

Original Article***Epidemiology of Gastro-esophageal Reflux Disease in a Rural Population of Bangladesh***

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*** For Correspondence****Abstract**

Background and aim: Gastro esophageal reflux disease (GERD) is considered to be a common and chronic gastrointestinal disorder that is associated with a range of troublesome symptoms encountered in clinical practice, Despite a common disorder there are only few studies which were conducted on GERD in Bangladesh. The previous studies on GERD in Bangladesh were hospital outpatient department, urban and semi urban population setting. Population-based data on gastro -esophageal reflux disease (GERD) is lacking in rural population of Bangladesh. This epidemiological study was designed to determine the prevalence of GERD in rural area and also identify the association of demographic variables with the prevalence of GERD.

Study design: Community based cross-sectional study.

Place of study: The study was carried out in Dhara village of Haluaghat upzilla under Mymensingh District.

Study period: Six Months, January, 2016 to June, 2016.

Materials and Method: This population-based cross-sectional study was done by door to door interview at their home using a validated GerdQ questionnaire translated into Bengali by interviewers and investigator in Dhara village of Haluaghat upzilla under Mymensingh. A cutoff point 8 or above was considered as a valid and reliable scale to confirm GERD. SPSS software (Version-16) was used for calculation.

Result: A total 1166 persons of age 18 years and above were interviewed. Among the study subjects 555 (47.6%) were male and 611 (52.4%) were female. Among these peoples prevalence of GERD was 25.9%, GERD was found more in female (26.5%), age more than fifty (50)years (38.1%), Illiterate (31%), day laborer (40.7%), widowed/widowers (34.1%) smokers (32.9%) obese (30.8%) low income (26.9%). The prevalence of GERD in the present study was 25.9% which was higher than other studies in Bangladesh (22.8%).

Conclusion: The prevalence of GERD in rural adult population from Dhara village is 25.9% which is higher as compared to other previous studies done in Bangladesh.

Key words: GERD, Rural population, Prevalence .

Introduction

Gastro esophageal reflux disease (GERD) is a common and chronic disease that is associated with a range of troublesome symptoms which can in turn have a significant impact on health related quality of life¹. According to Montreal Working Group, GERD is defined as a condition which develops when the reflux of stomach contents causes troublesome symptoms (at least two heart burn episodes per week) and or complications and it adversely affect an individual's well-being^{1,2}. GERD is considered as a spectrum of disease on one hand are the patients with classical symptoms of esophageal symptomatic syndrome such as typical reflux syndrome and reflux chest pain syndrome. Heartburn and regurgitation are the characteristic symptoms of typical reflux syndrome and it is diagnosed even without any endoscopic changes²⁻⁴. On the other hand patients present with esophageal syndrome with esophageal injury such as reflux esophagitis, with risks of complications like stricture, Barrett's esophagus and esophageal adenocarcinoma^{5,6}. Patients of GERD also present with extra esophageal syndromes some are such as reflux cough syndrome, reflux laryngitis syndrome, reflux asthma syndrome and reflux dental erosion syndrome^{6,7,8}.

This chronic disease substantially interferes with physical activity, impair social functioning, disturb sleep, and reduces productivity at work⁸. There is a notable geographical variation in the prevalence of GERD and it is a common condition in the Western population. The prevalence of GERD appears to be rising in the Western and in some Asian Countries⁹⁻¹³. Possibly prevalence of GERD is changing with time due to changes of environments, food habit, level of education, occupation, lifestyle, socioeconomic development geographical and ethnical variation.

This cross-sectional population-based survey was designed to find out the prevalence of the symptoms of gastro esophageal reflux disease (GERD) as well as to find out the association of various socio-demographic variables with the prevalence of the symptoms of GERD in rural population of Bangladesh. Knowledge on prevalence estimates and associated risk factors of GERD in our rural population might play a part in defining local health needs as well as to improve the management of these patients and prevent GERD related complications.

Materials & Methods

- Study design:** Community based cross-sectional study.
- Study period:** This study was conducted from 1st February 2016 and 30th July 2016 for six months period
- Place of study-** The study was conducted at Dhara village of Haluaghat upzilla under Mymensingh District
- Study population-** The study was conducted in a defined population at Dhara village of Haluaghat upzilla under Mymensingh district who fulfill inclusions and exclusions criteria. Total number of the subject as per voter list were 1392, of them 1166 were successfully interviewed. Rest 226 subjects were excluded due to-
 - 175 were absent
 - 35 were refused to participate
 - 05 were pregnant
 - 09 were significant illness
 - 02 were died
- Sample size-** Sample size determination depends on time and resources. As Prevalence of the symptoms of gastro-esophageal reflux disease (GERD) in rural area is not known in our country, so estimated population was calculated by using the following statistical formula:

$$n = z^2 p (1 - p) / d^2$$
 Where n= the desired sample size
 Z= the standard normal deviate, usually set at 1.96 at 5% level which corresponds to 95% confidence level.
 P means prevalence = 0.5(50%), (In unknown prevalence it can be regarded as 50%)
 The degree of accuracy or precision level is d which is considered at 5%.
 The higher value of d will yield lower sample size and smaller value of d will yield higher sample size.
 Suppose 50% (p = 0.5) prevalence of the symptoms of gastro-esophageal reflux disease GERD.
 Z statistic is 1.96, which corresponds to the 95% confidence level.
 d is the level of accuracy that is considered 5%.
 Using the above formula the expected sample size will be n = 384.

All adult population at Dhara village of Haluaghat upzilla under Mymensingh district who fulfill inclusions and exclusions criteria.

But in this study sample size 1166, because data were collated during six months of study period.

6. Sampling technique- Consecutive sampling

7. Selection criteria:

a. Inclusion Criteria:

- Resident of Dhara village of Haluaghat upzilla under Mymensingh district.
- Aged 18 years or more as shown by voter list.
- Those who will consent to participate in the study.

b. Exclusion criteria:

- Pregnancy.
- Absence during the period of survey.
- Lack of cooperation.
- Previous gastric surgery.
- Major psychiatric illness.

8. Study procedure- Total 1166 subjects with age 18 years and above were interviewed in a home setting by trained interviewers using a valid (GerdQ) questionnaire (cut-off point 8 or above out of 18) translated into Bengali under the direct supervision of the investigator. Data were collected according to update voter list. There are 1392 voters in Dhara village. They were interviewed door to door at their home using a questionnaire by the investigator and two interviewers. Interviewers had been trained by the investigator. Informed consents were taken from the participants and the question was read out to the subjects and filled up by the interviewers.

Interviewers used to visit the subjects in the evening at their home as they were most likely to be available at that time after working hours.

Twenty to twenty-five subjects were interviewed at each evening. Subjects who were not available at first visit, two follow up visits were conducted on the subsequent next evenings. The investigator rechecked randomly selected data to verify the collected data at weekly interval. To further validate the data, investigator randomly selected two or three individuals were interviewed.

9. Data management

All collected data was complied, edited and coded meticulously through checking and rechecking. All omissions and inconsistencies were corrected and were removed methodically then entered into the computer for statistical analysis by using **MS EXCEL**.

10. Statistical analysis

The questionnaires were coded for analysis, and the data will be entered in a computer and analysis by using SPSS software (Version 16). Univariate analysis will be performed by Student's t-test for continuous variables and by chi-squared test for categorical variables to determine the association between GERD and patient characteristics such as age, gender, education, BMI, occupation, income, smoking and marital status. A p value of less than 0.05 or less was considered statistically significant.

Results and Observations

The present study was conducted to find out the prevalence of Gastro- esophageal Reflux Disease (GERD) among rural population in Bangladesh. The survey was carried out between the periods of February, 2016 to July, 2016 in a defined population at Dhara village of Haluaghat Upzilla under Mymensingh District. Male: Female ratio was 0.90:1. Mean age of the study population was 39.8 + 16.8 whereas the mean age of the subjects with GERD was 45.4 + 16.8.

Table I: Prevalence of GERD in Rural adult people

GERD	Frequency (n)	Percentage (%)
Subjects with GERD	302	25.9
Subjects without GERD	864	74.1
Total	1166	100

Table 1 shows prevalence of GERD among rural adult people. Prevalence of GERD is 25.9% in rural adult population and non GERD 74.1%.

Table II: Gender distribution of the study subjects

Gender	GERD		P value	Total
	Yes	No		
	n%	n%		
Male	140(25.2)	415(74.8)		555
Female	162 (26.5)	449 (73.5)	0.616	611
Total	302 (25.9)	864 (74.1)		1166

Table II shows prevalence of GERD in male and female. Among male 25.2% and among female 26.5% had GERD. There was no significant difference between male and female.

Table III : Age distribution of the study subjects

Age (years)	GERD		P value	Total
	Yes	No		
	n%	n%		
18-20	15(11.9)	111(88.1)		126
21-30	59(17.4)	280 (82.6)		339
31-40	61(27.4)	162 (72.6)		223
41-50	57(30.2)	132(69.8)		189
>50	110(38.1)	179(61.9)		289
Total	302 (25.9)	864 (74.1)		1166
Mean ± SD	45.4±16.8	37.8± 16.4	<0.001	39.8±16.8
Range (Min-Max)	18.0-98.0	18.0-98.0		18.0-98.0

Unpaired t test was done to measure the level of significance

Table III shows prevalence of GERD in different age groups. Prevalence of GERD was highest in more than 50 years age group. Mean age was 45.4 ± 16.8 years in GERD patients. Age was significantly high in GERD patients.

Table IV: Distribution of level of education among study subjects

Educational status	GERD		P value	Total
	Yes	No		
	n%	n%		
Illiterate	140 (31.0)	312 (69.0)	0.002	452
Class V	124 (24.2)	388 (75.8)	0.246	512
SSC	26 (19.5)	107 (80.5)	0.076	133
HSC	9 (20.5)	35 (79.5)	0.401	44
Graduate and above	3 (12.0)	22 (88.0)	0.109	25
Total	302(25.9)	864(74.1)		1166

Chi-square test was done to measure the level of significance

Table IV shows distribution of study subjects according to educational status. Prevalence of GERD was highest among illiterate (31.0%) followed by class V (24.2%), HSC (20.5%), SSC (19.5%) and graduate and above (12.0%).

Low level of education was statistically significant in GERD patients.

Table V: Distribution of occupation of the study subjects (n=1166)

Occupation	GERD		P value	Total
	Yes	No		
	n%	n%		
Service Holder	12 (24.5)	37 (75.5)	0.818	49
Businessman	26 (19.3)	109 (80.7)	0.061	135
Student	2 (6.5)	29 (93.5)	0.012	31
Housewife	151 (25.9)	431 (74.1)	0.972	582
Day Laborer	50 (40.7)	73 (59.3)	0.001	123
Farmer	48 (24.1)	151 (75.9)	0.529	199
Others	13 (27.7)	34 (72.3)	0.779	47
Total	302 (25.9)	864 (74.1)		1166

Chi-square test was done to measure the level of significance

Table V shows distribution of study subjects according to occupation. Among study subjects most of the respondents were housewife. GERD was found highest among day laborer (40.7%) followed by housewife (25.9%), service holder (24.5%), farmer (24.1%), businessman (19.3%) and student (6.5%). There was statistically significant in occupation.

Table VI: Distribution of BMI among study subjects

BMI	GERD		P value	Total
	Yes	No		
	n%	n%		
Under Weight (<18.5)	124 (25.3)	366 (74.7)	0.693	490
Normal (18.5-24.9)	161 (26.1)	455 (73.9)	0.873	616
Over Weight (25.0-29.9)	13 (28.3)	33 (71.7)	0.709	46
Obese (≥30.0)	4 (30.8)	9 (69.2)	0.687	13
Total	302 (25.9)	864 (74.1)		1166

Chi-square test was done to measure the level of significance

Table VI shows distribution of study subjects according to BMI. GERD was found highest among obese (30.8%) followed by overweight (28.3%), normal (26.1%) and underweight (25.3%). There was statistically no significant in BMI.

Table VII: Distribution of monthly family income of the study subjects

Monthly family income (Taka)	GERD		Total
	Yes	No	
	n%	n%	
<5,000	186 (26.9)	505 (73.1)	691
5,000-10,000	80 (24.5)	247 (75.5)	327
10,000-20,000	32 (25.6)	93 (74.4)	125
>20,000	4 (17.4)	19 (82.6)	23
Total	302 (25.9)	864 (74.1)	1166

Chi-square test was done to measure the level of significance

Table VII shows distribution of study subjects according to monthly family income. GERD was found highest among the study subjects having monthly family income < Tk. 5,000 (26.9%) followed by Tk. 10, 000-Tk.20, 000 (25.6%),

Tk. 5,000- Tk. 10, 000 (24.5%) and > Tk.20, 000 (17.4%)

Table VIII: Distribution of marital status of the study subjects

Marital status	GERD		P value	Total
	Yes	No		
	n%	n%		
Married	269(26.1)	762(73.9)	0.681	1031
Unmarried	4(8.0)	46(92.0)	0.003	50
Widow/widower	29(34.1)	56(65.9)	0.072	85
Total	302 (25.9)	864 (74.1)		1166

Chi-square test was done to measure the level of significance

Table VIII shows distribution of study subjects according to marital status. GERD was found highest among widow/widower (34.1%) followed by married (26.1%) and unmarried (8.0%).

Table IX: Distribution of religion of the study subjects

Religion	GERD		P value	Total
	Yes	No		
	n%	n%		
Muslim	291(25.9)	832 (74.1)		1123
Hindu	11(25.6)	32 (74.4)	0.961	43
Total	302 (25.9)	864 (74.1)		1166

Chi-square test was done to measure the level of significance.

Table IX shows distribution of study subjects according to religion. Prevalence of GERD was almost similar in both religions. There was no statistically significant difference found in religion.

Table X: Distribution of habits of the study subjects

Habits	GERD		Total
	Yes	No	
	n%	n%	
Smoking	146 (32.9)	298 (67.1)	444
Tobacco chewing (Jorda, Gul)	79 (27.1)	213 (72.9)	292
Betel leaf/Nut	220 (29.9)	517 (70.1)	737

Chi-square test was done to measure the level of significance

Table X shows distribution of study subjects according to habits. Prevalence of GERD was 32.9% among smoker, 27.1% among tobacco chewers and 29.9% among betel takers.

Table XI: Distribution of smoking habits of the study subjects (n=1166)

GERD	Smoker	Non-smoker	P-value	Total
	444 (38.07)	722 (61.9)		1166
Present	146 (32.8)	156 (21.6)	0.001	
Absent	298 (67.1)	566 (78.4)		

Prevalence of GERD was 32.8% among smoker and 21.6% in non-smoker. There was statistical significant difference found in smoking habit.

Table XII: Frequency of heartburn according to age

Heart Burn	Age (years)					Total
	18-20	21-30	31-40	41-50	>50	
	n%	n%	n%	n%	n%	
0 days a week	74 (58.7)	160 (47.2)	72 (32.3)	64 (33.9)	88 (30.4)	458 (39.3)
Once in a week	21 (16.7)	74 (21.8)	68 (30.5)	46 (24.3)	65 (22.5)	274 (23.5)
2-3 days a week	22 (17.5)	87 (25.7)	61 (27.4)	62 (32.8)	93 (32.2)	325 (27.9)
4-7 days a week	9 (7.1)	18 (5.3)	22 (9.9)	17 (9)	43 (14.9)	109 (9.3)
Total	126 (100)	339 (100)	223 (100)	189 (100)	289 (100)	1166 (100)

Table XII shows Frequency of heartburn according to age

Frequency of heartburn once in a week according to age 16.7%, 21.8%, 30.5%, 24.3%, 22.5%, 23.5% Highest frequency of heartburn 30.5% between 31-40 years age group.

Highest frequency of heartburn two to three days in a week was 32.8% between 41- 50 years age group.

Highest frequency of heartburn 4 to 7 days in a week was 14.9% between more than 50 years age group.

Table XIII: Frequency of regurgitation according to age

Heart Burn	Age (years)					Total
	18-20	21-30	31-40	41-50	>50	
	n%	n%	n%	n%	n%	
0 days a week	70 (55.6)	149 (44.0)	749 (33.2)	66 (34.9)	88 (30.4)	447 (38.3)
Once in a week	20 (15.9)	100 (29.5)	64 (28.7)	43 (22.8)	64 (22.1)	291 (25.0)
2-3 days a week	29 (23.0)	76 (22.4)	63 (28.3)	64 (33.9)	100 (34.6)	332 (28.5)
4-7 days a week	7 (5.6)	14 (4.1)	22 (9.9)	16 (8.5)	37 (12.8)	96 (8.2)
Total	126 (100)	339 (100)	223 (100)	189 (100)	289 (100)	1166 (100)

Table XIII shows frequency of regurgitation according to age Frequency of regurgitation once in a week according to age 15.9%, 29.5%, 28.7%, 22.8%, 22.1%, 25% Highest frequency of regurgitation 29.5% between 21-30 years age group.

Highest frequency of regurgitation two to three days in a week was 34.6% more than 50 years age group.

Highest frequency of regurgitation 4 to 7 days in a week was 12.8% more than 50 years age group.

Discussion

Gastro- esophageal reflux disease (GERD) is a common problem worldwide ⁹. It is one of the most frequent health problems in the western world¹⁶ and as a chronic condition. GERD places a substantial burden on patients and the health care delivery system¹⁷. There is no gold standard diagnostic test for GERD. Most frequently done investigations like upper GI endoscopy and 24 hour esophageal pH monitoring lack sensitivity and have several limitations¹⁸. Questionnaire-based diagnosis of GERD is reliable with high sensitivity and specificity¹³. In this study questionnaire-based (GerQ) diagnosis was done to find out the prevalence of GERD in rural area of Bangladesh.

In this study, the prevalence of GERD based on questionnaire was 25.9% in rural adult population. The prevalence of GERD in this study was lower than that of only population-based study in Dhaka city (40.9%)¹⁹.The frequency of heartburn and or acid regurgitation in this study for at least daily, 2-3 days a week and weekly 9.3% 27.9% and 23.5% respectively. The monthly, weekly and daily prevalence of GERD reported by Rahman et al.¹⁰(2005) were 24.6% 17.2% & 12.5% respectively which is similar to this study. This significant difference may be due to inclusion of selected population who came for consultation in Gastroenterology outpatient clinic in a tertiary care hospital of Bangladesh.

The present population-based study was conducted in rural area. In eastern and south-eastern Asia, prevalence

ranged from 2.5 to 6.7% for at least weekly symptoms of reflux^{9,20,21}. A population based study in India conducted by Bhatia et al²² was found prevalence of GERD 7.6%. The prevalence of GERD in this study was similar to the prevalence in urban population in Pakistan as shown a study done by Jafri N et al²³ using a questionnaire where the prevalence was 24% and in a rural population of China was 21.7% shown in a study done by Wong et al. A population-based cross-sectional study in Tehran reported the prevalence of GERD (at least weekly symptoms of reflux during the last 6 months) to be 21.2%²⁴.

In the present study on the basis of weekly symptoms frequency the prevalence of heart burn was 23.5% which is higher the prevalence in other Asian countries such as China 6.2%, Korea 3.5%, and Japan 6.6%. The variation in the prevalence of GERD may be due to difference in dietary habits, environmental factors, selection of population and also geographical and ethnical variation. Community based study conducted in defined urban and rural areas of Sylhet prevalence of GERD was 6% which was lower than in this present study. This variation of GERD prevalence may be related to population selection, different questionnaire used dietary factors, level of education and sociocultural factors. Geographic differences in GERD prevalence estimates are difficult to interpret.

Rahman et al¹⁰ found GERD was more prevalent in female based on symptoms score (female 31.8%, male 19.9%; P value), In this study, among male 25.2% had and among female 26.5% had GERD. There was no significant difference between male and female. Prevalence of GERD was highest in more than 50 years age group. Mean age was 45.4 ± 16.8 years in GERD patients. In this study mean age was statistically significantly with the prevalence of GERD. Similar result was found in study of Rahaman et al.¹⁰ and Kumar & Shivalli²⁵. An increased prevalence of GERD symptoms was found with increasing age in the study of Shaha et al.²⁶.

Prevalence of GERD was highest among illiterate (31.0%) followed by class V (24.2%), HSC (20.5%), SSC (19.5%) and graduate and above (12.0%). This increased prevalence of GERD among persons with low level of education in our study is consistent with the report from Bangladesh^{10,26} and Spain²⁷. Lack of knowledge regarding healthy life style, less ability to

modify life style factors, ignore symptoms, consult with physician in late precipitating GERD symptoms might play a role²⁷. Present study showed that GERD was more prevalent among day laborer (40.7%) followed by housewife (25.9%), service holder (24.5%), farmer (24.1%), businessman (19.3%) and student (6.5%). These findings are not in agreement with the reports from Bangladesh^{9,10} and Korea¹⁹. Level of education, dietary habit, and health related awareness may play a role here.

GERD was found highest among obese (30.8%) followed by overweight (28.3%), normal (26.1%) and underweight (25.3%). BMI was found as a risk factor for GERD in the studies from India²², Spain²⁵ and Dhaka²⁷. But studies from Korea⁹ and Iran²⁸ found no association between GERD and BMI. In this study no significant difference in prevalence of GERD was found with increase in BMI which is consistent with Masud¹⁰. This may be due to relatively small number of over-weight and obese person in our study population. GERD was found highest among the study subjects having monthly family income < Tk. 5,000 (26.9%) followed by Tk. 10,000-Tk.20,000 (25.6%), Tk. 5,000-Tk. 10,000 (24.5%) and > Tk. 20,000 (17.4%). Higher prevalence of GERD among widow/widower (34.1%) and married (26.1%) in this study is in agreement with Shaha et al.²⁶. Psycho-social factor might have an influence here.

Prevalence of GERD was 32.9% among smoker, 27.1% among tobacco chewers and 29.9% among betel takers. Association between smoking and GERD is controversial. Several reports showed direct relation between smoking and GERD²⁶. However, studies from Spain²⁷ and India²² did not find any relation between smoking and GERD. In this study has shown that Prevalence of the GERD more common in smokers which was statistically significant. Prevalence of heartburn once in a week was 23.5%, 2 - 3 days a week was 27.9% and 4 - 7 days a week was 9.3%. Prevalence of regurgitation once in a week was 25.0%, 2 - 3 days in a week was 28.5% and 4 - 7 days in a week was 8.2%. The monthly, weekly and daily prevalence of heartburn and or acid regurgitation reported by Shaha et al. were 5.5%, 5.25% and 2.5% respectively²⁶. The variation in the prevalence of heart burn may be due to difference in dietary, environmental factors, and selection of population questionnaire used and sociocultural factors.

Conclusion

This questionnaire based community survey showed that GERD is not uncommon condition in our country though the disease burden is less than that of Western World. The study revealed that the prevalence of GERD in this rural community was 25.9%. GERD was found more in women, older age (>50 years), lower socioeconomic group with lower level of education, illiterate and smokers. This study was conducted in defined rural area, so it might not be representative of all rural population of Bangladesh. More research are required involving different rural population all over the country for exact estimation of the disease burden for rural population of Bangladesh and planning appropriate health care.

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