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ARTICLE

Frequency of Delayed Gastric Emptying Time & Its Associated Risk Factors in Adult Dyspeptic Patients Attending at Gastroenterology Department, BSMMU

Md. Touhid Al Mahmud[1]*, Md. Masudur Rahman Khan[2], Sharmin Quddus[3], Madhusudan Saha[4], D. M. Abu Hena Shahinujjaman[1]

[1] MO, Department of Gastroenterology, Rajshahi Medical College Hospital, Rajshahi, Bangladesh
[2] Associate Professor, Department of Gastroenterology, BSMMU, Dhaka, Bangladesh
[3] Professor, National Institute of Nuclear Medicine & Allied Sciences (NINMAS), BSMMU, Dhaka, Bangladesh
[4] Professor, Department of Gastroenterology, North East Medical College & Hospital, Sylhet, Bangladesh

ABSTRACT

Background: Dyspepsia, a common symptom with a broad differential diagnosis, involves various pathophysiologic mechanisms, including delayed gastric emptying, which causes symptoms such as nausea, vomiting, and bloating. Gastric emptying time is essential for dyspepsia evaluation. **Objective**: The study aimed to measure gastric emptying time in adult dyspeptic patients using Gastric Emptying Scintigraphy (GES) and identify associated risk factors. **Materials and Methods**: This cross-sectional study was conducted in the Department of Gastroenterology at BSMMU, Dhaka, from January to December 2022. A total of 35 dyspeptic patients meeting the selection criteria were evaluated through detailed history taking, physical examination, laboratory tests, and upper GI endoscopy. GES was performed to assess gastric emptying. **Results**: The majority of patients were aged 41-50 years (51.4%), with a mean age of 43.7 ± 8.5 years. Females were predominant, and 51.3% had a high BMI. Delayed gastric emptying was observed in 8 (22.8%) patients. GES revealed that 27 patients (77.2%) had normal gastric emptying (<10% retained meal), while 8 patients (22.8%) exhibited delayed emptying (>10% retained meal). Delayed emptying had 27.5% emptied at 60 minutes, 32.0% at 120 minutes, and 70.0% at 240 minutes. Statistically significant risk factors for delayed emptying included age (>50 years, p=0.017), diabetes mellitus (p=0.007), smoking (p=0.001), and hypothyroidism (p=0.007), but no significant difference was observed for gender and hypertension. **Conclusion**: Delayed gastric emptying is common in dyspeptic patients, with significant predisposing factors including age, obesity, smoking, diabetes, and hypothyroidism. Early identification and management of these risk factors are crucial for effective treatment.

Keywords: Dyspepsia, Gastric Emptying Scintigraphy, Delayed Gastric Emptying, Risk Factors, Diabetes

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***Corresponding Author**
Dr. Md. Touhid Al Mahmud, Medical Officer, Department of Gastroenterology, Rajshahi Medical College Hospital, Rajshahi, Bangladesh, E-Mail: mahmudrmc46@gmail.com

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INTRODUCTION

Dyspepsia, a term derived from the Greek δυς- (dys-) and ϖεψη (pepse), commonly referred to as indigestion, is a complex and multifactorial clinical condition with a significant global burden. Characterized by a spectrum of symptoms, including epigastric pain, early satiety, postprandial fullness, nausea, vomiting, belching, and bloating, dyspepsia is a prevalent disorder in both clinical and community settings [1]. The condition often reflects an underlying disturbance in the motility of the upper gastrointestinal (GI) tract, and more specifically, delayed gastric emptying (gastroparesis). This phenomenon, in which gastric contents are not efficiently emptied into the duodenum, is frequently associated with symptoms such as bloating, nausea, and postprandial fullness. Notably, dyspepsia is a heterogeneous syndrome with various underlying pathophysiological mechanisms, including motility dysfunction, visceral hypersensitivity, and psychosocial factors [2]. The investigation of delayed gastric emptying (DGE) remains an essential step in understanding the functional abnormalities associated with dyspeptic symptoms, as it provides insight into the motility disturbances contributing to this condition. In clinical practice, DGE is most commonly diagnosed through imaging techniques such as gastric emptying scintigraphy (GES), which has long been considered the gold standard in assessing gastric motility [3]. GES involves the ingestion of a radiolabeled meal, followed by imaging to track the movement of the gastric contents. Despite its well-established role, GES is limited by the need for specialized facilities, radiation exposure, and variability in the standardization of procedures [4]. Moreover, the pathophysiology of DGE is often poorly understood, with studies revealing a complex interaction between neural, hormonal, and muscular factors that influence gastric motility. For instance, recent research has identified two distinct neural circuits, the gastric inhibitory vagal motor circuit (GIVMC) and the gastric excitatory vagal motor circuit (GEVMC), which are involved in the regulation of gastric emptying [5]. The disruption of these circuits may lead to motility disturbances that underlie the symptoms of gastroparesis and functional dyspepsia.

The prevalence of dyspepsia varies widely, with estimates ranging from 7% to 40% in population-based studies, with functional dyspepsia (FD) being the most common subtype [6]. FD, as defined by the Rome IV criteria, is characterized by the presence of several cardinal symptoms such as postprandial fullness, early satiety, epigastric pain, and burning, in the absence of structural or organic abnormalities, as confirmed by upper gastrointestinal (GI) endoscopy [3]. While most patients with FD do not exhibit overt structural GI abnormalities, a substantial proportion—ranging from 25% to 50%—demonstrate delayed gastric emptying, often coupled with other motor disturbances such as antral hypomotility or impaired fundic relaxation [7, 8]. The correlation between delayed gastric emptying and the clinical presentation of FD suggests that motility dysfunction is a key player in the pathogenesis of this condition, although the precise mechanisms remain poorly defined. Functional dyspepsia and gastroparesis share many overlapping symptoms, making the distinction between the two challenging in clinical practice. Both conditions are associated with delayed gastric emptying, but while gastroparesis is typically defined by more severe motility impairment, FD is often characterized by milder disturbances in gastric emptying [4, 9]. As such, an accurate assessment of gastric motility is critical in diagnosing and managing these conditions. Gastric emptying is regulated by a combination of neural, hormonal, and mechanical factors. The primary mechanisms involved in gastric emptying include peristaltic waves, antral contractions, and reduction in gastric volume [10]. Moreover, recent studies have highlighted the role of two key neural circuits, GIVMC and GEVMC, in modulating gastric motility [2, 5]. These circuits are responsible for coordinating the contraction and relaxation of the gastric muscles, thereby influencing the rate at which gastric contents are emptied into the duodenum. In dyspeptic patients, disruptions in these circuits may lead to motility disturbances that contribute to the symptoms of delayed gastric emptying.

In addition to its role in functional dyspepsia, delayed gastric emptying has been implicated in a range of other conditions, including diabetes mellitus, gastroesophageal reflux disease (GERD), and chronic renal failure [11]. The association between delayed gastric emptying and these disorders underscores the importance of gastric motility in maintaining overall digestive health. In particular, diabetes mellitus has been shown to contribute to gastroparesis, as high blood glucose levels can lead to neuropathy of the vagus nerve, impairing gastric motility [2, 3]. Similarly, patients with GERD often exhibit motility abnormalities, including delayed gastric emptying, which may contribute to the pathogenesis of reflux symptoms [8-10]. To date, several methods have been developed to assess gastric emptying, each with its own advantages and limitations. These

techniques include direct imaging methods such as gastric scintigraphy and indirect methods like breath tests and the paracetamol absorption test [10, 12]. Gastric scintigraphy remains the gold standard for measuring gastric emptying, as it allows for the quantification of gastric motility and provides a reliable assessment of delayed gastric emptying. However, the use of scintigraphy is limited by the need for specialized equipment, radiation exposure, and a lack of standardization in procedure protocols. Other methods, such as the breath test, offer non-invasive alternatives but are less precise and may not provide the level of detail required for diagnosing complex motility disorders [4, 10].

Despite these advancements, the clinical diagnosis of delayed gastric emptying remains challenging, and there is a need for improved diagnostic tools that can provide more accurate, reproducible, and cost-effective assessments of gastric motility. Moreover, understanding the underlying pathophysiological mechanisms of delayed gastric emptying is critical for the development of targeted therapeutic interventions. Although research has identified several factors that contribute to delayed gastric emptying, including autonomic dysfunction, impaired gastric accommodation, and altered neuro-hormonal signaling, further studies are required to elucidate the precise molecular and cellular mechanisms involved [12, 13]. Additionally, while current treatment options for delayed gastric emptying primarily focus on symptomatic management, such as the use of prokinetic agents, there is a pressing need for more effective therapies that address the underlying causes of motility dysfunction. The aim of the present study is to assess the gastric emptying time in adult dyspeptic patients attending the Gastroenterology Department at Bangabandhu Sheikh Mujib Medical University (BSMMU) in Dhaka. By utilizing gastric emptying scintigraphy (GES) as the primary diagnostic tool, this research seeks to investigate the prevalence of delayed gastric emptying in patients with functional dyspepsia and to identify the risk factors associated with delayed gastric emptying in this population. Furthermore, this study aims to contribute to the growing body of knowledge on gastric motility disorders and to provide valuable insights into the pathophysiology and management of dyspepsia and gastroparesis.

Aims and Objective

The general objective of this study is to measure the gastric emptying time in adult dyspeptic patients. Specific objectives include observing food retention at 2- and 4-hours post-meal, determining the mean emptying time, and assessing the sociodemographic characteristics of the patients. Additional objectives include evaluating the association between gastric emptying time, sociodemographic characteristics, and predisposing factors.

MATERIAL AND METHODS

Study Design

This is a cross-sectional study conducted from January 2022 to December 2022 at the Department of Gastroenterology, BSMMU, Dhaka, in collaboration with NINMAS, BSMMU campus. The study aimed to evaluate gastric emptying time in patients with dyspepsia using scintigraphy. Patients were selected based on predefined inclusion and exclusion criteria, and data was analyzed to assess gastric retention and emptying at different time intervals (2 and 4 hours) post-meal.

Inclusion Criteria

Patients aged 18-60 years presenting with dyspepsia symptoms without any underlying organic gastrointestinal disorders such as PUD, GERD, or gastritis were eligible. Only patients who provided informed written consent to participate in the study were included. The study focused on individuals experiencing symptoms such as epigastric pain, postprandial fullness, early satiation, and nausea, fulfilling the Rome IV criteria for functional dyspepsia without the presence of systemic or metabolic diseases.

Exclusion Criteria

Patients with a history of allergies to eggs or any component of the standard meal, or those who were pregnant or lactating, were excluded from the study. Additionally, patients with organic gastrointestinal disorders such as PUD, GERD, or gastritis, or those on medications like prokinetics, tricyclic antidepressants (TCA), or opiates were not considered eligible. Patients with prior abdominal surgeries that could affect gastric motility were also excluded from the study.

Scintigraphic evaluation

The standard meal for scintigraphic gastric emptying consists of 4 ounces of Eggbeaters or equivalent egg white substitute, 2 slices of bread (120 kcal), strawberry jam (30 g, 74 kcal), and water (120 ml) radio labeled with 0.5–1 mCi ^{99m}Tc sulfur colloid. The egg white, to which the ^{99m}Tc is added, is cooked, either scrambled in a nonstick frying pan or microwaved in an

appropriately shielded container. The subject ingests the whole sandwich meal and water within 10 min. Gamma camera images are acquired using a 140 keV photopeak with a 20% window (140 keVl2 10%), which is optimal for detection of gamma radiation from the ^{99}Tc. A low-energy all-purpose collimator maximizes the count rate; a low-energy high-resolution collimator can also be used. Computerized digital images acquired in a 128 × 128 word mode matrix are required for quantification.

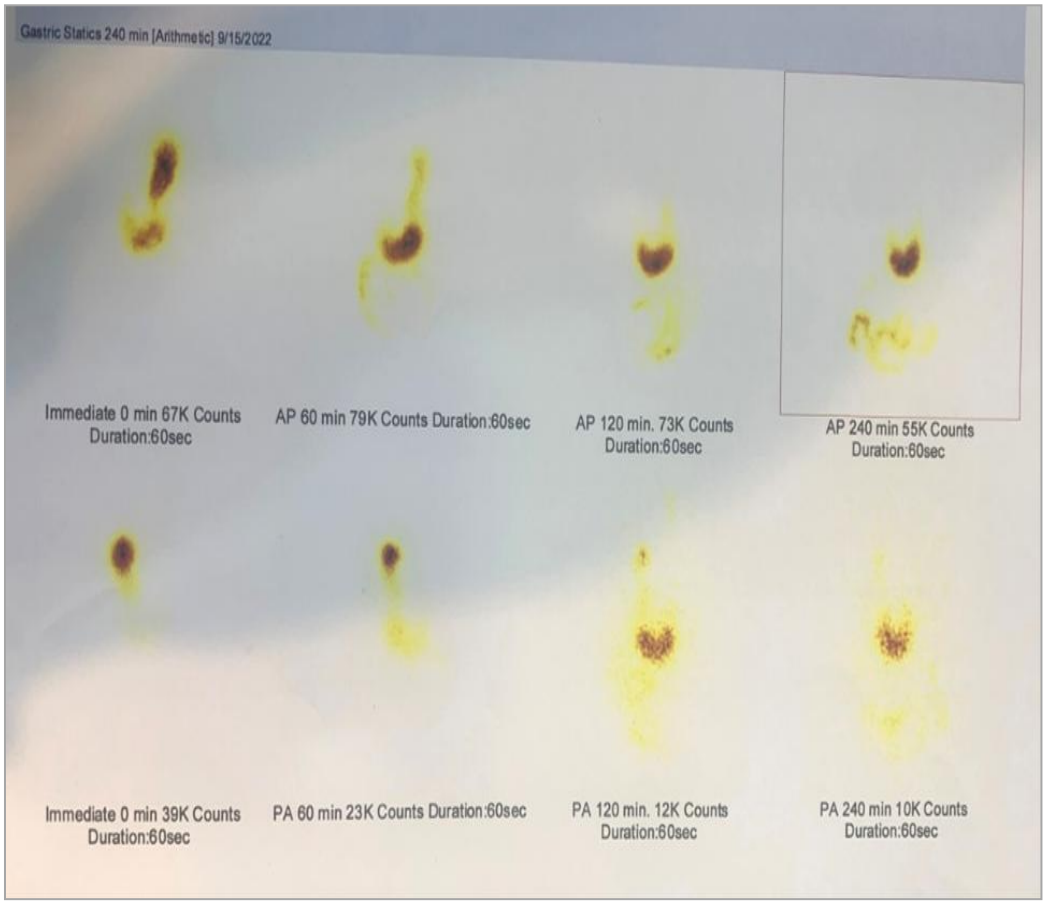

Figure 1: Gastric Emptying Scintigraphy Meal and Imaging Setup

Interpretation

The final results were expressed as percentage remaining in the stomach at each time point with the total gastric counts normalized to 100% for the time t = 0 (first image immediately after meal ingestion). The percent remaining in the stomach at each time point is reported. The normal values at the key time points are 1 h (37–90%), 2 h (30 – 60%), and 4 h (0–10%). Delayed gastric emptying is usually diagnosed when there is >10% retention at 4 h or more than 60% retained at 2 h. However, there are instances when gastric emptying may be initially slow with >60% retained at 2 h but <10% retained at 4 h. Such patients may still benefit from treatment intended to increase gastric emptying during the first 2 postprandial hours.

All the information recorded in data collection sheet. Data were processed and analysed with the help of computer program Microsoft excel. Quantitative data were expressed as mean and standard deviation and qualitative data expressed as frequency and percentage. Results presented by tabulation and graphical presentation in the form of tables, pie chart, graphs, bar diagrams, histogram & charts etc.

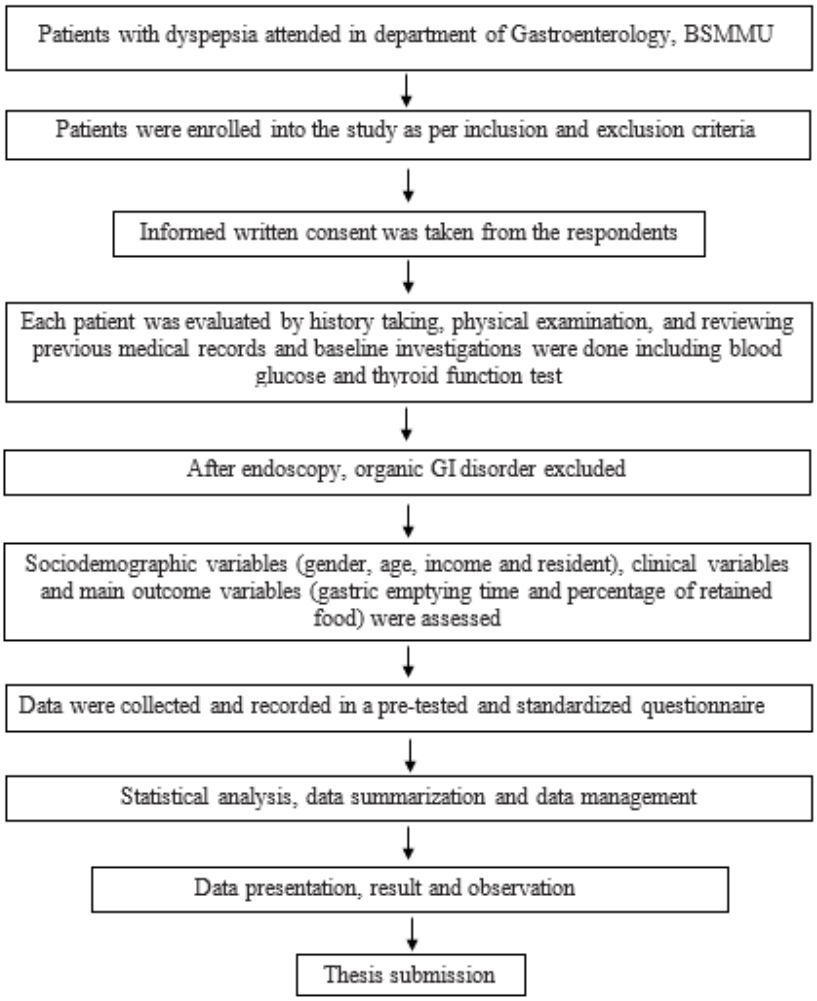

Figure 2: Flow chart of the method

Data Collection

Data was collected from dyspeptic patients aged 18 years and above attending the Department of Gastroenterology, BSMMU, who met the inclusion criteria. After informed consent, baseline investigations were performed, and upper GI endoscopy was conducted to exclude organic disorders. The gastric emptying scintigraphy procedure was followed, where patients ingested a standardized meal labeled with 99mTc-sulfur colloid, and gastric retention was measured at 2 and 4-hour intervals using a gamma camera.

Data Analysis

Data were analyzed using Microsoft Excel and SPSS version 26.0. Quantitative variables were expressed as means and standard deviations, and qualitative data were presented as frequencies and percentages. Statistical comparisons were made using the Chi-square test for categorical variables. The significance level was set at $p \leq 0.05$. Continuous data were assessed for normality, and appropriate parametric or non-parametric tests were applied. The results were presented through tables, graphs, and charts to visually represent findings.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Review Board (IRB) of BSMMU, Dhaka. Participants were fully informed of the study's purpose, procedures, and any potential risks, with verbal and written consent obtained prior to participation. The confidentiality of participants' data was strictly maintained throughout the study. Data collected was used solely for research purposes, and no participant identifiers were shared or published to ensure privacy and integrity of the research process.

RESULTS

This cross-sectional study was conducted in Department of Gastroenterology, BSMMU, Dhaka, to

measure the gastric emptying time in adult dyspeptic patients. A total of 35 patients were included in this study. The observations and results were as follows:

Table 1: Distribution of patients according to age (n= 35)

Age (years)	Frequency (n)	Percentage (%)
18 - 30	2	5.71
31 - 40	5	14.2
41 - 50	18	51.4
51 - 60	10	28.5
Mean ±SD	43.7 ± 8.5	
Range (min-max)	18 – 60	

Table 1 showed that majority patients belonged to age 41- 50 years (51.4 %). Mean age was 43.7 ± 8.5 years with range from 18 - 60 years.

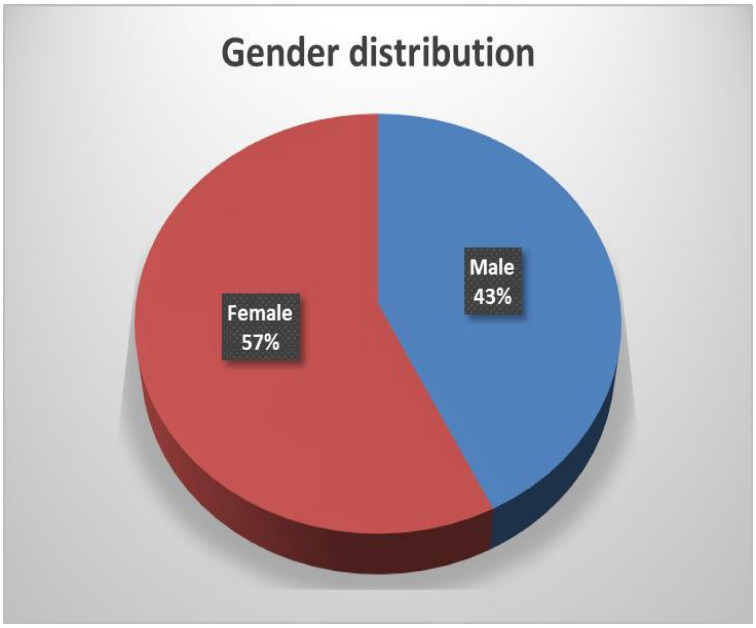

Figure 3: Gender distribution of patients (n= 35)

Females were predominant than male. Figure showed that majority patients were female 20 (57.1 %) and 15 (42.8 %) patients were male.

Table 2: Distribution of participants according to occupations (n=35)

Occupation	Frequency (n)	Percentage (%)
Housewife	11	31.4
Service holder	8	22.8
Businessman	10	28.5
Daily worker	6	17.1

Table 2 shows the occupation status of study subjects. Most of the patients were housewife 11(31.4%), followed by businessman 10 (28.5%), service holder 8 (22.8%) and daily worker 6 (17.1%).

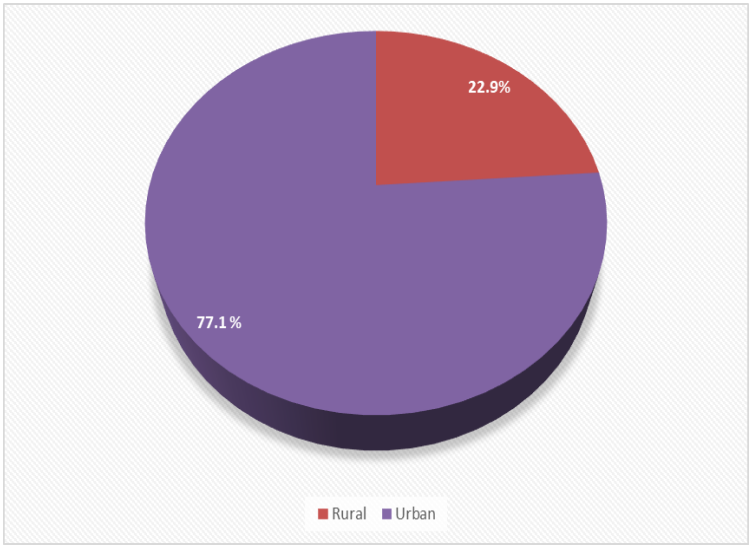

Figure 4: Place of living of the study subjects (n=35)

In this study, majority of the patients came from urban area 27 (77.1%).

Table 3: Distribution of participants according to BMI (n=35)

Body mass index (kg/m²)	Frequency (n)	Percentage (%)
18.5–24.9	17	48.5
25.0–29.9	13	37.1
>30.0	5	14.2

Present study showed that, 48.5% were normal weight, 37.1% were overweight and 14.2% were obese.

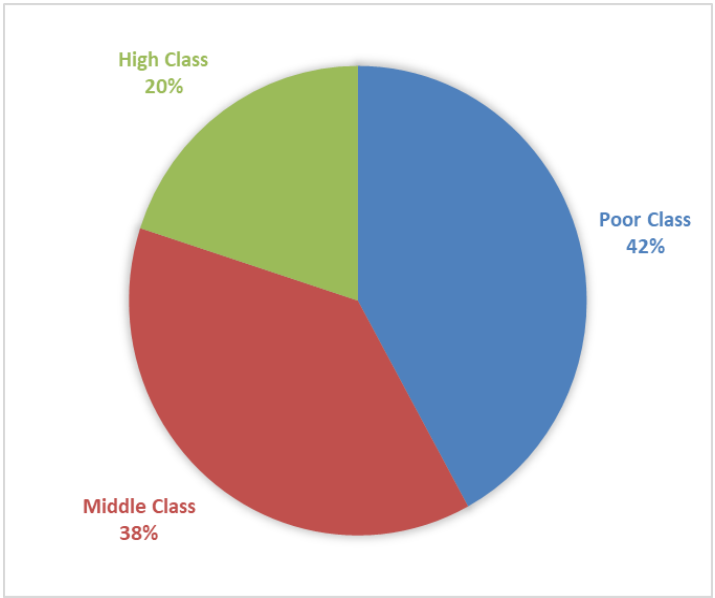

Figure 5: Distribution of participants according to socioeconomic status (n=35)

Socioeconomically patients were grouped into three classes. Poor class 42% comprising the major percentage of the patients, which is followed by middle class 38% and remaining are upper class 20%.

Table 4: Distribution of participants according to clinical manifestations (n=35)

Clinical manifestation	Frequency (n)*	Percentage (%)
Epigastric pain	27	77.0
Early satiation	32	91.4
Belching	18	51.4
Bloating	25	71.4
Heartburn	19	54.2
Post prandial fullness	35	100.0
Nausea after eating	15	42.8

*Multiple respondents.

Most common initial symptoms of the patients were post prandial fullness (100.0%), early satiation (91.4%), epigastric pain (77%) and bloating (71.4%).

Table 5: Distribution of participants according to predisposing factors (n=35)

Predisposing factors	Frequency (n)*	Percentage (%)
Diabetes mellitus	16	45.7
Hypertension	11	31.4
Smoking	8	22.8
Betal quid	5	14.2
Hypothyroidism	7	20.0

*multiple respondents

Table showed the different predisposing factors. Most common risk factor was diabetes mellitus (45.7%), followed by hypertension (31.4%), cigarette smoking (22.8%) and hypothyroidism (20.0%) of the patients.

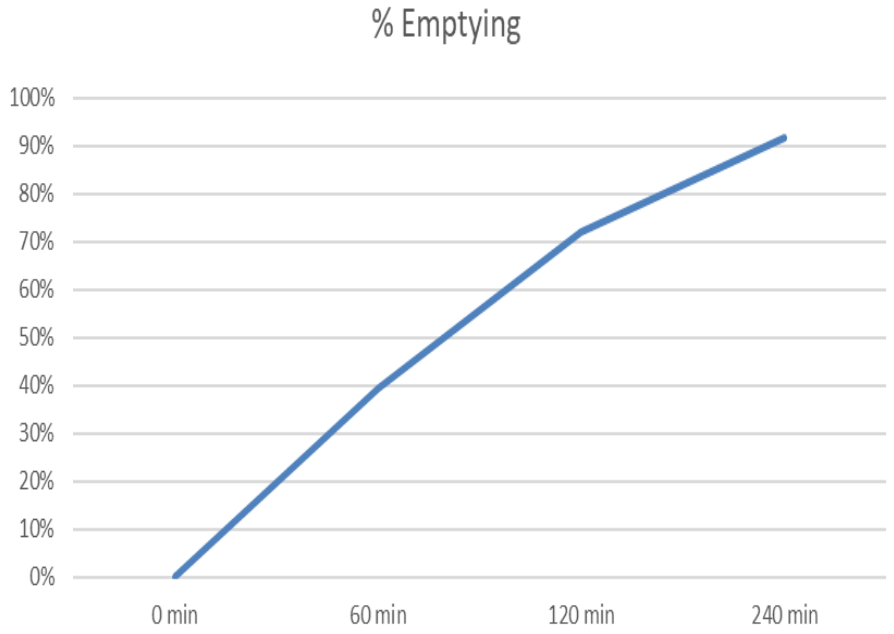

Figure 6: Assessment of gastric emptying rate (mean percent) of study population (n=35)

Figure showed mean percent of gastric emptying at different imaged time.

Table 6: Distribution of participants according to gastric retention rate following administration of radiopharmaceuticals (n=35)

Time point	% Retained	Frequency & percentage	Normal Limits of retention	Frequency & percentage
0 min	100%	35 (100.0)	100 %	35 (100.0)
60 min	>90%	11 (31.4)	30-90%	24 (68.6)
120 min	>60%	8 (22.8)	0-60%	27 (77.2)
240 min	>10%	8 (22.8)	0-10%	27 (77.2)

Table showed gastric retention rate at different time. At 0 min, all cases had 100% retained meal. At 60 min, 24 cases found 30% - 90% retained meal or normal gastric emptying, but 11 cases had >90% retained meal or delayed emptying. At 120 min to 240 min, 27 cases found 0% - 10% retained meal or normal gastric emptying, but 8 cases had >10% retained meal or delayed emptying.

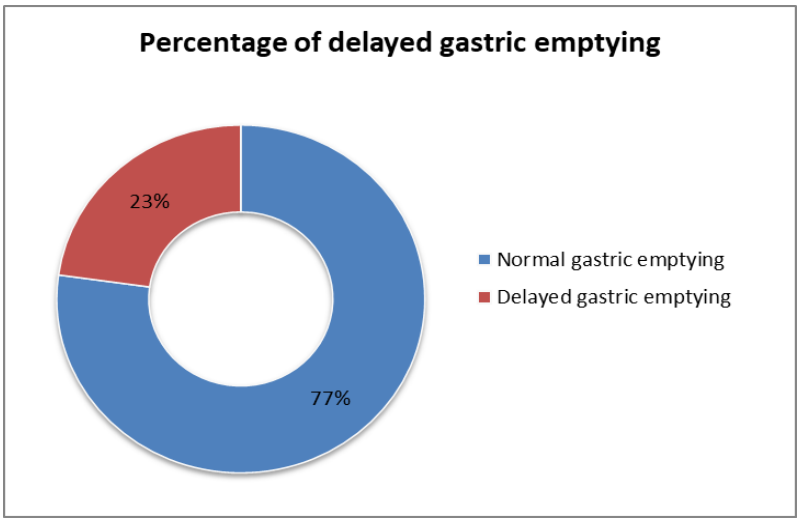

Figure 7: Percentage of delayed gastric emptying in dyspeptic patients (n=35)

Figure showed the Percentage of delayed gastric emptying in dyspeptic patients. In this study 8(22.8%) cases found delayed gastric emptying.

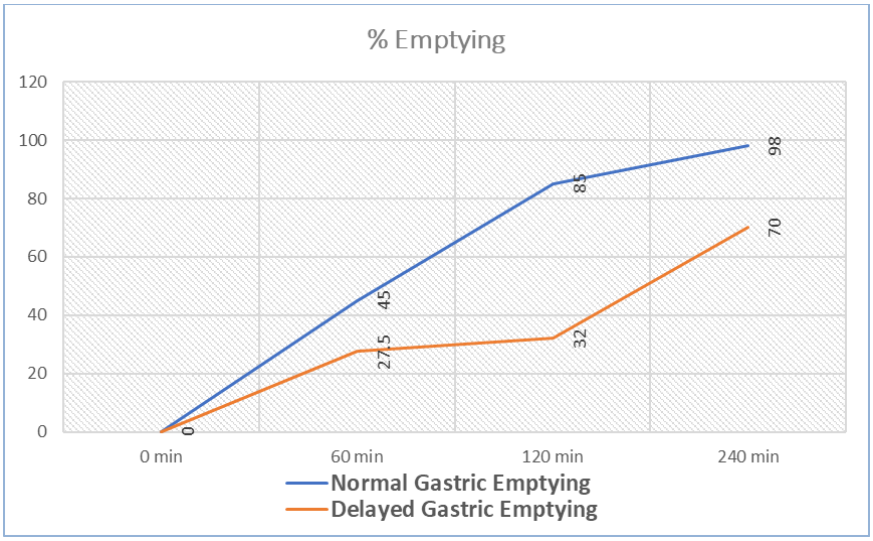

Figure 8: Schematic presentation of mean percent of gastric emptying (n=35)

Figure showed that mean percent of gastric emptying in subject with normal and delayed gastric emptying. At 0 min, all cases had 0% emptying. Patients with delayed emptying had 27.5% emptied at 60 min, 32.0% emptied at 120 min and 70.0% emptied at 240 min.

Table 7: Evaluation of different demographic and clinical factors in patients with normal and delayed gastric emptying (n=35)

Variables	Patients with normal gastric emptying (n=27)	Patients with delayed gastric emptying (n=8)	Percentage (%) of delayed gastric emptying	Total
Age				
<50 year	22 (81.4)	3 (37.5)	12	25
>50 year	5 (18.5)	5 (62.5)	50	10
Sex				
Male	12 (44.4)	3 (37.5)	20	15
Female	15 (55.5)	5 (62.5)	25	20
BMI				
<25.0	16 (59.2)	1 (12.5)	5.8	17
>25.0	11 (40.7)	7 (87.5)	38.8	18
Residence				
Urban	21 (77.7)	6 (75.0)	22.2	27
Rural	6 (22.2)	2 (25.0)	25	8
DM				
Yes	9 (33.3)	7 (87.5)	43.7	16
No	18 (66.7)	1 (12.5)	5.2	19
HTN				
Yes	8 (29.6)	3 (37.5)	27.3	11
No	19 (70.3)	5 (62.5)	20.8	24
Smoking				
Yes	1 (3.70)	7 (87.5)	87.5	8
No	26 (96.2)	1 (12.5)	3.7	27
Hypothyroidism				
Yes	2 (7.40)	5 (62.5)	71.4	7
No	25 (92.5)	3 (37.5)	10.7	28

Table showed 50% patients of age >50 years, 38% patients with high BMI, 43.7% diabetic patients, 87.5% smoker and 71.4% hypothyroid patients have delayed gastric emptying time.

Table 8: Evaluation of the predictive factors for delayed gastric emptying in patients with dyspepsia (n=35)

Variables	Total number of patients (n=35)	Patients with delayed gastric emptying (n=8)	Percentage (%)	95% CI	p-value
Age					
<50 year	25	3	12.0	6.12% to 65.48%	0.017*
>50 year	10	5	50.0		
Sex					
Male	15	3	20.0	-23.72% to 30.41%	0.732
Female	20	5	25.0		
BMI					
<25.0	17	1	5.88	4.90% to 56.02%	0.021*
>25.0	18	7	38.9		
Residence					

Urban	27	6	22.3	-23.03% to 38.71%	0.875
Rural	8	2	25.0		
DM					
Yes	16	7	43.7	10.13% to 61.92%	0.007*
No	19	1	5.26		
HTN					
Yes	11	3	27.2	-19.89% to 37.90%	0.679
No	24	5	20.8		
Smoking					
Yes	8	7	87.5	46.26% to 94.50%	0.001*
No	27	1	3.70		
Hypothyroidism					
Yes	7	5	71.4	21.53% to 82.23%	0.007*
No	28	3	10.7		

Chi-square test was done to measure the level of significance; *indicates significant result.

Table showed the predictive factors for delayed gastric emptying in patients with dyspepsia. Risk factors associated with delayed gastric emptying were the age, high BMI, DM, smoking and hypothyroidism. Elderly age (>50 year) was found significant predictive risk factor of delayed gastric emptying (p=0.017). Here it revealed that history of diabetes mellitus (p=0.007), smoking (p=0.001) and hypothyroidism (0.007) were the significant risk factors for the delayed gastric emptying. There was no statistically significant difference of other sociodemographic or clinical characteristics for delayed gastric emptying including –gender, residence, and hypertension.

Table 9: Univariate regression analysis to determine the risk factors of delayed gastric emptying (n=35)

Parameters	**OR**	**95% CI**		**p-value**
		Lower	Upper	
Elderly age	7.33	1.300	41.35	0.024
High BMI or Obesity	10.1	1.093	94.834	0.041
DM	14.0	1.486	131.89	0.021
Smoking	182.0	10.06	3290.4	0.004
Hypothyroidism	20.83	2.734	158.72	0.003

Univariate regression analysis was done to determine the risk factors of delayed gastric emptying. A significant association was found for delayed gastric emptying in patients with elderly age (OR, 7.33), smoking (OR, 182.0), hypothyroidism (OR, 20.83), diabetes mellitus (OR, 14.0) and obesity (OR, 10.1).

Table 10: Multivariate regression analysis to determine the risk factors of delayed gastric emptying (n=35)

Parameters	**OR (*r*)**	**95% CI**		**p-value**
		Lower	Upper	
Elderly age	4.16	1.218	14.24	0.022
High BMI or Obesity	5.04	0.678	37.45	0.114
DM	6.08	0.817	45.32	0.077
Smoking	13.06	1.769	96.48	0.011
Hypothyroidism	6.66	2.074	21.42	0.001

On multivariate regression analysis was done to determine the risk factors of delayed gastric emptying in patients with elderly age group (OR, 4.16), Smoking (OR, 13.06) and hypothyroidism (OR, 6.66).

DISCUSSION

Gastric Emptying in Dyspeptic Patients

Gastric emptying (GE) is a critical physiological process involving the movement of food from the stomach into the small intestine, and its rate is crucial for the digestion and absorption of nutrients. Disordered gastric emptying, particularly delayed gastric emptying, often referred to as gastroparesis, is a hallmark feature of several gastrointestinal disorders [14]. It is commonly observed in conditions such as functional dyspepsia (FD), diabetes mellitus (DM), and hypothyroidism [1, 9, 11]. The current study aimed to measure the gastric emptying time in adult dyspeptic patients in Bangladesh, comparing our results with other global findings and highlighting key risk factors influencing gastric emptying.

Demographics and Study Population

In this study, the majority of patients were aged between 41 and 50 years, with a mean age of 43.7 ± 8.5 years, which is consistent with previous studies that found the mean age of dyspeptic patients to be around 44 years (Talley et al., 2006). The predominance of female patients (57.1%) is also in line with other studies, where women have been reported to have a higher incidence of delayed gastric emptying [15]. Specifically, the female-to-male ratio in this study was 0.75:1, similar to the findings of Talley et al. (2006) who reported 74% of their dyspeptic patients were female. This may suggest that females are more susceptible to gastrointestinal motility disorders, including gastroparesis and functional dyspepsia, though this relationship remains debated. Furthermore, the study population was primarily urban (77.1%), which reflects the demographic trends in Bangladesh, where a significant portion of the population resides in urban areas. A similar trend is observed in other international studies, such as the United States, where a significant proportion of dyspeptic patients come from urban regions [2, 3].

Prevalence and Symptomatology of Dyspepsia

The most common symptoms in this study were epigastric pain (77%), postprandial fullness (100%), early satiation (91.4%), and bloating (71.4%). These findings align with the classic symptom profile of functional dyspepsia, which typically includes postprandial fullness, early satiation, and epigastric pain [13, 16]. The prevalence of dyspepsia in this study (35 patients) is consistent with previous studies showing a range of 25% to 50% of patients with functional dyspepsia experiencing delayed gastric emptying [7]. Interestingly, the most common risk factors identified were diabetes mellitus (45.7%), hypertension (31.4%), cigarette smoking (22.8%), and hypothyroidism (20.0%). These risk factors align with findings from other studies that also identify diabetes, smoking, and hypothyroidism as contributing factors to delayed gastric emptying (Seok, 2011). Specifically, the correlation between diabetes and delayed gastric emptying is well-documented, as high blood sugar levels can damage the vagus nerve, impairing gastric motility [3].

Gastric Emptying

Scintigraphic analysis is considered the gold standard for assessing gastric emptying, and it was employed in this study to quantify gastric motility [4, 17]. Our study found that 22.8% of patients exhibited delayed gastric emptying, which is comparable to the global prevalence rates of delayed gastric emptying in dyspeptic patients. Fosso *et al.* reported a prevalence of gastroparesis-like symptoms in 0.9% of the population, with an increased prevalence among diabetic individuals (1.3%) [18]. In contrast, a study conducted in the US estimated the prevalence of gastroparesis at 267.7 per 100,000 adults, with a population-based estimate suggesting up to 1.8% of individuals affected [15]. These statistics suggest that the prevalence of delayed gastric emptying may vary geographically and is influenced by local risk factors such as lifestyle and the prevalence of diabetes. In our study, scintigraphy revealed that at 60 minutes post-meal, 24 patients exhibited normal gastric emptying (30%-90% retention), while 11 had delayed gastric emptying (greater than 90% retention). These findings reflect a typical pattern of delayed gastric emptying, where the stomach retains food longer than normal. At 120 minutes, the majority of cases showed near-normal gastric emptying, while 8 cases still exhibited delayed emptying. This pattern is consistent with the classification used by Mayor *et al.*, where gastric retention greater than 30% at 60 minutes suggests delayed gastric emptying [19, 20].

Risk Factors for Delayed Gastric Emptying

Multivariate analysis in this study revealed that several factors were significantly associated with delayed gastric emptying, including age, BMI, diabetes mellitus, smoking, and hypothyroidism. Specifically, the age group over 50 years was a significant predictor of delayed gastric emptying (p=0.017). This finding corroborates previous studies that have identified advanced age as a risk factor for delayed gastric emptying, likely due to age-related changes in gastrointestinal motility [7]. The impact of BMI on gastric emptying has also been well-

documented. Our study found that 38% of overweight patients and 43.7% of diabetic patients had delayed gastric emptying, which aligns with findings from other studies that have shown a correlation between higher BMI and slower gastric emptying. Obesity and type 2 diabetes mellitus are both known to impair gastric motility through mechanisms such as autonomic dysfunction and increased visceral fat, which can affect the normal contractility of the stomach [10]. Similarly, smoking was identified as a significant risk factor for delayed gastric emptying (p=0.001), which is consistent with studies suggesting that nicotine can disrupt gastric motility by altering neural signaling and gastrointestinal smooth muscle function [17, 21].

Hypothyroidism was another significant risk factor in this study (p=0.007), which corroborates findings from other studies that have linked hypothyroidism with delayed gastric emptying due to the slowing of all body processes, including gastrointestinal motility. Interestingly, this study found no significant association between gender and delayed gastric emptying, contrary to other studies such as that of Nassar *et al.*, which found female sex to be associated with delayed gastric emptying in functional dyspepsia [13]. In this study, male and female patients exhibited similar rates of delayed gastric emptying (p=0.732), suggesting that gender may not be a significant factor in our local population.

Comparison with Global Studies

The global prevalence of delayed gastric emptying (DGE) and gastroparesis, a condition characterized by impaired gastric motility, varies significantly, reflecting the influence of different environmental, cultural, and healthcare factors. This study contributes valuable insights into the prevalence of delayed gastric emptying in dyspeptic patients in Bangladesh, and when compared to global studies, several patterns and regional differences emerge. In the United States and the United Kingdom, studies report prevalence rates of gastroparesis ranging from 0.9% to 1.8% of the general population [15, 22]. These studies suggest a relatively low prevalence in Western countries, which could be attributed to well-established diagnostic protocols and healthcare infrastructure that may facilitate the early detection of gastric motility disorders. Additionally, these countries have more widespread access to advanced diagnostic tools such as gastric scintigraphy, which might contribute to the identification of cases that would otherwise go undiagnosed. In contrast, studies conducted in Asian countries, including Japan and China, report higher rates of dyspepsia and delayed gastric emptying, ranging from 1.6% to 8.3% [7, 10]. Several factors may explain these differences, including dietary habits, the prevalence of certain chronic conditions like diabetes, and cultural factors influencing healthcare-seeking behavior. In particular, the higher incidence of gastric motility disorders in Asian populations could be linked to stress-heavy lifestyles, traditional dietary practices, and high rates of metabolic disorders, including diabetes, which is known to impair gastric motility [23]. One noteworthy factor contributing to these discrepancies is urbanization. In this study, a significant proportion of dyspeptic patients resided in urban areas (77.1%), which aligns with findings from other studies that suggest urban populations are more likely to experience delayed gastric emptying. Urbanization is often associated with lifestyle changes such as increased stress, reduced physical activity, and the consumption of processed or high-fat foods, all of which are known to contribute to gastrointestinal disturbances [24-29]. The shift from traditional diets to more processed and fast foods, combined with sedentary habits common in urban settings, likely plays a role in the higher prevalence of dyspepsia and delayed gastric emptying observed in this study.

Additionally, healthcare access and diagnostic practices may influence the reported prevalence of delayed gastric emptying across regions. In countries with well-established healthcare systems, such as those in the US and UK, individuals with dyspeptic symptoms may be more likely to receive diagnostic tests, including gastric emptying studies, leading to higher recognition rates. On the other hand, in countries like Bangladesh, where healthcare infrastructure may not be as widespread or equipped with advanced diagnostic tools, patients may go undiagnosed or misdiagnosed, resulting in underreporting of gastric motility disorders. Overall, the findings from this study are consistent with the trend observed in other Asian countries, where higher rates of dyspepsia and, delayed gastric emptying are seen compared to Western nations.

The global variation in the prevalence of these conditions underscores the need for region-specific approaches to diagnosis and treatment, particularly in areas with growing urban populations and changing lifestyles. Further research should explore the role of cultural factors, dietary habits, and healthcare access in shaping the prevalence of gastric motility disorders

across different populations.

CONCLUSION

Present study concluded that a significant number of dyspeptic patients have delayed gastric emptying or gastroparesis. Risk factors associated with delayed gastric emptying time were the elderly age, high BMI, DM, smoking and hypothyroidism. If patients suspected of having either gastroparesis or functional dyspepsia with upper gastrointestinal symptoms, they should undergo proper evaluation by measurement of gastric emptying time for further management.

Limitations

The sample size of the study was smaller.
The study period was relatively shorter.
All patients were collected in this study from a single tertiary level hospital which does not reflect the whole country.

Recommendation

A long-term multi-center study with larger sample size may be undertaken to make representation of the whole country population.
For further study, addition of other noninvasive and invasive methods/tests may be used to reach the final gastrointestinal diagnosis and to assess the correlation with Scintigraphy.

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Abbreviations

GES: Gastric Emptying Scintigraphy
BMI: Body Mass Index
DM: Diabetes Mellitus
GI: Gastrointestinal
CBC: Complete Blood Count
CVD: Cardiovascular Disease
ESR: Erythrocyte Sedimentation Rate
HIV: Human Immunodeficiency Virus
HCV: Hepatitis C Virus

ARTICLE AT A GLANCE

Study Purpose

To evaluate gastric emptying times in dyspeptic patients and identify associated risk factors at BSMMU, Dhaka.

Key Findings

Delayed gastric emptying was observed in 22.8% of patients, with diabetes, hypertension, smoking, hypothyroidism, and high BMI identified as significant risk factors. Urban patients had a higher prevalence of delayed gastric emptying.

Newer Findings

The study emphasizes the impact of urbanization on gastric emptying, highlighting stress, dietary habits, and sedentary lifestyle as contributing factors to delayed gastric emptying in urban settings.

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