Frequency and Associated Factors of Gastroesophageal Reflux Disease Using GERD-Q Tool in the High-Risk Group of Postgraduate Trainees Physicians

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Abstract

Objective: The aim was to determine the frequency of GERD using the GERD-Q tool in postgraduate trainees (PGTs) physicians working in a tertiary care hospital and to observe the association of causative factors in this high-risk population.

Methods: From October to December 2020, all post-graduate trainees at Aga Khan University Hospital received an online survey via email as part of a cross-sectional study. The GERD-Q questionnaire was scored in order to get the diagnosis. A GERD-Q score of e"8 was used to diagnose participants. Additionally, lifestyle decisions were evaluated in relation to GERD symptoms and associations. After that, stratification analysis was carried out to look at the study variables' effect modifiers.

Results: Analysis was done on 204 participants' data. After that, stratification analysis using SPSS-25.0 was carried out to look at the study variables' effect modifiers. 58.3% of the participants in the survey were female. The study participants' median age was 29 years old. With a median GERD-Q score of 6.00, 30.4% of patients were found to have GERD. BMI, a history of GERD in the past, an exacerbation following residency training, a surgical specialty, less coffee drinking, self-reported stress, and changed eating habits were all associated with GERD. Self-reported GERD, surgical specialty, and changed eating habits were independent variables linked to GERD in PGTs on multivariable logistic regression.

Conclusions: The frequency of GERD in postgraduate trainees was found to be 30.4%, which is slightly higher than previously reported in the literature. Significant associations were found between lifestyle habits and associated factors.

Keywords: Gastroesophageal Reflux Disease, Post Graduate Trainees, Associated Factors, Lifestyle Habits.

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Introduction

Gastroesophageal reflux disease (GERD) is a condition that develops when the reflux of stomach contents into the esophagus causes troublesome symptoms and/or complications. The disease significantly affects daily lifestyle and work efficiency among the adult population as well as a burden to the healthcare system[1]. The peak age distribution for the disease is over 50 years globally[2]. However, there is emerging evidence that the prevalence of GERD is on the rise in Asia because of the socio-economic development and consequent lifestyle changes in the population of many Asian countries[3]. Heartburn and acid regurgitation are reasonably specific symptoms for diagnosis of GERD.

Frequent GERD symptoms have been associated with an increased risk of developing esophagitis, esophageal strictures, Barrett's Esophagus, and the majority of cases of Adenocarcinoma of the esophagus are thought to have Barrett's Esophagus as one of the causative factors[4]. Early onset of

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GERD, before 30 years of age has the highest risk for esophageal adenocarcinoma[5]. Chronic cough, chronic laryngitis, and asthma are significantly associated with GERD[6].

There is little information on the prevalence of acid reflux disease (GERD) among medical professionals, and much less information is available for postgraduate trainees who may be at high risk for the condition because of their lifestyle choices during their training. The prevalence of GERD in medical students was reported to be 25% throughout the Middle East and South Asia[7].

Significant morbidities are associated with frequent use of proton pump inhibitors like acute interstitial nephritis, development of benign polyps masking of gastric diseases and cancer[8], osteoporosis, and recurrences of *Clostridium difficile* infection.

The primary aim of the study was to determine the frequency of gastroesophageal reflux disease (GERD) using the GERD-Q tool among postgraduate trainees working in a tertiary care hospital and the secondary aim was to observe the association of causative factors in this high-risk population.

Methodology

A cross-sectional study was conducted by using an online survey form and following STROBE checklist, which was e-mailed to all post-graduate trainees from October to December 2020. The sample size was calculated based on a previous study in which the frequency of Gastroesophageal reflux disease was reported at 25% in medical students[9]. A minimum of 195 participants were required, with a 5% margin of error and 95% confidence intervals. To lose any data, 204 participants were required. The sample size was calculated using the OpenEpi online calculator. All postgraduate trainees who have completed their six months of training were included in the study. Participants were excluded from the study, which did not give consent, were pregnant, had hiatal hernia, or were morbidly obese.

Demographic data included age, gender, specialty, year of post-graduate training, and work experience. GERD-Q questionnaire scoring was used for the diagnosis of GERD. The GERD-Q has 65% sensitivity and 71% specificity for the diagnosis of GERD[10] with a Cronbach's alpha of 0.81[11]. Participants with a GERD-Q score of e"8 were considered to have GERD, while others who got a score of <8 were not considered diseased. Information pertaining to symptoms and associated factors related to GERD was obtained via additional questions. Lifestyle choices were also assessed specific to symptoms and association with GERD. An open-end question at the end of the survey asked participants for factors playing a causative role in GERD in their case.

Informed consent was taken from all participants and the participation was voluntary. All responses were kept anonymous. The research complies with current bioethical research regulations, and it obtained the authorization of the institution's Ethics Review Committee (ERC # 2020-3547-10 135). Stratification analysis with SPSS-25.0 was then performed to observe the effect modifiers of study variables. Frequencies and percentages were computed for qualitative variables, while median and interquartile range (IQR) was used to express quantitative variables. Associations were analyzed using Chi-square, Fisher's exact test, or the Mann-Whitney test. The level of significance was set at $p<0.05$. Univariate analysis was performed with GERD-Q scores in relation to study variables. On Multivariate logistic regression, adjusted odds ratios (AOR) and 95% confidence intervals (CIs) were calculated and significance was obtained from Wald's method.

Results

Two hundred and nineteen postgraduate trainees of different specialties were contacted for data collection in which two hundred and four trainees were included and their data were analyzed. The median age of the study participants was 29 (27–30) years, with most of them being females (58.3%). The Median GERD-Q score was 6.00

(6.00–8.00), with 30.4% (n=62) of participants diagnosed as suffering from GERD. Median work experience was 30 (12–45) months. Body mass index (BMI) was self-reported as normal by 57% (n=116) of the participants, while 30% (n=61) were overweight, 6% (n=12) were obese, and the rest 7% (n=15) were underweight. 20.1% (n=41) of participants reported a prior history of GERD, while 35.8% (n=73) have a positive family history of GERD. 22.1% (n=45) reported that their symptoms of GERD aggravated during the period of clinical residency. On self-reporting, GERD was experienced by 29.4% (n=60) of the participants, which was slightly lower than the actual number diagnosed via the validated (GERD-Q) questionnaire (30.4%) as shown in Table 1.

Regarding factors associated with GERD, it was found that 12.7% (n=26) were smokers, 2.9% (n=6) consumed alcohol, regular consumption of tea and coffee was reported by more than two-thirds (n=136), occasional use of carbonated beverages by 79% (n=161), and regular by 12% (n=26). Approximately two-thirds (n=66) of participants reported that they miss breakfast. 89% (n=182) of them reported an on-call change of dinner routine and midnight snacks were also occasionally consumed by more than half (n=107), with 20.6% (n=42) reported altered habits of food intake. 72% (n=147) of study participants did not engage in any form of exercise and physical activity at least once weekly. 2.9% (n=6) reported lack of sleep as the cause of GERD. 16% (n=32) of study participants self-reported stress, while 11% (n=22) reported both stress and altered habits of food intake cumulatively responsible for their GERD. BMI (p=0.015), GERD history in the past (p0.001), aggravation after residency (p0.001), surgical specialty (p=0.017), self-reported stress (p0.001), changed eating habits (p0.001), and lack of sleep (p=0.0011) were all associated with GERD, as Table 2 illustrates.

On Univariate analysis, self-reported GERD [OR: 11.091 (5.491–22.401), p<0.001], Prior history of GERD [OR: 4.644 (2.261–9.537), p<0.001], Aggrav-

ation of symptoms after residency [OR: 5.314 (2.627–10.751), p<0.001], Surgical specialty [OR: 2.749 (1.238–6.103), p=0.013], regular use of fast food [OR: 2.118 (1.067–4.203), p=0.032], self-reported stress [OR: 7.260 (3.175–16.599), p< 0.001], altered food intake habits [OR: 6.531 (3.136–13.604), p<0.001], both stress and altered food intake habits combined [OR: 6.155 (2.365–16.020), p<0.001], and lack of sleep [OR: 12.368 (1.414–108.214), p=0.023] were associated factors with GERD as shown in Table 3.

On multivariate logistic regression, self-reported GERD [aOR: 5.838 (2.266–15.039), p<0.001], Surgical specialty [aOR:2.848 (0.995–8.158), p=0.050], and altered food intake habits [aOR: 3.130 (1.151–8.511), p=0.025] were independently associated factors with GERD in postgraduate trainees as shown in Figure 1.

Table 1. Demographics and General characteristics of the study population (n=204)

	Variables		Point Estimates n (%)
1.	Gender	Male	85 (41.7)%
		Female	119 (58.3)%
2.	Age (in years)		29.00 (IQR: 27–30)
3.	Work experience (>24 months)		94 (46.1)%
	Work experience (<24 months but > 6 months)		110 (53.9)%
4.	GERD-Q positive (score ≥8)		62 (30.4)%
	GERD-Q negative (score <8)		142 (69.6)%
5.	Prior history of GERD		41 (20.1)%
6.	Aggravation of GERD symptoms after the start of residency		45 (22.1)%)
7.	Family history of GERD		73 (35.8)%
8.	Self-reporting GERD		60 (29.4)%

GERD: Gastroesophageal reflux disease; GERD-Q: GERD questionnaire. Data is represented as frequency (percentage).

Table 2. Relationship of different variables with GERD-Q scale (n=204)

Variables	GERD-Q positive (n=62)	GERD-Q negative (n=132)	p-value
Age (in years)	29.00 (28.00–30.00)	29.00 (27.00–30.00)	0.220*
Work experience	34.00 (20.00–48.00)	24.00 (11.00–41.25)	0.070*
Median GERD-Q score	9.00 (8.00–11.00)	6.00 (5.75–6.25)	<0.001**
Specialty			
Medicine	22 (35.5%)	63 (44.4%)	0.017**
Surgery	27 (43.5%)	34 (23.9%)	
Diagnostics and therapeutics	13 (21.0%)	45 (31.7%)	
Year of Residency			
1st year	14 (22.6%)	48 (33.8%)	
2nd year	9 (14.5%)	28 (19.7%)	0.313**
3rd year	14 (22.6%)	24 (16.9%)	
4th year	15 (24.2%)	24 (16.9%)	
5th year	10 (16.1%)	18 (12.7%)	
Tea/Coffee consumption			
Never/occasional	21 (33.9%)	25 (17.6%)	
1-3 cups	35 (56.5%)	101 (71.1%)	
>3 cups	6 (9.7%)	16 (11.3%)	0.044^
Carbonated beverages			
Never	7 (11.3%)	10 (7.0%)	
Occasional	46 (74.2%)	115 (81.0%)	
Frequent	9 (14.5%)	17 (12.0%)	0.495**
Skip breakfast			
Never	18 (29.0%)	46 (32.4%)	
Occasional	25 (40.3%)	49 (34.5%)	
Frequent	19 (30.6%)	47 (33.1%)	0.727**
Time of dinner			
Before 9pm	14 (22.6%)	32 (22.5%)	
At 9pm	28 (45.2%)	54 (38.0%)	
After 9pm	20 (32.3%)	56 (39.4%)	0.565**
Midnight snack			
Never	19 (30.6%)	50 (35.5%)	
Occasionally	34 (54.8%)	73 (51.8%)	
Everyday	9 (14.5%)	18 (12.8%)	0.791**
Fast food			
Occasionally	14 (22.6%)	25 (17.6%)	
Few times a month	29 (46.8%)	49 (34.5 %)	
No fast food	19 (30.6%)	68 (47.9%)	0.072**
Physical exercise			
Not regularly	45 (72.6%)	101 (71.6%)	
Once weekly	12 (19.4%)	20 (14.2%)	
Frequently	5 (8.1%)	20 (14.2%)	0.360**
Alcohol	4 (6.5%)	2 (1.4%)	0.071^
Lack of sleep	5 (8.1%)	1 (0.7%)	0.011^
Any drug regimen	5 (8.1%)	13 (9.2%)	0.803^

GERD: gastroesophageal reflux disease; BMI; body mass index; GERD-Q: GERD questionnaire.Data is represented either median (IQR) or frequency (percentage).† For specialty, Community medici-ne, cardiology, dermatology, emergency medicine, family medicine, gastroenterology, internal medicine, nephrology, neurology, psychia-try, oncology, pulmonology and pediatric physicians are group together as **Medicine;** General Surgery, Anesthesiologists, Otolar-yngologists, Neurosurgery, Cardiothoracic surgery, Orthodontic and operative dentistry, Urology, Pediatric surgery and Ophthalmology are group toget-her as **Surgery**; Microbiology, Hematology, Histolo-gy, Pathology and Radiology are group into **Diagnostics and ther-apeutics**.* P-value calculated via Mann-Whitney test.** P-value calcu-lated by chi-square test.^ P-value calculated by Fisher's exact test.

Table 3. Univariate regression model of study variables for GERD-Q scale

| Variables	Odds ratio(OR)	95% confidence interval		p-value
		Lower	Upper	
Gender				
Male	1.000	-	-	
Female	0.614	0.336	1.121	0.112
Work experience				
Work experience (>24 months)	1.000	-	-	
Work experience (<24 months)	0.786	0.430	1.435	-
BMI				
BMI ($\leq$18.5 kg/m^2)	0.500	0.087	2.860	-
BMI (18.5–24.9 kg/m^2)	0.607	0.170	2.172	-
BMI (25.0–29.9 kg/m^2)	1.697	0.462	6.237	-
BMI ($\geq$30.0 kg/m^2)	1.000	-	-	
Prior history of GERD	4.644	2.261	9.537	<0.001
Aggravation of symptoms after residency	5.314	2.627	10.751	<0.001
Family history of GERD	1.460	0.790	2.697	0.227
Self-reporting GERD	11.091	5.491	22.401	<0.001
Speciality				
Medicine	1.209	0.551	2.651	0.636
Surgery	2.749	1.238	6.103	0.013
Diagnostics and therapeutics	1.000	-	-	
Year of Residency				
1st year	0.525	0.198	1.393	0.196
2nd year	0.579	0.197	1.700	0.320
3rd year	1.050	0.380	2.900	0.925
4th year	1.125	0.411	3.079	0.819
5th year	1.000	-	-	
Smoking	1.826	0.786	4.243	0.162
Alcohol	4.828	0.860	27.088	0.074
Tea/Coffee consumption				
Never/occasional	2.240	0.743	6.750	0.152
1-3 cups	0.924	0.335	2.547	0.879
>3 cups	1.000	-	-	
Carbonated beverages				
Never	1.322	0.375	4.658	0.664
Occasional	0.756	0.314	1.817	0.531
Frequent	1.000	-	-	
Skip breakfast				
Never	0.968	0.452	2.074	0.933
Occasional	1.262	0.615	2.588	0.525
Frequent	1.000	-	-	
Time of dinner				
Before 9pm	1.225	0.545	2.752	0.623
At 9pm	1.452	0.732	2.880	0.286
After 9pm	1.000	-	-	
On-call change of dinner routine	2.105	0.682	6.499	0.196
Midnight snack				
Never	0.802	0.309	2.080	0.650
Occasionally	0.983	0.403	2.398	0.970
Everyday	1.000	-	-	
Fast food				
Occasionally	2.004	0.875	4.590	0.100
Few times a month	2.118	1.067	4.203	0.032
No fast food	1.000	-	-	
Physical exercise				
Not regularly	1.765	0.623	4.997	0.285
Once weekly	2.400	0.713	8.077	0.157
Frequently	1.000	-	-	
Self-reported stress	7.260	3.175	16.599	<0.001
Altered habits of food intake	6.531	3.136	13.604	<0.001
Lack of sleep	12.368	1.414	108.214	0.023
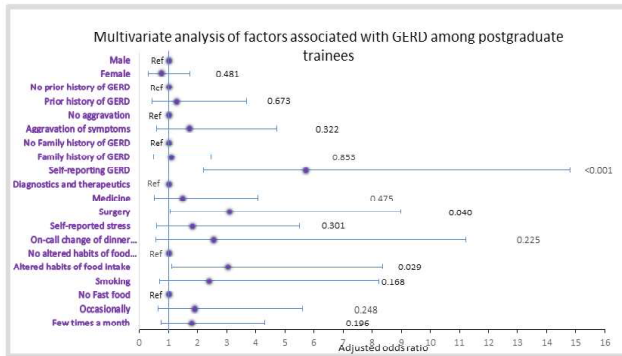
Fig 1. Multivariate analysis of factors associated with

GERD among PGTs.

x-axis shows adjusted odds ratio

y-axis shows variable factors.

Ref= reference variable.

<0.05= significant association on multivariable analysis.

Discussion

The study reported that 30.4% of participants have been suffering from GERD, based on the GERD-Q questionnaire. This study has identified a high-risk population for GERD percentage which is higher than previously reported studies among medical students by Atta, et al. with a frequency of 25%[7]. To the best of authors' knowledge, this was the first study reporting the frequency of GERD in postgraduate trainees with an assessment of various factors influencing the early-onset and/or aggravation of GERD.

A recent meta-analysis reported the global prevalence of GERD at 13.98%. There is a disparity in the prevalence of GERD in Asia from >10% in East Asia to 20% within the Middle East[12]. In this region, a recent study in the general population of South Punjab reported the frequency to be 26.6%[13]. This study showed that GERD is higher in post-graduate trainees in comparison to the general population.

Over the last decade, there has been a significant increase in the proportion of younger patients (age range 30-39 years) with GERD[14]. Possible causes of this alarming rise in post-grad-

uate trainees in this study can be attributed to altered lifestyles during residency training and its impact on young health professionals. A significant proportion has fear of side-effects of treatment and negative academic impact if they sought medical attention and hence were hesitant to do so. This puts the trainees at a higher risk of progression of GERD without seeking proper medical advice.

Gender association was not found to be statistically significant, although a male predominance was found in this study. This study attempted to associate the common associated factors among the participants. It was established that being overweight, prior history of GERD and family history were significant factors attributed to developing symptoms of GERD. The potential role of obesity in GERD is evident as the pathogenetic link[15]. A recent study on the South Asian population correlates GERD with BMI >25 kg/m^2 [16], and similar findings were reported in this study. Symptoms of GERD were higher in participants with a prior history of GERD. Genetic components related to the disease have been recognized in literature[17], but in this study, family history of GERD did not appear to be consistent as an associated factor.

The impact of lifestyle was also evaluated among post-graduate trainees. Intake of caffeine, carbonated drinks or tea was not found to be significant in this study. Alcohol and smoking positively correlate with the development of GERD[18-19], however, smoking was not found to be significant in the study, and alcohol consumers were not considered due to the low number of respondents.

Post-graduate trainees are prone to experience stress due to the demanding work environment, patient safety, and continual academic responsibilities and competencies. An association was found between anxiety and depression as psychological factors having a role in the onset of GERD[20]. Participants in this study self-reported, stress as one of the causes of their symptoms which was also found to be significant. Aggravation of symptoms after the start of residency training was also found to be significant and this underlined the imp-

act of training and associated lifestyle changes. Students experiencing a high level of perceived stress were at higher risk of GERD[21]. Inadequate sleep had a significant correlation in a recent study on students[22], which also did come positive in this study, but the survey had a limited number of respondents considering inadequate sleep as a contributing factor to GERD.

The surgical specialty was found to have a positive association with GERD in this study which was an interesting but expected finding in this population. Causes can be long working hours, binge eating, and highly stressful situations faced by surgical residents. Surgical post-graduate trainees remain at risk of depression and suicidal ideation due to severe burnout, and stress[23]. One meta-analysis found no association of burnout between surgical and medical post-graduate trainees[24], which might indicate other causes of the high frequency of GERD among surgical post-graduate trainees.

Altered food habits reported by postgraduate trainees in the open-ended question, were found to be an independent predictor of GERD in postgraduate trainees. Recent literature suggests that irregular dietary habits, which include fatty, spicy meals, increase the perception of acid reflux[25]. Although midnight snacks, on-call change of dinner routine, and skipping breakfast did not appear to be positively correlated in this study, intake of fast food had an association on univariate analysis.

In this study, GERD-Q was used which is a reliable and validated tool to assess the frequency of GERD. The study pre-specified target population of which the data is lacking in the literature. It was a single-center study with relatively small sample size. In this study selection bias cannot be ruled out. Due to the relatively small sample size, the results cannot be generalized. The study also lacks measures to ensure minimal non-response bias. Another limitation could be recalling bias because the data were obtained by self-report questionnaire.

Further studies are required for validation of results and modifiable and preventable causes like stress and dietary habits further need to be studied. The burden of this disease is debilitating for young medical professionals. Awareness of this disease and associated factors is the need of the hour among medical professionals.

Conclusion

In this study frequency of GERD was found to be 30.4% based on the GERD-Q questionnaire. Daily lifestyle choices during post-graduation training are contributing to the development of GERD among young medical professionals. Being overweight, fast food and self-reported stress are identified as causative factors, while specialty and altered food habits have an independent association with this disease.

Conflict of Interest

Authors have no conflict of interest and no grant funding from any organization.

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