International Surgery Journal
Kumar A et al. Int Surg J. 2018 Jan;5(1):54-61
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20175504

Original Research Article

An observational study on benign/malignant gastric outlet obstruction in tertiary care centre of RIMS, Ranchi, India

Amit Kumar, Md. Afsar Alam*, Jitendra Kumar, A. K. Tiwary

Department of General Surgery, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India

Received: 13 November 2017
Accepted: 24 November 2017

***Correspondence:**
Dr. Md. Afsar Alam,
E-mail: drafsar04@gmail.com

ABSTRACT

Background: Gastric outlet obstruction is a group of clinico-patho physiological consequence of mechanical impediment of gastric emptying. Clinical entities that can result in gastric outlet obstruction are categorized into two well-defined groups of causes - benign and malignant. The proximal stomach is now the most common site for gastric carcinoma in the west but in Japan and developing countries like India the distal gastric cancer (antrum 13% and pylorus 7%) still predominates. Diagnosis of gastric outlet obstruction depends on different clinical features and certain investigations. The definitive treatment involves surgical relief of the gastric outlet obstruction. The correct surgical procedure to be adopted is planned according to the cause of obstruction and condition of the patients. This is an observational study aimed for characterization of gastric outlet obstruction in terms of benign and malignant and their relation to its causes, sites and other related factors in tertiary care centre (RIMS).
Methods: This is an observational study comprises on 50 patients of gastric outlet obstruction admitted in the Department of Surgery R.I.M.S., Ranchi. The provisional diagnosis was based on detailed clinical history, thorough physical examinations, and some radiological investigations.
Results: Majority of the patients of gastric outlet obstruction were malignant lesions of stomach and very few are benign. Antral carcinoma of stomach was found to be the commonest etiology of gastric outlet obstruction followed by pyloric stenosis secondary to acid peptic disorders. Most of the patient was in the age group of 40 to 60 years of age, males were affected more than Females.
Conclusions: Gastric outlet obstruction in adults, a surgical problem of either sex, results commonly due to antral carcinoma or pyloric stenosis secondary to acid peptic disorder.

Keywords: Carcinoma of stomach, Malignant and benign gastric outlet obstruction, Peptic ulcer disease

INTRODUCTION

Gastric outlet obstruction is a group of clinico-patho-physiological consequence of mechanical impediment of gastric emptying. Clinical entities that can result in gastric outlet obstruction are categorized into two well-defined groups of causes - benign and malignant. In the past when peptic ulcer disease was more prevalent, benign causes were the most common, however, the scenario has changed dramatically with the advent of potent medical treatments like H_2 receptor antagonists, proton pump inhibitors and other drugs, reducing the incidence of peptic ulcer and its complications substantially. A recent review shows that only 37% of patients with gastric outlet obstruction have benign disease and remaining patients have obstruction secondary to malignancy.[1] Incidence of gastric outlet obstruction is no more than 5% among patients with peptic ulcer disease. It is usually due to duodenal or pre-pyloric ulcer disease and it may be acute outlet obstruction from inflammatory swelling and peristaltic dysfunction or chronic outlet obstruction from fibrosis or

cicatrix around a pyloric channel ulcer.[2] The proximal stomach is now the most common site for gastric carcinoma in the west but in Japan and developing countries like India the distal gastric cancer (antrum 13% and pylorus 7%) still predominates.[3] In India incidence of gastric cancer is 8.9 and 6 per lac respectively for male and female.[4] However, incidence of gastric outlet obstruction due to malignancy in India is not well known. In the United States, the distal stomach is the site of origin of about 30% of gastric cancers, which result in gastric outlet obstruction.[5]

In addition to gastric cancer and pyloric stenosis, other causes of gastric outlet obstruction include- adult hypertrophy of pylorus, proximal gastrointestinal tumours like leiomyoma, carcinoma head of the pancreas, ampullary cancer, duodenal cancer, cholangiocarcinoma, tuberculous pyloric stenosis, foreign bodies and bezoars like phytobezoar, trichobezoar, pancreaticobiliary disease, corrosive strictures at the pylorus, gall stone obstruction (Bouveret's syndrome), pancreatic pseudo cyst etc.[6]

In benign gastric outlet obstruction, there is usually a long history of peptic ulcer disease. The most common symptoms are early satiety, vomiting and weight loss. Early symptoms are epigastric fullness or heaviness after meals. Later, vomiting may develop that typically occurs one to several hours after eating and consists of partially digested food eaten that day or the previous day. The vomitus is characteristically totally lacking in bile. The patient commonly complains of losing weight and appears unwell and dehydrated. Occasionally patient may develop tetany and mental confusion.[7]

Clinical picture of outlet obstruction due to carcinoma of pylorus resembles benign gastric outlet obstruction more rapidly than do peptic ulcer. Characteristic features of malignant gastric outlet obstruction are- the history is short (a few months), there may or may not be any previous history of peptic ulcer, Anorexia, nausea and vomiting rate constant, vomiting affords little or no relief, the vomiting is offensive containing altered blood, coffee ground," loss of weight is marked, there may be severe cachexia etc. Abdominal examination may reveal Peristaltic waves running from left to right. In thin subjects, outline of enlarged stomach can sometimes be observed. A palpable lump may be present. Succession splash may be detected by shaking the patient's trunk vigorously and this is of significance if heard 3-4 hours after the last meal or drink. In carcinoma of pylorus, a hard, irregular, mobile or fixed lump is palpable which may or may not move with respiration. In carcinoma of stomach, cachexia and pallor are more pronounced.

Carcinoma of stomach in most cases produce obstruction more rapidly than do peptic ulcer, often not allowing time for gastric hypertrophy and dilatation to place to the same degree as in benign obstruction.[8] The presence of mass in pyloric region is very suggestive of carcinoma and is found in about half of the cancer cases.[9] The patient with gastric outlet obstruction usually suffer from dehydration, alkalosis, anemia and electrolyte imbalance specially hypokalaemia.[10] Prolonged vomiting leads to electrolyte disorder particularly hypokalaemic metabolic alkalosis from the large hydrochloric acid loses. Electrolytes abnormalities show severe hypokalaemia, hypochloraemia, and elevated bicarbonate suggesting metabolic alkalosis. Initially Na^+ and K^+ may be relatively normal. However, as dehydration progress, more profound metabolic abnormalities arise partly related to renal dysfunction. As the volume deficit progress, aldosterone mediated sodium reabsorption is accompanied by K^+ excretion. Because of dehydration, a phase of Na^+ retention follows and K^+ and H^+ are excreted in preference. This causes Paradoxical aciduria and hypokalaemia ensue.[11] A certain proportion of deficit may occur due to direct loss of K^+ and H^+ from prolonged vomiting by preoperative nasogastric aspiration. Alkalosis leads to a lowering in the circulating ionized Ca^{++} and tetany can occur. Metabolic consequences may be somewhat different in malignant gastric outlet obstruction from those of benign gastric outlet obstruction because of relative hypochlorhydria found in patients with gastric carcinoma. Metabolic alkalosis is usually less pronounced or absent in malignant gastric outlet obstruction as compared to benign type.

Diagnosis

Barium meal X-ray of stomach and duodenum can detect nature and site of obstruction, huge dilation of large & atonic stomach, fluid within which may cause flocculation of the Barium, severely scarred and distorted duodenal bulb and delayed emptying. A filling defect in the region of antrum suggests carcinoma of stomach. Upper gastrointestinal endoscopy is useful for diagnosis and treatment of gastric outlet obstruction.[12] It shows nature of the obstruction to exclude gastric neoplasia. Multiple biopsy and brush cytology can be obtained. Transluminal or endoluminal ultrasound may be helpful for gastric outlet obstruction. CT scan is used for gastric malignancy and peripancreatic malignancy. Laparoscopy and peritoneal cavity washing can identify a positive microscopic cytology and extension of the disease.

Treatment does not begin with surgery but assessing and correcting the metabolic disturbance of these critically ill, dehydrated and emaciated patient with severe electrolyte imbalance.

Treatment

The definitive treatment involves surgical relief of the gastric outlet obstruction. The correct surgical procedure to be adopted is planned according to the cause of obstruction and condition of the patients.

Surgical procedures in day-to-day practice are varied. For benign disease vagotomy and antrectomy or pyloroplasty,

high selective vagotomy and gastrojejunostomy are preferred procedures. Endoscopic pneumatic balloon dilatation is most useful in early cases. Now a day truncal vagotomy and gastrojejunostomy is also performed laparoscopically.

The surgical procedure varies with the stage and spread of the malignant disease. A Bilroth II radical partial gastrectomy remains the surgical treatment of choice. Palliative treatment includes gastrojejunostomy, open or laparoscopic and endoscopic self-expansible metal stenting.[13,14]

Cases of gastric outlet obstruction whether due to malignant or benign causes are commonly encountered in this region.

Aims and objectives

- To observe the various causes of gastric outlet obstruction in tertiary care centre, RIMS.
- To determine the incidence of benign and malignant gastric outlet obstruction.
- To study modes of presentation of gastric outlet obstruction.
- Evaluation of electrolyte abnormalities in gastric outlet obstruction.
- To analyses the outcome of treatment modalities applied in different cases.

METHODS

The present work comprises observations on 50 patients of gastric outlet obstruction admitted in the Department of Surgery R.I.M.S. Ranchi through outdoor, emergency and referred from medical ward. These cases of benign or malignant gastric outlet obstruction formed the material of the study.

Cases are described and categorized on the basis of their age incidence, sex incidence, their causative risk factors, socioeconomic status, personal habit and other important associated factors. The provisional diagnosis was based on- Detailed clinical history, thorough physical examinations including-

- General examination
- Abdominal inspection, palpation for any obvious abdominal lump, percussion and auscultation for succession splash.

Routine laboratory investigations and some Radiological investigations like-

- Plain x-ray abdomen
- Barium-meal X-ray of stomach and duodenum
- Upper gastrointestinal tract endoscopy
- Transabdominal and transluminal ultrasound
- CT scan whenever possible.

Histopathological examination of tissue obtained at endoscopy, at operation whenever needed.

Most of the patients were treated pre-operatively by gastric lavage, fluid and electrolytes replacement followed by elective surgery based on their cause of gastric outlet obstruction and the condition of the patient. The postoperative period was watched carefully, and the patients were asked to report for follow-up for postoperative complications, recurrence and morbidity and mortality.

RESULTS

The present study "An Observational study on benign/malignant Gastric outlet obstruction in tertiary care center, Rims" has seen carried out in the department of Surgery, RIMS, Ranchi. 50 cases of gastric outlet obstruction studied between the periods February 2014 to October 2015 has been selected for the study. The various observations in selected cases were recorded in tables and figures.

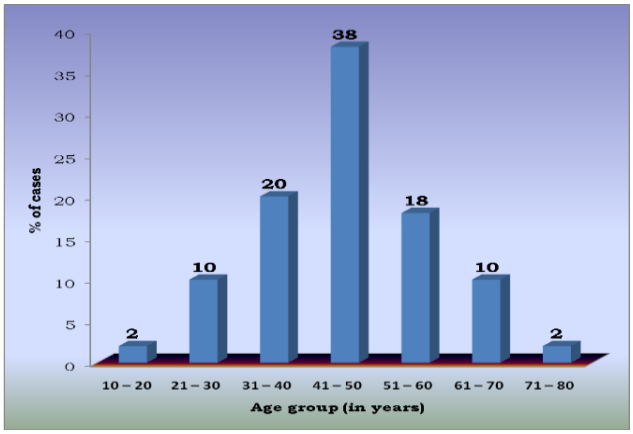

Figure 1: Age incidence.

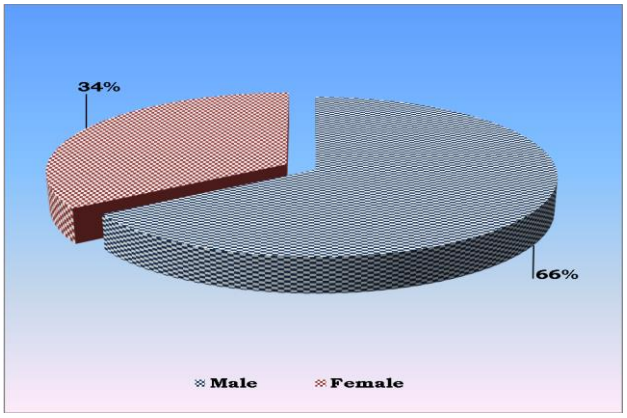

Figure 2: Sex incidence.

The youngest patient of gastric outlet obstruction was of 15 years female and the oldest of 72 years male. The incidence was maximum in 19 cases (38%) in the 5th

decade of life. Majority of the patients were between 40 to 60 years of age.

Out of 50 cases of gastric outlet obstruction 33 cases (66%) were males. Male to female ratio in this series was approximately 2:1. Maximum 39 cases (78%) were in low socio-economic group.

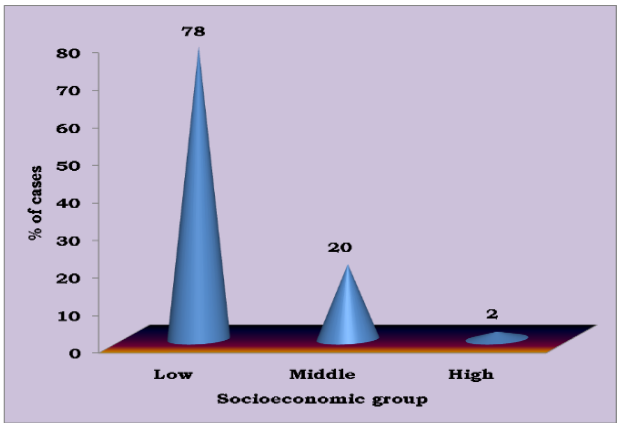

Figure 3: Incidence in relation to socioeconomic group.

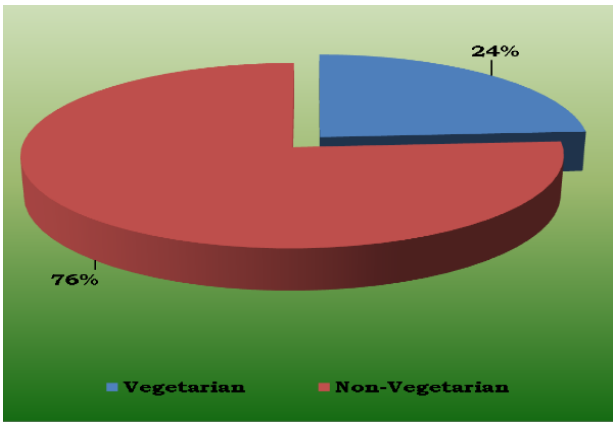

Figure 4: Incidence in relation to food habit.

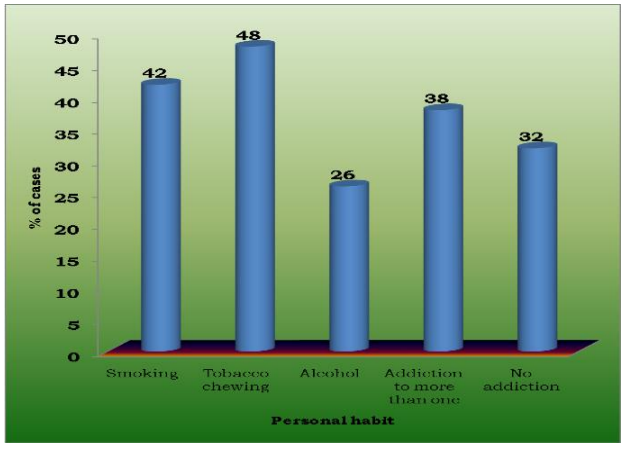

Figure 5: Incidence in relation to personal habit.

Maximum 38 cases (76%) were non-vegetarian and only 12 cases (24%) were vegetarian.

Maximum number of sufferers 21 cases (42%) were smokers and 24 persons having habit of tobacco chewing (48%). 13 cases (26%) were addicted to alcohol. 19 (38%) of cases had multiple addictions to more than one. 32% of cases had no addiction.

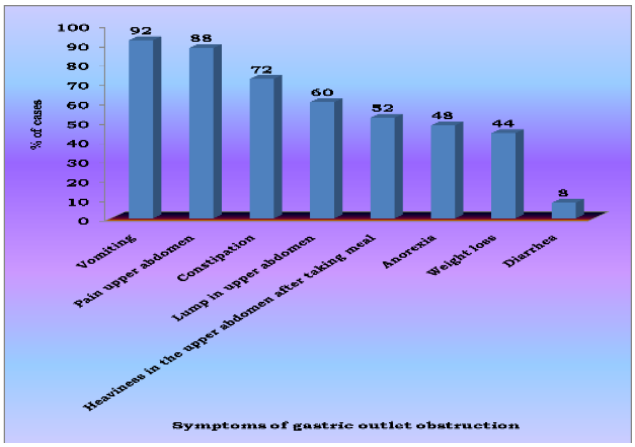

Figure 6: Incidence of presentation of important symptoms.

Copious and projectile vomiting was the commonest (92%) symptom followed by pain upper abdomen in 88% of cases. Something moving in the upper part of abdomen was complained by 60% of cases and 52% had feelings of fullness (heaviness) after taking meal. 44% of cases had weight loss at the time of admission.

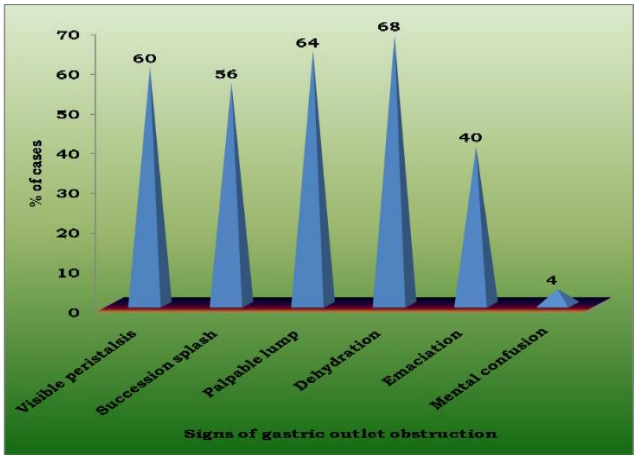

Figure 7: Incidence of common signs.

Visible peristalsis coming from left to right side in the upper part of the abdomen was present in 30 cases (60%) and succession splash in 56% cases. Hard, irregular lump of different size was palpable in 64% cases. 68% cases were dehydrated at the time of admission and 4% were mentally confused at the time of admission. 40% cases were found emaciated.

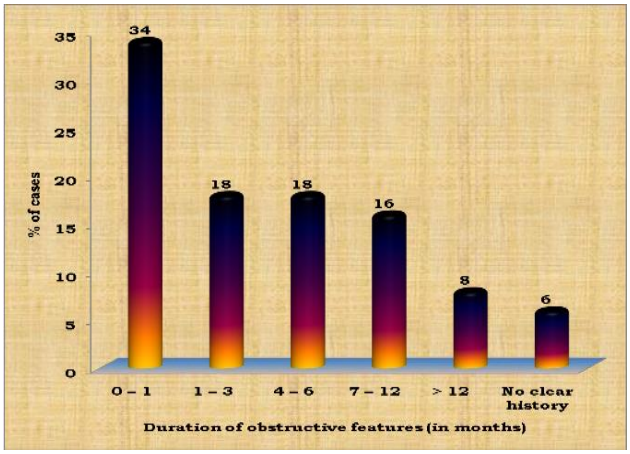

Figure 8: Duration of obstructive features.

Maximum (70%) cases presented within 6 months of obstruction.

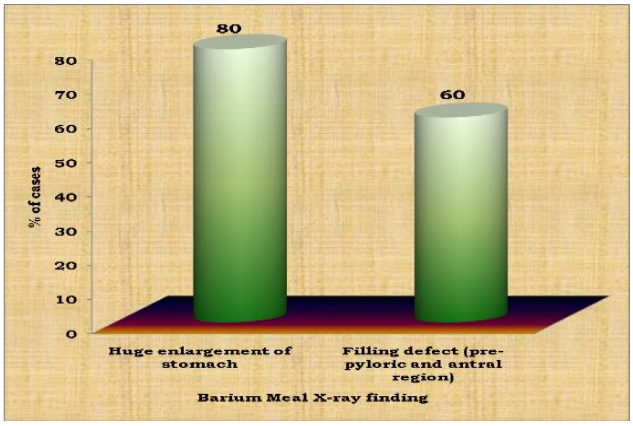

Figure 9: Results obtained from barium meal x-ray of stomach and duodenum.

Table 1: Serum electrolytes values in different patients.

Serum electrolytes	Level less than normal		Level within normal range	
	Benign		Malignant	
	No. of cases	%	No. of cases	%
Serum sodium	30	60	20	40
Serum chloride	29	58	21	42
Serum potassium	32	64	18	36
Serum calcium	18	36	32	64

Table 2: Etiological incidence of gastric outlet obstruction supported by histopathological examination of excised tissue.

Aetiology of obstruction	No. of cases	Percentage
Antral carcinoma	32	64
Pyloric stenosis secondary to acid peptic disorders	14	28
Gastric lymphoma	2	4
Carcinoma head of pancreas	1	2
Trichobezoar	1	2
Total	50	100

Table 3: Result obtained from endoscopy (gastroduodenoscopy) and biopsies of lesions.

Total no of cases	Total number of cases studied by gastroduodenoscopy	Benign Lesions	Malignant Lesions
50	25	8	17

Table 4: Different aetiology in different age groups.

Aetiology of obstruction	Age in years							Total no. of cases
	10-20	20-30	30-40	40-50	50-60	60-70	70-80	
Antral carcinoma	0	0	8	5	14	4	1	32
Pyloric stenosis secondary to acid peptic disorders	0	2	3	4	4	1	0	14
Gastric lymphoma	0	0	2	0	0	0	0	2
Carcinoma head of pancreas	0	0	1	0	0	0	0	1
Trichobezoar	1	0	0	0	0	0	0	1

Table 5: Distribution of cases according to operative procedures adopted.

Operation performed with disease	No. of cases	Benign	Malignant	Percentage
Gastrojejunostomy alone	31			62
A - Anterior	24	4	20	48
B - Posterior	7	5	2	14
Partial gastrectomy (Bilroth II or polyad operation)	5	0	5	10
Truncal vagotomy and gastrojejunostomy	6	6	0	12
No operation performed	8	-	-	16
Total	50			100

Maximum cases (64%) of gastric outlet obstruction were due to antral carcinoma followed by cicatricial narrowing of pylorus or deformation of duodenal bulb secondary to acid peptic disorder (28%). Gastric lymphoma and carcinoma head of pancreas accounted for 6% of gastric outlet obstruction respectively. 2% cases were related with trichobezoar obstruction.

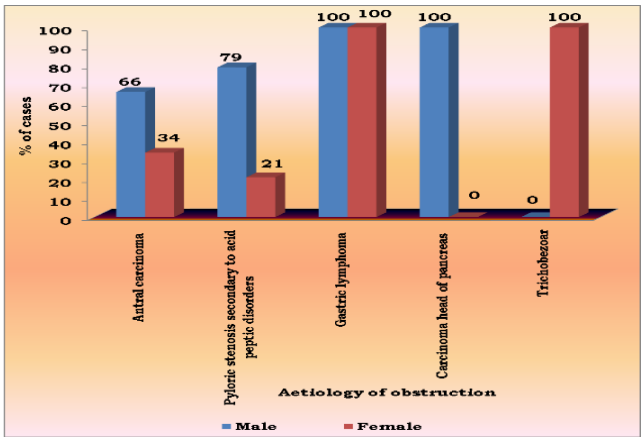

Figure 10: Incidence of sex distribution of patients in the different etiological group.

Out of 50 cases of gastric outlet, only 25 cases were exposed to endoscopy and biopsy study of which 17 patients had malignant lesions of stomach while 8 cases had benign lesions. Maximum cases of antral carcinoma were between 5th and 6th decade.

Antral carcinoma was present in 66 percent of males and 34% of females. 79% cases of pyloric stenosis were males and 21% were females.

Operation was performed in 42 cases only. Rest 8 cases were not operated. Maximum 31 cases (62%) were treated by gastrojejunostomy alone.12% cases were treated by truncal vagotomy and gastrojejunostomy. Partial gastrectomy and gastrojejunostomy (Billroth II or polya operation) was performed in 10% of cases.

Table 6: Incidence of post-operative complications.

Postoperative complications	No. of cases	Percentage
Haemorrhage	1	2.38
Aspiration pneumonitis	1	2.38
Anastomotic leak	0	0
Wound dehiscence	2	4.76
Anastomotic ulcer	0	0
Re-obstruction	2	4.76

Table 7: Follow-up of cases.

Follow-up cases (n=24/50)	6 months				1 year			
	No. of cases	Benign	Malignant	%	No. of cases	Benign	Malignant	%
Relieved of symptoms	18	10	8	69	22	4	18	85
Re- obstruction	2	0	2	8	0	0	0	0

Out of 50 cases, only 24 cases came for follow-up for 6 months to 1-year duration. 22 cases were relieved of their symptoms. 2 cases of antral carcinoma presented with reobstruction after 6 months of operation and died after 6 months. Remaining 2 cases were lost to follow up.

DISCUSSION

Gastric outlet obstruction was recognised as early as 4th Century B.C.[15] The first published case of pyloric stenosis in a patient who accidentally ingest sulphuric acid and died after nine weeks, by cicatrizing lesions of stomach in 1928. The first case of idiopathic hypertrophic pyloric stenosis in adult was reported in 1835 by when hypertrophy of the pyloric muscle was demonstrated in a 71-year old woman at necropsy. Christian Albert Theodor Bilroth (1881) did first successful gastrectomy in human beings for antral carcinoma.[16] The first operation for duodenal ulcer gastrojejunostomy according to Herrington was performed by Codivilla in 1893. This quickly became the procedure of choice for both duodenal and gastric ulcers. Then various modifications and newer operation done for gastric carcinoma.[17,18] Maximum cases (64%) of gastric outlet obstruction were due to antral carcinoma followed by cicatricial narrowing of pylorus or deformation of duodenal bulb secondary to acid peptic disorder (28%). Gastric lymphoma and carcinoma head of pancreas accounted for 6% of gastric outlet obstruction respectively, 2% cases were related with trichobezoar obstruction. Most of the cases of peptic ulcer were of chronic nature and all of them showed varying degrees of duodenal or pyloric stenosis resulting from cicatrisation following duodenal or duodenogastric (pyloric) ulcer on investigation and many had cicatricial stenosis on laparotomy. Patient admitted with gastric outlet obstruction, usually suffers from dehydration, alkalosis, anaemia and electrolyte imbalance specially

hypokalaemia.[19] In this study, hyponatraemia was seen in 30 (60%) patients, hypochloraemia was seen in 29 (58%) cases, hypokalaemia was seen in 32 (64%) cases and hypocalcaemia were seen in 18 (36%) cases, whereas electrolyte value within normal range in malignancy. In benign gastric outlet obstruction, electrolytes abnormalities are more pronounced than malignant type. Cases of gastroduodenal ulcerations having obstruction of which mostly were due to duodenal ulcers and few had gastric ulcers. In the gastric ulcer cases, most common was pyloric ulcer followed by antral ulcer and the remaining were situated away from the gastric outlet.[20] The duration of ulcer symptoms had varied from 1 month to 10 years, however it was less than 2 years in more than half of cases. Barium meal x-ray was done in 70 cases. Stomach size was found to be large in 80% cases and filling defect seen in 40%. Barium-meal examination revealed an elongated and narrowed pyloric canal with delayed emptying in most of cases. In some cases, an eccentric pyloric canal was noticed and in some Indentation of duodenal cap and marked dilatation of the stomach is seen. Most cases presented within 6 months of obstruction and remaining few had come to the hospital well before completing 1 year.[21] Vomiting was present in 92% cases, pain abdomen in 88%, visible peristalsis in 60% and loss of weight in 44%. 36% cases belonged to blood group 'O', 46% 'A', 12% to 'B' and rest 6% to 'AB'. Operation was performed in 42 cases only. Rest 8 cases were not operated. Maximum 31 cases (62%) were treated by gastrojejunostomy alone, 48% of them had anterior gastrojejunostomy and 14% had posterior gastrojejunostomy. 12% cases were treated by truncal vagotomy and gastrojejunostomy. Partial gastrectomy and gastrojejunostomy (Bilroth II or polyad operation) was performed in 10% of cases. 2 cases of antral carcinoma presented with reobstruction after 6 months of operation and died after 6 months. Remaining 2 cases were lost to follow up. The endoscopic instrumentation had improved the diagnosis of upper gastrointestinal cancer made along with double contrast radiological examination of stomach.[22] Out of 50 cases of gastric outlet obstruction 33 cases (66%) were males. Male to female ratio in this series was approximately 2:1. Maximum 39 cases (78%) were in low socio-economic group. Maximum 38 cases (76%) were non-vegetarian and only 12 cases (24%) were vegetarian. Maximum number of sufferers 21 cases (42%) were smokers and 24 persons having habit of tobacco chewing (48%). 13 cases (26%) were addicted to alcohol. 19 (38%) of cases had multiple addictions to more than one. 32% of cases had no addiction. Out of 42 cases operated, 2 cases (4.76% each) had wound dehiscence and re-obstruction respectively and aspiration pneumonitis and haemorrhage were found in 1 case (2.38% each) respectively. Acquired gastric outlet obstruction is more commonly owing to malignancy than ulcer disease. Endoscopy is the preferred method for diagnosis. Surgical palliation for malignant disease has poor results and high rates of morbidity and mortality. Outcomes may be improved with effective ulcer therapy with acid reduction and eradication of *H. Pylori* Surgery is associated with significant morbidity and mortality and should be reserved for endoscopic treatment failures.

CONCLUSION

Gastric outlet obstruction in adults, a surgical problem of either sex, results commonly due to antral carcinoma or pyloric stenosis secondary to acid peptic disorder. Previously, pyloric stenosis appeared to be responsible for more cases of gastric outlet obstruction than gastric carcinoma. However, the scenario has changed now with the advent of potent medical treatment like H_2 receptor antagonists, proton pump inhibitors and other drugs, reducing the incidence of peptic ulcer and its complications. This study supports that gastric outlet obstruction is now more commonly due to antral carcinoma than pyloric stenosis in developing countries also. An aggressive investigative approach in the very beginning in all cases of dyspepsia above 40 will probably help diagnosing many of gastric malignancy cases before they produce gastric outlet obstruction. Majority of patients reported early after onset of symptoms usually compelled by repeated vomiting, pain abdomen and other features of gastric outlet obstruction. Clinical, radiological and other investigations confirmed the diagnosis. Most of benign etiology had some degree of electrolytes deficiency (ranging from marginal cases reporting early) to considerable degree (cases presenting late). It can be concluded that all such patients should be evaluated by laboratory investigations and any electrolyte imbalance should be corrected with suitable fluid and electrolytes. This deficiency helps in reducing the postoperative morbidity and mortality. In this study maximum cases (62%) were treated by gastrojejunostomy alone, followed cases by truncal vagotomy and gastrojejunostomy. Partial gastrectomy (Bilroth II or polyad operation) was performed in 10% of cases mostly for antral carcinoma. No operation was performed in 16% of cases.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Ellis H. The surgery of stomach and duodenum. In: Nyhus ed. Anderson, 1977:459.
2. Ezberci F, Kargi H, Ergin A. Gastric outlet obstruction by gall stone obstruction sec. to pancreatic ca.; Surgical Vs endoscopic palliation; 2000.
3. Boylan JJ, Gradzka MI. Long-term results of endoscopic balloon dilatation for gastric outlet obstruction. Dig Dis Sci. 1999;44(9):1883-6.
4. Park KB, Do YS, Kang WK, Choo SW, Han YH, Suh SW, et al. Malignant obstruction of gastric outlet and duodenum: palliation with flexible

covered metallic stents. Radiol. 2001;219(3):679-83.
5. Gibson JB. Behrman SW. Fabian TC. Britt LG. J. of American coil. of Surgeon. 2000;191(1):32-7.
6. DeBakey M, Ochsner A. Bezoars and concretions. Surg. 1938;4(6):934-63.
7. Kreel L, Ellis H. Gut. Pyloric stenosis in adults- a clinical and radiological study. 1965 Jun;6(3):253-61.
8. Bockus HL. Gastroentero. Bockus 1943 and Hurst 1946. 1943;1:502-613.
9. Nayak SK. In Thesis for the degree of Master of Surgery, R.U., Ranchi. 67,1984. Miculicz. The Surgery of Stomach & Duod. Nyhus 1977:23.
10. Abouna GM, Veazey PR, Terry DB. Intravenous infusion of hydrochloric acid for treatment of severe metabolic alkalosis. Surg. 1974;75(2):194-202.
11. Haubrich WS. In Henry L. Bockus (ed.) Gastroenterolo; 2nd Ed, Philadelphia: Saunders, 1963:2.
12. Awan A, Johnston DE, Jamal MM. Gastric outlet obstruction with benign endoscopic biopsy should be further explored for malignancy. Gastrointestinal endoscopy. 1998 Nov 30;48(5):497-500.
13. Stupart DA, Panieri E, Dent DM. Gastrojejunostomy for gastric outlet obstruction in patients with gastric carcinoma. Sout Af J Surg. 2006;44(2):52-4.
14. Fiocca F, Ceci V, Donatelli G, Moretta MG, Santagati A, Sportelli G. Palliative treatment of upper gastrointestinal obstruction using self-expansible metal stents. European review for medical and pharmacological sciences. 2006;10(4):179.
15. Von Eiselsbirg. The surgery of the Stomach and Duodenum, 2nd Ed. J & A Churchill Ltd. London, 1888. Hippocrates and Gale.
16. Biilroth CWT, Nyhus and Wastell. Quoted by the surgery of stomach and duodenum, 3rd Ed. 1881:5.
17. Barkman DM. Coil Papers Mayo Clin. 1923;15:92. William Mayo in 1911.
18. Moynihan B.G.A. In duodenal ulcer. 2nd Ed. Philadelphia Saunders; 1912.
19. Davis NPW, Williams JA. Am. J. Surg.,121:260,1971- late results of bilateral selective vagotomy and pyloroplasty for duodenal ulcer. 1971;121:260.
20. Kozoll DD, Meyer KA. Obstructing duodenal ulcer, general factors influencing incidence and mortality, Arch.Surg.1964;88:793-799.
21. Kaushik SP, Moses T. Ind. J. Surg. End. Jour. Med. Res. 1973;61(10):1513.
22. Goldstein H, Janin M, Schapiro M, Boyle JD. Gastric retention associated with gastroduodenal disease- Am. J. Dig. Dis. 1966;11(11):887-97.

Cite this article as: Kumar A, Afsar MA, Kumar J, Tiwary AK. An observational study on benign/malignant gastric outlet obstruction in tertiary care centre of RIMS, Ranchi, India. Int Surg J 2018;5:54-61.