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ASSESSMENT OF GASTROESOPHAGEAL REFLUX DISEASE, RISK FACTORS AND MANAGEMENT IN THE GENERAL POPULATION OF NORTH REGION

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ABSTRACT: Background: Gastroesophageal reflux disease (GERD) is one of the major gastrointestinal problems around the globe and its effects greatly on individual health, quality of life, social life, and economy. This study is aimed to determine GERD prevalence, risk factors, and management. **Methods:** It was a cross-sectional study carried out using a validated questionnaire. The data was collected from the general population. The questionnaire consisted of demographic information, personal and habitual data, GERD Questionnaire. The Chi-Square test was used to find the association. **Results:** The prevalence rate of GERD was found to be about 31%. There was a significant association between GERD and sociodemographic variables such as older age, obesity, profession, do not exercise daily, skipping breakfast, intake of alcohol, fast food, and dinner timing within 1 hour of bedtime, history of illness, family history of GERD, and medication history. The population used both pharmacological and non pharmacological methods of management. The most common method for managing GERD symptoms used by 21.6% of the population was non-prescription or OTC drugs, other methods used were chewing (gum, licorice root, cumin seeds), drinking low-fat milk, ginger water, regular water, exercise (stand up and moving, nostril breathing exercise). **Conclusion:** The prevalence of GERD increases day by day. To prevent its adverse consequences, it is necessary to maintain a healthy lifestyle (reducing weight, daily walking or exercise, and increasing the time between dinner and bedtime).

INTRODUCTION: The study was carried out with the objectives of finding the prevalence and sociodemographic and lifestyle factors associated with gastroesophageal reflux disease and evaluating the various methods of management used by the population. Across the globe, millions of people are suffering from digestive disorders. As per American Nutrition, around the globe, 70 million individuals experience some form of digestive problems daily [1].

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Gastroesophageal reflux disorder (GERD) is one of the most common chronic disorders of the gastrointestinal system. It is a relapsing disorder characterized by the retrograde movement of refluxate into the esophagus [2]. According to the Montreal definition, GERD is defined as troublesome symptoms (Including heartburn, acid regurgitation, and epigastric pain) and some complications due to the reflux of stomach content into the esophagus [3].

The lower esophageal sphincter plays a vital role in this disease. It acts as a barrier to prevent the reflux of gastric content back into the esophagus [4]. Normally, during swallowing, it relaxes and remains closed between meals. If the relaxation occurs for a longer time and frequently, then it

loses the ability to prevent the content and leads to GERD [5]. Other symptoms are chest pain (without any cardiac complaint), dyspepsia, nausea, bloating, sore throat, epigastric pain, and Globus sensation. Extra oesophageal symptoms are asthma, laryngitis, chronic cough, pharyngitis, sinusitis, dental erosion, recurrent otitis media, and idiopathic pulmonary fibrosis [6]. Prolongation of the disease leads to several complications as esophageal ulcer, Barrett's esophagus, stricture, and adenocarcinoma of the gastroesophageal region [7-9]. Managing gastrointestinal reflux disease involves modifying lifestyle and habits, avoiding triggers, medical management, and surgical intervention [10]. Lifestyle modification acts as the stone of GERD management. Many studies show that altering lifestyle and modifying some food habits which are responsible for GERD, such as carbonated beverages, onion, chocolate, spicy food, and fatty meals. The main approaches are the elevated head, avoiding the right lying down position, loss of weight, avoid meals within 3 hours of bedtime [11].

To properly diagnose and manage GERD, it is important to recognize the various epidemiologic risk factors for the disease [12]. Even GERD is a major problem that adversely affects daily basis activities, though very rare general population studies were done on this particular topic in India. The prevalence of the disease varies according to population and geographical area. To prevent its adverse consequences, early detection based on earlier symptoms and proper management is necessary [13]. It was a rare study in this area on the general population.

MATERIAL AND METHODS:

Study Design and Setting: This was a cross-sectional observational study conducted on males and females of the general population of Bathinda District. This region is on the north-western side of Punjab, India. It was conducted for a time of 6 months in 2020- 2021.

Sample size: The data was collected from the general population through face-to-face interviews. The sample size was estimated by using Epi info software program version 7.2 with the previous prevalence of GERD symptoms among the population at 22.5% [14], 95% confidence level, and an acceptable confidence limit of 5%. Margin defect 1%. The calculated sample size was 267.

Study Tool and Data Collection: A validated questionnaire was used, which included age, gender, demographic detail, marital status, smoking, alcohol drinking, family history, eating habits, caffeinated beverages intake, medical history, and medication history. The GERD Questionnaire tool was used to evaluate the GERD symptoms, which consist of 6 questions to assess GERD symptoms (heartburn, regurgitation, sleep disturbances, use of medications, epigastric pain, and nausea). Each question scored from 0 to 3 based on symptoms 0 days in the week, 1 day in the week, 2-3 days in a week, and 4-7 days in a week. Scoring $\leq$ 8 indicates no GERD, and scoring 8 indicates GERD positive [15].

Statistical Analysis: Data will be analyzed by SPSS software version 22. Continuous variables were represented as mean and standard division. Frequencies and percentages were used as categorical variables. χ^2 square was used to find the significance between the various factors and disease. p value <0.05 acted as statically significant.

Ethical Consideration: The research was conducted after approval from the AIPBS Departmental Research Committee and Ethics Committee of Biomedical Science and Health Research, Adesh University, Bathinda. Informed consent was obtained from all the individuals.

RESULTS:

Prevalence of GERD in the General Population: Out of 267 individuals GERD was present in 83 individuals. Hence the prevalence rate was discovered to be 31 % as described in Figure 1. While the symptoms of heartburn were observed in 145 individuals and regurgitation was seen in 154 individuals **Fig. 1.**

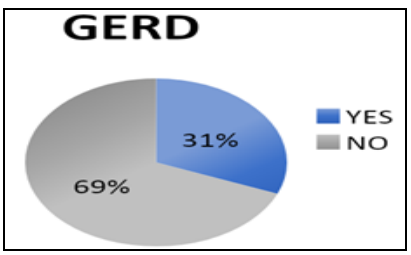

FIG. 1: REPRESENT THE PREVALENCE OF GERD

Details of data Distribution: As described in **Table 1**, the majority of individuals enrolled from the rural region. Out of 267 subjects, 88 were from urban areas, and 179 subjects were from rural areas. 145 belonged to the age category 18-38, 82 belonged to the age group of 38-58, 36 belonged to the age category 58-78 and 3 belonged to the age group above 78. 119 were male respondents and 148 were female. 65 individuals were overweight, and 20 were obese. 35 individuals were illiterate and 61 individuals had only primary education. Economics class was divided into 3 categories on the basis of monthly income 60 individuals belong to the upper class (income more than 25000), 136 belong to the middle class (income 11000-25000), and 71 belong to the low class (less than 11000) **Table 1.**

TABLE 1: REPRESENTS THE DISTRIBUTION OF SOCIODEMOGRAPHIC DATA

Variables		Frequency	Percentage %
Residence	Urban	88	33.0%
	Rural	179	67.0%
Age group	18-38	145	54.5%
	38-58	82	30.8%
	58-78	36	13.6%
	Above78	3	1.1%
Gender	Male	119	44.6%
	Female	148	55.4%
Obesity	Underweight	44	16.5%
	Normal weight	138	51.7%
	Overweight	65	24.3%
	Obese	20	7.5%
Education	illiterate	35	13.2%
	Primary	61	22.9%
	Matriculation	61	22.9%
	Higher	109	41.0%
Economics	Upper class	60	22.5%
	Middle class	136	50.9%
	Low class	71	26.6%
Profession	Employee	22	8.2%
	Teacher	21	7.9%
	Labourer	14	5.2%
	Farmer	57	21.3%
	Housewife	59	22.1%
	Student	66	24.7%
	Others	28	10.5%
Pregnancy	Yes	13	4.9%
	No	254	95.1%

Data Distribution According to Lifestyle Factors: Total out of 267 individuals 20 were daily smoking, 47 were drinking alcohol, 150 subjects ate quickly(within 10 minutes), 92 skipped breakfast regularly, 243 regularly drank caffeinated beverages, 56 were consuming fast food on regular basis, 47 were consuming spicy food, 28 were consuming chocolate on daily basis, 34 were consuming citrus fruit and 14 were consuming peppermint, 73 were drinking Tap water, 86 were drinking community RO system water, 108 were drinking home water purified. 118 were exercised on a daily basis, 107 had a medical history (15 had diabetes, 17 had hypertension, 9 had cardiovascular disease, 20 had a musculoskeletal disorder, 12 had stress, 34 had other disorders), 71 had a family history of GERD, 132 subjects regularly take medicines (24 take an analgesic, 10 take steroid, 32 individuals calcium, vitamin supplement,15 individuals on Antidiabetic medications, 17 take antihypertensive medicines, 34 take other class of medicines) **Table 2.**

TABLE 2: REPRESENTS THE DISTRIBUTION OF LIFESTYLE FACTORS

Variables		Frequency	Percentage
Cigarette	Yes	20	7.5%
smoking	No	247	92.5%

Intake of alcohol	Yes	47	17.6%
	No	220	82.4%
Quick eating	Yes	150	56.2%
	No	117	43.8%
Skipping breakfast	Yes	92	34.5%
	No	175	65.5.%
Drink caffeinated	Yes	228	85.4%
beverages regularly	No	39	14.6%
Type of beverages	Tea	159	60.3%
	Coffee	48	17.2%
	other caffeinated beverages	22	8.2%
	No	88	33.0%
Eating frequently	Fast food	56	21.0%
	Spicy food	47	17.6%
	Citrus fruit	34	12.7%
	Peppermint	14	5.2%
Eating dinner before sleep	Before 30 minute	49	18.4%
	Before 1 hour	126	47.2%
	Before 2 hour	76	28.5%
	More than 2 hour	16	6.0%
Drinking water	Tap water	73	27.3%
	Community RO system	86	32.2%
	Home water purifier	108	40.4%
Daily exercise	yes	148	55.6%
	No	118	44.4%

Factors Association*:* Association is determined by using a chi-square test with a p-value < 0.05 is considered significant. There was a significant association between GERD and sociodemographic variables such as age group (above 50), p-value 0.000, obesity, p-value 0.014, lower education p-value 0.001, profession (housewives), p-value 0.33. The significant association between GERD and lifestyle factors such as intake of alcohol, p-value 0.026, skipping breakfast, p-value 0.008), eating frequently spicy foods, and fast foods, p-value 0.014, do not exercise daily, p-value 0.010 (<0.05), drinking caffeinated beverages, p-value 0.008, dinner timing before sleep, of p-value 0.001 is highly significant. There was an association between GERD and factors Such as a history of illness, p-value 0.000 (<0.05), family history of GERD, p-value 0.008, and medication is taken frequently p-value 0.000.

There was no significant association between GERD and sociodemographic variables such as gender, residence, economic status, and pregnancy. There was also no association between GERD and lifestyle factors such as cigarette smoking, quick eating, and type of water drinking. **Table 3-5.**

TABLE 3: REPRESENTS THE ASSOCIATION OF SOCIODEMOGRAPHIC FACTORS TO GERD

		GERD		Association			
Variables		**yes**	**no**	**χ^2 test**	**df**	**P value**	**Significance**
Residence	Urban	23	65	1.50	1	0.220	Not significant
	Rural	60	119				
Age group	18-38	29	116	19	3	0.000	Significant
	38-58	34	48				
	58-78	17	19				
	above78	2	1				
Gender	Male	42	77	1.77	1	0.183	Not significant
	Female	41	107				
Obesity	Underweight	5	39				
	Normal weight	47	91				
	Overweight	22	42	10.59	3	0.014	Significant
	Obese	9	11				
Education	illiterate	17	18	16.72	3	0.001	Significant
	Primary	27	34				
	Matriculation	16	45				

	Higher	22	87				
Economics	Upper class	21	39	5.83	2	0.054	Not significant
	Middle class	48	88				
	Low class	14	57				
Profession	Employee	7	15				
	Teacher	5	16				
	Labourer	3	11	13.69	6	0.033	Significant
	Farmer	22	35				
	Housewife	26	33				
	Student	11	55				
	Others	9	19				
Pregnancy	Yes	3	10	0.409	1	0.522	Not significant
	No	80	174				

Significance value <0.05.

TABLE 4: REPRESENTS THE ASSOCIATION BETWEEN GERD AND LIFESTYLE FACTORS

Variables		**GERD**		**Association**			
		yes	**no**	**χ^2 test**	**df**	**P value**	**Significance**
Cigarette smoking	Yes	8	12	0.802	1	0.371	Not
	No	75	172				significant
Intake of alcohol	Yes	21	26	5.105	1	0.026	Significant
	No	62	158				
Quick eating	Yes	50	100	0.807	1	0.369	Not
	No	33	84				significant
Skipping breakfast	Yes	38	54	6.8413	1	0.008	Significant
	No	50	145				
Drink caffeinated beverages regularly	Yes	78	150	7.113	1	0.008	Significant
	No	5	34				
Eating frequently	No	16	72	14.01	5	0.014	Significant
	Fast food	26	30				
	Spicy food	15	32				
	Chocolate	10	18				
	Citrus fruit	10	24				
	Peppermint	6	8				
Eating dinner before sleep	Before 30 minute	30	19	30.02	3	0.0001	Significant
	Before 1 hour	35	91				
	Before 2 hour	12	64				
	More than 2 hour	6	10				
Drinking water	Tap water	25	48	1.523	2	0.467	Not
	Community RO system	29	57				significant
	Home water purifier	29	79				
Daily exercise	No	46	72	6.61	1	0.010	significant

TABLE 5: REPRESENTS THE ASSOCIATION BETWEEN GERD AND MEDICAL HISTORY

Variables		**GERD**		**Association**			
		yes	no	χ^2 test	df	P value	Significance
History of illness	No	30	130	38.81	6	0.000	Significant
	Diabetes	6	9				
	Hypertension	13	4				
	Cardiovascular disease	3	6				
	Musculoskeletal disorder	7	13				
	Stress	5	7				
	others	19	15				
	No	80	174				
Family history of GERD	Yes	31	40	7.140	1	0.008	Significant

	No	52	144
Take frequently	NSAIDS	11	13
	Steroid	6	4
	Calcium/Vitamin Supplement	9	23
	Antidiabetic	5	10
	Anti Hypertensive	13	4
	Others	18	16

Management Methods: The various methods were utilized by the general population to relieve symptoms described in **Fig. 2**. The most common method used by the general population was taking non-prescription or OTC drugs 21.65%, followed by other non-pharmacological methods standing up and moving 15.7%. About 13.7% of people used plain water to relieve the symptoms, 5.8% of people chew gum and suck lozenges, 5.35% of people drink low-fat milk to relieve symptoms, 3.89% of people drink ginger water, 1.70% of people lie down by head elevated to manage the symptoms, 1.22% people used nostril breathing exercise to relieve the symptoms, 3.16% people did not doing anything as they have mild symptoms and just wait for relief from the symptoms **Fig. 2.**

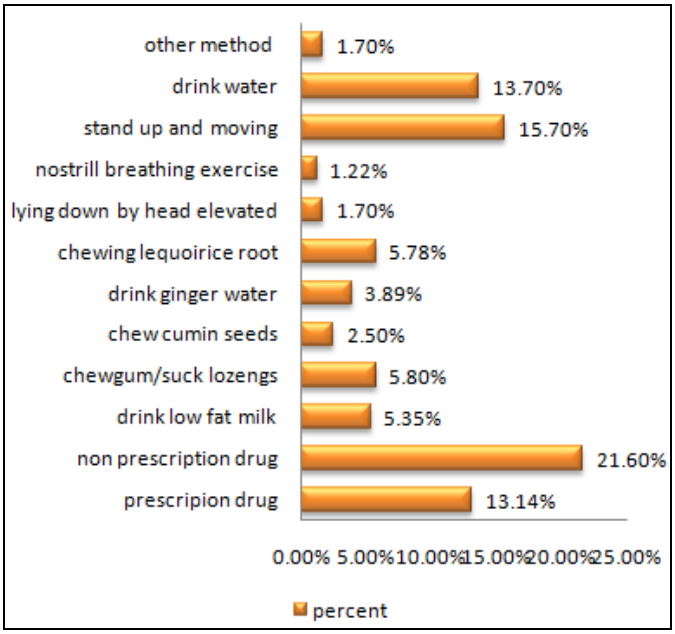

FIG. 2: REPRESENTS MANAGEMENT METHODS

DISCUSSION: In this study, it was found that the prevalence rate of GERD was 31%. Total out of 267 subjects 83 had GERD, Awadalla *et al.*, described the rate of prevalence as about 33% in students in Saudi Arabia, Manoterola *et al.*, represented in their study the prevalence rate was 4 4.8%, Arivan *et al.* represent the prevalence of GERD was 5%, Wang *et al.* showed 22.2% prevalence, Alarshed *et al.* represented the prevalence rate was 28.7%. The variation in prevalence is due to various geographical areas and factors [1, 16-18]. In this study, it was found that age was a significant factor associated with disease p-value 0.000(<0.05) prevalence rate increasing with raised age. The age group above 58 had a higher prevalence rate. Advancing age is more prone to GERD. Similar results found by Puspita *et al.* describe age >50 as significant with the disease. Fakhre *et al.* also reveals a similar result. A study by Rai *et al.* describes GERD as more prevalent in Western countries in ages (35-59). Eusebi *et al.* show advancing age is a significant risk factor for the disease Spantideas *et al.* reported in a study that the prevalence of GERD is higher in the age group 65-79. Wang *et al.* was also showing an association between ages above 50 years [19-23].

In this study, it was found that the area of residence was not statistically significant. Prevalence was approximately the same in both urban and rural areas. A similar result was found by (Spantideas *et al.*) [23]. In this study, it was found that gender was not a significant factor for GERD, a similar result was found by Eusebi *et al*, Spantideas *et al*, and Wang *et al* found there was no association between GERD and gender. The prevalence is equally distributed among both genders [22, 23, 25]. Pregnancy was not significantly associated with GERD; it was due to the very less number of pregnant women in the study. More research is required on the large population of pregnant women.

In this study, it was found that obesity is a significant risk factor for disease with a p-value of 0.014(< 0.05). GERD is more present in overweight (BMI 25-29.9) and obese (BMI greater than 30) similar result was found by Arivan *et al*, Alrashed *et al*, and Esubi *et al.* [1, 18, 22]. They found that obesity is significantly associated with disease, Singh *et al* reveal in their study that obesity is not only associated with GERD but also lead to

complication [24-25]. In this study, it was found that education with a p-value of 0.001(<0.05) was significantly associated with GERD. Those who are illiterate and have primary education have higher chances of GERD. A study by Alsuwat *et al.*, and Wang SE *et al* represents a similar result. Lower education leads to more prevalence of GERD. The reason for this is due to unhealthy lifestyle factors and the inability to change such habits [26-27]. Profession was significantly associated at the p-value of 0.033(<0.05) with GERD, indicating housewives have a more prevalence rate of GERD; the possible explanation is their stressful life and lack of exercise. Economics was not significantly associated with GERD, the study by Awadalla *et al.* also represents that economic level was not associated with GERD [16].

In this study, it was found that alcohol is significantly associated with the disease. Spantideas et al., and Pan J et al. found similar results. The possible explanation for that is alcohol reduces LES pressure, decreases the peristaltic wave amplitude, and impairs acid clearance [23, 28]. In this study, it was found that Cigarette smoking is not significantly associated with the disease. The complex result was due to less sample size and less number of people who were smoking daily. A similar result was found by Puspita *et al*, and Arivan *et al*. Some researchers Alrashed *et al.,* and Spantideas *et al. re*presented that smoking is associated with the disease [1, 18, 23].

In this study, it was found that skipping breakfast is significantly associated with diseases. Those who skip breakfast regularly had more prevalence of GERD. A similar result was found by Zhang M *et al.*, and Sharma *et al.* [29-30]. Regular skipping and irregular timing of eating lead to more prevalence of GERD. In this study, quick eating was not significantly associated with GERD. In this study, it was found that drinking caffeinated beverages is significantly associated with similar disease result is given by Arivan *et al*, and Alrashed *et al.* who represent that caffeinated beverages were highly associated with the disease as they lower the LES pressure [1, 18]. In this study, it was found that triggering food was significantly associated with GERD. The prevalence of GERD was higher in those who eat spicy food, and fast food frequently, the study by Zangh M *et al* represented in their study that fatty food and spicy food were associated with GERD. A study by Alsaleem, M. also represented that fast food was significantly associated with GERD. Many physiological studies represent that in response to the ingestion of various food items, there was an increase in oesophageal acid exposure and a decrease in lower oesophageal pressure [29-31]. In this study, it was found that the prevalence of GERD was more in those who eat dinner within 30 minutes to 1 hour before sleep. Alarshed *et al.* represented in their study that the individuals who slept within 1 hour after eating dinner had more prevalence of GERD. After meals lying in a supine position reduced the lower oesophageal sphincter pressure [1].

The type of drinking water was not significantly associated with GERD. More research is required in this field with a large sample size. The study by puspita *et al.* revealed that the prevalence rate was higher in those drinking tap water. This was due to contaminated water. This study found that regular exercise is associated with the disease with a p-value of 0.010 (<0.05); those who daily walk or exercise have less prevalence of GERD. Similarly, the study by Alsaleem *et al.* represented that those who continuously walk had less prevalence [31]. This study found that a history of illness is significantly associated with GERD with a p-value of 0.000(<0.05).

Those who had hypertension have a high prevalence rate of GERD, and those who had stress also represent a high prevalence rate. A study by Awadalla *et al.* represents *a* similar result that stress is associated with GERD stress increases gastric acid secretion; it delays gastric emptying. Awadalla *et al.,* Akyuz *et al.'s* study represent diabetes was associated with GERD [16-32]. This study found that a family history of GERD is significantly associated with the disease, with a p-value of 0.008 (<0.05). Those who had GERD in a family have a high prevalence rate. This study found that medication-taking frequently is significantly associated with the disease with a p-value of 0.000(<0.05). GERD was more prevalent in those who take steroids, antihypertensive medicines, and NSAIDs. A study by Mungan *et al.* represents that NSAIDs, oral contraceptives, and calcium channel blocker users had a high prevalence [33]. This study showed that both

pharmacological and non-pharmacological methods were used such as exercise, drinking low-fat milk, chewing cumin seeds, chewing gum, breathing nostril exercise, and head elevated exercise, and people also used plain water to relieve the symptoms. The population utilized management to relieve symptoms. Many more case-control studies are required in these non-pharmacological methods to find a more effective management method.

This study's discovery is significant for advancing the GERD prevention program. Most individuals are unaware of factors that lead to disease. There must be education programs and camp organizations so that people should be educated about the disease and how their lifestyle is associated with it. Way of life alteration procedures fundamentally should initially start with instruction so that dietary adjustment, lifestyle modification, and treatment cures can be executed. To prevent its serious complication, it is necessary to detect the symptoms early.

CONCLUSION: It was concluded that about 1/3 of the population had GERD, but the symptoms of regurgitation and heartburn were observed in about half of the population. Age, obesity, education, profession, alcohol intake, skipping breakfast, eating fast food, spicy food, eating dinner near bedtime, walking, history of illness, Medical history, and medication history were significantly associated. Both pharmacological and non-pharmacological methods were used to manage symptoms in the general population. The Strength of this study is that it was conducted through face-to-face interviews.

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CONFLICTS OF INTEREST: None.

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