

PREVALENCE AND RISK FACTORS OF GASTROESOPHAGEAL REFLUX DISEASE (GERD) IN ADULT KASHMIRI POPULATION

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ABSTRACT

Objective: The study was conducted with the objective of studying the prevalence of gastroesophageal reflux disease (GERD) and to study various factors associated with it in adult Kashmiri population.

Methods: It was a community based prospective cross-sectional observational study conducted by the Department of Medicine and Gastroenterology, GMC Srinagar over a period of 24 mo upon native Kashmiris from urban as well as rural areas as a study group. A total of 2600 subjects above the age of 18 y were studied and the overall prevalence of disease was calculated and also the associated (risk) factors were looked for.

Results: The overall prevalence of 20.3% was seen in the study population with female gender being more prone to the development of disease ($p < 0.001$). Other factors of greater significance included body mass index (BMI), smoking, physical activity, intake of spicy foods, posture after meals, dinner to sleep time, non-steroidal anti-inflammatory drug (NSAID) intake and some underlying ailments like asthma and history of abdominal surgery.

Conclusion: The overall prevalence of GERD in Kashmiri community is 20.3% with females being more prone with a definite role of factors like BMI, smoking, physical activity, posture after meals, dinner to sleep time interval, intake of spicy foods, drugs and also the co-morbidities.

Keywords: Gastroesophageal reflux disease (GERD), Prevalence, Risk factors, Co-morbidity, Severity

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INTRODUCTION

Gastro-oesophageal reflux (GERD) is the regurgitation of gastric contents and acid into the esophagus caused by the spontaneous and repeated opening of lower esophageal sphincter or its inappropriate closure [1]. GERD is a chronic and relapsing gastrointestinal disorder in which the reflux of the gastric contents into the esophagus causes a range of troublesome symptoms like heartburn and regurgitation, and/or complications [2]. The symptoms may not correlate with the endoscopic picture. The patient may present in different ways ranging from typical heartburn and reflux symptoms with endoscopic evidence of mucosal injury to the atypical symptoms such as dyspepsia, cough, asthma, pharyngitis, laryngitis, pneumonia or sometimes gum and dental erosions may be the only presentation [3].

GERD has a well-known list of associations like pregnancy, scleroderma, Zollinger-Ellison syndrome, post laparoscopic gastric banding for morbid obesity, after Heller myotomy for achalasia cardia and prolonged nasogastric intubation [3] and complications like esophagitis, esophageal ulcer, upper GI bleeding, esophageal stricture, Barrett's esophagus and adenocarcinoma [4]. Other associations include body obesity, genetic factors, nutritional factors, alcohol consumption, smoking habits, intake of non-steroidal anti-inflammatory drugs, posture after meals and dinner to sleep time interval [5]. Many of these factors are related to the population's lifestyle. Although GER symptoms and gastroesophageal reflux disease are rarely life-threatening, cross-sectional studies have shown that GER symptoms affect many aspects of health-related quality of life, reduce work productivity, and lead to increased health-care resource utilization [6]. Therefore, considering the different lifestyles in different regions of the Indian population, we expect some differences in the prevalence of GERD in different regions of the country and so in the Kashmiri community. With this thing in mind and owing to the burden of the disease and the impact of different lifestyle adopted by people from different regions on the prevalence and severity of GERD and also the absence of any such data from this part of Northern India,

the current study was conducted in our community where a lot of non-vegetable foods with added spices are consumed.

MATERIALS AND METHODS

It was a community based, cross-sectional, observational study conducted by the Department of Medicine and Gastroenterology, GMC Srinagar over a period of 24 mo, starting from Jan 2014 using only native Kashmiris (both from urban as well as rural areas) as a study group. A total of 2600 subjects above the age of 18 y were studied with the exclusion of non-resident Kashmiris and pregnant females.

The sample size was calculated based on an anticipated prevalence of 18.7% [7], taking the confidence level of 95% and an absolute error of 1.5% and a non-response rate of 10% and using the formula:

$$N = \frac{z^2 pq}{e^2}$$

Where, N=minimum sample required, Z= Z score [1.96 at 95% C. I]

p = Proportion of the factor under investigation (10%), e = maximum (absolute) error allowed (1.5%), Q=(1-p), So calculated Sample size was 2,600.

The study was conducted in different stages of 1-4. In stage 1, four districts were selected by a draw of lots followed by stage 2 in which four medical blocks/zones were selected randomly from each district. In stage 3, four sub-centres were selected from each medical block/zone and during the last stage (stage 4), four villages/mohallas were selected from the above-selected sub-centres and finally the first house and then every odd house was selected till we enrolled approximately ten patients per village. This process was repeated till the required sample size was achieved. Each selected subject was interviewed with the aid of a valid questionnaire (in local language) containing items eliciting the demographic, lifestyle factors and the symptom score for GERD [7, 8]. The scoring of symptoms was done on the basis of the frequency of symptoms both

ranging from 0-3. The total score was obtained by adding the final scores of individual symptoms. Thus the final score ranged from 0 to 18. The presence of GERD was defined as a score ≥ 4 .

RESULTS AND OBSERVATION

Out of the selected population, the prevalence was estimated and compared on the basis of age, sex, dwelling, socioeconomic status, lifestyle, dietary factors, BMI, underlying medical condition, addiction and drug intake if any. The overall prevalence amongst the studied population was 20.3% (table 1) and on comparing the same amongst two different sexes, a statistically significant difference with the p-value of <0.001 was found. In case of females, the prevalence was found to be 26.5% against 14.8% in case of males. Age, dwelling and socioeconomic status were factors with least impact on the prevalence of GERD (table 2) while the other factors that showed a statistically significant impact on the prevalence of GERD included body mass index (BMI), dietary habits, smoking, dinner to sleep interval, physical activity,, NSAID intake, intake of spicy foods, posture after meals, history of asthma and history of abdominal surgery (table 3). From our study, it was observed that prevalence of 53.6% was found in patients with BMI of ≥ 30 as against the prevalence of less than 20% in those

with a BMI of <20. Amongst the smokers, prevalence was found to be highest (27.2%) in current smokers followed by 22.3% in case of ex-smokers and the least (18.3%) was found in case of non-smokers. Consumption of spicy food intake was found to be associated with an increase in the prevalence of GERD to the extent of 27.4% as compared to the prevalence of 18.6% in case of those not consuming spicy foods. Coming to the dinner to sleep time interval and assuming a lying down posture after meals, both these factors were found to have a definite and statistically significant association with the prevalence of GERD. Lying down immediately after meals were associated with higher incidence of GERD and so was the shortened (≤ 2 H) dinner to sleep time interval. Being physically active is always good for biological system functioning and gut is in no way an exception. Prevalence of GERD is almost half in case of persons who are physically active as compared to those who have a sedentary lifestyle.

Amongst the co-morbid conditions studied, it was found that patients with asthma and those with history of abdominal pain and abdominal surgery showed an increased prevalence of GERD while as other co-morbid conditions did not have much impact on the prevalence as such and amongst the drugs, NSAID intake was found to result in high prevalence of GERD.

Table 1: Shows the prevalence of GERD as per the dwelling

Residence	Total enrolled	GERD	Prevalence
Rural	1300	282	21.7
Urban	1300	247	19.0
Total	2600	529	20.3
P-value		0.088#	

#Statistically insignificant (P-value>0.05)

Table 2: Showing prevalence of GERD in studied population as per Age

Age (y)	Total enrolled	GERD	Prevalence
18-29	258	62	24.0
30-39	652	138	21.0
40-49	891	174	19.5
50-59	660	119	18.0
≥ 60	139	36	25.9
mean \pm SD	46.4 \pm 16.34	44.9 \pm 19.45	-
P-value	0.103#		

#Statistically insignificant (P-value>0.05)

Table 3: Factors associated with GERD on multivariate analysis

Category		Multivariate odds ratio	95% CI	P-value
Gender	Male	1	-	0.016*
	Female	2.32	(1.06-3.45)	
BMI	<20	1	-	0.037*
	20-24.9	1.47	(0.96-2.01)	
	25-25.9	2.06	(1.56-2.89)	
	≥ 30	3.89	(3.29-4.55)	
Smoking	Non-smoker	1	-	0.041*
	Current Smoker	2.11	(1.72-2.58)	
Spicy Food	Ex-smoker	1.76	(1.05-2.13)	0.007*
	Yes	2.79	(2.21-3.89)	
Lying Down after a meal	No	1	-	0.326#
	Yes	1.16	(0.76-1.84)	
Diner to Bedtime	≤ 2 H	1	-	0.012*
	> 2 H	2.58	(1.98-3.74)	
Physical Activity	Sedentary	1.43	(0.91-1.75)	0.218#
	Non-sedentary	1	-	
Asthma	Yes	0.67	(0.24-0.96)	0.587#
	No	1	-	
Abdominal Surgery	Yes	0.75	(0.38-1.02)	0.469#
	No	1	-	
NSAID	Yes	0.98	(0.66-1.27)	0.365#
	No	1	-	
Abdominal Pain	Yes	1.17	(0.85-1.56)	0.414#
	No	1	-	

*Statistically significant value (p<0.05)

DISCUSSION

Until now, GERD was considered to be the disease of affluent people without being a significant health problem in developing countries including India [8]. GERD has a significant impact on quality of life (QIL) [9, 10], quantitative estimation of its actual prevalence is difficult and whatever is our current understanding about the epidemiology of GERD, it is based on data obtained from population-based cross-sectional studies conducted across the affluent western regions like the United States and Europe [9, 10], while such studies are lacking from countries in Asia. As per the data available, the prevalence of GERD symptoms in the Western population ranges from 10% to 44%. The traditional belief is that GERD occurs less frequently in Asia than in Western countries [11], however, there is an emerging suggestion that the prevalence of GERD might be on the rise in Asia [12]. The exact reasons for these changes in the prevalence of GERD are difficult to determine but this reflects, in general, the lifestyle changes that are currently occurring in many Asian countries [13]. Hence, although increasing attention is being given to the epidemiology of GERD in the Asia-Pacific region, yet community-based prevalence studies are lacking from most countries in this region. Studies from this region are required as ethnic and geographical differences in disease frequency may highlight environmental or genetic influences that contribute to our understanding of the etiology of this disease. Our study is one such study where we have focused both on the prevalence of the disease as well as have tried to look for its association with various risk factors.

In the present study, a total of 2600 cases were enrolled, 50% belonged to the urban areas and 50% came from rural areas (table 1) with the male: female ratio of 1.11. The age ranged from >18 y to more than 60 y with the mean age of the study population being 46.4±16.34 y (table 1) the overall prevalence of GERD in the study group was found to be 20.3% [table 2] and on comparing the prevalence among different age groups and sexes, it was observed that the prevalence was found to be more (26%) in persons above 60 y of age but the combined prevalence of almost 59% percent was observed between the age of 30-59 y and the mean age of the persons with GERD was found to be 44.9±19.4 y with female gender being more prone to the development of GERD as compared to their male counterparts. These results of our study with respect to many variables are comparable to some other studies [9, 14] conducted earlier by others although the difference still exists as far as some other variables are concerned [15]. In one of the studies conducted earlier in 1999 in Italy by Valle Cetal [16], the monthly prevalence of 21% was observed in which it is again comparable to that seen in our study group, but in this study, only the employees were included. In an Israeli study conducted by Menachem Moshkowitz *et al.* [17] in 2011, they had tried to see the prevalence of GERD on twice weekly, once weekly and once monthly basis and the same was found to be 8.4%, 12.5% and 21.5% respectively, but our study was not done on any such pattern. In fact, most of the literature available in this regard has mainly focused on the weekly, monthly or annual prevalence rates of the disease under study, so this opens the scope for further research on the similar pattern. The prevalence seen in our study is also comparable to the results of certain other studies like the one conducted in school going children in one of the cities in Taiwan by Jiann-HWA [18] in 2014 where same was found to be 20.5% and also in some Indian studies like those conducted in Bihar [19] (23.6%) and Ladakh [7] (18.7%). In fact in Bihar, the prevalence has been found to be more in case of Muslim community than their Hindu counterparts that can be attributed to the consumption of more of non-vegetarian diet by Muslims; however the prevalence found in our study group is much higher than that seen in many other parts of the world like Korea [15], Brazil [20], Spain [21], China [22], Russia [23], Australia [24] and even in some parts of the India like Delhi [8]. The higher prevalence of GERD in our set up can be due to many reasons and one of the important factors that could give such a high prevalence is the food that we consume which contains a lot of fat and added spices. Also, the ignorance among the people here about the importance of exercises in maintaining the good health as well as the peace of mind that indirectly relieves the GERD symptoms can be a very important factor responsible and the role of genetic make can never be ruled out. However, there are certain studies available from China as well as Spain where the

prevalence has been shown to be higher than what we have observed in our study [25]. Coming to the association of various risk factors with the prevalence of GERD, the results have been consistent with other studies conducted so far on such association [26, 27]. In our study the prevalence of GERD was seen to go up as the BMI went above 25 kg/m² and was found to be 29.7% in persons with BMI between 25-25.9 and in those persons where BMI was above 30 kg/m², the prevalence of GERD was found to be 53.6%. The prevalence of GERD has been increasing in Western countries over past 30 y that has largely been attributed to the parallel increase of obesity [28]. In obese individuals (defined as a BMI ≥ 30), epidemiological studies suggest the prevalence of GERD is considerably higher than in the non-obese population [28]. Obesity also appears to be associated with complications related to long-standing GERD such as erosive esophagitis, Barrett's esophagus, and esophageal adenocarcinoma [29]. Current evidence suggests that central obesity results in an increase in intragastric pressure, thus increasing the abdominal-thoracic pressure gradient, which overwhelms the reflux barrier [30]. This leads to reflux of acidic, weakly acidic and nonacidic material in the esophagus. In addition, visceral fat is metabolically active and produces a variety of cytokines including interleukin (IL-6) and TNF- α , which may affect the function of the lower esophageal sphincter (LES). Recent data also suggest that insulin resistance, a consequence of visceral obesity may be an important contributing factor [31].

Other associated risk factors of statistical significance in our study included smoking, consumption of more of spicy food with the history of lying down immediately after meals, <2h dinner to bedtime interval and history of NSAID intake.

The prevalence rate in the case of current smokers was found to be 27.7% as against 18.3% seen in the case of non-smokers. In fact, the prevalence among ex-smokers was also less (22.3%) as compared to the current smokers. Although it is mentioned in Sleisenger; 9th edition, that a review of studies looking at interventions to limit the exposure to alcohol, tobacco, and caffeine suggested that these practices are of limited value [32], however, there are studies [8, 33, 34] available that have documented the increased prevalence of GERD associated with smoking but at the same time few studies [35, 36] are contradictory. Persons consuming spicy foods showed the prevalence of 27.4% compared to those who would avoid taking spicy foods where the same was found to be only 18.6%. As per the literature [20] available, spicy food such as curry may precipitate GERD symptoms, but interventional studies are lacking.

The prevalence in the case of persons who would lie down immediately after meals were 27.6 % in our study population and the same was only 18.9% in those who would avoid lying down immediately after meals. Dinner to bedtime interval was found to have a great impact on the GERD development as far as our study is concerned. In persons where this interval was <2 hours, the prevalence was as high as 33.1% while as in the other group where this interval was >2 h, the same was 17% only. This could be because of the fact that basal LES pressure is lowest after meals and is influenced greatly by circulating peptides and hormones, foods (particularly fats), as well as number of drugs and thus NSAID intake, was seen to increase the GERD prevalence to the extent of 27.3% against 19.7% in their absence in our study. Previously also some studies [14] have shown the association between NSAID and calcium channel blocker intake with increasing prevalence of GERD, while others [7, 33] have not been able to prove any such association. In our study also, we had tried to find out if there was any association of GERD with the intake of calcium channel blocker, but no such association could, however, be ascertained. Tea, intake of non-vegetarian diet and low socioeconomic status also showed the increased prevalence of GERD in our study but not to the extent of statistical significance. Increased incidence of GERD in persons from low socioeconomic status has been proved by studies conducted earlier by Moshkowitz M *et al.* [17] and Kumar S *et al.* [19] but no explanation for such an association has been given. Role of increased tea intake and spicy foods has also been proved by earlier researchers in their studies [20, 34]. Increased risk of GERD with the intake of meat has been proved by earlier studies [7, 24] also and has been attributed to the high-fat content of meat being responsible for delayed gastric emptying.

Physical activity as per our study has a very important role to play in the prevalence of GERD. Those who resorted to a sedentary lifestyle were more prone to develop GERD than those who remained physically active. The prevalence in the former group in our study was 36.2% against 18.2% in the later. Other studies showing the association of GERD with sedentary lifestyle include those conducted by Kumar S *et al.* [7], Pandeya N *et al.* [24] and Lulzim Cela *et al.* [26].

Co-morbid conditions that had a statistically significant role in increasing the prevalence of GERD in our study include asthma and history of abdominal surgeries where the prevalence was found to be 44.8% and 39.7% respectively as against the prevalence of 19.5% and 19.7% in absence of asthma and abdominal surgeries respectively. Our results are consistent with the studies conducted earlier [8, 15, 34]. Other Co-morbid medical conditions that were studied in our study were hypertension, diabetes mellitus, IHD and COPD but no such association could be ascertained.

CONCLUSION

So to conclude the results of our study, the prevalence of GERD in the adult Kashmiri population was found to be 20.3%, females being more prone to the development of the same as compared to their male counterparts without any effect of age on the same. The various risk factors that have got a great impact on the prevalence of GERD as per our study include, increased BMI, smoking, consumption of spicy foods, lying down after meals, <2hour dinner to bed time interval, physical inactivity, NSAID intake and also the underlying asthma and h/o abdominal surgery if any, thus supporting many studies conducted earlier but the role of excessive tea intake, consumption of non-vegetarian diet, low socioeconomic status, calcium channel blocker intake, diabetes mellitus, hypertension and IHD could not be ascertained thus contradicting the results of other studies.

Limitations: The study was conducted in only two districts of Kashmir, so may not actually represent the true picture of whole state.

AUTHORS CONTRIBUTIONS

Rakesh K Koul, Padma Lahdol, and Prof Samia Rasheed contributed in study designing and collection of data.

Shagufta Parveen and Nisar A Shah contributed to statistics and manuscript writing.

CONFLICT OF INTERESTS

Authors have no conflict of interest

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