



Evaluation of dyspepsia in young and old patients using ultrasound of abdomen and esophagogastroduodenoscopy

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Abstract

Background: Dyspepsia is an upper gastrointestinal disorder affecting 20-45% of the global population. It is characterized by frequent discomfort, burning in the epigastrium and postprandial distress severe enough to hamper routine activities. The aim of this study was to evaluate dyspepsia in young (<40 years) and old patients (>40 years) using ultrasound of abdomen and esophagogastroduodenoscopy as investigative modalities.

Methods: The present study was single centre hospital based observational study. 145 patients with dyspepsia were grouped into two categories on the basis of age into those less than and above 40 years of age. All the patients were evaluated using ultrasound of abdomen and esophagogastroduodenoscopy.

Results: Epigastric pain was the most common symptom in both groups. It was experienced by 71.23% of the patients less than 40 years and 69.44% of the group above 40 years. Ultrasound examination was normal in majority of patients studied; however more ultrasound abnormalities were detected in the older group of patients. Fatty liver disease was diagnosed in 19.26% younger patients and 48.6% older patients. Cholecystitis and gall bladder polyps were detected only in older patients. Esophagogastroduodenoscopy revealed significant number of abnormalities in both groups. Pangastritis in 21.91% young patients and antral gastritis in 20.80% older patients were the commonest findings in the respective groups.

Conclusion: The study concluded that older patients had more frequent organic dyspepsia while younger patients had functional dyspepsia more commonly as evaluated by both esophagogastroduodenoscopy as well as ultrasound examination.

Keywords: dyspepsia; endoscopy; esophagogastroduodenoscopy; fatty liver; gastritis; ultrasound

Introduction

Dyspepsia is not a disease rather an array of symptoms originating as discomfort or pain in any part of the epigastrium, the upper central region of the abdomen [1]. A meta-analysis mentioned that the frequency of dyspepsia increased with the changing lifestyle of the modern community. Dyspepsia was observed in about 45% of patients in 2020-21 [1, 2] which rose to 54% in 2022 [3]. Several studies demonstrated that heterogeneous symptoms of dyspepsia depend on age, sex, socio-economic conditions and geographical differences. According to various studies, the prevalence of uninvestigated dyspepsia was the highest in the US (23-25.8%), India (30.4%) and New Zealand (34.2%) [4]. A multicentre study reported that around 7.6%-49% of individuals in India experience dyspeptic symptoms [5].

An average of 20-30% of patients consulting primary healthcare for gastrointestinal disorder have dyspepsia [6]. It is also related to various co-morbid conditions such as psychological disorders, hypertension, and diabetes mellitus.

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Since it is difficult to identify different types of dyspepsia merely based upon the symptoms and physical examination, various guidelines have been suggested for management of these patients [7]. Two key diagnostic tools viz esophagogastroduodenoscopy and abdominal ultrasound are utilized for proper assessment of patients with dyspepsia [8, 9].

Esophagogastroduodenoscopy or upper gastroendoscopy is a relatively expensive diagnostic technique that allows direct visualization of the inner lining of the gastrointestinal tract and collection of tissue for biopsies [10]. On the other hand, the ultrasound imaging technique is a cost-effective, innocuous and uncomplicated technique to assess patients with dyspepsia [9]. Enquiry about alarming symptoms such as sudden weight loss, unexplainable iron deficient anaemia, gastrointestinal bleeding, swallowing issues, family history of gastric cancer and medical history of chronic peptic ulcer are important to understand the severity of cases [1].

Patients with dyspepsia in whom any underlying structural or biochemical abnormalities are identified are labelled as organic dyspepsia. On the other hand those in whom no organic cause is identified are deemed to have functional dyspepsia [7]. Abnormalities such as those found in patients with gastro-oesophageal reflux disease, food intolerance, peptic ulcer disease, inflammatory lesions of upper gastrointestinal tract, *Helicobacter pylori* infections and hiatus hernia are the main reasons of organic dyspepsia [8]. Functional dyspepsia is due to psychological disorders, living style and dietary habits [4, 11].

There are various reviews and reports published elucidating epidemiological factors of dyspepsia and various investigative modalities used for diagnosis; yet the precise cause of this disease is still being investigated [1, 6, 7, 11, 12]. There is paucity of comparative studies on dyspepsia in young and older population using various diagnostic tools [13]. Therefore, the present study was aimed to evaluate and compare the causes of dyspepsia in young (<40 years) and old patients (>40 years of age) using esophagogastroduodenoscopy and abdomen ultrasound as investigative modalities.

Methods

This single-centred, observational prospective study was carried out from January 2021 to December 2022 in the Department of Medicine and Radiology at a teaching hospital in Northern India. Ethical clearance from the institutional ethics committee was obtained prior to the research.

All adult patients with uninvestigated dyspepsia and willing to give consent were included in the study. As per Rome IV criteria, uninvestigated dyspepsia was defined as chronic or recurrent pain and/or discomfort thought to originate from the gastroduodenal region and at least having one or more of postprandial fullness, early satiation, epigastric pain or burning present for at least the last 3 months [2]. Patients who were already diagnosed with carcinoma of the stomach and peptic ulcer disease were excluded.

The study sample consisted of 145 patients who were divided into two groups. Group I included patients <40 years and group II included patients >40 years of age.

The patients then underwent ultrasound of abdomen followed by esophagogastroduodenoscopy as per standard protocols. Abdominal ultrasonography was conducted using a scanner equipped with a 2.0-5.0-MHz transducer (Samsung HS 70). It was performed by experienced sonologist (AJ) on the patients after a fast of at least six hours prior to scan and images recorded. Esophagogastroduodenoscopy was performed by experienced gastroenterologist (MRS) after obtaining written informed consent. Patients were kept fasting for 12 hours and water intake was also stopped 4 hours prior to procedure. Patients were laid down in left lateral position and 4% xylocaine was used to administer pharyngeal analgesia. Fujinon 190 forward viewing video endoscope was used for the procedure. The findings of esophagogastroduodenoscopy were noted. The findings of ultrasound and esophagogastroduodenoscopy were compared between the two groups.

Statistical analysis

The statistical analysis was performed to validate the results using Graphpad Prism software and Microsoft Excel. The results were described as frequencies, percentages and mean \pm standard deviation. Two population proportion test was used to compare the endoscopic findings between age groups <40 years and >40 years. P value \leq 0.05 was considered statistically significant.

Results

145 patients were selected for the study and divided into two groups: 73 patients with dyspeptic symptoms between the ages of 18 and 40 were included in group I whereas in group II, 72 patients with dyspepsia symptoms over the age of 40 years were included (Table 1).

Body mass index (BMI) and abdominal girth were compared in the two groups since these factors have

been shown to affect the prevalence of dyspepsia. According to WHO, BMI 18.5 to 24.9 kg/m² has been considered as normal range [14]. Majority of patients in both the groups had normal BMI. Abdominal girth above 94 cm in male and 80 cm in female are at highest risk of adverse health conditions [15]. It was observed that in group I, 45.20% had increased abdominal girth whereas 58.33% in group II had increased abdominal girth indicating a higher number of patients with central obesity in elderly patients.

Diabetes and hypertension are factors that have been shown to impact patients with dyspepsia [1]. Out of the two groups studied, none of the patients in group I had diabetes or hypertension; while a significant number of individuals in group II had either diabetes (37.5%) or hypertension (47.22%; Table 1).

Table 1: Analysis of different parameters in study groups.

Parameters	Group I (<40 years), n=73	Group II (>40 years), n=72	p value
Smoking	19 (26.0 %)	23 (31.9%)	0.3
Alcohol	14 (19.1%)	16 (22.2%)	0.4
Mean BMI (kg/m ²)	22.31 ± 2.68	23.37 ± 3.38	0.04
Under weight (<18.5 kg/m ²)	6 (8.21%)	7 (9.72%)	0.25
Over weight (>24.9 kg/m ²)	10 (13.69%)	23 (31.94%)	0.02
Abdominal girth above normal range	33 (45.20%)	42 (58.33%)	0.03
Mean abdominal girth (cm)	92.43 ± 8.89	94.70 ± 8.12	0.04
Co-morbidities	Nil	DM:27, HTN:34 Prediabetics: 2	

Abbreviations: BMI: Body mass index, HTN: Hypertension, DM: Diabetes Mellitus, p value calculated using t-test.

Symptoms in patients with dyspepsia

The most prominent symptom in the patients was epigastric pain. On analyzing the patients in the studied groups, epigastric pain was the most common dyspeptic symptom in group I (71.23%) followed by nausea/vomiting (65.75%), indigestion (63.01%), heartburn (54.79%) and food intolerance (34.24%) (Table 2). In group II, out of 72 patients, epigastric pain was reported by 69.44% patients followed by heartburn in 44.44%, nausea/vomiting in 34.72%, indigestion in 26.38% and food intolerance in 25% patients (Table 2). In contrast to other dyspeptic symptoms, loss of appetite was more in the elder group, experienced in 12.3% as compared to younger population (9.7%).

Table 2: Frequency of symptoms in patients with dyspepsia.

Symptoms	Group I (<40 years), n=73		Group II (>40 years), n=72	
	No. of cases	Percentage	No. of cases	Percentage
Epigastric pain	52	71.2	50	69.4
Heart burn	40	54.8	32	44.4
Nausea/vomiting	48	65.7	25	34.7
Indigestion	46	63.0	19	26.3
Food intolerance	25	34.2	18	25
Loss of appetite	7	9.7	9	12.3

Ultrasound findings between the study groups

The ultrasonography findings suggested that out of the total 145 patients, 63.44% had normal findings. On sub group analysis of ultrasound examination no abnormalities were seen in 80.82% in group I and 45.83% in group II indicating that larger number of patients less than 40 years of age had normal ultrasound examination as compared to older population (p value 0.04; Table 3).

The ultrasound findings revealed fatty liver as the commonest abnormality detected in a majority of patients with dyspepsia. In group I, 17.8% and in group II, 37.5% had fatty liver grade I. In group I both fatty liver grade II and cholelithiasis was detected in only 1.36% patients (p-value 0.04). Whereas in group II, 11.11% individuals were found to have grade II fatty liver and 12.5% had cholelithiasis. In group II, 1.38% had cholecystitis and 4.16% had gall bladder polyp; however, none of the patients in group I had these abnormalities. This result indicated higher prevalence of fatty liver disease and cholelithiasis in the older population (Table 3).

Table 3: Ultrasound findings between the study groups.

Ultrasound finding	Group I (<40 years) n=73		Group II (>40 years) n=72		p value
	No. of cases	Percentage (%)	No. of cases	Percentage (%)	
Normal	59	80.82	33	45.83	0.04
Fatty liver grade I	13	17.80	27	37.5	0.04
Fatty liver grade II	1	1.36	8	11.11	0.19
Cholelithiasis	1	1.36	9	12.5	-
Cholecystitis	0	0	1	1.38	-
Gall bladder Polyp	0	0	3	4.16	-

Esophagogastroduodenoscopy findings between the study groups

In comparison to the ultrasonography, the esophagogastroduodenoscopy revealed higher number of abnormalities in the present study.

Esophagogastroduodenoscopy was found to be normal in 15.0% in group I and 8.3% in group II (p-value 0.06; Table 4). Group I patients had higher rate of pangastritis (21.9%) followed by antral gastritis (17.8%), esophagitis (15.06%), erosive gastritis (13.6 %), fundal gastritis (10.9%); whereas in group II antral gastritis (20.8%) was detected at higher rate followed by *H. pylori*-associated infections (19.4%), erosive gastritis (18.05%), hiatus hernia (12.5%) and duodenitis (12.5%; Table 4).

The most common esophagogastroduodenoscopy finding in group I was pangastritis (21.9%); while antral gastritis (20.8%) was the most common endoscopy finding in group II.

H. pylori positive cases were higher in group II. Out of 72 patients in group II, 19.44% were identified with *H. pylori* infection; whereas in group I, out of 73 patients 12% were found to be *H. pylori* positive (Table 4).

Table 4: Frequency of findings on esophago gastroduodenoscopy.

Gastroendoscopy findings	Group I (<40 years)		Group II (>40 years)		p value
	No. of cases	Percentage	No. of cases	Percentage	
Normal	11	15.06	6	8.33	0.06
Esophagitis	11	15.06	6	8.33	0.06
Esophageal candidiasis	0	0	1	1.38	NA
Lax LES	6	8.21	5	6.94	0.45
GERD	1	1.36	2	2.77	0.25
Hiatus hernia	7	9.5	9	12.5	0.35
Fundal gastritis	8	10.95	2	2.77	NA
Corpus gastritis	6	8.21	3	4.16	0.25
Antral gastritis	13	17.8	15	20.8	0.43
Gastric polyp	1	1.36	2	2.77	0.25
Pan gastritis	16	21.91	10	13.8	0.25
Erosive gastritis	10	13.69	13	18.05	0.37
Atrophic gastritis	2	2.73	1	1.38	0.25
<i>H. pylori</i> +ve	9	12.32	14	19.4	0.17
Duodenitis	7	9.58	9	12.5	0.35
Duodenal ulcer	0	0	1	1.36	NA

Classification of patients on the basis of organic and functional dyspepsia

On the basis of ultrasound findings

Those with any type of abnormalities detected either in ultrasound of abdomen or esophagogastroduodenoscopy were grouped as organic dyspepsia and rest as functional dyspepsia.

According to the ultrasound study only 19.7% of patients in group I were found to have abnormal findings; hence grouped as organic dyspepsia. In contrast out of 72 participants in group II a larger number of patients 54.1% had abnormal findings and were regarded as organic dyspepsia (Table 5).

Table 5: Classification as organic and functional based on ultrasound findings.

	Group I (<40 years)		Group II (>40 years)		P value
	Number of case (73)	percentage	Number of case (72)	percentage	
Organic	14	19.7	39	54.1	0.98
Functional	59	80.8	33	45.8	

On the basis of esophagogastroduodenoscopy findings

It was observed that in group I, 84.9% had abnormal endoscopy findings and grouped as organic dyspepsia whereas in group II, 91.9% were diagnosed as organic dyspepsia due to detection of any endoscopic lesions. On the other hand, in 15% patients in group I and 8.3% cases in group II no organic cause was diagnosed. Therefore these were classified as functional dyspepsia (Table 6).

Table 6: Classification as organic and functional based on esophagogastroduodenoscopy findings.

	Group I (<40 years)		Group II (>40 years)		p value
	Number (73)	percentage	Number (72)	percentage	
Organic	62	84.9	66	91.6	0.8
Functional	11	15.0	6	8.3	

This data suggested that more number of organic cases were detected using esophagogastroduodenoscopy as compared to ultrasound of abdomen. The above results indicated that ultrasound examination does not show any pathology in majority of patients with symptoms suggestive of dyspepsia resulting in functional dyspepsia being diagnosed in majority of patients if only ultrasound examination is carried out. The liver

and gall bladder are commonly observed to be affected in patients with dyspepsia, especially in elderly patients, on ultrasound examination.

Abnormal endoscopy findings as well as ultrasound findings were more common in older age group as compared to younger population thereby indicating that with advancing age more patients with dyspepsia have an underlying cause for this condition.

Discussion

Dyspepsia is a digestive disorder manifesting as epigastric pain, nausea/vomiting, early satiety or postprandial fullness. It is often related to conditions like diabetes mellitus, hypertension and psychological disorders [1]. Although it is not fatal, it impacts an individual socially and economically. These patients experience lower lifestyle quality than the average population due to anxiety, mood swings and other psychological disturbances persistent among them [4]. A few studies have tried to prove the impact of age, gender, infections, diet and psychological factors on the prevalence of dyspepsia [4, 11]; however the results are not entirely consistent across the globe.

Dyspepsia remains a complex disorder that comprises of one or more symptoms related to the upper abdomen either singly or overlapping in patients. This makes it difficult to detect the exact etiology of such conditions even after a regular clinical examination [1]. Ultrasound of abdomen and esophagogastroduodenoscopy have been reported as among the most important diagnostic tools in patients with dyspepsia [16].

Diabetes and hypertension are factors that have been shown to impact patients with dyspepsia. In the present study, co-morbidities such as diabetes mellitus (37.5%) hypertension (47.2%) were identified in group II patients (>40 years). Froutan et al. [17] and Basha et al. [18] also reported a similar occurrence of co-morbidities in dyspeptic patients.

Epigastric pain was reported to be the most common symptom (70.34%) in both groups in the present study. Similar observations were made when various gastrointestinal parameters were studied in diverse literatures [13, 17-21]. Most of the dyspeptic symptoms like epigastric pain, heartburn, indigestion, food intolerance and nausea/vomiting were significantly higher in group I (young patients <40 years) whereas loss of appetite was higher in group II (old patients >40 years). Kaosombatwattana et al also reported that, younger patients compared to older patients had significantly higher incidence of epigastric pain (93.4% vs. 86.9%) and heart burn (19.2% vs 18.5%)

[13]. Serra et al reported epigastric pain to be most common symptom in younger and older patients, but the difference was found to be insignificant (84.9% vs 80.9%), whereas heart burn was significantly higher (74.5%) in younger patients when compared to older patients (69.5%) [20]. These variations in younger and older population may be explained by the diversity in gastric hormones, psychological factors and individual differences in life styles in the two groups [20, 22].

Ultrasound findings

Normal ultrasound examination was seen more in group I (80.8%) as compared to group II patients (45.8%) thereby indicating that only 20.5% younger patients had an organic cause of illness identified, compared to 65.75% of patients over the age of 40. The most frequent ultrasound finding was fatty liver in the total population. A higher incidence of fatty liver and gall bladder pathologies were observed in patients older than 40 years. Froutan et al. also reported in their study that fatty liver was seen in 18.3% patients and cholelithiasis in 19% patients. They observed that older population is more likely to develop fatty liver disease [17]. Al Saif et al. reported fatty liver infiltration in 49.7% and gall stone in 13.3% cases [23]. They found that males over the age of 40 were more likely to have fatty liver, cholelithiasis, gastric polyp, and cholecystitis [23]. These results are in concordance with the present study.

The prevalence of higher rate of fatty liver, cholelithiasis and cholecystitis among older population may be attributable to the increased consumption of alcohol. In the present study also more patients in older group were alcohol consumers (22.2%) and habitual smokers (31.9%). Alcohol affects gastric secretions and has the ability to induce fatty liver infiltration [24]. Along with high alcohol consumption, increased central obesity may also be a reason for increase in ultrasound findings. The occurrence of dyspepsia has been linked to central obesity, which depends on increased BMI and abdominal circumference [9, 24, 25]. Increased BMI causes bile secretion to increase, which causes crystallization and the development of gall stones [17].

Esophagogastroduodenoscopy findings

Esophagogastroduodenoscopy identified majority of patients with organic dyspepsia (84.9% vs 91.6%) in both the groups. Only 15.06% of people in group I and 8.33% in group II had no significant findings and were categorized as functional dyspepsia. While comparing the two groups on esophagogastroduodenoscopy, patients in group I had pangastritis (21.9%) as the most common finding whereas in group II antral gastritis (20.8%) was the commonest endoscopy finding.

Kamran et al. also reported gastritis in 40.1% patients below 45 years and in 44% patients above 45 years [10]. Hiatus hernia was reported in 13.5% and 13.1% patients below and above 45 years respectively which is consistent with our findings [10]. Kaosombatwattana et al. reported higher number of endoscopic findings in both the groups with gastritis, erosive gastritis, erosive esophagitis and duodenal polyp in 42.8%, 10.8%, 7.9% and 2% cases respectively below 40 years and 43.73%, 19.2%, 10.16% and 5.06% cases respectively, in patients above 40 years [13]. The lower prevalence of esophagogastroduodenoscopy findings in the current study may be due to the dissimilarity in living conditions, dietary factors, psycho-social activities, geographic distribution and smaller sample size. Piotrowicz et al. [26] reported 17.3% and 26.08% patients <45 years and >45 years respectively to suffer from antral gastritis

which was in symmetry with our findings. Ulcer was diagnosed in 4.34% in group I patients and 7.39% in group II patients [26]. However in our study, the prevalence of peptic ulcers is quite low. Only 1.36% in elderly group had duodenal ulcer in the present study indicating that majority of patients had already received standard treatment with acid suppression therapy before being referred to our tertiary centre.

Classification of dyspepsia as organic and functional

Both ultrasound examination and esophagogastroduodenoscopy categorized more number of patients as organic dyspepsia in older age group as compared to younger patients. Similar results were reported in several publications [10, 26-28] (Table 7).

Table 7: Summary of studies on prevalence of dyspepsia in young and old population.

	Young population			Old population	
	Age cut off between young and old (years)	Organic dyspepsia (%)	Functional dyspepsia (%)	Organic dyspepsia (%)	Functional dyspepsia (%)
Kamran et al [10]	45	58.7	41.2	64.8	35.8
Piotrowicz et al [26]	45	59.5	40.4	88.2	11.7
Kovács et al [27]	35	NA	9.6	NA	9.7
Seyedmirzaei et al [28]	35	NA	17.8	NA	13.1
Current study	40	84.9	15.06	91.6	8.33

Ghoshal et al. reported a figure of 8-23% in Asian individuals with functional dyspepsia without any structural abnormality via esophagogastroduodenoscopy [11]. This study suggested that functional dyspepsia was more prominent in younger age group which is in concordance with the present study [11]. Hence it is evident that different studies have given different figures categorizing patients as functional or organic dyspepsia depending upon different population studied and modes of investigation used.

In the present study, more patients in the older age group were identified with organic dyspepsia by esophagogastroduodenoscopy and ultrasound evaluation although this number was higher on esophagogastroduodenoscopy. In recent years, studies have advocated that esophagogastroduodenoscopy may not be preferred mode of investigation in younger patients except in patients with red flag signs [9, 10]. In the present study a large number of young patients also had esophagogastroduodenoscopic abnormalities and hence it is recommended that all patients with dyspepsia whether young or old should

undergo esophagogastroduodenoscopy as part of their evaluation. The earlier studies have also reported that esophagogastroduodenoscopy facilitates higher rate of diagnosis and provides better results especially in those with alarming symptoms [8, 29].

Although the data obtained in present research may help in future designing of line of management and setting up guidelines in different age groups with dyspepsia, the study had a few limitations. Firstly, being a small study having less number of patients in both groups, actual differences in findings on esophagogastroduodenoscopy and ultrasound of abdomen could not attain statistical significance in the parameters studied. Secondly, as this was single centred tertiary hospital based study the findings may not hold true in the two groups of patients due to referral bias and pre-treatment of cases by general practitioners. The actual behaviour of the illness may vary in larger population drawn from different geographical areas and cultural backgrounds. Lastly, biopsies after esophagogastroduodenoscopy were not performed. Histopathological studies could have delineated more number of organic causes of dyspepsia following esophagogastroduodenoscopy examination.

Conclusion

Although majority of young patients showed no abnormalities on ultrasound screening, it can be used as a screening method for patients of any age with dyspepsia to diagnose structural disorders related to liver and gall bladder. Esophagogastroduodenoscopy detected abnormal findings in majority of patients of dyspepsia in young as well as older age group and should be used as the investigative modality of choice for all patients with dyspepsia whenever required. Both ultrasonography and esophagogastroduodenoscopy revealed higher pathological findings in patients > 40 years indicating higher chances of organic dyspepsia in them, whereas functional dyspepsia was more commonly seen in <40 years patients.

Conflicts of interest

Authors declare no conflicts of interest.

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