

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/mjafi

Original Article

Prevalence and the risk factors of gastro-esophageal reflux disease in medical students

Abhilasha Sharma^a, Col Praveen Kumar Sharma^{b,*},
Brig Pankaj Puri^c^a Medical Cadet, Armed Forces Medical College, Pune 411040, India^b Associate Professor, Department of Internal Medicine, Armed Forces Medical College, Pune 411040, India^c Brig (Med), HQ 12 Corps, C/O 56 APO, India

ARTICLE INFO

Article history:

Received 17 March 2017

Accepted 14 August 2017

Available online 7 October 2017

Keywords:

Gastro-esophageal reflux disease

Prevalence

Risk factors

Medical students

ABSTRACT

Background: Gastroesophageal reflux disease (GERD) is a commonly prevalent gastrointestinal disorder in adults. Very few studies on magnitude of GERD in student community have been done and there is none so far from India. Rigorous MBBS curriculum makes medical students prone for reflux symptoms. Hence, this study was conducted to determine the prevalence of GERD in medical students and the potential risk factors associated with it.

Methods: This was a cross sectional observational study conducted on medical students in a premier medical college of India. All participants were interviewed for GERD symptoms using the validated questionnaire on frequency scale for the symptoms of GERD. Additional 11 questions include enquiries on medical history and lifestyle factors.

Results: Of the 600 students, 150 (25%) had GERD symptoms. Of these, 88 (58.6%) had mild, 58 (38.6%) moderate, and 4 (2.7%) severe reflux symptoms. Fifty eight (38.6%) of students with GERD had associated dyspepsia. On univariate analysis higher BMI, final years of MBBS course, use of NSAID or alcohol, inadequate sleep, sleeping within one hour of taking dinner, missing breakfast regularly and quick eating were significantly associated with GERD ($p < 0.05$).

Conclusions: Prevalence of symptoms of GERD in medical students is 25%, majority had mild symptoms. Associated dyspeptic symptoms were present in 38.6%. Factors predisposing to GERD in them are higher BMI, final years of MBBS course, use of NSAID, inadequate sleep, sleeping within one hour of taking dinner, missing breakfast on regular basis and quick eating.

© 2017 Published by Elsevier B.V. on behalf of Director General, Armed Forces Medical Services.

Introduction

Symptomatic gastroesophageal reflux disease (GERD) is a commonly prevalent gastrointestinal disorder. In western

countries the prevalence of GERD ranges from 10% to 30%.¹ Magnitude of this problem is not clearly known in India. A recent study from north India concluded that GERD symptoms were prevalent in 16.2% of hospital employees.² The principal symptoms of GERD are heartburn and/or regurgitation.³

* Corresponding author.

E-mail address: pksgemed@gmail.com (P.K. Sharma).<http://dx.doi.org/10.1016/j.mjafi.2017.08.005>

0377-1237/© 2017 Published by Elsevier B.V. on behalf of Director General, Armed Forces Medical Services.

Younger age, female sex, obesity, shorter dinner-to-bed time, fatty meal, mental stress, smoking, and alcoholism are known risk factors for this disorder.^{1,4,5}

There is no study on the prevalence of and severity of GERD and dyspepsia amongst medical students from India. There are two studies from Asia which revealed prevalence of GERD in university students between 14.8% and 25%. Many of them also had overlap of reflux symptoms with dyspepsia and irritable bowel syndrome.^{6,7} Most medical students who suffer from GERD and/or dyspeptic symptoms do not reach out to a doctor since they either consider these symptoms insignificant, or do self-medication. GERD may affect their quality of life and thus affecting daily activities, college attendance and the students' well-being.

In view of the above, to ascertain the prevalence of GERD in young Indian medical students and to find out the risk factors associated with it this study was conducted.

Materials and methods

Study participants

Study population was all the medical students in age range 17–25 years, studying in different years of MBBS in a premier medical college of India.

Study design

A cross sectional study was done in 2015 and data collection was completed over 3 months.

Inclusion criteria

- 1) MBBS students
- 2) Willing to participate in the study

Exclusion criteria

- 1) Unwilling students
- 2) Incomplete answers to the questionnaire

Methodology

Students studying in different years of MBBS in a medical college were selected as per the inclusion and exclusion criteria. Demographic characteristics of students such as age, gender, weight (in kg), height (in meter), body mass index, lifestyle habits (smoking, alcohol intake, dietary and sleep hygiene) was recorded in the questionnaire.

All participants were interviewed by principal worker and two of her colleagues for reflux symptoms using Frequency Scale for the Symptoms of GERD (FSSG) questionnaire, which comprises of 12 questions regarding GERD symptoms, to which participants answered correspondingly along with the frequency of symptoms: never, occasionally, sometimes, often oral ways. GERD was considered present if the total FSSG score was ≥ 8 . FSSG score was used in this study as it can evaluate not only the acid-reflux related symptoms but also the dyspeptic

symptoms. FSSG at cut off eight points showed sensitivity of 62%, specificity of 59%, and accuracy of 60% in diagnosing GERD.⁸ Copy of FSSG questionnaire is provided as supplementary material to this article.

Additional 11 questions include enquiries on medical history and lifestyle factors. This questionnaire was self-administered to all the study subjects so as to reduce interviewer bias. All the points in both the questionnaires were explained to the students. Ethical clearance was obtained from the ethics committee of our medical institute and written informed consent was taken from all the participants.

Statistical analysis

The data recorded was analyzed using appropriate statistical methods using SPSS software version 24. Frequency was calculated for categorical variables and mean \pm standard deviation for continuous variables. Chi-square test was used for comparing categorical variables. Univariate analysis was done to find out association of GERD with each independent variable so as to determine potential risk factors and a p -value of <0.05 was taken as significant.

Results

Out of 614 questionnaires filled, 600 were complete with a response rate of 97.7%. Detailed demographic profile of these 600 valid participants is summarized in Table 1. Out of these 600 medical students, 500 (71.8%) were male and 100 (28.2%) were female. Their age ranged between 17 and 25 years with a mean of 21.5 ± 1.9 years. There were 120 students each in first to fifth year of MBBS course. BMI $> 25 \text{ kg/m}^2$ was present in 161 (26.8%) and 560 (93.3%) had never smoked. Need based non-steroidal anti-inflammatory drugs (NSAIDs) were used by 62 (10.3%), proton pump inhibitors (PPI) by 26 (4.3%), histamine 2 receptor-antagonists (H2RA) by 13 (2.2%). 411 (68.5%) were non-veg and 189 (31.5%) were vegetarians in diet preference, 177 (29.5%) were missing their breakfast on regular basis and 137 (22.8%) were sleeping within one hour of taking dinner. Only 12 (2%) students admitted to be social drinkers and 196 (32.6%) were quick eaters which were defined as finishing major meals in less than ten minutes.

Prevalence of symptomatic GERD

Of the 600 students, 150 (25%) had GERD. Of these 150 symptomatic students 88 (58.6%) had mild, 58 (38.6%) moderate, and 4 (2.7%) had severe symptoms. Fifty eight (38.6%) of students with GERD had associated dyspepsia as compared to only 35 (7.7%) students having dyspepsia without associated GERD symptom's.

Factors associated with GERD symptoms

Univariate analysis revealed, high BMI, final years of MBBS course, use of NSAID or alcohol, inadequate sleep, sleeping within one hour of taking dinner, missing breakfast on regular basis and quick eating has significant ($p < 0.05$) association with the presence of GERD (Table 2). Age, sex, initial years of

Table 1 – Baseline characteristics of 600 medical students.

Parameters	n (%)
Age (years) (mean [SD]) [range]	21.5 (1.9) [17-25] ^a
Male	500 (71.8%)
Female	100 (28.2%)
BMI (>25 kg/m ²)	161 (26.8%)
<i>Year of MBBS course</i>	
First	120 (20%)
Second	120 (20%)
Third	120 (20%)
Fourth	120 (20%)
Fifth	120 (20%)
<i>Smoking status</i>	
Non-smokers	560 (93.3%)
Current smokers	40 (6.7%)
<i>Drug use</i>	
NSAID	62 (10.3%)
PPI	26 (4.3%)
H2RA	13 (2.2%)
Alcohol consumers	12 (2.0%)
Exercising <30 min/day	213 (35.5%)
Inadequate sleep	223 (37.1%)
Sleeping within one hour of dinner	137 (22.8%)
Veg:non-veg	189 (31.5%):411 (68.5%)
Missing breakfast regularly	177 (29.5%)
Quick eating	196 (32.6%)
Taking mid-night snacks	164 (27.3%)
GERD symptoms	150 (25%)
Associated dyspepsia	93 (15.5%)

^a Value in mean (SD).

MBBS course, current smoking or type of diet (veg or non-veg) were not related to presence or absence of GERD. Significantly, more patients with GERD had associated dyspepsia than those not having GERD symptoms ($p < 0.05$).

Discussion

GERD has been accepted as a significant problem of adult western population. There are very few studies on GERD in student community especially medical students who are always under pressure of studies and examinations. Psychological stress, as a risk factor and even one of the causes of GERD, is higher in medical students than the general population. Studies have shown that psychological stress may produce symptoms of GERD through increasing gastric acid secretion, reducing gastric emptying, and increasing mucosal sensitivity to acid in the esophagus.^{9,10} In addition, there are many other risk factors for developing GERD in students such as consuming more tea and coffee than the general population, irregular meal timings and quick eating.⁷ Significantly more students in final MBBS years were symptomatic with GERD which may be due to university examination stress.

GERD was present in 25% of medical students and of this majority had either mild (58.6%) or moderate (38.6%) symptoms, severe symptoms were present in only in 2.7% of GERD subjects. These prevalence rates are higher than those reported from India and various Asian countries but similar to figures of 10-30% reported from west.^{1,2} In two separate

Table 2 – Variables associated with GERD on univariate analysis.

Characteristic	GERD (n = 150) [n (%)]	NO GERD n = 450 [n (%)]	p value
Age (years) ^a	21.6[1.6]	21.7[1.9]	0.55
Sex – M:F (%)	115 (76.7%):35 (23.3%)	385 (85.5%):65 (14.4%)	0.003
BMI (>25 kg/m ²)	67 (44.6%)	94 (20.8%)	0.000
<i>Year of MBBS course</i>			0.11
First	28 (18.6%)	92 (20.4%)	0.48
Second	25 (16.6%)	95 (21.1%)	0.44
Third	24 (16%)	96 (21%)	0.06
Fourth	35 (23.3%)	85 (18.8%)	0.03
Fifth	40 (26.6%)	80 (17.8%)	0.02
<i>Symptom severity (FSSG score)</i>			
Mild (8-12)	88 (58.6%)	–	
Moderate (13-20)	58 (38.6%)	–	
Severe (>20)	4 (2.7%)	–	
Current smokers	14 (9.3%)	26 (5.8%)	0.08
<i>Drug use</i>			
NSAID	21 (14%)	41 (9.1%)	0.007
PPI	15 (10%)	11 (2.4%)	0.000
H2RA	10 (6.6%)	3 (0.6%)	0.002
Alcohol consumers	7 (4.6%)	5 (1.1%)	0.01
Exercising <30 min/day	51 (34%)	162 (36%)	0.64
Inadequate sleep	50 (33.3%)	173 (38.4%)	0.26
Sleeping within one hour of dinner	53 (35.3%)	84 (18.7%)	0.001
Veg:non-veg	49 (32.6%):101 (67.3%)	140 (31.1%):310 (68.8%)	0.45
Missing breakfast regularly	56 (37.3%)	121 (26.9%)	0.010
Quick eating	58 (38.7%)	138 (30.7%)	0.040
Taking mid-night snacks	49 (32.6%)	115 (25.5%)	0.070
Associated dyspepsia	58 (38.6%)	35 (7.7%)	0.000

^a Value in mean (SD).

studies on medical students in 2015 and 2017 from Iran and Syria the reported prevalence of GERD was 14.8% and 16%, respectively.^{6,7} Few community based epidemiological studies from Europe reported a much higher prevalence of up to 70%.¹² This differences in prevalence may be due to the non-uniformity of the populations studied and methodology used.

The strength of this study is the interview-based filling up of questionnaire by the principal worker and her two colleagues. This has an advantage over the self-administered questionnaires in terms of avoiding the misinterpretation of non-dyspeptic symptoms for reflux symptoms by the participants. Most of the studies on prevalence of GERD have used self-reported questionnaire. There are very few available studies in literature using interview method of completing the questionnaire.

Multitude of Questionnaires exist in literature for assessing symptoms of GERD, response to therapy and for assessment of health-related quality of life (HRQOL).¹¹ The FSSG questionnaire used in present study is well validated and has good reliability for diagnosis of GERD. Another advantage of this questionnaire is that it also assesses the presence of associated dyspeptic symptoms which are prevalent in up to 30% of general population and can be associated with GERD.⁸

Dyspeptic symptoms were present in 38.6% of students with GERD and were significantly more frequent compared with students with no GERD symptoms. Literature reports association of dyspepsia with GERD in 21–63% of GERD patients.¹² Dyspeptic symptoms substantially reduce HRQOL associated with GERD.^{8,9}

Since, the study population included only medical students in age range 17–25 years, no correlation can be found with age in this study. This study showed significantly more females having GERD. A review in 2005, reported inconsistent relation of GERD with gender.¹³ In a study on 620 university students in Iran, GERD was more prevalent in females, although this difference was not significant.¹⁴ The impact of obesity on the prevalence of GERD is not clear. Our study shows a significant association of BMI ≥ 25 kg/m² with prevalence of GERD which is concordant with the results of previous studies both in Indian as well as western populations.^{2,15} However, this association is not found to be consistent.¹⁶

Smoking by lowering lower esophageal pressure can aggravate GERD resulting in its increased prevalence in current smokers when compared with non-smokers.² However, present study has revealed negative association of smoking with the occurrence of reflux symptoms. This could be due to very few smokers in this study. Similar to smoking, use of alcohol has been shown to incite reflux episodes.^{17,18} Though we found a statistically positive association of alcohol consumption with GERD but the number of alcohol consumers in this study was so small that this positive association may not be accurate. The present study did not find any significant difference in the occurrence of reflux symptoms among vegetarian or non-vegetarian. This finding is similar to findings from an Indian study done on 4039 hospital employees.²

Some studies report a positive association of aspirin/NSAIDs use and the occurrence of GERD whereas, others did not.^{19,20} The present study found that consumption of NSAIDs was associated with GERD symptoms. Understandably, significantly more students having GERD were using PPI or H2RA for symptom

relief. It is a popular belief that fast eating causes various functional gastrointestinal symptoms. Wildi et al. in a study on healthy volunteers showed that eating a 690 K calorie meal in five rather than thirty minutes induced up to 50 per cent more acid reflux episodes due to increased gastric acid production and increased transient lower oesophageal sphincter relaxations.²¹

Significantly more students who were missing their breakfast regularly have symptoms of GERD. This may be indirectly related either to bad sleep hygiene or consuming more of junk food in lieu of regularly timed breakfast. Studies have shown irregularly timed meals as strong risk factor for developing GERD.²² Habit of sleeping within an hour of eating dinner is associated with GERD symptoms. The pathophysiological mechanisms of postprandial reflux are multifactorial. The primary mechanism postulated is reduced lower esophageal sphincter pressure in supine position during an early post-prandial state.^{23,24}

Conclusions

This interview based questionnaire study from a premier medical college in India found the prevalence of GERD in medical students to be 25% and of these 38.6% had associated dyspeptic symptoms too. This prevalence is as high as that reported from western countries. The potential risk factors of GERD in medical students are BMI ≥ 25 kg/m², final years of MBBS course, use of NSAID or alcohol, inadequate sleep, sleeping within one hour of taking dinner, missing breakfast on regular basis and quick eating. To reduce the burden of GERD symptoms in medical students they should be educated on orderly eating habits, good sleep hygiene, maintaining ideal body weight and avoiding smoking, alcohol and self medication with NSAID's or antacids drugs.

Conflicts of interest

The authors have none to declare.

Acknowledgment

This article is based on ICMR STS project number 2014-00242.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.mjafi.2017.08.005](https://doi.org/10.1016/j.mjafi.2017.08.005).

REFERENCES

- Holtmann G. Reflux disease: the disorder of the third millennium. *Eur J Gastroenterol Hepatol.* 2001;13:S5–S11.
- Sharma PK, Ahuja V, Madan K, et al. Prevalence, severity, and risk factors of symptomatic gastroesophageal reflux disease among employees of a large hospital in Northern India. *Indian J Gastroenterol.* 2011;30(3):128–134.

3. Vakil N, van Zanten SV, Kahrilas P, Dent J, Jones R. The Montreal definition and classification of gastroesophageal reflux disease: a global evidence based consensus. *Am J Gastroenterol.* 2006;101:1900-1920.
4. El-Serag HB. Epidemiology of non-erosive reflux disease. *Digestion.* 2008;78(suppl 1):6-10.
5. Pace F, Negrini C, Wiklund I, Rossi C, Savarino V. Quality of life in acute and maintenance treatment of non-erosive and mild erosive gastroesophageal reflux disease. *Aliment Pharmacol Ther.* 2005;22:349-356.
6. Saadi TA, Idris A, Turk T, Alkhatib M. Epidemiology and risk factors of uninvestigated dyspepsia, irritable bowel syndrome, and gastroesophageal reflux disease among students of Damascus University, Syria. *J Epidemiol Glob Health.* 2016;6(4):285-293.
7. Bordbar G, Bolandnaza N. Gastroesophageal reflux disease (GERD): prevalence and association with psychological disorders among medical sciences students. *Int J PharmTech Res.* 2015;8(7):120-130.
8. Kusano M, Shimoyama Y, Sugimoto S, et al. Development and evaluation of FSSG: frequency scale for the symptoms of GERD. *J Gastroenterol.* 2004;39:888-891.
9. Naliboff BD, Mayer M, Fass R, et al. The effect of life stress on symptoms of heartburn. *Psychosom Med.* 2004;66(3):426-434.
10. Taché Y, Martinez V, Million M, Wang III L. Stress-related alterations of gut motor function: role of brain corticotropin-releasing factor receptors. *Am J Physiol-Gastrointest Liver Physiol.* 2001;280(2):173-177.
11. Mouli P, Ahuja V. Questionnaire based gastroesophageal reflux disease (GERD) assessment scales. *Indian J Gastroenterol.* 2011;30(3):108-117.
12. Jones RH, Hungin AP, Phillips J, et al. Gastro-esophageal reflux disease in primary care in Europe: clinical presentation and endoscopic findings. *Eur J Gen Pract.* 1995;1:149-154.
13. Grainger SL, Klass HJ, Rake MO, et al. Prevalence of dyspepsia: the epidemiology of overlapping symptoms. *Postgrad Med J.* 1994;70:154-161.
14. Dent J, El-Serag H, Wallander MA, Johansson S. Epidemiology of gastro-oesophageal reflux disease: a systematic review. *Gut.* 2005;54(5):710-717.
15. Somi MH, Farhang S, Mirinezhad K, et al. Prevalence and precipitating factors of gastroesophageal reflux disease in a young population of Tabriz, Northwest of Iran. *Saudi Med J.* 2006;27(12):1878-1881.
16. Isolauri J, Laippala P. Prevalence of symptoms suggestive of gastro-oesophageal reflux disease in an adult population. *Ann Med.* 1995;27:67-70.
17. VerLagergren J, Bergstrom R, Nyren O. No relation between body mass index and gastro-oesophageal reflux symptoms in a Swedish population based study. *Gut.* 2000;47:26-29.
18. Kaufman SE, Kaye MD. Induction of gastro-oesophageal reflux by alcohol. *Gut.* 1978;19:336-338.
19. Kitzan J, Wade W, Yu HH. Assessing NSAID prescription use as a predisposing factor for gastro-oesophageal reflux disease in a Medicaid population. *Pharm Res.* 2001;18:1367-1372.
20. Haque M, Wyeth JW, Stace NH, Talley NJ, Green R. Prevalence, severity and associated features of gastro-oesophageal reflux and dyspepsia: a population based study. *N Z Med J.* 2000;113:178-181.
21. Wildi SM, Tutuian R, Castell DO. The influence of rapid food intake on postprandial reflux: studies in healthy volunteers. *Am J Gastroenterol.* 2004;99:1645.
22. Hyun Song J, Chung SJ, Lee JH, et al. Relationship between gastroesophageal reflux symptoms and dietary factors in Korea. *J Neurogastroenterol Motil.* 2011;17(1):54-60.
23. Freidin N, Mittal RK, McCallum RW. Does body posture affect the incidence and mechanism of gastro-oesophageal reflux? *Gut.* 1991;32:133-136.
24. Hila A, Castell DO. Night time reflux is primarily an early event. *J Clin Gastroenterol.* 2005;39:579-583.