

Relationship of Dyspeptic Symptoms with Dinner to Breakfast Time Interval

Vishal Kumar Chandkai, Shahid Karim, Adeel Rahat, Dheeraj Kumar, Punhal Khan, Madhuri Kumari

Department of Gastroenterology, Liaquat National Hospital, Karachi Pakistan

ABSTRACT

Objective: To ascertain the relationship of dyspeptic symptoms with dinner to breakfast time interval.

Study Design: Cross-sectional study.

Place and Duration of Study: Department of Gastroenterology, Liaquat National Hospital, Karachi Pakistan, from Aug 2021 to Apr 2022.

Methodology: We enrolled patients of either gender, between 18 to 50 years of age, with persistent symptoms of dyspepsia for at least two months and/or confirmed cases of dyspepsia. Written, informed consent was taken from all patients prior to recruiting them. Patients visiting outpatient department with symptoms of dyspepsia and/or confirmed cases of dyspepsia were interviewed to fill out Short-form Leeds Dyspepsia Questionnaire (SF-LDQ).

Results: Total 400 patients were studied with nearly half of the participants being female 188 (47%) with 72(18%), 87(21.8%), 113(28.2%) and 128(32%) patients had dinner to breakfast duration of ≤ 8 hours, 8.1-10 hours, 10.1-12 hours and >12 hours, respectively. There was moderate positive correlation between fasting duration and SF-LDQ ($r = 0.46, p < 0.001$). Nightly fasting duration of more than 10 hours had increased risk of indigestion, heartburn and regurgitation.

Conclusion: Longer duration between dinner and breakfast was found to be associated with increased likelihood of dyspeptic symptoms including indigestion, heartburn and regurgitation.

Keywords: Dyspepsia, Gastroesophageal Reflux Disease, Indigestion

How to Cite This Article Chandkai VK, Karim S, Rahat A, Kumar D, Khan P, Kumari M. Relationship of Dyspeptic Symptoms with Dinner to Breakfast Time Interval. *Pak Armed Forces Med J* 2024; 74(5): 1429-1434. DOI: <https://doi.org/10.51253/pafmj.v74i5.9021>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

The word breakfast conveys “breaking of the night fast”, indicating the very first meal after the previous night meal.¹ While there is no standard definition of breakfast, it is consumed at the commencement of day-to-day activities, within two hours of awakening and of an energy level 20-35% of total daily energy.² Regular and timely intake of morning meal is linked with multiple advantages in young children and adults if it includes sufficient consumption of macro and micronutrients.³ The timing of eating is important as it may activate different body systems that are responsible for appropriate food absorption, digestion, or metabolism,⁴ thus, delaying or skipping breakfast negatively impacts metabolic and digestive system. Dyspepsia denotes abdominal or epigastric pain which is frequently associated with other gastrointestinal disorders.⁵ Dyspeptic pain in the upper abdomen may be present with nausea, distention, anorexia or belching.⁶ These symptoms are usually troublesome, recurring and may affect a patient’s quality of life.⁷ A wide variation of dyspepsia

prevalence is noted in literature because of changed diagnostic criteria, time differentiation, different ecological and dietary factors and lifestyles.⁸ but the prevalence of dyspepsia in hospital based studies may not reflect its burden in the community as majority of patients who suffer dyspeptic complaints do not approach medical practitioners due to causative factors of these symptoms, like peptic ulcers, gastroesophageal reflux or functional dyspepsia, being chronic in nature without the presence of known cause. Indeed, no clear cause is identified in nearly half of the cases.⁹ The time between dinner and breakfast is maximum in duration as compared to other two meals and prolonging or delaying the breakfast further disturbs the stomach environment. Moreover, the literature related to time duration between meals and frequency of gastrointestinal symptoms is scant. The present study was planned to ascertain the association of time interval between dinner and breakfast with dyspeptic symptoms.

METHODOLOGY

The cross-sectional study was performed at Department of Gastroenterology, Liaquat National Hospital and Medical College, Karachi, Pakistan, from August 2021 to April 2022. Ethical approval was granted to carry out this study (Ref: App 0662-2021 LNH- ERC). Written, informed consent was taken

Correspondence: Dr Vishal Kumar Chandkai, Department of Gastroenterology, Liaquat National Hospital, Karachi Pakistan
Received: 06 Jul 2022; revision received: 02 Jan 2023; accepted: 05 May 2023

from patients prior to their recruitment into the study through non-probability consecutive sampling.

Inclusion criteria: Patients of either gender, aged 18 to 50 years, with persistent symptoms of dyspepsia for at least two months and/or confirmed cases of dyspepsia, were included.

Exclusion Criteria: Patients who had history of smoking, non-steroids anti-inflammatory drugs, coronary artery diseases, abdominal surgeries and with suggestive features of irritable bowel syndrome, were excluded.

As no previous study was available, a pilot study was conducted for sample size estimation. Using 95% confidence interval and a precision of 5%, sample size was separately calculated for each of the symptoms and sample of 384 patients was calculated for frequency of indigestion (50%). Open-Epi, an online calculator, was used for sample size calculation. Patients with symptoms of dyspepsia and/or confirmed cases of dyspepsia were interviewed to fill out Short-form Leeds Dyspepsia Questionnaire (SF-LDQ).¹⁰

Data was entered in Statistical Package for the Social Sciences (SPSS) v 23.0 for analysis. Categorical variables were presented as frequency and percentage. Numerical variables were computed as mean±standard deviation. Chi-square linear by linear association test was applied to determine association symptoms severity with patients' features. Spearman correlation was computed to assess the relationship between total score of SF-LDQ. Univariate binary logistic regression was applied to determine the patients' factors associated with dyspeptic symptoms. Multivariable model was adjusted with variables significant at $p < 0.25$ in univariate model and other variables of clinical importance. Two tail p -value of ≤ 0.05 was defined as statistically significant at final regression model.

RESULTS

We enrolled 400 participants in the study, with median age and BMI of 35 (IQR= 26.3 - 42) years 24.9 (IQR= 20.8 - 27.7) kg/m², respectively. Nearly half of the participants were female (188, 47%) and median duration of symptoms and number of meals per day was 12 (IQR= 9 - 24) months and 3 (IQR= 2 - 3), respectively. Median time of dinner and breakfast was 10.30 (IQR=10-11) pm and 9.30 (IQR= 7.30 - 11) am respectively. Median duration of night fasting was 11.3(9.3 - 12.3) hours. Nearly two-third of patients

reported that they slept within 2 hours of having dinner 252(63%). Figure-1 shows the dyspeptic symptoms during previous two months among patients with dinner to breakfast duration of ≤ 10 hours and >10 hours. Patients with night fasting duration of more than 10 hours had significantly higher likelihood for indigestion ($p < 0.001$), heartburn ($p < 0.001$), regurgitation ($p < 0.001$) and nausea ($p = 0.003$) during past two months.

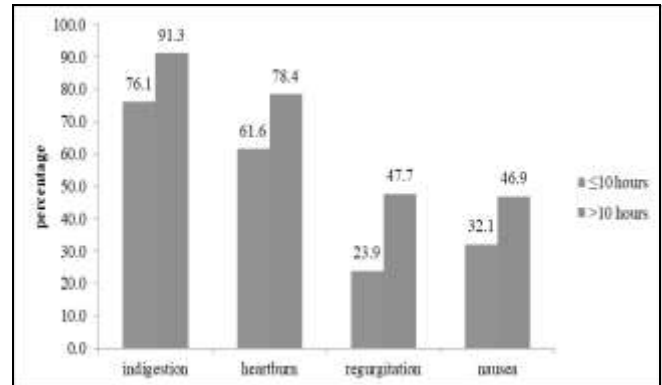


Figure-1: Dyspeptic Symptoms During Previous 2 Months Among Patients With Dinner To Breakfast Duration of ≤ 10 Hours And >10 Hours (n=400)

Table I shows the severity of dyspeptic symptoms at which quality of life was affected due to these symptoms between patients who reported having breakfast within and later than 10 hours of having dinner. Frequency of symptoms severity was significantly higher in patients with night fasting duration of more than 10 hours as compared to patients having their breakfast within 10 hours of night meal.

Figure-2 depicts the scatter plot of fasting time and total Leeds score showing there was moderate positive correlation between both ($r = 0.46$, $p < 0.001$).

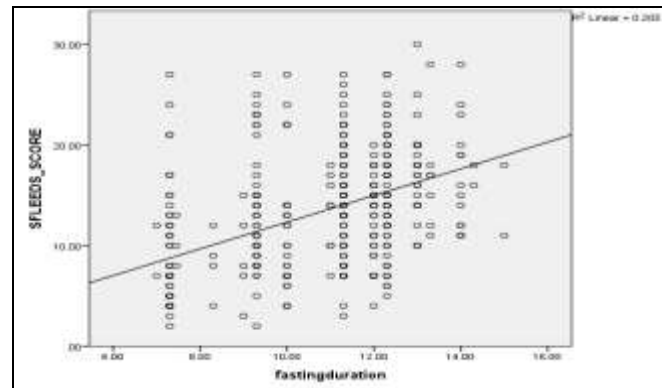


Figure-2: Scatter Plot of Fast Time and Total Leeds Score (n=400)

Dyspeptic Symptoms with Dinner to Breakfast

Unadjusted odds ratio of the dyspeptic symptoms were associated with the gap between dinner and breakfast, with higher likelihood of symptoms among patients having breakfast after 10 hours as compared to those who were having breakfast within 10 hours of having night meal. The odds ratio was adjusted with age, gender, number of

influencing routine energy utilization.¹³ Type of food intake triggers numerous gastrointestinal mechanisms with gastric emptying and motility of small intestine in upper intestinal passage playing an important role in regulation of satiety, hunger, glycemic control and gut hormone, in addition to colonic transit, which may be associated with insulin sensitivity and metabolic

Table-I: Comparison of Symptom Severity Among Patients with Dinner to Breakfast Duration of ≤10 and >10 hours, (n=400)

Symptoms	Severity	Dinner to breakfast duration		p-value
		≤10 hours n(%)	>10 hours n(%)	
Indigestion	Not at all	38(64.4)	21(35.6)	**<0.001
	Less than once a month	2(100)	0(0)	
	Between once a month and once a week	20(39.2)	31(60.8)	
	Between once a week and once a day	45(36.3)	79(63.7)	
	Once a day or more	54(32.9)	110(67.1)	
Heartburn	Not at all	62(54.4)	52(45.6)	**<0.001
	Less than once a month	0(0)	0(0)	
	Between once a month and once a week	15(31.3)	33(68.8)	
	Between once a week and once a day	42(45.2)	51(54.8)	
	Once a day or more	40(27.6)	105(72.4)	
Regurgitation	Not at all	121(49)	126(51)	**<0.001
	Less than once a month	0(0)	1(100)	
	Between once a month and once a week	8(25)	24(75)	
	Between once a week and once a day	6(23.1)	20(76.9)	
	Once a day or more	24(25.5)	70(74.5)	
Nausea	Not at all	108(46)	127(54)	*0.015
	Less than once a month	2(50)	2(50)	
	Between once a month and once a week	20(23.5)	65(76.5)	
	Between once a week and once a day	23(39.7)	35(60.3)	
	Once a day or more	6(33.3)	12(66.7)	

*P-valuetrend: Linear by linear association test is reported, *Significant at p<0.05, **Significant at p<0.01*

meals per day, early bedtime after dinner and other dyspeptic symptoms. All of the symptoms were associated with dinner to breakfast duration excluding nausea. Table-II represents the association of interval between dinner and breakfast with different dyspeptic symptoms.

DISCUSSION

Presently, the healthy role of breakfast in attaining optimal nutritional benefits has been universally recognized.¹⁻¹¹ Available literature does not report consensus of researchers regarding any particular cut-off of fasting time which is injurious to digestive health and leading to dyspeptic symptoms, however, one author calculated the ideal time gap between meals after which stomach reaches to unacceptable Ph levels as being 7.74 hours.¹² Food regulation is a feedback mechanism to physiological and environmental signals, directly influencing ingestive conduct from meal extent to diet range, and

cross-organ signaling.^{14, 15} One cross-sectional investigation determined irregular meal time, ascertained as one hour delay than normal time, and breakfast skipping as pattern of dietary component, with significantly a higher frequency of irregular meal time among patients with functional dyspepsia than healthy controls (26% versus 4%) and frequency of skipped breakfast also being higher among dyspepsia patients than control group (20% versus 6%).¹⁶ Another study emphasized that irregular meal times might influence symptoms of chronic gastritis as they were associated with all dyspeptic symptoms.¹⁷ Irregularity of meal intake, including skipping breakfast disturbs the entire functioning of gastrointestinal tract and physiological environment of digestive system and can even lead to peptic ulcers.^{18,19} Among various lifestyle factors, including smoking, sleep quality, alcohol consumption, early bedtime after dinner, irregular nutritional behaviors have been reported as strong causes.²⁰ One cross-sectional study

Dyspeptic Symptoms with Dinner to Breakfast

Table-II: Univariate and Multivariable Analysis showing Association of Dinner to Breakfast Duration with Dyspeptic Symptoms (n=400)

Variables	Univariate logistic regression		Multivariate logistic regression	
	OR (95% CI)	p-value	aOR (95% CI)	p-value
Indigestion				
Age (in years)	1.01(0.98 - 1.04)	0.704	1(0.9 - 1)	0.916
Gender, male	1.11(0.63 - 1.92)	0.720	1.2(0.6 - 2.3)	0.574
Body mass index	1.0 (0.96 - 1.08)	0.456	1(0.9 - 1.1)	0.825
Early Bedtime after having dinner	2.12(1.21 - 3.70)	*0.008	1.8(0.9 - 3.5)	0.090
Heartburn	13.75(3.29 - 57.36)	**<0.001	24.3(5.6 - 105.5)	**<0.001
Regurgitation	0.95(0.53 - 1.68)	0.869	1.1(0.5 - 2.1)	0.856
Nausea	0.58(0.32 - 1.06)	0.078	0.7(0.3 - 1.3)	0.225
Dinner to Breakfast Duration				
≤10 hours	Ref		Ref	
>10 hours	3.2 (1.84 - 5.86)	**<0.001	3.4(1.7 - 6.7)	**<0.001
Heartburn				
Age (in years)	0.99(0.96 - 1.01)	0.228	0.9(0.9 - 1)	0.309
Gender, male	1.47(0.95 - 2.28)	0.080	1.1(0.7 - 1.9)	0.630
Body mass index	1.03(0.98 - 1.08)	0.148	1(0.9 - 1.1)	0.732
Early Bedtime after having dinner	1.97(1.26 - 3.08)	**0.003	1.2(0.7 - 2.1)	0.460
Indigestion	13.75(3.29 - 57.36)	**<0.001	27.6(6.2 - 122.5)	**<0.001
Regurgitation	0.08(0.042 - 0.176)	**<0.001	0.1(0.04 - 0.2)	**<0.001
Nausea	0.64(0.41 - 1.02)	*0.061	1.1(0.6 - 1.9)	0.698
Dinner to Breakfast Duration				
≤10 hours	Ref		Ref	
>10 hours	2.26 (1.45 - 3.52)	**<0.001	2(1.1 - 3.4)	*0.014
Regurgitation				
Age (in years)	0.99 (0.98 - 1.02)	0.889	1(0.9 - 1)	0.725
Gender, male	0.50 (0.33 - 0.76)	*0.001	2(1.2 - 3.3)	**0.008
Body mass index	1.07 (1.02 - 1.12)	**0.003	1(0.9 - 1.1)	0.601
Early Bedtime after having Dinner	4.21 (2.61 - 6.81)	**<0.001	3.2(1.8 - 5.6)	**<0.001
Indigestion	0.95 (0.54 - 1.68)	0.869	1.1(0.5 - 2.1)	0.885
Heartburn	0.08 (0.04 - 0.17)	**<0.001	0.1(0.04 - 0.2)	**<0.001
Nausea	0.37 (0.24 - 0.57)	**<0.001	0.4(0.3 - 0.7)	**0.001
Dinner to Breakfast Duration				
≤10 hours	Ref		Ref	
>10 hours	2.90 (1.86 - 4.52)	**<0.001	2(1.1 - 3.5)	*0.015
Nausea				
Age (in years)	1(0.98 - 1.02)	0.971	1(0.9 - 1)	0.989
Gender, male	1 (0.67 - 1.49)	0.987	0.8(0.5 - 1.3)	0.364
Body mass index	1.03 (0.98 - 1.08)	0.211	1(0.9 - 1)	0.694
Early Bedtime after having dinner	2.23(1.46 - 3.47)	**<0.001	1.5(0.9 - 2.5)	0.083
Indigestion	0.58 (0.32 - 1.06)	*0.078	0.7(0.4 - 1.3)	0.273
Heartburn	0.64 (0.41 - 1.02)	*0.061	0.9(0.6 - 1.7)	0.942
Regurgitation	0.37 (0.24 - 0.57)	**<0.001	0.4(0.3 - 0.7)	**0.001
Dinner to breakfast duration				
≤10 hours	Ref		Ref	
>10 hours	1.86 (1.23 - 2.84)	**0.003	1.1(0.70 - 1.8)	0.633

CI: confidence interval, aOR= adjusted odd ratio, OR= odd ration, Ref= Reference category, *Significant at $p<0.05$, **Significant at $p<0.01$

reported that effects of breakfast skipping were stronger in contrast to tobacco smoking and alcohol intake.²¹ Another cross-sectional survey reported a significant reverse association of frequency of breakfast consumption and heartburn in adult

population.²² as Gastroesophageal Reflux Disease (GERD) occurs with a backward flux of stomach contents into the esophagus.²³ and a typical symptom of GERD is heartburn. One cross-sectional study studied the impact of lifestyle factors on symptoms of

GERD and frequency of breakfast skipping was identified as a dietary factor of increased odds of GERD than those who were not habitually skipping of breakfast.²⁴

LIMITATION OF STUDY

Confounders such as other underlying diseases, depression, anxiety, type of food, dining out and usage of junk food, daily water intake were not recorded simultaneously which could have impact of gastrointestinal symptoms.

CONCLUSION

Longer duration between dinner and breakfast was found to be associated with increased likelihood of dyspeptic symptoms including indigestion, heartburn and regurgitation.

Conflict of Interest: None

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

VKC & SK: Data acquisition, data analysis, critical review, approval of the final version to be published.

AR & DK: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

PK & MK: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Paoli A, Tinsley G, Bianco A, Moro T. The influence of meal frequency and timing on health in humans: the role of fasting. *Nutrients* 2019; 11(4): 719. <https://doi.org/10.3390/nu11040719>
2. Sievert K, Hussain SM, Page MJ, Wang Y, Hughes HJ, Malek M, et al. Effect of breakfast on weight and energy intake: systematic review and meta-analysis of randomised controlled trials. *BMJ* 2019; 364: l42. <https://doi.org/10.1136/bmj.l42>
3. Coulthard JD, Palla L, Pot GK. Breakfast consumption and nutrient intakes in 4-18-year-olds: UK National Diet and Nutrition Survey Rolling Programme (2008-2012). *Br J Nutr* 2017; 118(4): 280-290. <https://doi.org/10.1017/S0007114517002214>
4. Lopez-Minguez J, Gómez-Abellán P, Garaulet M. Timing of breakfast, lunch, and dinner. Effects on obesity and metabolic risk. *Nutrients* 2019; 11(11): 2624. <https://doi.org/10.3390/nu11112624>
5. Baron JH, Watson F, Sonnenberg A. Three centuries of stomach symptoms in Scotland. *Aliment Pharmacol Ther* 2006; 24(5): 821-829. <https://doi.org/10.1111/j.1365-2036.2006.03044.x>
6. Jaber N, Oudah M, Kowatli A, Jibril J, Baig I, Mathew E, et al. Dietary and lifestyle factors associated with dyspepsia among pre-clinical medical students in Ajman, United Arab Emirates. *Cent Asian J Glob Health* 2016; 5(1): 192. <https://doi.org/10.5195/cajgh.2016.192>
7. Clevers E, Törnblom H, Simrén M, Tack J, Van Oudenhove L. Relations between food intake, psychological distress, and gastrointestinal symptoms: a diary study. *United European Gastroenterol J* 2019; 7(7): 965-973. <https://doi.org/10.1177/2050640619863431>
8. Yazdanpanah K, Moghimi N, Yousefinejad V, Ghaderi E, Azizi A, Nazem SF. Dyspepsia prevalence in general population aged over 20 in the west part of Iran. *J Pak Med Assoc* 2012; 62(7): 672-676.
9. Grainger SL, Klass HJ, Rake MO, Williams JG. Prevalence of dyspepsia: the epidemiology of overlapping symptoms. *Postgrad Med J* 1994; 70(821):154-161. <https://doi.org/10.1136/pgmj.70.821.154>
10. McColl E. Best practice in symptom assessment: a review. *Gut* 2004;53 Suppl 4(Suppl 4):iv49-54. <https://doi.org/10.1136/gut.2004.053249>
11. Potter C, Griggs RL, Brunstrom JM, Rogers PJ. Breaking the fast: meal patterns and beliefs about healthy eating style are associated with adherence to intermittent fasting diets. *Appetite* 2019; 133: 32-39. <https://doi.org/10.1016/j.appet.2018.10.035>
12. Mehta M. Ideal time gap between meals: stomach as a batch reactor. 2014.
13. Lam YY, Ravussin E. Analysis of energy metabolism in humans: a review of methodologies. *Mol Metab* 2016; 5(11): 1057-1071. <https://doi.org/10.1016/j.molmet.2016.09.005>
14. Fändriks L. Roles of the gut in the metabolic syndrome: an overview. *J Intern Med* 2017; 281(4): 319-336. <https://doi.org/10.1111/joim.12586>
15. Holst JJ, Gribble F, Horowitz M, Rayner CK. Roles of the gut in glucose homeostasis. *Diabetes Care* 2016; 39(6): 884-892. <https://doi.org/10.2337/dc16-0351>
16. Xu JH, Lai Y, Zhuang LP, Huang CZ, Li CQ, Chen QK, et al. Certain dietary habits contribute to the functional dyspepsia in South China rural area. *Med Sci Monit* 2017; 23: 3942-3951. <https://doi.org/10.12659/msm.902784>
17. Li Y, Su Z, Li P, Li Y, Johnson N, Zhang Q, et al. Association of symptoms with eating habits and food preferences in chronic gastritis patients: a cross-sectional study. *Evid Based Complement Alternat Med* 2020; 2020: 5197201. <https://doi.org/10.1155/2020/5197201>
18. Wang C, Guo X, An Y, Xu S, Zhang D, Qin Y, et al. Risk factors of peptic ulcer in military personnel: a systematic review of the literature. *Explor Res Hypothesis Med*. 2020; 5(3): 103-109. <https://doi.org/10.14218/erhm.2020.00020>
19. Jain U, Chauhan A, Gupta J, Gupta A. Evaluation of Boey scoring in predicting morbidity and mortality in peptic ulcer perforation peritonitis. *Int J Surg* 2021; 5(3): 41-43.
20. Verma A, Ranganna KM, Reddy RS, Verma M, Gordon NF. Effect of rosuvastatin on C-reactive protein and renal function in patients with chronic kidney disease. *Am J Cardiol* 2005; 96(9): 1290-1292. <https://doi.org/10.1016/j.amjcard.2005.06.063>

Dyspeptic Symptoms with Dinner to Breakfast

21. Yamamichi N, Mochizuki S, Asada-Hirayama I, Mikami-Matsuda R, Shimamoto T, Konno-Shimizu M, et al. Lifestyle factors affecting gastroesophageal reflux disease symptoms: a cross-sectional study of healthy 19864 adults using FSSG scores. *BMC Med* 2012; 10: 45.
<https://doi.org/10.1186/1741-7015-10-45>
 22. Milajerdi A, Bagheri F, Mousavi SM, AH K, Saneei P, Esmailzadeh A, et al. Breakfast skipping and prevalence of heartburn syndrome among Iranian adults. *Eat Weight Disord* 2021; 26(7): 2173-2181.
<https://doi.org/10.1007/s40519-020-01062-1>
 23. Antunes C, Aleem A, Curtis SA. Gastroesophageal reflux disease. [Updated 2021 Jul 18]. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2022.
 24. Ahmed S, Jamil S, Shaikh H, Abbasi M. Effects of lifestyle factors on the symptoms of gastroesophageal reflux disease: a cross-sectional study in a Pakistani population. *Pak J Med Sci* 2020; 36(2): 115-120.
<https://doi.org/10.12669/pjms.36.2.1231>
-