

Etiological study of Gastric Outlet Obstruction in the era of advanced medical treatment of Peptic Ulcer Diseases

Md. Sherajul Islam¹, Mohammad Ershad Alam², S.M Akramuzzaman³, Masudur Rahman⁴, Fatema Fairuj Samad⁵, Niksar Akhter⁶, Md. Golam Mostafa⁷, Prabhashish Adhikari⁸, ABM Abdul Matin⁹

ABSTRACT:

Introduction: Although the incidence of gastric outlet obstruction (GOO) is decreasing in the world with improvement of advanced medical treatment, still this is a common disease in surgical practice. Two most common causes of GOO are gastric cancer and pyloric stenosis secondary to peptic ulcer disease (PUD).

Objectives: To determine the relative incidence of malignant and non-malignant pathology in patients presenting with GOO in this era of advanced medical treatment. **Methods:** A retrospective study is carried out in Sheikh Sayera Khatun Medical College Hospital. The records of 50 consecutive patients, admitted in surgery ward with features of GOO from July 2019 to June 2020 were reviewed. **Results:** The mean age of the patients is 45.5 years, with male preponderance (84%, M: F-5.25:1), most presented after 4th decade of life. All (100%) presented with characteristic vomiting. Others are epigastric pain (60%), bleeding (30%) indicated by haematemesis and melena, anorexia (52%) and marked weight loss (62%). Epigastric fullness (60%) and epigastric mass (20%) indicating advanced malignant lesion; 82% had past history of PUD, 88% were either smoker or habituated to betel nut and betel leaf, 72% belongs to low socioeconomic condition. Majority (70%) were anaemic, 6% icteric, 78% severely dehydrated. Visible peristalsis seen in 46% patients and succussion splash in 54%. Four malignant case had virchow's gland. Ascites in 20% and hepatomegaly 8% cases, representing advanced malignancy and signs of inoperability. Post-operative complications were more in malignant than benign cases mostly wound infection and wound dehiscence. Two patients in malignant group developed duodenal stump leakage and ultimately died. Most common cause of GOO was benign pyloric stenosis or oedema and spasms associated with acute ulcers in pylorus or duodenum (48%) which is followed immediately by antral carcinoma (46%), and extra gastric tumors (6%). **Conclusions:** The relative incidence of GOO due to pyloric stenosis secondary to chronic duodenal ulcer is more than antral carcinoma, observed in this series; but when considered antral carcinoma combined with other malignancies, pyloric stenosis is a relatively less common cause of GOO. Multicenter study is required to get the real picture in our country to find out the actual cause of GOO.

Key Words: Gastric outlet obstruction, haematemesis and melena, virchow's gland.

(The Insight 2020; 3(2): 35-43)

INTRODUCTION:

Although the incidence of gastric outlet obstruction (GOO) is decreasing in the world with improvement

of advanced medical treatment, still this is a common disease in surgical practice. Two most common causes of gastric outlet obstruction are gastric cancer and pyloric stenosis secondary to

1. Assistant Professor (Surgery), Sheikh Sayera Khatun Medical College. Gopalganj.
2. Assistant Professor (Surgery), Chittagong Medical College. Chittagong.
3. Assistant Professor (Surgery), Sheikh Sayera Khatun Medical College, Gopalganj.
4. Assistant Professor (Surgery), Sheikh Sayera Khatun Medical College, Gopalganj.
5. Junior Consultant (Gynae & obs.), Dhaka Medical College Hospital. Dhaka.
6. Assistant Professor (Radiology & Imaging), Sheikh Sayera Khatun Medical College. Gopalganj.
7. Assistant Professor (ENT), Sheikh Sayera Khatun Medical College. Gopalganj.
8. Assistant Professor (Anaesthesia), Sheikh Fajilatunnesa Mujib Eye Hospital & Training Institute. Gopalganj.
9. Associate Professor (Surgery), Sheikh Sayera Khatun Medical College, Gopalganj

peptic ulceration. Previously the later was more common¹. In the past when peptic ulcer disease (PUD) was more prevalent; benign causes were the most common; however, one review shows that only 37% of patients with GOO have benign disease and remaining patients have obstruction secondary to malignancy².

Until 1970s, benign disease was responsible for the majority cases of GOO in adults, while malignancy accounted for only 10-39% of cases^{3,4}. By contrast in recent decades 50-80% cases have been attributable to malignancy^{4,5}. Pancreatic adenocarcinoma with extension to the duodenum or stomach is a common cause of malignant GOO⁶. Fifteen to 25% of patients with pancreatic cancer present with GOO⁶. Such patient also has biliary obstruction^{7,8}. Distal gastric cancer remains a relatively common cause of malignant GOO accounting for up to 35% of GOO⁹.

In recent years the anatomical location of gastric cancer appears to have shifted from the antral portion to a more proximal part of stomach including involvement of gastro-oesophageal junction¹⁰. Carcinoma of the distal stomach and body of stomach is most common in low socioeconomic group, whereas the increase in proximal gastric cancer seems to affect principally higher socioeconomic groups¹.

Persistent inflammation in chronic peptic ulcer causes intense fibrosis and scarring with subsequent channel narrowing. This presentation of chronic peptic ulcer disease is now less common in western world. Another common cause of GOO is carcinoma of the head of the pancreas. Rare causes of delayed gastric emptying include a variety of benign tumours, lymphomas, crohn's disease, duodenal haematoma, adult pyloric hypertrophy, annular pancreas, mucosal diaphragm and Wilkie's disease¹¹.

In benign GOO there is usually a long history of peptic ulcer like symptoms. These patients often note gradually increasing ulcer pains over weeks or months with the eventual development of anorexia, vomiting and failure to gain relief from anti-ulcerants. Vomiting is characteristically unpleasant and is totally lacking of bile, effortless & projectile in

nature and contains partially digested food taken hours or even several days previously, marked weight loss, epigastric mass, hematemesis, melena, back pain.

On examination patient is dehydrated. It may be possible to see the distended stomach with visible peristalsis and a succussion splash may be audible. Anaemia is found in about 25% of patients¹². In malignant cases an epigastric mass, virchow's gland, ascitis, hepatomegaly may also present.

The means of diagnosis mostly are contrast radiography and upper gastrointestinal tract endoscopy and biopsy. Sometimes difficulty is encountered in distinguishing between benign GOO and obstructing antral gastric cancer. This may require repeated endoscopy with biopsy and brush cytology before the true nature of disease is established¹¹. Results of biopsy to rule out carcinoma are generally reliable and help to determine the most appropriate course of treatment.

Treatment of the patient involves resuscitation of the patient by correcting metabolic abnormalities, correction of anaemia and dealing with mechanical problems. The patient should be rehydrated with intravenous isotonic saline with potassium supplementation. Gastric lavage should be performed with a wide bore tube using saline for irrigation. If 5-7 days of gastric aspiration do not result in the relief of the obstruction the patient should be treated surgically¹². Surgery is usually undertaken in the form of gastroenterostomy and vagotomy¹¹. Endoscopic treatment with balloon dilatation has been practiced in early cases but the disadvantages are need for repetition and chance of perforation¹³. Depending on the resectability of carcinoma stomach is treated by radical or palliative gastrectomies or by simple bypass operation or other palliative non-surgical treatments.

The present study is retrospective study of cases in one year from July 2019 to June 2020 to determine the incidence of malignant and nonmalignant pathology in patients with gastric outlet obstruction and also to determine whether the clinical features can differentiate between this two. It also tries to find out the correlation between the clinical

presentations, upper gastrointestinal tract barium findings, endoscopic, operative and histopathological findings.

METHODS & MATERIALS:

This study was a retrospective one, carried out in Sheikh Sayera Khatun Medical College, Gopalganj. The records of 50 consecutive patients who was admitted in surgery ward with features of gastric outlet obstruction between July 2019 to June 2020 were reviewed.

The diagnosis of GOO was made on clinical presentation, upper gastrointestinal barium findings and/or endoscopic finding of upper gastrointestinal tract (GIT). Retained gastric barium on upper gastrointestinal tract series after 45 minutes and/ or inability to pass the endoscope beyond the first part of duodenum was considered diagnostic.

Evaluation of each patient included complete history regarding age, sex, occupation, personal history, epigastric pain or mass, detail history of vomiting, hematemesis and melena, past history of peptic ulcer disease and history of antiulcer drugs. Physical examination included general condition, pulse, blood pressure and respiration, state of hydration, palpable lymph nodes and abdominal examination to find out visible peristalsis, palpable lump, succussion splash and ascites included. Digital rectal examination for any metastatic deposits in pelvis in malignant cases.

Investigation records were reviewed with special attention to Hb%, barium meal x-ray of stomach and duodenum, endoscopic examination of upper gastro intestinal tract (GIT) and endoscopic biopsies.

Treatment options were either conservative or operative depending on the diagnosis and response to initial conservative treatment, including gastric lavage, intravenous infusions and parenteral H₂ receptor blocker.

The early postoperative follow up also recorded to detect any complications like wound infection, anastomotic leakage, paralytic ileus,

wound dehiscence and other systemic complications.

RESULTS:

Total number of patients in this series was 50; Mean age was 45 years with a range from 25 to 70 years. Forty-two (84%) were male and 8(16%) were female. Male female ratio was 5.25:1. Maximum number (16) of patients was in 41-50 years' age group.

Table I: Age incidence of the patients

Age group (years) Percentage%	Patient number
21 – 30	04
08	
31 – 40	13
26	
41 – 50	16
32	
51 – 60	10
20	
61 – 70	07
14	
Total	50
100	

Table II: Chief Complaints of the patients

Presenting complaints	Number	Percentage (%)
Vomiting	50	100
Epigastric Pain	30	60
Haematemesis and/or melaena	16	32
Epigastric fullness	30	60
Epigastric mass	10	20
Dyspepsia	27	54
Anorexia	40	80
Weight loss	31	62
Jaundice	03	06

All the patients had complaint of vomiting. Out of them 28 cases were induced, projectile, profuse in amount contained undigested and partially

digested food materials, devoid of bile. Thirty patients (62%) had past history suggestive of peptic ulcer disease. The duration of which varied from 2 to 10 years. Forty-one (82%) patients had history of ingestion of antacids, 31 (62%) patients took H₂ receptor blocker and 30 (60%) took proton pump inhibitor. Almost all the patient had taken these drugs irregularly and alternatively. Forty-four (88%) patients had history of smoking or betel nut & betel-leaf chewing.

Table III: Association of cause of GOO with socio-economic condition

Cause of gastric outlet obstruction	Socioeconomic condition		Total
	Low	Middle	
Benign	24 (48%)	0 (00%)	24 (48%)
Malignant	12 (24%)	14 (28%)	26(52%)
Total	36 (72%)	14 (28%)	50(100%)

Chi square =17.94, P value =<.001

No patient belonged to high socio-economic group, 36 (72%) were from low socio-economic group and 14(28%) were from middle socio-economic group. All the benign causes were almost from low socio-economic group (p- <.001).

Physical Findings: 41(82%) patients were found malnourished on presentation, 35(70%) were anaemic and 3(6%) were icteric, 39(78%) patients were dehydrated and 10(20%) patients had pitting ankle oedema, 4(8%) patients had palpable left supraclavicular lymph node (Virchow's gland). Abdominal examination revealed visible peristalsis in 23(46%) patients, 10(20%) patients had palpable lump in epigastrium. Succussion splash could be elicited in 27(54%) patients. Ascitis was present in 10(20%) patients, hepatomegaly in 4(8%) patients.

On investigation, 31 patients (62%) had Hb% less than 60% and 19(38%) had more than 60% Barium meal X-ray of stomach and Duodenum shows out

of 50 patients, stomach was found distended in 26 (52%) cases. Dye had not passed beyond the duodenum in 26(52%) cases. Deformed duodenum cap was found in 22 (44%) cases. Persistent irregular filling defect was delineated in 19(38%) of the cases. On endoscopy of upper GIT, out of 50, 41 patients had done the endoscopic examination of upper GIT. In 27(65.85%) cases endoscopist failed to negotiate the duodenum. Antral growth was found in 19(46.34%) cases. Active gastric ulcers were present in 9 (21.95%) case, active duodenal ulcer in 3 (7.31%) cases and pyloric channel ulcer in 4 (9.75%) cases. In 5(12.19%) cases endoscopic findings were normal. Endoscopic biopsies were taken in 32 cases; 19 from antral growth, 09 from gastric ulcers and 4 from pyloric channel ulcer. 21 biopsies revealed adenocarcinoma of stomach, 9 biopsies revealed chronic ulcers and necrotic tissue was found in 2 cases **USG whole abdomen** was done only in 26 patients. 6 patients (23.07%) had metastasis in liver, 13 patients (50%) had ascites, 2 (7.69%) patients had mass in head of pancreas, and 1(3.85%) patient had gall bladder mass.

Preoperative diagnosis: Preoperatively 21 patients were diagnosed as GOO due to antral growth, 26 patients were diagnosed as pyloric stenosis due to chronic duodenal ulcer and 3 patients as extra gastric growth involving pylorus.

Treatment Given: All the patients diagnosed clinically and with investigations as nonmalignant (24 patients); initially given conservative treatment for 7-10days. Five (20.83%) patients had responded to it and showed features of improvement. The 19 (79.17%) patients not responding clinically undergone operative treatment. Out of 26 malignant patients 16 undergo surgery and remaining 10 patients did not undergo surgery; for because of metastatic disease and due to other co-morbid conditions.

Operative Findings: Out of 50 patients 35, (70%) underwent operative treatment. On laparotomy 19 were diagnosed as benign pyloric stenosis. 6 patients had resectable antral carcinoma of stomach, 7 cases were irresectable gastric carcinoma, 2 patients had a growth in the head of

the pancreas which pressed the duodenum and common bile duct (CBD) and 1 patient had advanced carcinoma of gallbladder.

Choice of Operations: Bilateral truncal vagotomy and gastrojejunostomy was done in 19 (54.28%) cases of pyloric stenosis due to chronic duodenal ulcer. Radical partial gastrectomy was done in 6 (17.15%) resectable antral neoplasms. The nonresectable antral neoplasms and extragastric neoplasms palliated by gastrojejunostomy alone 10 (28.57%) and biopsy were taken from the lesion.

Histopathological findings of operative specimens: Operative specimens were sent for

histopathology only in malignant cases (16 in number). Histopathology of partial gastrectomy specimens (06) confirmed adenocarcinoma of stomach again. Of the 10 cases undergone palliative bypass, biopsy was taken from the lymph nodes revealed metastatic adenocarcinoma.

Post-operative period: Post-operative period was uneventful in most of the cases of benign gastric outlet obstruction. Complications had occurred mostly in malignant cases. Seven (20%) patients had developed wound infection of which 6 (14.14%) had wound dehiscence. 2 (5.71%) patients had developed duodenal stump leakage who ultimately died on 17th and 19th post-operative day.

Table IV: Causes of gastric outlet obstruction (n=50)

Causes	Number of Patient	Percentage
Pyloric stenosis from cicatrization of chronic duodenal ulcer and/or due to oedema and spasm associated with duodenal or pyloric channel ulcer	24	48
Antral carcinoma of stomach	23	46
Carcinoma pancreas obstructing the duodenum	02	04
Carcinoma gallbladder with metastasis	01	02

Table: V Cause of gastric outlet obstruction in relation to age

Cause of gastric outlet obstruction	Age					Total	P value
	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years		
Benign	4 (8.0%)	13 (26%)	7 (14%)	0 (0.0%)	0 (0.0%)	24 (48%)	
Malignant	0 (0.0%)	0 (0.0%)	9 (18%)	10 (20%)	7 (14%)		

Total	4 (8.0%)	13 (26%)	16 (32%)	10 (20%)	7 (14%)	26 (52%)	.001
						50 (100%)	

Chi-square = 34.225

DISCUSSION:

Gastric Outlet Obstruction has traditionally been considered synonymous with pyloric stenosis as a result of peptic ulcer disease in adults, accounting for up to 90% cases in the 1960's and early 70's¹⁴. Peptic ulcer, however, remains to be a disease of remittances and relapses; its incidence and prevalence in the western world, epidemiologically, increased at the turn of the previous century to reach a peak period in 1960-70. This may in part account for the great preponderance of peptic ulcer as a cause of gastric outlet obstruction. A ten-year study, from 1970 to 79, showed peptic ulcer to be the etiology amongst 81% of the gastric outlet obstruction patients¹⁸. A local study comprising of 1218 endoscopies in 1993 reported gastric carcinoma in only 0.82% of the patients whereas gastric ulcer, duodenal ulcer and gastritis were collectively reported in about 26% of the patients¹⁹. The advent of proton pump inhibitors saw a sharp decline in the incidence of peptic ulcers and hence its complications like gastric outlet obstruction. Now with the decrease in the incidence of peptic ulceration and the advent of potent medical treatment, the malignancy is the commonest cause of gastric outlet obstruction especially in the West^{1,4,11}.

The present series comprises of 50 cases of gastric outlet obstruction that were reviewed retrospectively. Data were collected in prescribed forms regarding the history, examination findings, investigation reports, treatment given, operative findings and biopsy reports. The presentation of the patients, investigation reports and operative findings were analyzed to detect the various etiologies of gastric outlet obstruction and correlation between its clinical findings,

investigation and operative findings in our hospital setting among our population. In this study, out of 50 patients, 52% had malignancy (antral carcinoma 46%, carcinoma head of pancreas 4% and carcinoma gall bladder involving pylorus 2%) as the cause of obstruction, while 48% had benign disease due to chronic duodenal ulcer. Another study from India in 1998 showed malignancy as the cause of gastric outlet obstruction in 76% of the patients¹⁵. Interestingly, a study of 64 patients from Nigeria during 1991-1996 periods did not show this change in aetiology and reported chronic duodenal ulcer as the commonest cause (66%) of gastric outlet obstruction, while carcinoma of the stomach was seen only in 15% cases¹⁶. Another study from Nigeria described a similar figure of 14% for gastric carcinoma amongst cases of gastric outlet obstruction¹⁷. This reflects that pyloric stenosis due to chronic duodenal ulcer is still more common in developing countries.

The mean age of the patients is 45.5 years and most of the patients present in their 4th, 5th and 6th decade of life, which is not consistent with another study where 52 patients of gastric outlet obstruction were studied and the peak incidence, were in 5th and 6th decade of life⁹. In this study males are seen to be affected more than female. Only 16% were female. The male female ratio was 5.25:1. This signifies and consistent with the authors that peptic ulcer disease is still more common in male and gastric cancer are also commoner in male^{1,12}. The marked difference in male female ratio with that of the western world reflect the influence of habit and occupation of male and female in our country.

All patients (100%) in this series presented with characteristic vomiting which drew attention to the possibility of clinical diagnosis of gastric outlet

obstruction. Epigastric pain complained by 60% patients. Bleeding was present in 30% indicated by haematemesis and melena, 60% patient's complaints of epigastric fullness and 20% epigastric mass which indicates advanced malignant lesion. Anorexia 52% and weight loss were marked in more than 62% of patients. The average duration of illness was more in benign cases and less in malignant cases. Forty-one patients (82%) had past history of peptic ulcer disease. All these patients had history of ingestion of H₂ receptor blocker and/or antacid and or proton pump inhibitor. All of them took these drugs irregularly and not completed a full course of medical treatment. It is documented that effective medical treatment can cause a reduction in the incidence and the number of hospital admission for duodenal ulceration. The incidence of gastric outlet obstruction due to duodenal ulceration also appears to have declined⁴. It is clear from the present study that still a great incidence of long-term complication of peptic ulcer disease is contributed by incomplete or maltreatment of peptic ulcer in our country.

Eighty-eight percent patients of this series were either smoker or habituated to betel nut and betel leaf. Seventy-two patients belong to low socioeconomic condition. This proves that antral carcinoma is more common in lower socioeconomic condition¹. Chronic duodenal ulcer also common in this group. This study also shows the association between smoking and gastric pathologies.

Seventy percent (70%) patients were anaemic whereas only 6% patients were icteric. Dehydration was marked in 78% patients. 4 malignant patients had virchow's gland, that is well advanced malignancy. Visible peristalsis was seen in 46% patients. Succussion splash was more prominent feature by its presence in 54% cases. Clinically stomach found distended in 44% cases. This is because the benign cases are of long duration and cause distended stomach. The malignant cases had shorter history and do not cause a distended stomach in most of the cases. Ascites 20%, hepatomegaly 8% of cases, which represents the well-advanced malignancy and signs of inoperability¹¹. This also indicates negligence and

late presentation to surgeons which is a common picture in our poor people.

Haemoglobin percentage was done in all the patients of the series and 62% of them had less than 60% of the normal value. Barium meal X-rays of upper gastrointestinal tract were done in 100% of the patients presenting with persistent vomiting. This investigation revealed 19 (38%) cases of antral growth by persistent filling defect in the antrum but this investigation could not exclude malignancy in the rest of the cases. Complete outlet obstruction was detected by failure to pass dye beyond duodenum in 26(52%) cases. Endoscopy was done in 41 cases. It detected 19 antral neoplasms and 9 suspicious cases of stomach ulcer, 4 pyloric channel ulcers, from all of which biopsy was taken. Histopathology confirmed 21 cases adenocarcinoma of stomach and 7 chronic nonmalignant ulcers and 2 necrotic tissues due to inadequate biopsy material. It was also seen that some patients have active gastric and duodenal ulcers in addition to the obstructive lesions. This proves that radiology is not always helpful in detecting malignancies where there is no clinical suspicion of malignancy. But endoscopy and biopsy can make the more correct diagnosis. It is same as the study where endoscopy detected 6 cases of malignancy where radiology failed to detect it²⁰. So, it seems likely that if biopsy had been performed in all cases of gastric outlet obstruction then the rate of correct preoperative diagnosis would have been improved and so does the management of the patients.

In all the patients diagnosed clinically and with investigations as benign gastric outlet obstruction, initially conservative treatment was given for one week including gastric lavage, intravenous infusion and injectable H₂ receptor blockers. Five patients (20.83%) responded to this treatment and showed features of improvement such as return of appetite and no vomiting with trial feeding. So, these patients were discharged after a follow up barium meal X-ray which showed evidence of passage of dye in the small gut. The benefit of bed rest, rehydration, gastric lavage and milk drinks is that an ulcer begins to heal and the inflammatory changes also subside, so the obstruction begins to

remit^{4,11}. The fallacy is that such improvement is often apparent even when the cause of the obstruction is a malignancy¹¹. So, a long-term follow-up for this group of patients is expected. But in the present study long term follow up was not done, so the ultimate outcome of this group of patients cannot be predicted.

Bilateral truncal vagotomy and gastrojejunostomy was done for benign pyloric stenosis which is the treatment of choice for gastric outlet obstruction caused by duodenal ulceration¹¹. In this series among the 26 malignant patients only 16 could be operated and remaining 10 patients were not operated due to the widespread metastatic manifestations and or due to their comorbid conditions. Among those 16 only in 6 cases curative resection was possible and the others underwent palliative bypass. This signifies the late presentation of malignant diseases to a surgeon that may be due to the self-negligence or due to poor referral system and clearly due to lack of cancer screening program in the risk group.

Post-operative complications were commoner in malignant cases than benign cases. Wound infection, wound dehiscence comprises the most. Two patients in malignant group developed duodenal stump leakage and ultimately died. In the present series the most common cause of gastric outlet obstruction was benign pyloric stenosis or oedema and spasms associated with acute ulcers in pylorus or duodenum (48%) which is followed immediately by antral carcinoma (46%). The extra gastric tumors comprised the rest (6%). The result differs with the study performed in other developed countries, where malignancy predominates in the causation of gastric outlet obstruction^{4,5}. The initial ratio between benign and malignant causes of GOO is gradually reversing in favor of malignant lesions, but in our country, this reversal is slow and gradual.

The cause of still a high incidence of benign pyloric stenosis in our country despite of advanced medical treatment is lack of adequate treatment and proper follow up of peptic ulcer disease patients which results in persistence of the disease and leads to the chronic complications. As barium meal X ray of

upper GIT and even endoscopic examination of upper GIT cannot reliably exclude early gastric carcinoma and with the conservative treatment the symptoms and signs of gastric outlet obstruction are improved, even if the cause is a malignancy; a number of malignant cases could have missed which would otherwise be diagnosed in subsequent long term follow up. But the malignant cause is still higher than before the introduction of H2 receptor blocker when the usual incidence was 6% as shown in a study²¹. Without a long term follow up of a large number of study people and a longer duration of study, a concrete conclusion cannot be made after analyzing the result of such a retrospective study.

CONCLUSION:

The relative incidence of GOO due to pyloric stenosis secondary to chronic duodenal ulcer is more than antral carcinoma, observed in this series; but when considered antral carcinoma combined with other malignancies, pyloric stenosis is a relatively less common cause of GOO.

Multicenter study is required to get the real picture in our country to find out the actual cause of GOO.

REFERENCES:

1. Primrose J.N. Stomach and Duodenum. Williams NS, Blustrode CJK, O'Connell PR. Editors: Bailey & Love's Short Practice of Surgery, 25th edition, London, Arnold. 2008:1045-1080.
2. Anderson A, Bergdahl L. Carcinoid tumour of appendix in children, a report of 25 cases, Acta. Chir. Scand. 1977; 143(3): 173-5.
3. Johnsonn CD. Gastric outlet obstruction malignant until proved otherwise (letter). Am J Gastroentrol. 1995; 6:253.
4. Shone DN, Nikomanesh, P Smith-Meek. Malignancy is the most common causes of gastric outlet obstruction in the era of H₂ blockers. Am J Gastroentrol. 1995; 90:1769-70.
5. Chowdhury A, Dhali GK, Banerjee PK. Etiology of gastric outlet obstruction. Am J Gastroentrol. 1996; 91 :1679.
6. Tendler D. Malignant gastric outlet obstruction: Bridging another divide, Am J Gastroentrol. 2002; 97:4.

7. Adler DG, Baroon TH. Endoscopic palliation of malignant gastric outlet obstruction using Self expanding metal stents. *Am J Gastroenterol.* 2000; 95:2578.
8. Emerson L, Layfield LJ, Rohr LR. Adenocarcinoma arising in association with gastric heterotrophic pancreas; a case report and review of literature. *J surg. Oncol.* 2004; 87:53-55.
9. Samad A, Khanzada TW, Shoukat I, Gastric outlet obstruction; changes in etiology, *Pakistan Journal of Surgery.* 2007; 23:29-35.
10. Mc Anena O and Joyce M. Operative management of upper gastrointestinal disease. Farquharson M, Moran B, editors: *Farquharson's text book of operative general surgery*, 9th edition, London, Arnold. 2005: 285-315.
11. Cuschieri A Sir, Disorders of the stomach and duodenum, Cuschieri A Sir, Steele RJC, Moosa AR, editors: *Essential surgical practice*, 4th edition, London Arnold. 2002:216-319.
12. Doherty GM, Way LW, *Stomach and Duodenum*, In: *Current Surgical Diagnosis and Treatment*, 12th edition, USA; The McGraw-Hill Companies, Inc, 2006: 508-538.
13. Kuada SK, Alexander GI. Long term outcome of endoscopic dilatation of non-malignant pyloric stenosis. *Gastrointest –Endose.* 1995; 41(1):15-22.
14. Johnson CD. Gastric outlet obstruction-malignant until proven otherwise. *Am J Gastroenterol.* 1995 Oct; 90(10): 1740-45.
15. Dogo D, Yawe T, Gali BM. Gastric outlet obstruction in Maiduguri. *Afr J Med Sci.* 1999 Sept-December; 28(3-4): 199-201.
16. Olaolorun DA, Oladiran IO. Gastric outlet obstruction in Ogbomoso, Nigeria. *West Afr J Med.* 2001; 20(3): 234-7.
17. Yousuf M, Mirza MR, Khan S. Gastric outlet obstruction. *J Surg Pak.* 2005; 10(4): 48-50.
18. Jaffin BW, Kaye MD. The prognosis of Gastric outlet obstruction. *Am Surg.* 1985; 201(2): 176-9.
19. Hussain R, Rathore AH. Incidence of various upper gastrointestinal diseases as diagnosed by endoscopy in Faisalabad. *Pak J Gastroenterol.* 1993; 7(1): 60-4.
20. Johnson CD, Ellis H. Gastric Outlet Obstruction now predicts malignancy. *Br J Surg.* 1990; 77 :1023-1024.
21. Goldstein H, Jenin M, Schapiro M, Boyle JD. Gastric retention associated with gastroduodenal disease; a study of 217 cases. *Am J Digest Dis* 1966; 11:887-897.