ORIGINAL ARTICLE

Upper GI Endoscopy findings in patients with different breakfast timings and their short Leeds score.

Baby Anbreen[1], Shahid Karim[2], Punhal Khan[3], Raheela Khalid[4], Baseer Ahmad[5]

ABSTRACT… Objective: To see endoscopic changes in patients with different breakfast timings and their short Leeds dyspepsia score, visiting outpatient clinics in a tertiary care hospital. **Study Design:** Cross-sectional study. **Setting:** Outpatient Clinics of Gastroenterology Department, Liaquat National Hospital, Karachi, Pakistan. **Period:** November, 2024 to April, 2024. **Methods:** A total of 450 patients of 18-65 years of either gender with at least past two months history of dyspeptic symptoms were analyzed. Short-Form Leeds Dyspepsia Questionnaire (SF-LDQ) was used to identify severity of dyspepsia and gastroscopy was performed in symptomatic patients to see endoscopic findings. Data were analyzed using IBM-SPSS Statistics, version 26.0. **Results:** In a total of 450 patients, 239 (53.1%) were males, and 211 (46.9%) females. The mean age was 43.01 ± 15.83 years (ranging between 18-65 years). The mean breakfast time was $9.0am \pm 1.8hr$ (ranging between 5:30am to 11.45am). Endoscopic features like frequency of esophagitis (50.0%), moderate to severe gastritis (38.7%, and 65.4%, respectively), and duodenitis (69.9%) were higher in patients having breakfast after 9-10 am. Frequency of dyspeptic symptoms was 86.5%, 75.3%, 45.3%, and 42% for indigestion, heartburn, nausea and regurgitation, respectively. Mean SF Leeds score was 14.04 ± 5.61. Regression analysis showed that there was increase of 2.03 units in SF Leeds score with one-unit increase in breakfast timing. **Conclusion:** Significant relationship of breakfast timing was found with endoscopic severity of inflammation in gut and increase SF Leeds score, particularly in patients having breakfast after 10:00 O' clock in the morning.

Key words: Breakfast, Duodenitis, Dyspepsia, Endoscopy, Gastritis.

INTRODUCTION

Dyspepsia is a generic term that describes a variety of upper gastrointestinal (GI) symptoms, including epigastric pain, feeling full, discomfort, burning, early satiety, nausea, vomiting, and belching.[1] The definition of dyspepsia has evolved over time, from a general description that includes any upper GI symptoms to more precise criteria as described by the Rome classification. Depending on the definition used, dyspepsia occurs in 20% to 40% of the population.[2,3]

Though the causes underlying dyspepsia are yet to be known fully, theories of pathophysiological mechanisms for this condition in the past include alterations in gastrointestinal motility and the etiologic involvement of psychosocial factors.[4] Dietary lifestyles of a patient may also contribute to symptoms of dyspepsia.[5] Breakfast, by definition, is the termination of the overnight fast and is usually referred to as the most important meal of the day, supplying necessary nutrients after an extended period of fasting.[6] Much of the research on breakfast emphasizes its relationship with overall health outcomes and not merely its nutritional value.[7] In spite of its reputation as a healthy eating habit, breakfast skipping is a common practice among both adults and youths.[8,9] As lifestyle habits are determined by sociocultural factors, carrying out epidemiological studies across different populations may enhance understanding of the ways in which eating habits, like breakfast eating, are connected with various health conditions.[10]

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Breakfast patterns may differ significantly among people, even in the same culture or nation, and may change over time in terms of content and timing. Eating habits, like devouring large meals rapidly or taking meals at irregular intervals, may exceed the stomach's accommodation capacity, which may lead to dyspeptic symptoms.[11] Over long periods of time, the regular occurrence of irregularities in meal timing have been linked with an increased risk of gastritis and Helicobacter pylori (HP) infection. Missing breakfast will lead to reduced energy levels and performance, since the body burns up its stock of energy while sleeping. Lengthy fasting gives the stomach little chance to settle, resulting in acid accumulation.[12] Research indicates that the irregular timing of meals can heighten gastric acidity, facilitate acid reflux, and ultimately lead to stomach discomfort.[13]

Skipping meals specially breakfast is one of the dietary habits that is less investigated and its relation with GI disorders. Literature documents that irregular eating habits such as abnormal breakfast time, skipping meals and late-night snacking are potential predictors of GI problems like reflux esophagitis, gastritis and duodenitis. Researchers have evaluated the impact of breakfast skipping on obesity, cardiovascular diseases, impaired glucose metabolism, impaired cognitive function and even cancer[14,15], but there is lack of research particularly focusing on impact of breakfast timing on endoscopic gut changes. Delayed first meal impacts significantly the overall health potential of individuals, as well as adversely affects the quality of life. The current study was planned to investigate the effects of delayed breakfast on upper GI system with the help of gastroscopy and severity of disease and dyspeptic symptoms in adult patients visiting outpatient clinics in a tertiary care hospital.

METHODS

This cross-sectional study was performed in outpatient clinics of Gastroenterology Department in Liaquat National Hospital, Karachi, Pakistan after acquiring formal permission from Hospital Ethics Committee with letter bearing number (No. 1102-2024-LNH-ERC, dated: October 23, 2024). Study duration was November, 2024 to April, 2024. Patients of age 18-65 years of either gender with at least past two months history of dyspeptic symptoms. Patients with history of smoking, coronary artery disease, NSAIDs, abdominal surgery, clinical features suggestive of irritable bowel syndrome and not willing to participate into the study were excluded. Sample size was estimated performing pilot study on 30 patients, and a total of 450 patients were considered for this study. Non-probability, consecutive sampling was used.

"Short-Form Leeds Dyspepsia Questionnaire (SF-LDQ)" was employed to determine the occurrence and severity of dyspeptic symptoms in relationship to the timing of breakfast. The SF-LDQ is an 8-item, validated questionnaire measuring the severity of symptoms. The SF-LDQ particularly evaluates the occurrence of upper gastrointestinal symptoms such as indigestion, heartburn, regurgitation, and nausea, experienced over at least two months. Severity of symptoms is rated from 0 to 32. Item responses are scored from 0 (not at all) to 4 (once a day or more), and the total score is determined by adding up the severity ratings for all the symptoms. In the opinion of Fraser et al.[16], a total score of 4 or greater is indicative of dyspepsia.

After evaluating patients on short form Leeds score those patients who were willing to undergo gastroscopy were included in study and their findings on endoscopy were noted. The patients were stratified in groups according to breakfast timing as group 1 (7:00 a.m. and before), group 2 (during 7 a.m. to 8 a.m.), group 3 (during 8 a.m. to 9 a.m.), group 4 (during 9-10 a.m.), group 5 (during 10 a.m. to 11 a.m.) and group 6 (after 11:00 a.m.). These groups were used to relate frequency and severity of symptoms with breakfast timing. To relate the frequency and severity of pathological findings on endoscopy with the breakfast timings, the patients were categorized in three categories with having breakfast at before 8 am, 8-10 am and > 10 am.

Data were entered and analyzed using "IBM SPSS Statistics version 26.0". Continuous variables were reported as mean±standard deviation (SD) or median and interquartile range

(IQR), while categorical variables were expressed as frequencies and percentages. The association between breakfast timing and the frequency of dyspeptic symptoms was analyzed using the Chi-square test. Median SF-LDQ scores across different breakfast timing groups were compared using the Kruskal-Wallis H test. Simple linear regression was applied to evaluate the predictive relationship between breakfast timing and severity of dyspeptic symptoms (SF-LDQ score). A p-value of <0.05 was considered statistically significant.

RESULTS

In a total of 450 patients, 239 (53.1%) were males, and 211 (46.9%) females. The mean age was 43.01±15.83 years (ranging between 18-65 years). The mean breakfast time was 9.0am±1.8hr (ranging between 5:30am to 11.45am). Table-I is showing characteristics of patients.

Characteristics		Frequency (%)
Age (years)	18-29	107(23.8)
	30-39	74(16.4)
	40-49s	91(20.2)
	50-59	92(20.4)
	60-65	86(19.1)
Gender	Male	239(53.1)
	Female	211(46.9)
Breakfast timing	7:00 a.m or before	116(29.0)
	7:00-8:00 a.m.	54(12.0)
	8:00 am to 9:00 am	58(12.9)
	9:00 am to 10:00 a.m.	58(12.9)
	10:00 a.m. to 11:00 a.m.	80(17.8)
	After 11:00 a.m.	84(18.7)

Table-I. Characteristics of patients (n=450)

Frequency of dyspeptic symptoms was 86.5%, 75.3%, 45.3% and 42% for indigestion, heartburn, nausea and regurgitation respectively. Mean SF Leed's score was 14.04±5.61. Table-II displays comparison of dyspeptic symptoms among patients having breakfast at different timings. Frequency of all dyspeptic symptoms including indigestion, heartburn, regurgitation and nausea was significantly increasing with increasing breakfast time.

Median SF Leed's score for 7:00 a.m. and before, during 7 a.m. to 8 a.m., during 8 a.m. to 9 a.m., during 10 a.m. to 11 a.m. and after 11:00 a.m. was 5.5 (IQR=4-8), 10 (IQR=8-13.3), 14 (IQR=9-18), 13.5 (IQR=10.8-16.5), 15 (IQR=13-19) and 18 (IQR=15-21) respectively (p<0.001). When stratification was done for all patients' features, among all sub-groups median SF Leed's score it was observed that median SF Leed's score was lower from patients of all groups having breakfast at 7:00 a.m. or before which was gradually rising with delayed breakfast timing (Table-III).

Breakfast timing was found to be predictor of dyspepsia severity. Regression analysis showed that there was increase of 2.03 units in SF Leeds score with one-unit increase in breakfast timing (Table-IV).

On endoscopy frequency of esophagitis was higher in patients with breakfast after 10 a.m. I-e 50%, similarly frequency and severity of gastritis was high in patients with breakfast after 10 a.m (table-5). (moderate gastritis 38.7 % and severe gastritis 65.4%). Duodenitis was more frequent and severe with breakfast after 10 a.m. (69.9%).

DISCUSSION

Usually individuals are suggested to consume meals on time to main overall health. Habit of skipping may potentially impact metabolism and energy levels. It is indicated in some studies that irregular meal patterns and meal skipping practice may disrupt circadian rhythm and imbalance gut microbiota and eventually impacting gastrointestinal health.[17,18] The evidence is not conclusive, and more research is needed to establish a clear causal relationship. As breakfast is very important starting meal of day which can boost your performance of whole day we focused on particular breakfast meal in this study. To date, there is no strong scientific evidence to directly support the claim that skipping breakfast leads to gastrointestinal disorders. The relationship between breakfast skipping and gastrointestinal health is complex and may vary among individuals.[18]

Variables	Breakfast timings						P-Value
	≤7:00 a.m n(%)	>7 a.m to 8 a.m n(%)	> 8 a.m. to 9 a.m. n(%)	> 9 a.m. to 10 a.m. n(%)	>10 a.m. to 11 a.m. n(%)	>11:00 a.m. n(%)	
Indigestion	79(68.1)	49(90.7)	49(84.5)	53(91.4)	72(90)	80(95.2)	**<0.001
heartburn	53(45.7)	30(55.6)	43(74.1)	42(72.4)	72(90)	75(89.3)	**<0.001
Regurgitation	13(11.2)	11(20.4)	22(37.9)	22(37.9)	43(53.8)	57(67.9)	**<0.001
Nausea	17(14.7)	19(35.2)	28(48.3)	21(36.2)	35(43.8)	62(73.8)	**<0.001

Table-II. Comparison of dyspeptic symptoms with breakfast timings
**Significant at p<0.01

Patients' Features		Breakfast timings						P-Value
		≤7:00 a.m n(%)	>7 a.m to 8 a.m n(%)	> 8 a.m. to 9 a.m. n(%)	> 9 a.m. to 10 a.m. n(%)	>10 a.m. to 11 a.m. n(%)	>11:00 a.m. n(%)	
Age (years)	18-29	4(4-7)	8(5.5-11)	9.5(4-14.3)	9(7-15.3)	15(13.5-17.5)	14.5(11.8-17.3)	**<0.001
	30-39	7(4-9.8)	9(7-12.3)	9.5(5.8-12)	14(11.5-18)	15(9.5-20.5)	17(14.8-20.3)	**<0.001
	40-49	7(4-7.8)	10(8-13)	13(6.5-15)	13.5(13-15.5)	14(11-18)	18(17-21)	**<0.001
	50-59	7(4.5-13)	14(10.5-24.5)	16(14-22)	15.5(11.8-19.3)	15(13.8-20)	17(15-22)	**<0.001
	60-65	7(5.5-14.5)	14(12-16)	16(14-22)	15.5(11.8-19.3)	15(13.8-20)	17(15-22)	*0.033
Gender	Male	5(4-11)	10(8-14)	15(9-18)	14(12-20)	15(11-20)	18(16-20)	**<0.001
	Female	6(4-7)	9.5(7.8-13)	13(9-19)	13(10-14)	15.5(14-18)	18(12-21)	**<0.001

Table-III. Comparison of SF Leed's score among patients having breakfast at different timings with rest to stratification of patients' features.

Model		Unstandardized Coefficients		Standardized Coefficients	t-statistics	Significant	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-5.360	1.116	-	-4.805	0.000	-7.553	-3.168
	Breakfast timing	2.032	.122	.620	16.718	0.000	1.793	2.271

Table-IV. Regression model for relationship of breakfast timing and SF Leeds score
Dependent Variable: SFLEEDS_SCORE, R^2= 0.384, Adjusted R^2=0.383

There is no a scientific thumb rule for breakfast timing which is applicable to individuals. Breakfast timing varies among individuals based on their lifestyle and daily routine. Nevertheless, there are some considerations and recommendations related to breakfast timing such as breakfast should be consumed within two hours of waking up to stimulate metabolism and provide sufficient nutrients to body after a long period of night fast. According to breakfast definition by Timlin and Pereira, breakfast, eaten before or at the start of daily activities within 2 h of waking, typically no later than 10.00 hours.[19] It is also said that waking up early is good for overall human health as it is related with maintaining circadian rhythm which regulate gastrointestinal physiology. In this study a considerable proportion of patients was found to have breakfast after 10: a.m. (36.5%). Although, studies are not available for direct comparisons.

Endoscopic Findings		Breakfast Timing		
		<8am	8am-10am	>10am
Esophagus	Normal Mucosa	138(38.3%)	100(25.0%)	122(33.9%)
	Esophagitis	1(16.7%)	2(33.3%)	3 (50.0%)
	Esophageal Ulcer	1(33.3%)	1(33.3%)	1(33.3%)
	Hiatus hernia	9(25.0%)	11(30.6%)	16(44.4%)
	Esophageal candidiasis	1(20.0%)	2(40.0%)	2(40.0%)
Stomach	Gastritis Mild	77(84.6%)	9(9.9%)	5(5.5%)
	Gastritis Moderate	70(31.5%)	66(29.7%)	86(38.7%)
	Gastritis severe	8(9.9%)	20(24.7%)	53(65.4%)
	Gastric ulcer	-	-	3(100%)
Duodenum	Normal mucosa	152 (41.9%)	87(24%)	124(34.2%)
	Duodenitis	3(13.0%)	4(17.4%)	16(69.9%)
	Duodenal ulcer	-	-	1(100%)
	Fissured/Decreased folds D2	5(38.5%)	5(38.5)	3(23.1)
Table-V. Endoscopic findings in patients with different breakfast timings				

A larger survey performed in Saudi Arabia among multi-ethnic population of middle age-men reported that frequency of breakfast skipping was 40.3% in Pakistanis, 20.9% in Indians, 9% in Bangladeshi, 28.7% in Turkish and 73.3% among Saudi.[20] Frequency of breakfast skipping among Iranian general population was reported to be 32.4%.[21] The frequency of breakfast skipping can vary across populations and may be influenced by cultural, social, economic, and individual factors.[22,23]

In this study, it was found that delaying breakfast significantly causes pathological changes in gut including esophagitis, moderate to severe gastritis and duodenitis. The pathophysiology is that keeping stomach empty for long time makes it good environment for growing bacteria and acid attack to mucosa of gut leading to inflammation.[24] Bile acids also reflux to stomach and even esophagus leaking to bile acid esophagitis and gastritis. There were also other endoscopic changes seen including duodenal ulcers, fissured d2, esophageal candidiasis and ulcers but currently it is difficult to correlate it solely with breakfast timings.

This study found that overall dyspepsia score was significantly associated with breakfast timing. We analyzed that overall dyspepsia score was increasing with delayed breakfast time. Another similar study reported that a 25% prevalence of functional dyspepsia among those who were having irregular meal times whereas frequency of functional dyspepsia was 19.7% among those who were skipping breakfast.[5] A larger study on 4763 Iranian adults analyzed that irregular patterns was significantly associated with higher risk of chronic uninvestigated dyspepsia (OR=1.42, 95% CI: 1.12-1.78) in contrast to those having regular meal pattern.[25]

There are some limitations of present study. This study did not record coexisting diseases and any type of medication they were taking which may aggravate dyspeptic symptoms. The study was performed in gastroenterology out-patients clinics enlisting patients who were also on follow-up visits and following consultant's advice related to life style changes.

CONCLUSION
The present study found a significant relationship of breakfast timing and burden of gastrointestinal disease with increasing frequency of dyspeptic symptoms with delayed breakfast timings particularly in those patients having breakfast after 10:00 O' clock in morning.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Baby Anbreen:** Data collection, drafting, responsible for data, proof reading, approved manuscript for publication.
2	**Shahid Karim:** Conception design, proof reading, critical revisions, approved manuscript for publication.
3	**Punhal Khan:** Literature review, data analysis, proof reading, approved manuscript for publication.
4	**Raheela Khalid:** Literature review, data collection, proof reading, approved manuscript for publication.
5	**Baseer Ahmad:** Literature review, data collection, proof reading, approved manuscript for publication.