similarly the results of the present study also showed a positive significance of chest burning which is a symptom of GERD with that of intake of fast foods

REGURGITATION AND CHICKEN AND POULTRY

Chicken and poultry consumption by an individual had a strong significance with that of regurgitation symptoms felt by an individual as its p value results were less than 0.05

Table 4.7 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.192[a]	16	.017
Likelihood Ratio	32.403	16	.009
Linear-by-Linear Association	.970	1	.325
N of Valid Cases	100		

Study conducted by Wang et al. (2021) found out that consumption of chicken and other poultry was significantly related with an increased risk of GERD symptoms. Another study conducted by Gong et al. (2019), also found significant association of chicken and other poultry (eggs, fish etc.) with that of increased risk of GERD symptoms among individuals. Similar findings of our study showed that consumption of chicken and poultry caused an increase problem of regurgitation amongthe GERD patients.

REGURGITATION AND MEAT INTAKE

Consumption of mutton showed a very high significance with that of regurgitation symptoms among individuals as its P-value resulted in less than 0.01

Table 4.8 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	35.445[a]	16	.003
Likelihood Ratio	31.736	16	.011
Linear-by-Linear Association	1.639	1	.200
N of Valid Cases	100		

According to a research conducted by Gong et al. (2019), consumption of meat was positively associated with causing GERD symptoms. Similarly a study conducted by Wu et al., (2013) among Chinese population showed that intake of meat was associated with increased risk of GERD. Similar findings of our study showed that meat consumption was significantly related to exacerbating symptoms of GERD among individuals.

REGURGITATION AND FRUITS

Consumption of fruits among the individuals had a strong non-significant relation with that of regurgitation symptoms as its p-value came out to be more than 0.05

Table 4.9 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.767[a]	12	.549
Likelihood Ratio	12.855	12	.380
Linear-by-Linear Association	.000	1	1.000
N of Valid Cases	100		

A study performed by Kubo et al. (2014) showed that frequent consumption of fruits and fruit juices had a preventive role in lowering GERD symptoms among individuals. Wu et al. (2013), and Badillo and Francis, 2014) also carried a study whose results showed a protective effect of fruits in reducing incidence of GERD symptoms among individuals. A similar study conducted by Wang et al. (2021), showed that consumption of fruits was associated with reduced risk of acid reflux among study participants. The present study also reveal the same results that an increased intake of fruits was associated with reduced risk of GERD symptoms.

REGURGITATION AND VEGETABLES

Vegetables consumption by the individuals showed a strong non-significance with symptoms of regurgitation as p-value was estimated to be greater than 0.05

Table 4.10 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.033[a]	16	.596
Likelihood Ratio	15.555	16	.484
Linear-by-Linear Association	.001	1	.972
N of Valid Cases	100		

Winberg et al., (2012) performed a research which showed that a diet rich in vegetables was associated with lower risk of reflux disease among individuals. Also according to a study conducted by Heidarzadeh et al., (2021), revealed that high consumption of vegetables was negatively associated with risk of GERD. Same findings of our study showed that a diet rich in vegetables was negatively related with increased risk of the reflux disease among participants

DISTURBED DIET AND VEGETABLE CONSUMPTION

Diet disturbance among the individuals showed no significance with consumption of vegetables as p-value was greater than 0.05

Table 4.11 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.105[a]	4	.893
Likelihood Ratio	1.935	4	.748
Linear-by-Linear Association	.040	1	.841
N of Valid Cases	100		

According to studies performed Wu et al. (2013), vegetables consumption was associated with reduced risk of reflux symptoms. Winberg et al., (2012), also performed a research which showed that a diet rich in vegetables was associated with lower risk of reflux disease among individuals. Also according to a study conducted by Heidarzadeh et al., (2021), revealed that high consumption of vegetables was negatively associated with risk of GERD. Same findings of our study showed that a diet rich in vegetables was negatively related with increased risk of the reflux disease among participants

DIET DISTURBANCE AND ROTI CONSUMPTION

Roti consumption among the study sample showed a strong significance with that of diet disturbance as it's p-value was less than 0.05

Table 4.12 Chi-square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.236[a]	3	.011
Likelihood Ratio	12.114	3	.007
Linear-by-Linear Association	4.515	1	.034
N of Valid Cases	100		

Yadegarfar et al., (2018), Carried out a study in Iran to assess the lifestyle and dietary factors associated with GERD. Results of their study showed that consumption of white bread or roti was associated with an increase incidence of GERD. Similar findings of the present study revealed the same results that a high intake of roti or white bread was associated with increased problem of regurgitation among the GERD patients.

DISTURBED DIET AND SPICY FOODS

Diet disturbance due to spicy foods consumption among the study sample showed a very high significance as its p-value was recorded less than 0.01

Table 4.13 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.259[a]	5	.003
Likelihood Ratio	4.583	5	.004
Linear-by-Linear Association	1.092	1	.002
N of Valid Cases	100		

Study conducted by Koul et al., (2018) showed that consumption of spicy foods was associated with an increased risk of GERD symptoms. The present study also showed similar results with a p-value of less than 0.01 that revealed a strong significance of GERD symptoms i.e. Disturbed diet with that of spicy foods intake.

DISTURBED DIET AND FASTFOODS

Disturbed diet among the study sample had a strong significance with that of fast foods consumption as its p-value was recorded to be less than 0.01.

Table 4.14 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.056[a]	3	.003
Likelihood Ratio	1.887	3	.010
Linear-by-Linear Association	.097	1	.020
N of Valid Cases	100		

A study carried out by Alrashed et al. (2018), found a significant association between consumption of fast foods and increased risk for GERD symptoms. Similarly the results of the present study also showed a positive significance of chest burning with that of intake of fast foods.

DISTURBED DIET AND TEA INTAKE

Tea intake by the individuals showed no significance to that of disturbed diet as its p-value came out to be greater than 0.05

Table 4.15 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.272[a]	3	.965
Likelihood Ratio	.398	3	.941
Linear-by-Linear Association	.202	1	.653
N of Valid Cases	100		

Consumption of high-caffeine products such as tea and coffee was not associated with increased incidence of GERD according to studies conducted by Asl et al., (2015), and Eslami et al., (2017). Similarly according to another study conducted by Heidarzadeh Esfahani et al. (2020), no significant association was found between products containing caffeine for example tea and coffee. Findings of our study also showed non-significant relation between tea consumption and Symptoms of GERD.

DISTURBED SLEEP AND FASTFOOD

Sleep disturbance among the study subjects was strongly associated with fast foods consumption as its P-value is recorded less than 0.05.

Table 4.16 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.778[a]	12	.040
Likelihood Ratio	13.506	12	.030
Linear-by-Linear Association	.017	1	.080
N of Valid Cases	100		

Khan et al. (2021) conducted a study and found a strong association between fast foods intake and sleep disturbance among the study population. Findings of our study also indicated a positive relation between intake of fast foods and sleep disturbance.

DISTURBED SLEEP AND SPICY FOODS

Sleep disturbance among the study subjects a high significance with that of spicy foods as its p-value was recorded less than 0.01.

Table 4.17 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.101[a]	16	.002
Likelihood Ratio	11.868	16	.001
Linear-by-Linear Association	.115	1	.001
N of Valid Cases	100		

Xiang et al. (2022) found a significant association between GERD patients with sleep disturbance and intake of spicy foods. Similar results of our study showed a positive association between the intake of spicy foods and disturbed sleep among the study population.

DISTURBED SLEEP AND VEGETABLE CONSUMPTION

No significance was shown between sleep disturbance and vegetable consumption as its p-value was greater than 0.05

Table 4.18 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.906[a]	16	.680
Likelihood Ratio	15.369	16	.498
Linear-by-Linear Association	.434	1	.510
N of Valid Cases	100		

According to a study conducted by Heidarzadeh et al., (2021), revealed that high consumption of vegetables was negatively associated with risk of GERD. Same findings of our study showed that a diet rich in vegetables was negatively related with increased risk of the reflux disease among participants.

MEDICATION AND SOFTDRINKS

Use of medication by the study sample has a strong significance with consumption of soft drinks as its p-value came out to be less than 0.05

Table 4.19 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.195[a]	6	.040
Likelihood Ratio	17.408	6	.008
Linear-by-Linear Association	.196	1	.658
N of Valid Cases	100		

Guadagnoli et al. (2022) found a positive relation between use of medication and intake of soft drinks among the GERD patients. Similar results of our study showed a positive association between use of medication and consumption of soft drinks by GERD patients.

MEDICATION USE AND VEGETABLE INTAKE

Use of medications for heartburn showed no significance with that of vegetables intake for its p-value came out far greater than 0.05.

Table 4.20 Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.652[a]	8	.887
Likelihood Ratio	4.514	8	.808
Linear-by-Linear Association	.478	1	.489
N of Valid Cases	100		

Mehta et al. (2021) found a strong positive association of increased intake of vegetables with lower usage of PPI's among the study population. Similar findings of our study revealed that high consumption of vegetables led to low usage of PPI's.

CONCLUSION AND RECOMMENDATIONS

The present study was conducted to determine association between Gastroesophageal reflux disease and dietary factors. It concluded that a more consumption of high fat foods, spicy foods, fast foods, carbonated beverages, protein rich diet, low intake of fruits and vegetables and whole grains were the risk factors associated with increased risk of GERD symptoms among the individuals.

RECOMMENDATIONS

Results of the study showed that GERD can be overwhelmed with modification in one's dietary patterns and lifestyle.

Some of the recommendation include;

- Having a walk for about 10-15 mins after eating meals.
- Avoid intake of high fat foods and fast foods.
- Avoid too much intake of carbonated beverages and spicy foods.
- Cut back on processed foods.
- Consume more fruits, vegetables, and whole grains.
- Avoid going to sleep soon after having meals.

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