Correlation of Dyspepsia with the Type of First Meal of the Day; Breakfast or Brunch: A Cross-Sectional Study from Karachi Pakistan

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Abstract

Background: Breakfast skipping is traditionally viewed as a bad habit. The customary choice for those who skip breakfast is brunch. Changes in gastrointestinal function are correlated with a range of dietary factors.

Objective: To evaluate the correlation of the type of first meal of the day with dyspepsia among patients visiting gastroenterology clinics with dyspeptic symptoms.

Methods: This cross-sectional study was conducted in the Department of Gastroenterology, Liaquat National Hospital from August 2021 to April 2022. Short-Form Leeds Dyspepsia Questionnaire was used to identify the presence of dyspepsia (SF-LDQ). Breakfast was defined as the meal consumed in the morning and any beverages or food taken in the morning before 11:00 a.m. regularly in a week. Data were analyzed using the statistical package SPSS version 21.

Results: A total sample of 390 patients was analyzed in this study with median age and duration of symptoms of 35 (IQR=26-42) years and 12 (IQR=8-24) months respectively. The frequency of breakfast skipping was 15.6%. The frequency of dyspeptic symptoms including indigestion, heartburn, regurgitation, and nausea was significantly higher among patients taking brunch as the first meal of the day than those who were having breakfast regularly. The frequency of dyspepsia was 75.1%. On univariate and multivariable analysis, the practice of consuming breakfast regularly was found to be associated with a lower risk of dyspepsia than those who were consuming brunch as the first meal of the day.

Conclusion: The current study analyzed that type of first meal was significantly associated with dyspepsia. The frequency of dyspeptic symptoms was significantly higher among patients taking brunch at least once a week than patients who were regularly consuming breakfast.

Keywords: *Dyspepsia, breakfast, indigestion, regurgitation, nausea, heartburn.*

INTRODUCTION

A nutritious breakfast is a sign that you're off to a positive and energetic start to the day. From a physiological standpoint, breakfast differs from the other meals we eat in that it is consumed following the longest postprandial fast, in this case, an overnight fast. Breakfast is traditionally referred to as the "most important and first meal of the day" which should be consumed within 2-3 hours of awakening. It should be comprised of food or beverage from at least one food category and is regarded as a crucial element of a healthy diet, accounting for 20% to 35% of total energy intake [1-3].

Breakfast skipping is traditionally viewed as a bad habit. People's eating habits have evolved significantly during the past several decades as a result of changes in their way of life. Nowadays, people lead busy and stressful lives, which is evident from the fact that they miss meals frequently. As a result, skipping breakfast has grown more prevalent among kids, teenagers, and adults. These bad eating habits could contribute to an increase in the risk of chronic disease in the future [4]. The customary choice for those who skip breakfast is brunch. In an article published in Hunter's Weekly in 1895, the word "brunch," a creative mashup of "breakfast" and "lunch," first appeared in print [5]. The concept of brunch was developed in England in the late 19th century. Initially, brunch was created as a weekend-only replacement for breakfast for those who woke up late and skipped it after a restless night [6]. However, gradually it became a trend to routinely skip breakfast and even in Asian countries. The data is lacking on this fact. But during our clinical practice, we observed that the majority of the patients report the practice of brunch due to busy and sedentary lifestyles.

It has been shown that breakfast consumption habits are strongly correlated with all aspects of health status (physiological, psychological, and social) [7]. The gastrointestinal system, which breaks down food particles after ingestion, includes the stomach as just one component. The pH of the environment in the stomach, which produces gastric juice primarily made of hydrochloric acid, ranges from 1 to 3. The cells on the stomach wall continuously generate hydrochloric acid, which activates the digesting enzyme pepsin, which only functions optimally at a pH of 1-1.5 [8]. Most

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likely because of this phenomenon, over a long length of time, frequent mealtime deviations seem to be linked to an increased risk of gastritis and Helicobacter pylori infection. Missing meals might make you feel sick since your stomach is empty save for stomach acid [2]. Changes in gastrointestinal function are correlated with a range of dietary factors. It has been proven that eating at odd times causes more acidity, gastric reflux, and eventually stomachaches [7].

A collection of gastrointestinal (GI) symptoms known as dyspepsia includes nausea, bloating, and epigastric pain. Uninvestigated dyspepsia (UD) is the term used to describe dyspepsia that has not been subjected to any medical investigation (such as an upper GI endoscopy) and whose cause has not been established to be either functional or organic. According to epidemiological research, the prevalence of UD varies between 7% and 45% worldwide [9]. Dyspepsia may develop with patients' odds of habitual eating patterns such as consuming meals quickly, in big quantities, or at odd times, which may overload the stomach accommodation process, leading to dyspeptic symptoms [10, 11]. Increasing sedentary lifestyle behavior, skipping early breakfast, and switching to brunch meals are the facts that we observe in our daily clinical practice. To validate this observation, we planned to determine the correlation of the type of first meal of the day with dyspepsia among patients visiting gastroenterology clinics with dyspeptic symptoms as no such study has been conducted yet in Pakistan.

METHODOLOGY

The Gastroenterology department at Liaquat National Hospital conducted this cross-sectional study from August 2021 to April 2022. The Hospital Ethics Committee (IRB#: App# 058-2022 LNH-ERC) first evaluated and approved the study protocol. With their written informed consent, study participants were enlisted. The study included patients with indigestion, heartburn, regurgitation, or nausea who were of any gender and between the ages of 18 and 50 who had the symptoms for at least the previous two months. Patients having a history of alcohol use, smoking or any other addiction, antipsychotic drugs, diabetes mellitus, thyroid/ parathyroid disorders, gluten-related disorders, non-steroidal anti-inflammatory medicines, patients on proton pump inhibitors, H2 blockers, coronary

Please answer both parts of each question

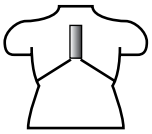
Patient ID: **Date:**	**A** **How often have you had this symptom over the last 2 months?** Tick only one box per question	**B** **How often has this symptom interfered with your normal activities (eating, sleeping, work, leisure) over the last 2 months?** Tick only one box per question
1. Indigestion Indigestion is a pain or discomfort in the upper abdomen. 	☐ Not at all ☐ Less than once a month ☐ Between once a month and once a week ☐ Between once a week and once a day ☐ Once a day or more	☐ Not at all ☐ Less than once a month ☐ Between once a month and once a week ☐ Between once a week and once a day ☐ Once a day or more
2. Heartburn Heartburn is a burning feeling behind the breastbone. 	☐ Not at all ☐ Less than once a month ☐ Between once a month and once a week ☐ Between once a week and once a day ☐ Once a day or more	☐ Not at all ☐ Less than once a month ☐ Between once a month and once a week ☐ Between once a week and once a day ☐ Once a day or more
3. Regurgitation Regurgitation is an acid taste coming up into your mouth from your stomach.	☐ Not at all ☐ Less than once a month ☐ Between once a month and once a week ☐ Between once a week and once a day ☐ Once a day or more	☐ Not at all ☐ Less than once a month ☐ Between once a month and once a week ☐ Between once a week and once a day ☐ Once a day or more
4. Nausea Nausea is a feeling of sickness without actually being sick.	☐ Not at all ☐ Less than once a month ☐ Between once a month and once a week ☐ Between once a week and once a day ☐ Once a day or more	☐ Not at all ☐ Less than once a month ☐ Between once a month and once a week ☐ Between once a week and once a day ☐ Once a day or more
5. Which, if any, of these symptoms has been the most troublesome to you in the last 2 months? **Please tick one box only**	☐ Heartburn ☐ Regurgitation ☐ Indigestion ☐ Nausea ☐ None of these have troubled me.	

Fig. (1): Validated short dyspepsia questionnaire.

artery disease, abdominal operations, and suggestive symptoms of irritable bowel syndrome were excluded from this study as well as those who were unwilling to participate. Based on self-reporting/history evident from the records they showed and the currently available reports we ruled out these conditions.

To reach the maximum sample size with a 95% confidence level and a precision of 5%, it was hypothesized that patients with dyspeptic symptoms skip breakfast 50% of the time. Online accessible calculator Open-Epi was used for performing sample size calculation.

Breakfast was defined as the meal consumed in the morning and any beverages or food taken in the morning before 11:00 am regularly in a week were categorized as breakfast otherwise it was considered as brunch. Patients who complained of heartburn, indigestion, or regurgitation and visited gastroenterology clinics were asked questions about their age, gender, BMI, the length of their symptoms if they slept within two hours of dinner, and whether they had breakfast or brunch.

Short-Form Leeds Dyspepsia Questionnaire was used to identify the presence of dyspepsia (SF-LDQ). SF-LDQ is a validated 8-item questionnaire that evaluates frequency and severity. This 4-item tool evaluates the frequency of upper gastrointestinal symptoms such as indigestion, heartburn, regurgitation, and nausea during the last two months, while severity is evaluated by rating the questionnaire from 0-32. The replies are evaluated on a scale of 0 (not at all) to 4 (once a day or more). The frequency and severity of all symptoms are then added together to determine the overall score (**Fig. 1**). Based on the sum of the frequency of symptoms, Fraser *et al.* recommended a cut-off value of 4 and above for the presence of dyspepsia [12].

To analyze the collected data, data were entered into the statistical software SPSS version 24. Frequencies and percentages were used to express categorical variables. With the Shapiro-Wilk test, the first normal distribution for numerical data was evaluated. The asymmetry of the distribution was confirmed, and the numerical data were reported as median with interquartile range (IQR). Univariate odd ratios with a 95% confidence interval were computed to determine the association of patients' features with symptoms and dyspepsia frequency. Multivariable logistic regression was run to compute the adjusted odd ratio by putting up the variables with p<0.25 in univariate analysis in the final regression model. Statistical significance was considered when the p-value was found to be less than or equal to a 5% level of significance on the final regression model.

RESULTS

A total sample of 390 patients was analyzed in this study with a median age of 35 (IQR=26-42) years. The majority of patients were males (52.8%). Patients had a median BMI of 24.8 (IQR=20.8-27.6) Kg/m^2 and their median duration of dyspeptic symptoms was 12 (IQR=8-24) months. Table **1** displays their socioeconomic features.

Table 1: Descriptive statistics for socio-demographic characteristics of studied patients.

Variables	Total n(%)	Male n(%)	Female n(%)
Age categories			
≤30 years	147 (37.7)	82(39.8)	65(35.3)
>30 years	243 (62.3)	124(60.2)	119(64.7)
Body mass index			
Underweight	44 (11.3)	10(4.9)	34(18.5)
Normal weight	155 (39.7)	65(31.6)	90(48.9)
Overweight	158 (40.5)	107(51.9)	51(27.7)
Obese	33 (8.5)	24(11.7)	9(4.9)
Sleeping early after having dinner			
Yes	246 (63.1)	131(63.6)	115(62.5)
No	144 (36.9)	75(364)	69(37.5)

Table 2: Comparison of patients' features among those having breakfast brunch as the first type of meal.

Patients' features	Type of first meal		p-value
	Breakfast n(%)	Brunch n(%)	
Age (in years)#	35 (28 – 42)	30 (24.5 – 42)	*0.014
Gender			
Male	172(83.5)	34(16.5)	0.619
Female	157(85.3)	27(14.7)	
Overall Leed's dyspepsia score#	12 (7.5 – 15)	17 (13.5 – 20.5)	**<0.001
Dyspepsia presence	234 (71.1)	59 (96.7)	**<0.001

Non-normal variables were expressed as median with inter-quartile range
*Significant at p<0.05, **Significant at p<0.01

The frequency of breakfast skipping was 15.6%. Table **2** displays a comparison of patients' features among those having breakfast and brunch. Age, overall Leed's dyspepsia score, and dyspepsia presence were significantly different among patients having breakfast and brunch.

Fig. (2) depicts the frequency of dyspeptic symptoms among patients having breakfast and brunch. The frequency of dyspeptic symptoms including ingestion

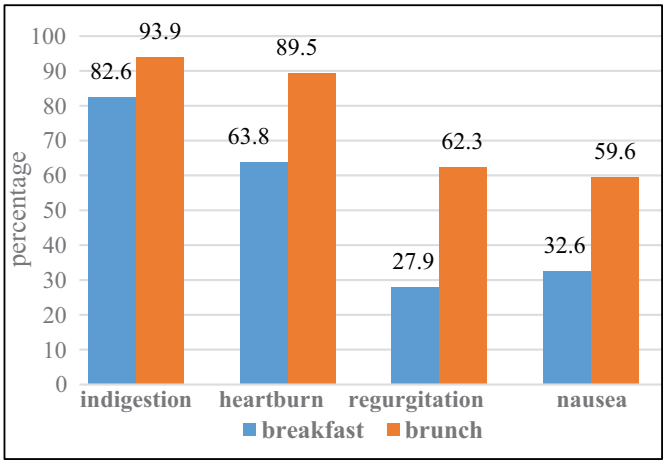


Fig. (2): Frequency of dyspeptic symptoms among patients having either regular breakfast or brunch.

(p=0.025), heartburn (p=0.003), regurgitation (p<0.001), and nausea (p<0.001) was significantly different based on the type of first meal of the day. **Fig. (2)** depicts a comparison of the severity of dyspeptic symptoms among patients taking breakfast and brunch as the first meal of the day. The frequency of severe dyspeptic symptoms was significantly higher among patients having brunch than those having breakfast (p<0.001).

Table **3** shows a comparison of symptoms among patients having regular breakfast or brunch with a stratification of gender. Among males, heartburn, regurgitation, and nausea were significantly higher for those having brunch. Among females, regurgitation and nausea were significantly higher among females having brunch.

Table 3: Comparison of dyspeptic symptoms according to stratification of gender.

Dyspeptic symptoms	Males			Females		
	Breakfast n(%)	Brunch n(%)	p-value	Breakfast n(%)	Brunch n(%)	p-value
Indigestion	144(83.7)	33(97.1)	0.055	133(84.7)	25(92.6)	0.378
Heartburn	123(71.5)	31(91.2)	*0.016	102(65)	22(81.5)	0.091
Regurgitation	67(39)v	25(73.5)	**<0.001	41(26.1)	15(55.6)	**0.002
Nausea	59(34.3)	25(73.5)	**<0.001	56(35.7)	18(66.7)	**0.002

*Significant at p<0.05,
**Significant at p<0.001.

Table **4** shows the univariate and multivariable association of patients' factors with different symptoms of dyspepsia. The likelihood of dyspeptic symptoms including indigestion, heartburn, regurgitation, and nausea was significantly lower among patients taking breakfast regularly than those who skipped breakfast and had brunch.

Median Overall SF-Leed score was 13 (IQR=8-17). According to the threshold of 4/16, the frequency of dyspepsia was 75.1%. Table **5** presents the univariate and multivariable association of breakfast intake with the presence of dyspepsia according to SF-Leed's questionnaire. On univariate and multivariable analysis, the practice of consuming breakfast regularly was found to be associated with a lower risk of dyspepsia than those who were consuming brunch as the first meal of the day.

Table 5: Univariate and multivariable association of participants' features and type of first meal with dyspepsia.

Variables	OR (95% CI)	aOR (95% CI)
Age (in years)	0.99 (0.96 - 1.01)	-
Gender, male	1.26 (0.79 - 1)	-
Body mass index (Kg/m^2)	1.07 (1.01 - 1.12)*	1.04 (0.98 - 1.11)
Sleep early after having dinner	6.70 (4.03 - 11.19)**	4.85 (2.85 - 8.25)**
breakfast intake	0.07 (0.03 – 0.20)**	0.1 (0.04 - 0.28)**

aOR= Adjusted odds ratio, CI: Confidence interval, OR= Odds ratio*Significant at p<0.05, *Significant at p<0.01

DISCUSSION

With the acceleration of the pace of modern life, breakfast, which is regarded as an important meal of the day, is being ignored by more and more people, which seemingly as a universal behavior, may have negative effects on your health [13]. One of the key causes of acidity, gastric reflux, stomach pain, belching, or flatulence is skipping meals. When you are on an empty stomach for a long time, there is an increased secretion of gastric acid in the stomach. Since the meals are recognized as triggers for at least a subset of symptoms, dietary and lifestyle modifications often represent the first-line management in FD patients despite the scanty quality evidence produced so far.

The present study found overall 15.6% of total patients were skipping breakfast and having brunch. This study found that the frequency of breakfast skipping among males and females was 16.5% and 14.7% respectively. Unfortunately, the literature on this fact is dearth in Pakistan and the majority of the studies conducted in our region investigated breakfast skipping among children, adolescents, and students. To the best of our literature search, none of the studies investigated the frequency of skipping breakfast in the Pakistani general population. However, a study conducted in Saudi Arabia investigating breakfast skipping among a Multi-ethnic group of young men, reported that the frequency of breakfast skipping was 50% among Pakistani males [14]. On the other hand, a study conducted in Pakistan analyzing the effects of breakfast skipping on body mass

Table 4: Univariate and multivariable association of participants' features and type of first meal with dyspeptic symptoms.

Study variables	Indigestion		Heartburn		Regurgitation		Nausea	
	OR (95% CI)	aOR (95% CI)	OR (95% CI)	aOR (95% CI)	OR (95% CI)	aOR (95% CI)	OR (95% CI)	aOR (95% CI)
Age (in years)	1 (0.97 - 1.04)	-	0.98 (0.96 - 1.01)	-	0.99 (0.97 - 1.02)	-	0.99 (0.98 - 1.02)	-
Gender, male	1 (0.57 - 1.78)	-	1.43 (0.92 - 2.23)	-	1.85 (1.22 - 2.80)**	1.81 (1.12 - 2.92)	1.02 (0.68 - 1.53)	-
Body mass index (Kg/m^2)	1.03 (0.96 - 1.09)	-	1.03 (0.98 - 1.08)	-	1.07 (1.02 - 1.12)*	1.04 (0.98 - 1.09)	1.03 (0.98 - 1.07)	-
Sleep early after having dinner	1.95 (1.10 - 3.48)*	1.60 (0.88 - 2.88)	2.05 (1.31 - 3.21)**	1.56 (0.97 - 2.48)**	3.95 (2.44 - 6.39)**	2.97 (1.77 - 4.98)**	2.23 (1.47 - 3.54)**	1.81 (1.15 - 2.87)**
Breakfast intake	0.311 (0.14 - 0.71)**	0.36 (0.15 - 0.83)*	0.21 (0.11 - 0.40)**	0.2 (0.12 - 0.45)**	0.23 (0.15 - 0.37)**	0.28 (0.18 - 0.47)**	0.33 (0.21 - 0.51)**	0.38 (0.24 - 0.61)**

aOR= Adjusted odds ratio, CI: Confidence interval, OR= Odds ratio, *Significant at p<0.05, **Significant at p<0.01.

index among university female students demonstrated that only about a quarter of the studied females were having breakfast regularly (24%) [15]. Another Pakistani survey conducted in Lahore among university students for exploring the impact of breakfast skipping on lipid profile and anthropometric measures found that 41.3% of males and 40.6% of females were not regularly taking breakfast [16]. One of the possible reasons for the lower frequency of breakfast skipping in our study is the different study population as this study enrolled patients from gastroenterology clinics where some of them were on a follow-up visit and it is possible that after the advice of the doctor, they changed their habits. However, an Iranian study aiming to ascertain the association between breakfast consumption and heartburn syndrome reported a breakfast-skipping frequency of 32.4% among the general population [17].

Inadequate dietary patterns lead to dyspeptic symptoms. Different dietary patterns are frequency of daily meals, regular time of meals, and speed of chewing meals. The present study analyzed that the frequency of dyspeptic symptoms was significantly higher among patients who were having brunch than those who were regular breakfast consumers and regression analysis also showed a significant association of type of first meal with dyspeptic with a lower likelihood among patients regularly consuming breakfast in contrast to those who reported to have brunch at least once a week. The literature is unclear regarding the association of the type of first meal of the day with dyspeptic symptoms. However, some studies investigated the association of irregular meal timings with gastrointestinal symptoms. A Chinese study included military personnel to learn more about emerging digestive disorders while they were being trained. There were several reported digestive complaints, including nausea, stomach pain, acid reflux, abdominal distention, diarrhea, and loss of appetite. It was shown that eating at irregular times was linked to a higher frequency of digestive complaints, including nausea, anorexia, acid reflux, and constipation. [18]. Other Chinese surveys, studied the correlation between gastrointestinal symptoms and dietary factors and demonstrated that the majority of the patients had symptoms because of poor dietary habits including eating fast and irregular meal times (58.2%). The survey analyzed that acid reflux, heartburn, and nausea were strongly associated with irregular meal timings [19].

Patients with functional dyspepsia frequently complain that their symptoms are brought on by or made worse by their diet and that they can only tolerate limited amounts of food at a time [20]. According to the Rome IV criteria, dyspepsia is any combination of the following four symptoms: postprandial fullness, early satiety, epigastric pain, and epigastric burning. These symptoms must occur at least three days per week for the past three months and have started at least six months beforehand [21]. However, in the present study, we used the Short-Form Leeds Dyspepsia Questionnaire, and the presence of dyspepsia was labelled based on the total scores of frequency at the threshold of 4 and above. This questionnaire is validated and at the threshold of 4 and above, it has sensitivity and specificity of 86% and 66.2% respectively with the area under the curve of 83% [12]. This study found that the frequency of patients having dyspepsia based on SF-LDQ was significantly higher among those having brunch than those who were regularly having breakfast. Even this association was significant in multivariable regression analysis. A community-based survey was carried out in China to assess the relationship of poor dietary habits with functional dyspepsia. Xu and coworkers investigated irregular meal timing and the habit of breakfast skipping as predictors of different dyspeptic symptoms. It was analyzed that irregular meal timings were significantly associated with upper abdominal pain and burning, early satiety, regurgitation, and functional dyspepsia. On the other hand, the habit of breakfast skipping was found to be associated with epigastric and post-prandial syndrome [22]. Milajerdi *et al.* evaluated that Daily breakfast consumption was linked to a lower risk of heartburn syndrome, in a way that those who were consuming breakfast regularly had a 43% lower risk of heartburning in contrast to those having breakfast once a week (OR=0.57; 95% CI 0.45-0.72) [17].

The present study brought up a unique idea of the association of the type of first meal with dyspeptic symptoms. However, there are some major limitations such as this study was hospital-based and conducted in gastroenterology clinics also registering the patients who were on follow-up, which could mask the true frequency of breakfast skipping. This study reveals the experience of a single-center institute in Karachi with a cross-sectional nature of the investigation and a limited sample size. Adding more variables such as educational status and their knowledge of the importance of breakfast could further help analyze the broad spectrum features of breakfast skipping and preferring brunch. Further in this study, gastroparesis was not ruled out as multiple investigations need to be done. The findings of the present study should be verified by planning a future-community-based study should be conducted for determining the type of first meal of the day and comparison of gastrointestinal symptoms and dyspepsia among those taking breakfast regularly and having brunch.

CONCLUSION

The current study analyzed that type of first meal was significantly associated with dyspepsia. The frequency of dyspeptic symptoms was significantly higher among patients taking brunch at least once a week than patients who were regularly consuming breakfast.

ETHICS APPROVAL

Before beginning the study, the Hospital Ethics Committee (IRB#: App# 058-2022 LNH-ERC) gave its initial approval for this research. The Helsinki Statement

and the institutional and/or national research committee's ethical standards were followed in all aspects of studies involving human subjects.

CONSENT FOR PUBLICATION

Online informed consent was taken from survey respondents.

AVAILABILITY OF DATA

Upon a reasonable request, the associated author will provide the data.

FUNDING

None.

CONFLICT OF INTEREST

None

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AUTHORS' CONTRIBUTION

VKC conceptualized the study. SK designed the study protocol. VKC and PK were involved in data cleaning, analysis, result writing, and interpretation. VKC and PK prepared the initial draft of the manuscript. SK provided constructive criticism and updated the original copy. The manuscript was reviewed and approved by all authors.

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