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Prevalence and Associated Risk Factors of Gastroesophageal Reflux Disease Among Adults Attending Gastroenterology Outpatient Clinics in Hyderabad, Sindh: A Cross-Sectional Study.

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Abstract:

Background: Gastroesophageal reflux disease (GERD) is a prevalent chronic gastrointestinal disorder with a rising global burden. However, data on GERD prevalence and associated lifestyle and dietary risk factors in Sindh, Pakistan, are limited. This study aimed to estimate the prevalence of GERD and identify its associated sociodemographic, lifestyle, and dietary factors among adults attending gastroenterology outpatient clinics in Hyderabad, Sindh.

Methods: A hospital-based cross-sectional study was conducted from January to May 2023 among adults aged ≥18 years attending gastroenterology outpatient departments of tertiary care hospitals in Sindh. Data were collected using a structured questionnaire covering sociodemographic characteristics, lifestyle and dietary habits, and the Frequency Scale for the Symptoms of GERD (FSSG). GERD was defined as an FSSG score ≥8. Associations were analyzed using chi-square tests, and independent predictors were identified through multivariate binary logistic regression using SPSS version 23.

Results: A total of 601 participants were analyzed, with a GERD prevalence of 48.9% (n = 294). GERD was significantly associated with male gender, increasing age, lower educational status, and middle economic status ($p < 0.05$). Lifestyle and dietary factors, including physical inactivity, frequent consumption of junk food, meat, tea, and soft drinks, showed significant associations with GERD. Multivariate analysis identified male gender, older age, lower education level, economic status, family size, and junk food consumption as independent predictors of GERD.

Conclusion: GERD was highly prevalent among adults attending gastroenterology outpatient clinics in Sindh. Several modifiable lifestyle and dietary factors were independently associated with GERD, underscoring the need for targeted preventive and behavioral interventions.

Introduction

Gastroesophageal reflux disease (GERD) is a long-standing gastrointestinal condition in which gastric acid or other stomach contents repeatedly flow back into the esophagus, leading to mucosal irritation. Persistent reflux exposure may result in a wide range of symptoms, including retrosternal burning sensation, acid regurgitation, chest discomfort, swallowing difficulty, and an unpleasant acidic taste in the oral cavity.[1,2]

Clinically, GERD manifestations are classified into typical, atypical, and extra-esophageal symptoms. Typical symptoms predominantly include heartburn and acid regurgitation.[3] Atypical manifestations encompass belching, non-cardiac chest pain, chronic cough, dental

erosion, globus sensation, halitosis, hoarseness, sore throat, vocal changes, wheezing, and laryngeal granulomas.[4] Extra-esophageal presentations frequently involve persistent cough, throat clearing, sore throat, and globus sensation, reflecting reflux involvement beyond the esophagus.[4]

The pathogenesis of GERD is complex and multifactorial. Several mechanisms contribute to disease development, including increased frequency of reflux events, sliding hiatal hernia, reduced basal pressure of the lower esophageal sphincter, transient lower esophageal sphincter relaxations, formation of an acid pocket, obesity-related anatomical changes, increased compliance of the esophagogastric junction, impaired esophageal acid clearance, and delayed gastric emptying.[4]

Multiple demographic and lifestyle-related factors have been implicated in the occurrence of GERD. These include positive family history, physical inactivity, cigarette smoking, inadequate dietary fiber intake, habitual tea consumption, and frequent intake of oily, greasy, and fast foods.[5]

Evidence from recent epidemiological studies indicates that GERD prevalence has increased globally.[6] Systematic reviews have reported prevalence estimates ranging from 18.1% to 27.8% in North America, 8.8% to 25.9% in Europe, 2.5% to 7.8% in East Asia, 8.7% to 33.1% in the Middle East, 11.6% in Australia, and 23.0% in South America.[7,8]

In Pakistan, the burden of GERD appears to be considerable. Previous research has documented a prevalence of approximately 36.4% among patients attending outpatient gastroenterology clinics.[9] Similarly, a study conducted in southern Punjab reported a prevalence of 36.6%.[11] Several investigations have demonstrated significant associations between GERD and factors such as advancing age,[15] sex differences,[23] physical activity levels,[24] and dietary habits.[25]

Although existing studies have largely concentrated on sociodemographic characteristics and general lifestyle behaviors, dietary patterns—particularly the consumption of meat, vegetables, and dairy products—remain insufficiently explored. Moreover, there is a scarcity of published data assessing GERD prevalence among the adult population of Hyderabad.

Therefore, the present study was designed to estimate the prevalence of GERD among adults residing in Hyderabad and to examine its association with sociodemographic variables, lifestyle behaviors, and dietary consumption patterns.

Methodology

A cross-sectional study was conducted at Liaquat University Hospital Hyderabad, Liaquat University Hospital Jamshoro, and Civil Hospital Mirpurkhas using non-probability convenience sampling. Patients were recruited from the outpatient departments from January 2023 to May 2023.

Inclusion Criteria

Patients aged ≥18 years who were willing to participate, completed the questionnaire, had no comorbidities, and were not taking any medications were included.

Exclusion Criteria

Respondents with any comorbidity or history of medication use were excluded.

A total of 601 samples were collected after excluding incomplete responses. According to the 2023 census, the population of Sindh is 57.93 million.[10] With an expected frequency of 50% and 5% precision, a minimum sample size of 385 was required.

Data Collection

After obtaining informed consent, data were collected using a structured questionnaire administered through interviews. The data collection team explained the study and provided instructions for completing the questionnaire.

Variable Setting

The questionnaire consisted of four sections:

1. Demographic factors
2. Lifestyle factors related to GERD
3. FSSG (Frequency Scale for the Symptoms of GERD)

A cut-off score of 8 was used. The FSSG has shown a sensitivity of 62% and specificity of 59%.[12]

Statistical Analysis

Data were analyzed using SPSS version 23. Descriptive statistics were presented as frequencies and percentages. The chi-square (χ^2) test assessed associations between GERD and risk factors. Binary logistic regression identified predictors of GERD.

Ethical approval was obtained from the Institutional Review Board of the Department of Physiology and MLT, University of Sindh, Jamshoro.

Results:

Comparison with Sociodemographic Factors

A total of 616 respondents were enrolled in this study. Of these, 601 participants provided complete information, while 15 respondents were excluded due to incomplete data, yielding a response rate of 97.5%.

Based on the Frequency Scale for the Symptoms of GERD (FSSG), participants were categorized into two groups: those with GERD symptoms (GERD group) and those without GERD symptoms (Non-GERD group).

Among the 601 participants included in the final analysis, females constituted the majority (58.2%). Age-wise distribution revealed that the largest proportion of participants belonged to the 31–40 years age group (213; 35.44%). Most respondents were Sindhi-speaking (361; 60.1%) and the majority belonged to middle-class families (302; 53.2%).

Regarding marital status, a substantial proportion of participants were married (474; 78.9%). In terms of educational status, illiterate individuals comprised the largest group (208; 34.6%).

The detailed distribution of sociodemographic characteristics is presented in Table 1.

Comparison with Lifestyle Characteristics

The prevalence of GERD was significantly higher among participants who consumed junk food compared to those who did not ($\chi^2 = 291.08$, $p \leq 0.0001$).

Similarly, GERD was significantly less prevalent among individuals who engaged in daily physical exercise compared to those who did not participate in regular physical activity ($\chi^2 = 46.742$, $p \leq 0.0001$).

With regard to dietary habits, the prevalence of GERD was significantly higher among participants who consumed beef and chicken compared to those who did not. In contrast, vegetable intake did not show a statistically significant association with GERD.

Concerning dairy products, the consumption of yogurt, butter, and milk was lower among individuals with GERD compared to those without GERD.

Furthermore, the prevalence of GERD was significantly higher among individuals with greater consumption of tea and soft drinks.

The detailed comparison of lifestyle characteristics between GERD and Non-GERD groups is presented in Table 2.

Discussion

This cross-sectional study provides important insight into the burden of gastroesophageal reflux disease (GERD) among adults attending tertiary care outpatient departments in Sindh, Pakistan. The overall prevalence of GERD based on the Frequency Scale for the Symptoms of GERD (FSSG) was 48.91%, indicating that nearly half of the study population experienced clinically significant reflux symptoms. The FSSG is a validated, non-invasive instrument consisting of 12 items and has demonstrated a sensitivity of 62% and specificity of 59% when compared with endoscopic findings.[12] Due to its practicality and cost-effectiveness, it is particularly useful in large epidemiological studies conducted in resource-limited settings.

The prevalence observed in our study is higher than some previously reported regional figures but comparable to others conducted in South Asia. For instance, studies in Rawalakot reported a prevalence of 61.7%,[27] while research among rural women in Pakistan documented a prevalence of 64.11%.[28] A community-based study in southern India also reported substantial GERD prevalence.[29] Differences in reported prevalence rates may be attributed to variations in study design, diagnostic tools, population characteristics, and dietary and lifestyle behaviors. Globally, GERD prevalence varies widely, ranging from 2.5% to 27.8% depending on geographic region.[7,8] This variability reflects differences in obesity rates, dietary habits, and environmental exposures.

In the present study, sex was significantly associated with GERD, with males demonstrating a higher prevalence. This finding is consistent with previous Pakistani data.[13] A possible biological explanation may involve the role of sex hormones. Elevated circulating testosterone levels have been suggested to contribute to relaxation of the lower esophageal sphincter (LES), thereby facilitating reflux.[30] Although hormonal influences require further investigation, they may partially explain sex-based differences in GERD occurrence.

Age also showed a significant association with GERD prevalence, with higher rates observed in older individuals. This is in agreement with earlier research conducted in Pakistan.[9] Advancing age is associated with weakening of esophageal peristalsis, reduced LES tone, and delayed gastric emptying, which predispose individuals to reflux symptoms.[15] However, some population-based studies have reported no significant association between age and GERD,[21,22] suggesting that age may interact with other confounding variables such as obesity, dietary habits, and comorbidities.

Educational status demonstrated a significant inverse relationship with GERD prevalence, with higher rates observed among illiterate participants. This finding is supported by a global meta-analysis reporting higher GERD prevalence among individuals with lower educational attainment.[14] Lower education levels may reflect reduced health awareness, unhealthy dietary practices, and limited access to healthcare services.

Lifestyle factors were strongly associated with GERD in our study. Participants consuming junk food had significantly higher GERD prevalence, consistent with previous research demonstrating that high-fat and energy-dense meals increase transient LES relaxations and delay gastric emptying.[2] High-fat diets have long been implicated in reflux pathophysiology.[4] Similarly, frequent meat consumption, particularly beef and chicken, was significantly associated with GERD. This observation aligns with recent findings that diets rich in animal products are linked with increased GERD risk.[17] High-fat content in meat may promote LES relaxation and acid exposure.[26]

Physical inactivity was another important factor associated with GERD. Individuals who did not engage in daily exercise demonstrated higher prevalence of reflux symptoms. Previous studies have also reported that moderate physical activity may reduce GERD symptoms by improving gastric motility and reducing obesity-related intra-abdominal

pressure.[24] Conversely, sedentary lifestyle behaviors may contribute to increased reflux episodes.

In contrast, vegetable intake did not show a statistically significant association with GERD in our study. Similar findings were reported in an Iranian population.[18] Although vegetables are rich in dietary fiber, which may theoretically reduce reflux by improving gastric emptying, the protective effect may depend on overall dietary patterns rather than isolated food groups.[25]

Dairy product consumption was also not significantly associated with GERD symptoms. This result is consistent with findings from large population studies evaluating both low-fat and full-fat dairy intake.[19,29] The relationship between dairy and GERD remains controversial and may vary according to fat content and individual tolerance.

Tea consumption was significantly associated with GERD in our population. Tea is widely consumed in Pakistan, and its caffeine content may contribute to LES relaxation and increased acid secretion. A meta-analysis has demonstrated an association between tea consumption and GERD symptoms, particularly in Asian populations.[20] Similarly, soft drink and carbonated beverage consumption were significantly associated with GERD. Carbonated beverages increase gastric distension and transient LES relaxations, thereby promoting reflux.[27]

Overall, this study underscores the multifactorial nature of GERD and highlights the importance of modifiable risk factors, particularly dietary and lifestyle behaviors. The relatively high prevalence observed suggests that GERD represents a substantial public health concern in Sindh.

However, several limitations must be acknowledged. First, GERD diagnosis was based solely on symptom assessment using FSSG rather than objective diagnostic modalities such as endoscopy or 24-hour pH monitoring. Second, recall bias may have influenced self-reported dietary and lifestyle information. Third, the use of convenience sampling and hospital-based recruitment may limit the generalizability of findings to the broader community. Despite these limitations, the study provides valuable baseline data for future large-scale investigations.

Conclusion

This study demonstrates a high prevalence of gastroesophageal reflux disease among adults attending tertiary care outpatient departments in Sindh, Pakistan, with nearly half of the participants experiencing clinically significant reflux symptoms. GERD was significantly associated with male sex, increasing age, lower educational status, physical inactivity, frequent junk food consumption, higher meat intake, tea consumption, and soft drink use. These findings emphasize the critical role of modifiable lifestyle and dietary factors in the development and persistence of GERD symptoms.

The use of the Frequency Scale for the Symptoms of GERD (FSSG) proved to be a practical and cost-effective screening tool in a resource-limited setting. However, reliance on symptom-based diagnosis may underestimate or overestimate the true burden of disease.

Given the substantial prevalence observed, public health strategies focusing on lifestyle modification, dietary counseling, and awareness programs are urgently needed to reduce GERD-related morbidity and prevent long-term complications such as Barrett's esophagus and esophageal adenocarcinoma. Future multicenter, community-based studies incorporating objective diagnostic methods are recommended to further validate these findings and improve generalizability.

Characteristics		Total (N=601)		GERD (N=294)		No GERD (N=307)		P-value	Chi-square value
		N	%	N	%	N	%		
Gender	Male Female	251 350	41.8 58.2	141 153	56.2 43.7	110 197	43.8 56.3	0.002	9.083
Age	18-29 30-39 40-49 50-59 ≥60	101 242 170 60 28	16.8 40.2 28.2 9.9 4.6	59 105 72 33 25	58.4 43.3 42.3 55.0 89.3	42 137 98 27 03	41.5 56.6 57.6 45.0 10.7	0.000	184.54
Ethnicity	Sindhi Muhajir Punjabi Pathan Baloch	361 165 43 22 10	60.1 27.5 7.2 3.7 1.7	160 104 07 18 05	44.3 63.0 16.3 81.8 50.0	201 61 36 04 05	55.7 37.0 83.7 18.2 50.0	0.000	44.069
Economic Status	Lower Middle Upper	281 320 00	46.8 53.2 0.0	147 147 00	52.3 45.9 0.0	134 173 00	47.7 54.1 0.0	0.070	2.434
Marital Status	Married Single Widowed Divorced	474 116 07 04	78.9 19.3 1.2 0.7	228 63 01 02	48.1 54.3 14.3 50.0	246 53 06 02	51.9 45.7 85.7 50.0	0.184	4.838
Education Level	Illiterate Primary/Middle Matriculation/Intermediate University Degree	208 155 172 66	34.6 25.8 28.6	134 71 61 28	64.4 45.8 35.5 42.4	74 84 111 38	35.6 54.2 64.5	0.000	37.797

			11.0				57.6		
No of family members	1-7 8-15 ≥16	385 205 11	64.1 34.1 1.8	160 123 11	41.6 60.0 100.0	225 8200	58.4 40.0 0.0	0.000	57.566

Table no.1 Association of Demographic factors with GERD

Characteristics		Total (N=601)		GERD (N= 294)		No GERD (N=307)		P-value	Chi-square value
		N	%	N	%	N	%		
BMI	Underweight Normal Overweight Obese	96 255 152 98	16.0 42.4 25.3 16.3	51 116 74 53	53.1 45.5 48.7 54.1	45 139 78 45	46.9 54.5 51.3 45.9	1.000	62.591
Daily physical exercise	Yes No	250 351	41.5 58.4	81 213	32.4 60.6	169 138	67.6 39.3	0.000	46.742
Junk food	Yes No	287 314	47.7 52.2	179 115	62.3 36.6	108 199	37.6 63.3	0.000	39.77
Spicy meal	Little Moderate Very	219 323 59	36.4 53.7 9.8	108 155 31	49.3 48.0 52.5	111 168 28	50.7 52.0 47.5	0.715	1.360
Consumption of Beef	Yes No	340 261	56.5 43.4	209 85	61.4 32.5	131 176	38.5 67.4	0.000	49.364
Consumption of Mutton	Yes No	235 366	39.1 60.8	112 182	47.6 49.7	123 184	52.3 50.2	0.341	0.245
Consumption of Chicken	Yes No	295 306	49.0 50.9	251 43	85.0 14.0	44 263	14.9 85.9	0.000	303.28
Consumption of Fish	Yes No	136 465	22.6 77.3	86 165	63.2 39.1	50 257	36.7 60.9	0.000	14.418
Leafy Vegetables	Yes No	313 288	52.0 47.9	148 146	47.2 50.6	165 142	52.7 49.3	0.225	0.698
Non-leafy Vegetables	Yes No	281 320	46.7 53.2	134 160	47.6 50.0	147 160	52.3 50.0	0.314	0.320
Consumption of Yogurt	Yes No	277 324	46.0 53.9	140 154	50.5 47.5	137 170	49.4 52.4	0.257	0.542
Consumption of Milk	Yes No	293 308	48.7 51.2	87 207	29.6 67.2	206 101	70.3 32.7	0.000	84.570
Consumption of Butter	Yes No	191 410	31.7 68.2	20 274	10.4 66.8	171 136	89.5 33.1	0.000	165.62
Consumption of Cake	Yes No	358 243	59.5 40.4	179 115	50.0 47.3	179 128	50.0 52.6	0.288	0.414
Consumption of Chocolate	Yes No	92 509	15.3 84.6	47 247	51.0 48.5	43 264	48.9 51.4	0.367	0.204
Consumption of Biscuits	Yes No	299 302	49.7 50.2	142 152	47.4 50.3	157 150	52.5 49.6	0.269	0.485

Cigarettes	Yes	74	12.3	64	86.4	10	13.5	0.000	47.665
	No	527	87.6	230	43.6	297	56.3		
Pan	Yes	75	12.4	29	38.6	46	61.3	0.38	3.604
	No	526	87.5	265	50.3	261	49.6		
Alcohol	Yes	03	0.5	03	100.0	00	0.0	0.116	3.148
	No	598	99.5	291	48.7	307	51.3		
Naswar	Yes	43	7.2	36	83.7	07	16.3	0.000	22.449
	No	558	92.8	258	46.2	300	53.8		
Consumption of Tea	Yes	368	61.2	240	65.2	128	34.7	0.000	100.913
	No	233	38.7	54	23.1	179	76.8		
Consumption of Coffee	Yes	136	22.6	45	33.0	91	66.9	0.000	17.628
	No	465	77.3	249	53.5	302	46.4		
Soft drinks	Yes	238	39.6	178	74.7	60	25.2	0.000	105.548
	No	363	60.3	116	31.9	247	68.0		
Green tea	Yes	156	25.9	52	33.3	104	66.6	0.000	20.480
	No	445	74.0	242	54.3	203	45.6		
Water consumption	1-4	120	20.0	60	50.0	60	50.0	0.000	65.079
	5-8	304	50.6	135	44.4	169	55.6		
	9-14	152	25.3	83	54.6	69	45.4		
	≥15	25	4.2	16	64.0	09	36.0		
Time interval between meal and sleep	No	7	1.2	03	42.9	04	57.1	0.233	10.477
	Half hour	24	4.0	19	79.2	05	20.8		
	1-2 hour	375	62.4	173	46.1	202	53.9		
	≥3 hour	195	32.4	99	50.8	96	49.2		
Water right after meal	Yes	162	26.9	162	100.0	00	00	0.000	303.093
	No	374	62.2	81	21.6	293	78.3		
	Occasionally	65	10.8	51	78.4	14	21.5		
Habit of quick eating	Yes	192	31.9	134	69.8	58	30.2	0.000	49.192
	No	409	68.1	160	39.1	249	60.9		
Eating more than need	Yes	192	31.9	118	61.5	74	38.5	0.000	17.754
	No	409	68.1	176	43.0	233	57.0		
Acid reflux after fasting	Yes	281	46.7	130	46.2	151	53.7	0.127	1.489
	No	320	53.2	164	51.25	156	48.75		

Table no.2 Association of Lifestyle and dietary Habits with GERD

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