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Original Research Article

Burden of Peptic Ulcer Disease Among Smoking and Non-Smoking Healthcare Providers: A Comparative Cross-Sectional Study in Gazipur, Dhaka

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ABSTRACT: ***Background:*** Peptic ulcer disease (PUD) is a significant health concern among healthcare providers, with lifestyle factors such as smoking, dietary habits, and stress being key contributors. This study aims to explore the burden of PUD among smoking and non-smoking healthcare providers in Gazipur District, Bangladesh. ***Methods:*** A comparative cross-sectional study was conducted between March and August 2024, with data collected from 300 healthcare providers (male and female) from several private hospitals and Upazila health complexes in Gazipur. Participants were categorized into smoking and non-smoking groups. A structured questionnaire was used to assess sociodemographic details, lifestyle factors, and PUD symptoms. Statistical analysis included frequency distributions, chi-square tests, and multivariable logistic regression. ***Results:*** The prevalence of PUD was significantly higher among smokers (65%) compared to non-smokers (19.4%) ($p < 0.001$). Smokers reported higher levels of stress (72% vs. 42%, $p < 0.001$) and more frequent consumption of spicy foods (75.6% vs. 38.8%, $p < 0.001$). A lower BMI (<18.5 kg/m²) was associated with higher PUD prevalence (46.7%, $p = 0.002$). Multivariable logistic regression revealed smoking (OR 3.85, $p < 0.001$) and high-stress levels (OR 2.92, $p = 0.001$) as independent risk factors for PUD. ***Conclusion:*** Smoking and high-stress levels were identified as the most significant risk factors for PUD among healthcare providers in Gazipur. The findings suggest the need for targeted health interventions, including smoking cessation programs and stress management strategies, to mitigate the risk of PUD in this population. Further, longitudinal studies are needed to establish causal relationships.

Keywords: Peptic Ulcer Disease, Smoking, Stress, Healthcare Providers, Risk Factors, Bangladesh, Cross-Sectional Study.

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INTRODUCTION

Peptic ulcer disease (PUD) is a common gastrointestinal disorder characterized by the formation of open sores or ulcers in the lining of the stomach or the duodenum. The condition is a significant cause of morbidity worldwide and has been associated with various risk factors, including **Helicobacter pylori** infection, the use of nonsteroidal anti-inflammatory drugs (NSAIDs), excessive alcohol consumption, and smoking. Among healthcare providers, who often face high levels of occupational stress, long working hours, and irregular eating habits, the prevalence of PUD may be elevated [1, 2]. Smoking, in particular, is a

well-established risk factor for the development of PUD. It contributes to increased gastric acid secretion, impaired mucosal defenses, and delayed healing of existing ulcers, leading to a higher incidence of ulcer-related complications. Studies have consistently shown that smokers are more likely to develop PUD than non-smokers, and smoking cessation has been linked to improved outcomes in patients with the condition [3]. In addition to smoking, stress has also been implicated as a risk factor for PUD. Healthcare workers, especially those in high-pressure environments such as hospitals and clinics, often experience chronic stress, which can exacerbate the risk of gastrointestinal disorders. Stress is thought to influence gastric physiology by increasing acid secretion and altering mucosal barrier function [4]. The role of dietary habits, including the consumption of spicy foods and irregular meal times, has also been examined in the context of PUD. Healthcare providers, due to their demanding schedules, may exhibit poor eating patterns, which can further increase their susceptibility to developing ulcers. The relationship between smoking and the development of peptic ulcer disease has been well-documented, with substantial evidence linking smoking to an increased risk of ulcer formation in men. However, the evidence regarding the effects of smoking on peptic ulcer disease in women remains less conclusive. This discrepancy in the data stems from the fact that the majority of studies examining this relationship have primarily focused on male populations, leaving a gap in our understanding of how smoking may influence peptic ulcer risk in women [5, 6]. Numerous studies, particularly case-control studies, have shown a significant association between smoking and peptic ulcer disease in men. The evidence suggests that smokers are more likely to develop peptic ulcers compared to non-smokers. Smoking is thought to contribute to the development of ulcers by increasing gastric acid secretion, impairing mucosal blood flow, and reducing the healing capacity of the stomach lining. These factors collectively create an environment conducive to ulcer formation. Additionally, smoking may alter the production of prostaglandins, which play a crucial role in protecting the stomach lining from the acidic environment [7]. The 1980 Surgeon General's report on the health consequences of smoking specifically noted that, while there was compelling evidence of the link between smoking and peptic ulcer disease in men, the data concerning women were insufficient. The report concluded that "there is little information dealing specifically with the relationship between smoking and peptic ulcer disease in women" [8]. This statement highlights a significant gap in the scientific literature at the time, as many studies did not include a sufficient number of female participants or failed to analyze the gender-specific effects of smoking on peptic ulcer risk. More recent case-control studies, which have included both men and women, have provided some insight into the potential link between smoking and peptic ulcer disease in women. These studies suggest that the risk of peptic ulcer disease in women who smoke appears to be similar to that seen in men who smoke reported similar risks of peptic ulcers for both men and women who smoke [5, 9]. While this finding is suggestive of a gender-independent relationship between smoking and ulcer development, it is important to note that case-control studies are observational and can be influenced by confounding factors, such as dietary habits, alcohol consumption, and stress, which may also play a role in ulcer development. Despite the growing body of case-control evidence, prospective studies—those that track individuals over time to observe the development of disease—have been less common, especially when it comes to women. Most of the large prospective studies examining the relationship between smoking and peptic ulcer disease have been conducted in male populations. For example, studies following male college students and assessing their smoking habits and the subsequent development of peptic ulcers have shown a clear association between smoking and ulcer formation [7]. Similarly, studies that have examined smoking and mortality rates among men have demonstrated that smoking is a significant risk factor for a variety of gastrointestinal diseases, including peptic ulcers [8-10]. In contrast, studies specifically focusing on women have been more limited in scope and have often lacked the follow-up duration or sample size needed to draw strong conclusions. This is partly because many of the early cohort studies did not include enough women or did not differentiate between men and women in their analyses of smoking-related risks [6, 10]. This study aims to explore the burden of PUD among

smoking and non-smoking healthcare providers in Gazipur District, Bangladesh. By examining the association between smoking, stress, dietary habits, and PUD prevalence, this research seeks to provide valuable insights into the risk factors contributing to PUD in this specific population. The findings may help inform targeted health interventions and raise awareness about the importance of lifestyle modification in preventing PUD among healthcare workers.

METHODOLOGY

This comparative cross-sectional study was conducted in the Gazipur district, Dhaka, to assess the burden of peptic ulcer disease among smoking and non-smoking healthcare providers. Data were collected from 300 healthcare providers, including both male and female participants, working in several private hospitals and Upazila health complexes within the district. The study was carried out over six months, from January to June 2024. Participants were selected using a stratified random sampling technique to ensure representation from both smoking and non-smoking groups. Data were collected through structured interviews using a pre-tested questionnaire, which included sections on sociodemographic information, smoking habits, dietary practices, stress levels, and clinical history of peptic ulcer disease. Medical records were reviewed to validate self-reported diagnoses. All participants provided informed written consent before enrollment in the study. Confidentiality was maintained throughout the research process. The study received ethical clearance from the Institutional Review Board (IRB) of the lead research institution.

RESULT

Table 1: Sociodemographic Characteristics of Healthcare Providers

Variable	n	%
Gender		
- Male	180	60.0%
- Female	120	40.0%
Age Group (years)		
- 20–29	75	25.0%
- 30–39	165	55.0%
- 40–49	60	20.0%
Profession		
- Doctor	105	35.0%
- Nurse	135	45.0%
- Allied Health Worker	60	20.0%

Table 1 shows the sociodemographic distribution of the participants. Most were male (60%), aged 30–39 years (55%), and worked as nurses (45%).

Table 2: Smoking Status Among Healthcare Providers

Smoking Status	n	%
Smokers	135	45.0%
Non-Smokers	165	55.0%

Table 2 highlights the smoking behavior of the healthcare providers, with 45% identifying as smokers and 55% as non-smokers.

Table 3: Prevalence of Peptic Ulcer Disease Among Smokers and Non-Smokers

Peptic Ulcer Disease	Smokers (n=135)	Non-Smokers (n=165)	p-value
Yes	88 (65.0%)	32 (19.4%)	<0.001
No	47 (35.0%)	133 (80.6%)	

Table 3 reveals a significantly higher prevalence of peptic ulcer disease among smokers (65%) compared to non-smokers (19.4%), with a p-value of <0.001 indicating statistical significance.

Table 4: Dietary Habits of Smokers and Non-Smokers

Dietary Habit	Smokers (n=135)	Non-Smokers (n=165)	p-value
Spicy Food Consumption	102 (75.6%)	64 (38.8%)	<0.001
Regular Meal Timing	33 (24.4%)	93 (56.4%)	0.002

Table 4 demonstrates that smokers were more likely to consume spicy foods frequently (75.6%) and were less likely to follow regular meal timings (24.4%), with statistically significant differences ($p < 0.05$).

Table 5: Stress Levels Among Healthcare Providers

Stress Levels	Smokers (n=135)	Non-Smokers (n=165)	p-value
High	97 (72.0%)	69 (42.0%)	<0.001
Moderate	38 (28.0%)	96 (58.0%)	

Table 5 highlights that smokers experienced significantly higher stress levels (72%) compared to non-smokers (42%), with a p-value of <0.001.

Table 6: Medication Use for Gastrointestinal Symptoms

Medication Use	Smokers (n=135)	Non-Smokers (n=165)	p-value
PPI Use	79 (58.5%)	42 (25.5%)	<0.001
Antacid Use	57 (42.2%)	31 (18.8%)	0.003

Table 6 shows that smokers relied more on proton pump inhibitors (58.5%) and antacids (42.2%) compared to non-smokers, with statistically significant differences ($p < 0.05$).

Table 7: Body Mass Index (BMI) and Peptic Ulcer Disease

BMI Category	With PUD (n=120)	Without PUD (n=180)	p-value
<18.5 kg/m²	56 (46.7%)	37 (20.6%)	0.002
18.5–24.9 kg/m²	48 (40.0%)	102 (56.7%)	
≥25.0 kg/m²	16 (13.3%)	41 (22.7%)	

Table 7 indicates that participants with a lower BMI (<18.5 kg/m²) were significantly more likely to have peptic ulcer disease ($p = 0.002$).

Table 8: Multivariable Logistic Regression Analysis of Risk Factors for Peptic Ulcer Disease

Variable	OR	95% CI	p-value
Smoking	3.85	2.45–6.05	<0.001
High Stress	2.92	1.79–4.76	0.001
Spicy Food Consumption	1.75	1.10–2.78	0.017

Table 8 identifies smoking (OR 3.85, $p < 0.001$), high stress (OR 2.92, $p = 0.001$), and spicy food consumption (OR 1.75, $p = 0.017$) as independent risk factors for peptic ulcer disease.

DISCUSSION

This study aimed to explore the burden of peptic ulcer disease (PUD) among smoking and non-smoking healthcare providers in Gazipur District, Bangladesh. The results revealed significant differences between the two groups in terms of prevalence, associated behaviors, and risk factors. These findings help shed light on the impact of smoking on the development of PUD and provide essential insights for healthcare

interventions. The prevalence of PUD among smokers was found to be 65%, compared to 19.4% among non-smokers ($p < 0.001$). This difference was highly significant, confirming smoking as a major risk factor for the development of PUD. The association between smoking and PUD has been well-documented in existing literature. Nicotine has been shown to increase gastric acid secretion, impair mucosal defense, and reduce bicarbonate secretion, leading to a higher risk of ulceration in the stomach and duodenum [11, 12]. A study conducted in Japan similarly concluded that smoking significantly increases the risk of recurrent PUD due to these harmful physiological effects. Regarding dietary habits, the study revealed that a majority of smokers (75.6%) consumed spicy foods regularly compared to only 38.8% of non-smokers ($p < 0.001$). Additionally, smokers exhibited poorer meal timing, with only 24.4% adhering to regular meal schedules, in contrast to 56.4% of non-smokers ($p = 0.002$). Irregular eating patterns and frequent consumption of spicy foods are known risk factors for PUD, as these can aggravate gastric irritation and increase acid production [13]. This study's findings align with similar research conducted in South Korea, which highlighted that poor dietary habits exacerbate the risk of PUD in healthcare providers. Stress levels were another significant factor in this study [14, 15]. A striking 72% of smokers reported high stress levels, compared to 42% of non-smokers ($p < 0.001$). Psychological stress is a known risk factor for PUD, as it can stimulate the release of stress hormones such as cortisol, which in turn can increase gastric acid secretion and weaken the gastric mucosal barrier [16]. The results of this study corroborate findings from previous research conducted in Turkey, which indicated a higher prevalence of gastrointestinal disorders, including PUD, among healthcare providers under high stress. In terms of medication use, 58.5% of smokers used proton pump inhibitors (PPIs) for gastrointestinal symptoms, compared to 25.5% of non-smokers ($p < 0.001$). Antacid usage was also higher among smokers (42.2%) than non-smokers (18.8%, $p = 0.003$). These findings suggest that smokers are more likely to self-medicate, which is consistent with research from China, where smokers with gastrointestinal complaints frequently use PPIs and antacids to manage symptoms, potentially masking underlying conditions [17]. This self-medication behavior may delay proper diagnosis and treatment of PUD, further complicating the condition. The study also assessed the relationship between body mass index (BMI) and PUD prevalence. Individuals with a lower BMI (<18.5 kg/m²) exhibited a higher prevalence of PUD (46.7%) compared to those with normal BMI (40%) or higher BMI (13.3%, $p = 0.002$). This observation suggests that lower body weight may be a risk factor for PUD, possibly due to malnutrition and compromised mucosal defenses. Similar findings have been reported in studies from Bangladesh and Nigeria, which highlighted a higher risk of PUD among individuals with lower BMI [18-26]. Multivariable logistic regression analysis further confirmed smoking as the most significant independent risk factor for PUD (OR 3.85, $p < 0.001$), followed by high stress (OR 2.92, $p = 0.001$) and the consumption of spicy foods (OR 1.75, $p = 0.017$). These results are consistent with global literature that emphasizes the role of smoking, stress, and diet in the development of PUD (Smith et al., 2021). The findings highlight the need for healthcare providers to adopt comprehensive interventions targeting these modifiable risk factors. One of the strengths of this study is its large sample size (n=300) and its focus on healthcare providers, a group with unique occupational stressors and lifestyle habits. Additionally, the study used a comprehensive set of variables, providing a well-rounded view of the factors contributing to PUD. However, the study is limited by its cross-sectional design, which does not allow for the establishment of causality. Furthermore, self-reported data on smoking status, dietary habits, and stress levels could be subject to recall bias, which may affect the accuracy of the results.

CONCLUSION

This study highlights a significantly higher burden of peptic ulcer disease among smoking healthcare providers compared to non-smokers. Smoking, dietary habits, and stress were identified as key risk factors contributing to the development of PUD. The findings underscore the importance of targeted health interventions, including smoking cessation programs, stress management strategies, and dietary counseling, to reduce the risk of PUD among healthcare workers. Future research using a longitudinal design could provide a more in-depth

understanding of the causal relationships between these factors and the development of PUD.

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