P

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"CLINICAL STUDY OF GASTRIC CARCINOMA"

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CERTIFICATE

This is to certify that this dissertation in **"CLINICAL STUDY OF GASTRIC CARCINOMA"** is a work done by **Dr.RAJAMAHENDRAN .R,** under my guidance during the period 2004 - 2006. This has been submitted in partial fulfillment of the award of M.S. Degree in General Surgery (Branch - I) by the Tamil Nadu Dr.M.G.R. Medical University, Chennai - 600 032.

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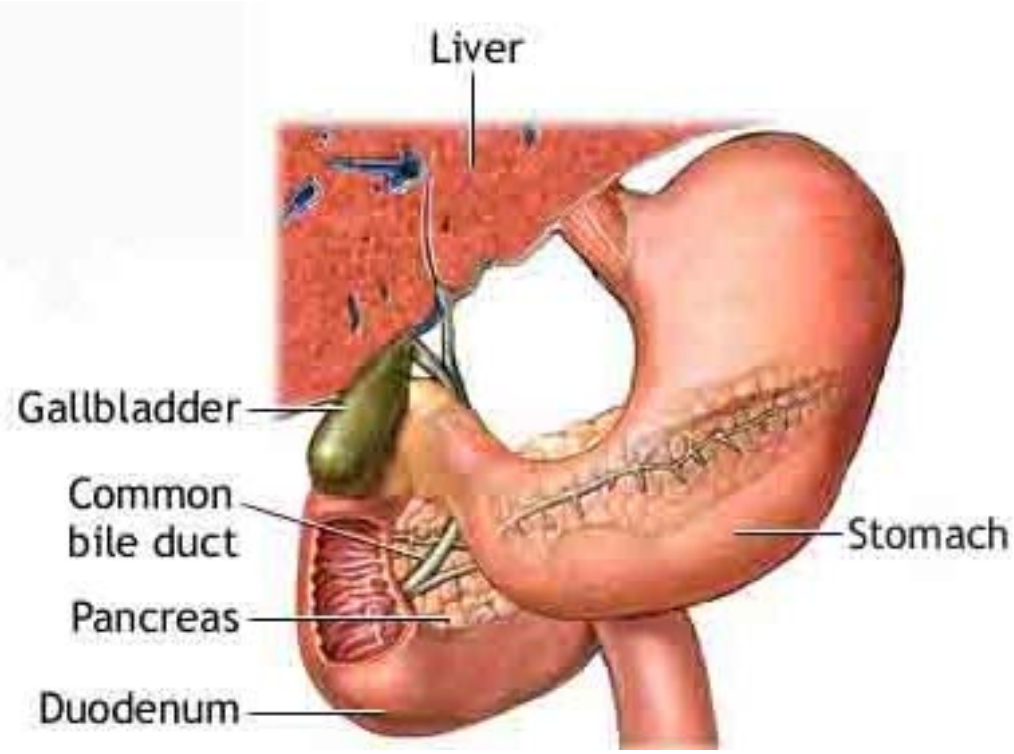


Introduction

1. INTRODUCTION

Carcinoma Stomach is the main Gastrointestinal Malignancy encountered in surgical clinic. The importance of early diagnosis and gastric cancer cannot be overemphasised. Early Gastric cancer without lymphnode metastasis is highly curable, whereas advanced cancer is associated with a poor prognosis.

By improved methods of diagnosis, the Japanese had developed mass screening programs and have significantly improved their 5 year survival statistics. In Japan 50% of gastric cancers treated are early gastric cancers. In united states about 20% of the resected specimens show Early gastric cancer.

World wide especially in Asia and Eastern Europe, Gastric cancer remains the second most common among cancers and is the leading cause of cancer deaths. In India carcinoma stomach is the fourth common malignancy and second common cause of death due to malignancy. The detection of early gastric cancer is still less than 5 to 10% in India.

The present study is an attempt to establish the incidence, role of risk factors, analyse the symptomatology, stage of disease, mode of various surgical treatment and results in our patients and compare them with results abroad.

2. AIM OF THE STUDY

The aim was to study the following objectives in patients admitted with a diagnosis of Gastric Cancer, and operated in Government Kilpauk Medical College Hospital and Government Royapettah Hospital, Chennai.

* To discuss the incidence, causative factors, mode of presentation, disease pattern of Gastric carcinoma in our patients.

* A study of Barium meal examination, upper gastro intestinal endoscopy and computerised tomography in the diagnosis of Gastric carcinoma.

* To discuss various surgical modalities in the management of gastric cancer.

* To compare the results with that of world statistics.

3. REVIEW OF LITERATURE

Gastric resections were first performed in 1881 by Billroth. Wolfler a colleague of Billroth performed a gastroenterostomy the same year. Schlatter performed a total gastrectomy in 1897. An attempt at wide lymphatic resection was described by Appleby in 1952, who reported a case of a patient with a tumor in body of stomach.

Prior to the availability of flexible endoscopy in the early 1970's, symptomatic patients who had abnormal upper GI series generally went to exploratory laparotomy and gastric resection if possible. Breaux et al., reported that Diagnostic laparotomies decreased from 23% in the 1950s to 9.4% in the 1980's. At present date, the diagnostic accuracy of upper GI endoscopy is approximately 94% and the need for Diagnostic laparotomy is rare.

The majority of gastric cancers are detected at an advanced stage, defined as an extension beyond the muscularis propria. The 5 year survival is therefore quite low, in the range of 10% to 15%. The mean survival rate of 5 year in Japan is about 90% to 95% due to the effective screening procedures at present.

Sedgwick, G.R. Gilles, Dupout and Indians like Sarkar et al., B.R.Prabhakar and N.Rangabashyam have studied the age incidence of carcinoma stomach. Kniller et al., Lawrence, W. Way and others studied the incidence in various socioeconomic group.

Systemic and local recurrences are common even after complete tumor resection and extensive lymphadenectomy. Therefore role of multidisciplinary approach with adjuvant and neoadjuvant chemotherapy, radiotherapy, combined chemoradiation are increasingly evaluated for the management of these tumor.

Adenocarcinoma of stomach was the leading cause of cancer death world wide through most of the twentieth century now ranks second only to lung cancer. It is estimated 22,700 new cases are diagnosed annually in U.S with approximately 11,800 deaths per year. There has been increasing incidence of proximal gastric cancer, annual rate of increase for proximal gastric lesions was 4.3% for white men and 4.1% for white women.

The highest incidence of stomach cancer can be found in Japan, South American and Eastern Europe, with incidence rates as high as 30 to 85 per 1,00,000 population. In contrast, low incidence areas such as U.S., Israel and Kuwait have incidence rates of study of only 4 to 8 cases per 1,00,000 population.

4. FUNCTIONAL ANATOMY OF STOMACH

Stomach is the most dilated part of the alimentary tract, it lies mainly in the left hypochondrium, Epigastric, umbilical region with much of it under cover of lower ribs.

It is a muscular bag, and can accommodate 1500 ml or more in adult. The junction with the esophagus is the cardia and the most fixed part, pyloric opening is at Gastroduodenal junction. Main parts fundus, body and pylorus. The stomach is completely invested by peritoneum which passes in a double layer from the lesser curvature to the liver as lesser omentum and hanging down from the fundus and greater curvature as greater omentum which fuses with the transverse colon and mesocolon.

Fundus is the part projecting above the level of cardia and is in contact with left dome of diaphragm.

Body is the largest part extending from the fundus to the angular notch (incisura angularis).

Pyloric part extends from the angular notch to the gastroduodenal junction, consists of proximal dilated portion the pyloric antrum and it narrows distally as the pyloric canal which is continued distally as pylorus. The circular muscle in the pylorus thickened to form pyloric sphincter. Anterior to pyloric sphincter is the prepyloric vein of Mayo, landmark of pyloroduodenal junction.

BLOOD SUPPLY

1.	Left gastric artery	:	Smallest branch of the coeliac axis
2.	Right gastric artery	:	Branch of common hepatic artery
3.	Right gastro epiploic artery	:	Branch of gastroduodenal artery, which is the largest branch of common hepatic artery
4.	Left gastro epiploic artery	:	Largest branch of splenic artery
5.	Vasa brevia	:	5 to 7 short gastric vessels from splenic artery.

VENOUS DRAINAGE

Those corresponding to the right and left gastric arteries terminate in portal vein. Those corresponding to left gastroepiploic vein and short gastric veins drain into splenic vein. The right gastroepiploic vein drains into superior mesentric vein.

NERVE SUPPLY

Parasympathetic : vagus nerve branches.

LYMPHATIC DRAINAGE

The lymphatic vessels of the stomach arise in its submucous and subperitoneal layers, and divide into four main sets that accompany corresponding blood vessles.

Lymphnode stations are divided into 3 groups by Japanese.

Group I (Perigastric nodes)

1 - Right cardiac

2 - Left cardiac

3 - Lesser curve side

4 - Greater curve side

5 - Suprapyloric

6 - Infrapyloric

Group II (along major vessels)

7 - Left gastric artery

8 - Common hepatic artery

9 - Coeliac artery

10 - Splenic hilus

11 - Splenic artery

Group III

12 - Along hepatoduodenal ligament

13 - Retroperitoneal nodes

14 - At root of mesentry

15 - Along Middle colic vessels

16 - Para aortic nodes

HISTOLOGY

Gastric epithelial cells lining the stomach are of columnar type. They are filled with mucigenous granules and are responsible for the lubrication of contents.

Various types of cells in stomach

Body	:	Parietal cells
		Chief cells
Antrum	:	Gastrin `G' cells
Entire stomach	:	`D' cells
		`ECL' cells

FUNCTIONS OF VARIOUS CELLS

1. Parietal cells : Produce acid (H^+)
2. Chief cells : Produce pepsinogen
3. Endocrine cells

    `G' cells - produce gastrin

    `D' cells - produce somatostatin

    `ECL' cells - produce histamine

    (Enterochromaffin like cells)

5. REVIEW OF GASTRIC CARCINOMA

EPIDEMIOLOGY

Gastric Cancer is the 10th most common cancer in the United states, the incidence of which has been decreasing over last 70 years. It is estimated 22,000 patients will develop the disease each year and 13,000 of those will die.

* The male preponderance (2:1) is encountered world wide. The incidence also increase with age.

* The disease is most frequently seen in the age group between 50 and 70, with a peak age about 60 for both sexes. Gastric cancer is rare under the age of 30 years.

* One of the most striking epidemiologic observations has been the increasing incidence of adenocarcinomas involving the proximal stomach and distal esophagus. These tumors have different etiological factors for example, gastric body lesions are associated with low acid production and H.Pylori infection, whereas cardia lesions are not associated with either.

* A decreased incidence has been observed with increased consumption of fresh vegetables and fruits.

* The 5 year survival is 17% overall and ranges from 2% when associated with distant metastasis to 55% when confined to stomach. The 5 year survival is 18% when regional lymph nodes are involved.

PREDISPOSING FACTORS

TABLE - 5.1

Definite (Surveillance Suggested)
Familial adenomatous polyposis
Gastric adenomas
High grade dysplasia (on biopsy)
Definite
Chronic atrophic gastritis
Gastric metaplasia
Helicobacter pylori infection
HNPCC
Probable
Pernicious anemia
Tobacco smoking
Salted, pickled, smoked food
Menetrier's disease
H/o. subtotal gastrectomy (> 20 years)
Peutz jeghers syndrome
Questionable
Benign gastric ulcer
Hyperplastic polyps

HELICOBACTER PYLORI

* Helicobacter pylori is a curved, spirochete like organisum identified in the gastric mucus adherent to the surface epithelium and in the pits but without evidence of tissue invasion.

* H.Pylori produces a six fold increased risk for carcinoma stomach.

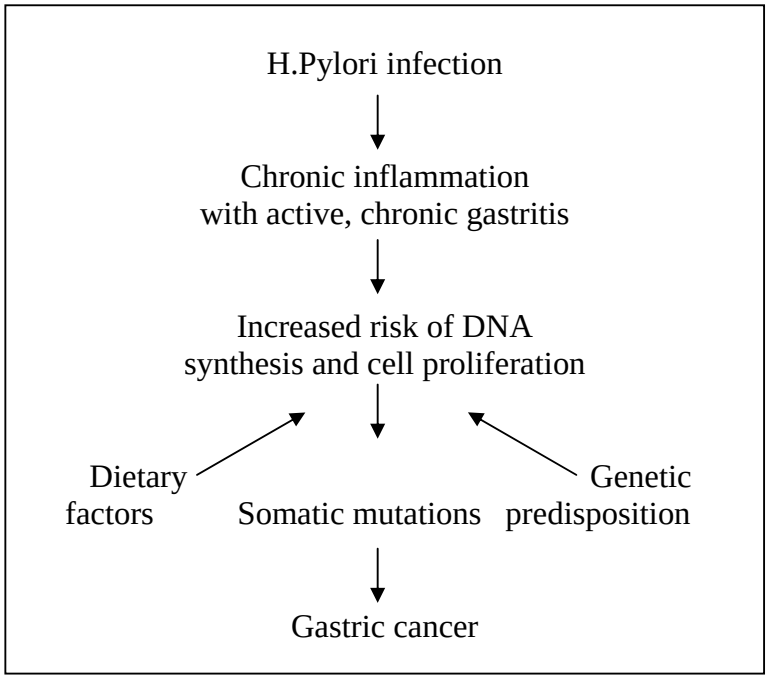
H.Pylori promotes carcinogenesis in a variety of ways.

1. Exposure of mucosal cells to oxidative stress of free radicals.

2. Enhanced progression of normal to metaplastic epithelium.

3. Secretion of ascorbic acid is also decreased in H.Pylori induced, type B chronic gastritis that allows greater degree of intragastric NOC formation.

TABLE - 5.2



H.pylori is associated in 80% cases of intestinal type cancers and 32% cases of Diffuse type cancers.

H.pylori is not associated with carcinoma involving cardia and fundus of stomach.

2. FAMILY STUDIES IN GASTRIC CANCER

* Family History of gastric cancer is observed in 10% - 15% of cases especially with diffuse type.

* Elevated risk (2 to 3 fold) is observed in first degree relatives.

* Diffuse gastric cancer is found predominantly in patients under the age of 40 years and is associated with an equal sex ratio, Blood group A and poor prognosis.

* In Hereditary non polyposis colorectal cancer (HNPCC) type II (Lynch syndrome) 5% to 10% of all carcinomas originate from the stomach.

* In Juvenile polyposis there is 12% chance of gastric cancer.

* In FAP (Familial adenomatous polyposis) the risk of Ca.stomach is 10 fold higher than general population.

3. GENETIC FACTORS IN GASTRIC CANCER

A number of genetic analysis have been carried out in primary gastric carcinoma samples and a list of useful information obtained (Table - 3).

TABLE - 5.3

Karyotype abnormalities	Breakpoints at 3p21
DNA Aneuploidy	Found in 50% - 75%
Gene amplification	Cerb B-2 / neu : 5% to 7% Ksam : 20% in diffuse type C-met : Occasionally
Oncogene Mutation	ras mutations found in <7% cases
Tumor suppressor gene	P53 - LOH in 60% to 70% Mutation in 38% to 67% APC - LOH in 30% to 40% Mutation in 7% to 21% PCC - LOH in 20% to 60%
Microsatellite instability	Found in 15% - 39%

4. MISCELLANEOUS

a. Chronic atrophic gastritis:

Two to three told increased risk of Gastric cancer, particularly intestinal type.

b. Pernicious Anemia :

They reported a 1% to 10% gastric cancer in long term studies.

c. Gastric ulcer :

Malignant transformation is quite rare, occurring in less than 1% cases.

Such malignant change is defined as ulceration and scarring that extends into muscularis propria with carcinoma located at the edge but not the base of ulcer.

d. Post gastrectomy :

Gastric carcinoma arising in the post surgical gastric remnant after distal gastrectomy may be defined as a cancer occurring 5 or more years after the surgical procedure.

In an analysis of 20 studies reported by Offerhaus an overall two fold increased risk was reported. Typically these tumors arise after 20 years period and when operated in young age (Under 45).

e. Menetrier's Disease (Hypertrophic gastropathy) :

Rare, idiopathic disease characterised by rugal fold hypertrophy, hypochlorhydria, protein - losing enteropathy and hyperplasia of surface foveolar mucus cells. 15% of these cases describe an association with gastric carcinoma.

f. Gastric epithelial polyps :

Two Types :

High malignant potential adenomas and low malignant potential hyperplastic polyps.

TABLE - 5.4

Neoplastic Polyps :	(8.2%)	
	Tubular adenomas Villous adenomas Tubulovillous adenomas Mixed adenoma - hyperplastic polyp.	
Hyperplastic polyps :	(90%)	
Hamartomatous polyps	Peutz jeghers polyps Juvenile polyposis	
Foveolar adenoma	Gardners syndrome	
Fundus gland polyps unclassified		

* Upto 40% of adenomas may develop malignancy especially in larger tumors greater than 2 cm. In contrast, the prevalence in hyperplastic polyps is low (0.4%), typically occurring only in large stalked lesions over 2 cm in size.

g. Dysplasia :

Dysplasia is defined by presence of cytologic atypia, abnormal cellular differentiation and disorganised architecture. It is generally classified into mild, moderate or severe. Gastric dysplasis is detected in biopsy or resection specimen.

The most important histological marker of gastric cancer is dysplasia. There are two types :

Type A :

Affects metaplastic gastric epithelium and can lead to the development of intestinal type gastric cancers.

Type B :

Lergely made up of undifferentisted round cells with a clear or amphophilic cytoplasm lacking a brush border.

* Severe dysplasia is regarded nowadays as insitu gastric cancer.

PREMALIGNANT LESIONS

A premalignant condition is a histologic change in healthy mucosa that places mucosa at risk of malignancy (Table - 5).

TABLE - 5.5

*	Persistent infection with H.pylori
*	Atrophic gastritis and pernicious anemia
*	Previous partial gastrectomy
*	Adenomatous and hyperplastic polyps
*	Familial polyposis
*	Hypogamma globulinemia
*	Blood group A
*	Type III intestinal metaplasia

TYPES OF INTESTINAL METAPLASIA

Depending on the degree of cell differentiation and abnormal mucus production.

Type I (Complete)- Mature absorptive and goblet cells. The latter secrete sialomucin (Normal)

Type II (Incomplete) - Absorptive cells are few or absent. Columnar intermediate cells of dedifferenitation are present. The goblet cells secrete sialomucins and sulphomucins (abnormal)

Type III (Incomplete) - Cell de-differentiation is more. Intermediate cells secrete predominently sulphomucins (abnormal). The goblet cells secrete sialomucins and sulphomucins. A variable degree of disorganised glandular architecture is present.

Type III intestinal metaplasia has been reported in relatives of patients with gastric carcinomas and in patients with pernicious anemia.

PATHOLOGY

The vast majority of gastric carcinomas arise from mucus secreting basal cells of the crypts, usually in the setting of chronic atrophic gastritis with intestinal metaplasia.

TABLE - 5.6

WHO Histological typing of malignant epithelial tumors of the stomach.

ADENOCARCINOMA

- Papillary
- Tubular
- Mucinous
- Signet ring cell

Adenosquamous

Squamous cell

Small cell

Undifferentiated

In order of frequency :

Carcinomas (90 - 95%)

Lymphomas (4%)

Spindle cell tumors (2%)

Carcinoids (3%)

Among the carcinomas, Adenocarcinoma is the common type

1. Differentiated - Papillary, Tubular
2. Undifferentiated - Signet ring cell, anaplastic type

CLASSIFICATION AND PERCENTAGE OF TUMOR TYPES

Early Gastric Garcinoma

Early gastric cancer is defined as Adenocarcinoma limited to the mucosa and submucosa of the stomach regardless of lymphnode status. The entity is common in Japan where gastric cancer is the number one cause of cancer death.

Approximately 10% of patients with early gastric cancer will have lymphnode metastasis.

TABLE - 5.7

Classification for Early Gastric Cancer : (Japanese Classification)		
Type I	:	Exophytic lesions (extends into gastric lumen)
Type II	:	Superficial variant
		IIA - Elevated (height less than the thickness of adjacent mucosa)
		IIB - Flat lesions
		IIIC - Depressed lesion (Eroded but not ulcerated)
Type III	:	Excavated lesions (ulcerated tumors)

Approximately 70% of early gastric cancers are well differentiated and 30% are poorly differentiated.

ADVANCED GASTRIC CARCINOMA

They include lesions that share common feature of invasion through the submucosa into the muscularis propria and beyond.

BORRMANN'S CLASSIFICATION OF ADVANCED GASTRIC CANCER

TABLE - 5.8

Types	Macroscopic description
I	Polypoid or fungating
II	Ulcerative, circumscribed with everted margins
III	Ulcerative, noncircumscribed with ill defined margins infiltrating gastric wall (CRATERIFORM)
IV	Diffuse imfiltrating type
V.	Unclassified.

Types II and III are the most common, followed by Type IV.

Polypoidal type are least common.

STOUT CLASSIFICATION

1. Ulcerative (most common)
2. Fungating (Polypoid)
3. Superifical spreading
4. Diffusely infiltrating

This is purely morphological classification with no prognostic significance hence fallen out of favour.

MING'S CLASSIFICATION

1. Expanding (67%)
2. Infiltrative (33%)

HISTOLOGIC CLASSIFICATION

LAUREN'S CLASSIFICATION : (DIO CLASSIFICATION)

Diffuse - 33%

Intestinal - 53%

Others - 14%

* **Intestinal type :**

Tumor cells are typical large and pleomorphic with large hyperchromatic nuclei. Neoplastic glands may exhibit focal cytoplasmic or intraluminal mucin secretions. Good prognosis. It includes differentiated carcinoma.

* **Diffuse type :**

Clusters or solitary uniform cells, poorly differentiated cells that infiltrate the gastric wall. Gland formation is uncommon. Signet ring pattern (Intracellular mucin with pushed out nuclei) have a poor prognosis. It includes undifferentiated carcinomas and signet ring cell carcinoma.

TABLE - 5.9

CLINICO PATHOLOGICAL DIFFERENCES BETWEEN INTESTINAL AND DIFFUSE GASTRIC CARCINOMAS

	Intestinal	**Diffuse**
Histogenesis	Areas of Intestinal metaplasia	Normal gastric mucosa
Lymphocytic infiltration of the stroma	Present	Absent
Early Cancer	Protruding type	Flat, depressed or excavated
Advanced cancer	Borrmann's type I-III	Borrmann's type IV-III
Infiltration	Localised	Difuse
Peritoneal dissemination	Infrequent	Frequent
Hepatic metastasis	Nodular	Diffuse
Sex Incidence	More common in Males	More common in Females
Age Incidence	More common in the elderly	More common in the young
Association with Blood group `A'	No	Yes
Association with pernicious anemia	No	Yes
Genetic prediposition	No	Yes
DNA ploidy pattern	Diploid	Polyploid
Prognosis	Survival better than the Diffuse	Dismal

BRODER'S CLASSIFICATION

Broder's classification grades cells from grade I (well differentiated) to grade IV (anaplastic).

SITE OF PREDOMINANCE

Common sites in India,

Prepyloric and pyloric region	-	65%
Body of stomch	-	25%
Fundus and OG junction	-	10%

* But in western countries proximal stomach tumours are increasing in incidence few decades and attained the most common site of Gastric cancer.

* In high socio economic status, proximal tumors are common.

* In India and in Japan Distal gastric cancers are still common.

* Tumors are also more common on the lesser curvature side then graster curvature side (40% vs 10%).

* Distal cancers are related by diet and environmental factors with histologic type predominently Intestinal hence are `epidemic'.

* Proximal cancers are genetically related with diffuse type and hence are endemic.

MODE OF SPREAD

TABLE - 5.10

I. Direct Spread :

- Lesser and greater omentum
- Liver and diaphragm
- Pancreas
- Spleen
- Biliary tract
- Transverse colon
- Oesophagus (via submucosal lymphatics)
- Diaphragm (via subserosal lymphatics)

II. Nodal Metastasis :

- Local
- Distant
  - Virchow's node (Left supraclavicular)
  - Irish's node (Left axillary)

III. Vascular metastasis :

- Liver (40%)
- Lung and Pleura (40%)
- Bone (10%)
- Brain

IV. Peritoneal metastasis :

- Disseminated
- Pelvic
  - Krukenberg tumor - ovary
  - Blumer's rectal shelf

Liver is the most frequent site of metastasis, being involved almost twice as frequently as the peritoneum or omentum.

CLINICAL FEATURES

TABLE - 5.11

Symptom	Frequency (%)
Weight loss	62%
Abdominal pain	52%
Nausea	34%
Anorexia	32%
Dysphagia	26%
Melena	20%
Early satiety	18%
Ulcer symptoms	17%
Hematemesis	15%

From Wanebo et al., (ACS - Patient care study)

EARLY GASTRIC CANCER

* Asymptomatic
* Epigastric pain (2/3 cases)
* Nausea and vomiting (40%)

* Anorexia (1/3)

* Weight loss, hematemesis or melena

Mean duration of symptoms - 21 to 36 months.

ADVANCED GASTRIC CANCER

Abdominal pain is the first symptom

Weight loss, anorexia, early satiety,

Bloating, diarrhoea or bleeding

DEPENDING ON THE SITE OF LOCATION

1. OG junction - Dysphagia, loss of weight

2. Pyloric region - Gastric outlet obstruction (Vomiting)

ON EXAMINATION

1. Epigastric mass

2. Liver secondaries

3. Ascites

4. Obstructive jaundice

5. Krukenberg tumor (Deposits over the ovary)

6. Trousseau's sign (thrombophlebitis of veins)

7. Troisier's sign (left supraclavicular node enlargement)

8. Sister Mary Joseph nodule (Hard nodule at the umbilicus)

9. Blumer's shelf (Deposits in the rectovesical pouch)

10. Pleural effusion

11. Paraneoplastic signs :

    * Acanthosis nigricans
    * Leser Trelat sign (appearance of watery keratosis & pruritus)
    * Dermatomyositis

STAGING OF CARCINOMA STOMACH

Two types of staging system are used at present.

1. AJCC (American Joint Committee on Cancer Staging of Gastric Cancer, 2002)

   TNM staging based on primary tumor, regional lymphnodes, distant metastasis.

2. Cancer staging in an alternate way by Japanese known as PHNS staging. Four factors are used, namely, the grade of peritoneal dissemination (Pfactor), the presence of hepatic metastasis (Hfactor), lymph node involvement (Nfactor) and serosal invasion (Sfactor).

TABLE - 5.12

AMERICAN JOINT COMMITTEE ON CANCER STAGING OF GASTRIC CANCER, 2002

Definition of TNM			
PRIMARY TUMOR (T)			
TX	Primary tumor cannot be assessed		
T0	No evidence of primary tumour		
Tis	Carcinoma in situ : intraepithelial tumor without invasion of the lamina propria		
T1	Tumor invades lamina propria or submucosa		
T2	Tumor invades muscularis propria or subserosa		
T2a	Tumor invades muscularis propria		
T2b	Tumor invades subserosa		
T3	Tumor penetrates serosa (visceral peritoneum) without invasion of adjacent structures		
T4	Tumor invades adjacent structures		
REGIONAL LYMPH NODES (N)			
NX	Regional lymph node(s) cannot be assessed		
N0	No regional lymph node metastasis		
N1	Metastasis in 1-6 regional lymph nodes		
N2	Metastasis in 7-15 regional lymph nodes		
N3	Metastasis in more than 15 regional lymph nodes		
DISTANT METASTASIS (M)			
MX	Presence of distant metastasis cannot be assessed		
M0	No distant metastasis		
M1	Distant metastasis		
STAGE GROUPING			
0	Tis	N0	M0
IA	T1	N0	M0
IB	T1 T2a/b	N1 N0	M0 M0
II	T1 T2 T3	N2 N1 N0	M0 M0 M0
IIIA	T2a/b T3 T4	N2 N1 N0	M0 M0 M0
IIIB	T3	N2	M0
IV	T4 T1-3 Any T	N1-3 N3 Any N	M0 M0 M1

TNM, tumor, node, metastasis.

TABLE - 5.13
PHNS STAGING SYSTEM

P FACTOR	
P0	No evidence of peritoneal spread
P1	Peritoneal spread limited to supracolic area; includes greater omentum, not diaphragm
P2	Small number of nodules below mesocolon or diaphragm
P3	Numerous nodules below mesocolon or diaphragm
H FACTOR	
H0	No metastasis to liver
H1	Metastasis limited to one lobe
H2	Small number of metastasis to both lobes
H3	Many metastasis to both lobes
N FACTOR	
N0	No lymph node involvement
N1	Group 1 involvement
N2	Group 2 involvement
N3	Group 3 involvement
N4	Extending beyond group 3
S FACTOR	
S0	No penetration to serosa
S1	Minimal involvement of serosa
S2	Obvious involvement of serosa
S3	Obvious involvement of serosa and neighbouring organs.

Stage I	$P_oH_oN_oS_o$
Stage II	$P_oH_oN_1N_2S_1$
Stage III	$P_oH_oN_3S_2$
Stage IV	$>P_1H_1N_4S_3$

The Japanese staging system extensively classifies 18 lymphnode region into favour N categories depending on their relation to the primary tumor and anatomic location.

PROGNOSIS

The prognosis for patients with gastric cancer depends on the extent of the disease and on treatment.

Extension of the Disease, whether local or regional, adversely affects survival. Lymphnode involvement is adverse prognostic factor.

The important prognostic factor in patients without detectable metastasis is **depth of invasion** of the stomach wall by the tumor. Other significant but lesser prognostic variables are the **type of cancer** (Intestinal or diffuse), **Location of tumor** (growths of the cardia having a poorer prognosis than lesions of the middle and lower third) and the **histological type** (degree of differentiation).

PROGNOSTIC DETERMINANTS OF GASTRIC CANCER

TABLE - 5.14

Depth in invasion	Prognosis
Mucosa (in situ)	100% 5 year survival
Mucosa + muscaris mucosa	80 - 95% 5 years survival
Submucosa	75 - 80% 5 years survival
Muscularis propria	0 - 40% 5 years survival
Size of primary	
< 2cm	85% 5 year survival
> 4 cm	0 - 50% 5 year survival
Histological types	
Intestinal (differentiated)	Favourable
Diffuse (undifferentiated)	Unfavourable
Nodal Status	
No involvement	80% 5 years survival
Metastasis	0 - 40% 5 years survival (depending on level of node involvement)

INVESTIGATIONS

Investigations in carcinoma stomach are based on the following headings.

I. Diagnostic :
1. Barium meal
2. UGI endoscopy

II. Staging :
1. USG abdomen
2. CT scan abdomen
3. MRI
4. Endoscopic ultrasound
5. Laparoscopy

III. Others :
1. Routine investigations
2. Serum markers

1. BARIUM MEAL EXAMINATION

Radio diagnosis is accurate in 90 percent of pyloric growth, 70 percent of the cardia growth and 60 percent of growth in body. Single or double contrast baruim studies have a sensitivity of 70% to 75% and the specificity is about 90% in advanced cases. There studies have a low sensitivity for superficial gastric mucosal cancers. A non distensible stomach suggests a diffusely infiltrating cancer (LINITIS PLASTICA).

2. UPPER GI ENDOSCOPY

This has gradually replaced the barium meal study and has become the gold standard investigation for diagnosis. Visual inspection alone will diagnose only 50% of early gastric cancer. A single biopsy from a suspicious lesion may be positive in 70% to 100% of cases. Diagnostic accuracy is dramatically improved by obtaining six to eight biopsies from the edge and base of ulcer. `J' manoever is used to visualize the lesions in the cardia / fundus of stomach.

3. ENDOSCOPIC ULTRASOUND (EUS)

EUS uses high frequency sound waves (7.5 to 12 MHZ) that provide excellent spatial resolution. EUS is superior to CT for local staging although they are complimentary to each other. EUS can be used to accurately differenitate early from advanced gastric carcinoma in 90% to 99% of cases. `T' staging is 78% and `N' staging is 70% accurate with EUS.

4. COMPUTERISED TOMOGRAPHY (CT SCAN)

CT scan cannot differentiate between T1 and T2 lesions. Lymphatic metastasis can be diagnosed with greater than 90% specificity but sensitivity varies from 48% to 91%. CT scan fails to identify local invasion, cannot identify small peritoneal metastasis, tumor involvement in normal and near normal sized nodes. Sensitivity for detecting tumor invasion into colon (or) mesocolon and pancreas was 76% and 50% respectively.

5. MRI SCAN

It may be superior to CT scan in `T' staging in delineating the stomach wall.

6. DIAGNOSTIC LAPAROSCOPY

More sensitive in detecting Hepatic, nodal and peritoneal metastasis. An extensive laparoscopic procedure, while quite accurate, has not been widely adopted.

7. TUMOR MARKERS

The only reliable marker is CA72 4 which correlates well with tumor burden and lymphnode involvement. Others CEA, CA199, CA125, CA724 are used to detect the recurrence and progression of tumor.

8. ROUTINE INVESTIGATIONS

- Anemia (due to blood loss)

- Abnormal liver function test (hepatic metastasis)

- Radiographic evidence of Bone or pulmonary metastasis.

TREATMENT : Three therapeutic modalities

1. Surgery

2. Chemotherapy

3. Radiotherapy

Depends on the staging of tumor

I. OPERATIVE TREATMENT

1. Curative

2. Palliative

1. CURATIVE RESECTIONS :

Extent of Gastric Resection :

Resection which provides a 2 cm margin for early or well circumscribed tumors and 5 cm for infiltrative advanced lesions is adequate.

A total gastrectomy is necessary for the following

i. When the proximal distance from the cardia is less than the required length to achieve a safe tumor free margin.

ii. Neoplasm involves two or all three sectors of stomach.

iii. Diffuse carcinoma (Borrmann IV) irrespective of size.

a. FOR PROXIMAL GASTRIC CANCER :

Though radical upper gastrectomy can be performed for these patients because of functional problems and alkaline reflux gastritis it is better to perform a radical total gastrectomy with resection of involved part of Esophagus.

b. FOR MIDDLE THIRD LESIONS :

Radical lower gastrectomy is performed if an adequate proximal clearance is possible or else a Radical total gastrectomy performed.

c. FOR LOWER THIRD LESIONS :

Radical lower gastrectomy with 1-2 cm of the duodenum is the preferred method.

RECONSTRUCTIONS

After Distal Gastrectomy :

i. Billorth I (Gastroduodenal)

ii. Billroth II Polya (Gastrojejunal)

After Total Gastrectomy :

i. Single isoperistaltic jejunal interposition between oesphagus and Duodenum

ii. Simple Roux-en-y oesophago jejunostomy

iii. Hunt Laurence Roux-en-y pouch.

EXTENT OF LYMPHNODE DISSECTION

TABLE - 5.15

Site	D1	D2	D3
Lower Third Lesions	3. Lesser Curvature 4. Greater curvature 5. Supra Pyloric 6. Infra Pyloric	1. Right cardiac 7. Left gastric artery 8. Hepatic 9. Coeliac	1-11 as in R_1, & R_2 and 12. Hepatoduodenal ligament
Midle Third Lesions	1. Right cardiac 2. Left cardiac 3. Lesser Curvature 4. Greater curvature 5. Supra Pyloric 6. Infra Pyloric	7. Left gastric artery 8. Hepatic 9. Coeliac 10. Splenic hilar 11. Splenic artery	13. Retropancreatico-duodenal 14. Root of mesentry 15. Midcolic 16. Periaortic
Upper Third Lesions (include cardia)	1. Right cardiac 2. Left cardiac 3. Lesser Curvature 4. Greater curvature & short gastric 5. Supra Pyloric 6. Infra Pyloric	7. Left gastric artery 8. Hepatic 9. Coeliac 10. Splenic hilar 11. Splenic artery 11a. Para oesophageal (Cardia lesions)	

D1 Resection	-	Lymphnode clearance is continued to the primary group of nodes
D2 Resection	-	Additional clearance of lymph nodes along the main arteries. Pancreatectomy and splenectomy are not done nowadays due to increased morbidity and mortality. Pancreas and spleen preserving D2 resection is possible and splenectomy is done only in cases with frank lymphnode mets or infiltration in splenic hilum.
D3 Resection	-	Even further clearance of nodes of Group III which is not practiced nowadays.

Randomized trials like Bonenkamp et al and Cuschieri et al., had proved there is no survival advantage of D2 resection over D1 resection, hence D2 resection is not favored except in Japan.

In AJCC system Group III nodes are considered as distant metastasis (M1).

2. PALLATIVE PROCEDURES

Signs of Inoperability

1. Fixation to pancreas or posterior abdominal wall.
2. Involvement of mesentry, especially the origin of superior mesentric vessels.
3. Gross local involvements of lymphnodes leading to fixity.
4. Retrograde spread to preaortic lymphnodes.
5. Multiple secondaries in liver
6. Peritoneal seedings and pelvic deposits

Symptoms which may call for palliation

1. Pain - Obstructive, ulcer type, infiltrative
2. Vomiting - Obstructive, non - obstructive
3. Dysphagia
4. Bleeding

PALLIATIVE PROCEDURES FOR GASTRIC CANCER

Radical Palliative Resections :

Total gastrectomy
Oesophago gastrectomy
Partial gastrectomy

Conservative Palliative surgeries :

Gastroenterostomy
Devine's exclusion by pass
Gastrostomy
Feeding jejunostomy

Non surgical palliative procedures :

Laser resection
(Reboring using Nd - YAG Laser)

II. ADJUVANT CHEMOTHERAPY

Cunningham - Marsden Regimen : (ECF Regimen)

Epirubicin - 50 mg / m^2 in 3 weekly boluses

Cisplatin - 60 mg / m^2 in 3 weekly boluses

5-Fluorouracil- 200 mg / m^2 daily by continuous infusion line for 3 weeks

For 6 cycles is the most widely accepted effective regimen at present.

South west oncology group (SWOG 9008) trial provides convincing evidence that a postoperative 5 fluorouracil (5FU) based chemoradiotherapy improves disease free and overall survival when compared with observation alone.

III. ADJUVANT RADIOTHERAPY

A British stomach cancer group study showed local recurrance rate was lowered with adjuvant radiotherapy (10% vs 27% with surgery alone) although U.S national cancer institute did not show any overall survival advantage.

However improved local control was seen with adjuvant radiotherapy, compared with surgery alone.

ADJUVANT CHEMORADIATION TREATMENT

Outcomes from Gastrointestinal intergroup trial of adjuvant chemoradiation for surgically resected gastric cancer show a major advantage in overall survival, disease free survival and loco - regional control with the use of adjuvant chemoradiation.

RECENT ADVANCES

EARLY GASTRIC CANCER : (EGC)

Involving only mucosa and submucosa irrespective of lymphnode

Investigations :

1. Virtual endoscopy
2. Magnifying endoscopy
3. Flourescence endoscopy
4. Endoscopic USG

Treatment Options :

1. Endoscopic Mucosal Resection (EMR) :

- Grasp and pull technique
- Cut and suction technique

Indicated for lesions less than 2 cm size in the submucosal region

2. Laparoscopic Endoluminal Resection :

For lesions in the posterior wall and near cardia or pylorus

3. Laparoscopic Gastric Resection :

The conclusions from various studies in Japan showed mucosal tumors less than 3 cm size needs no lymphadenectomy; and submucosal and mucosal tumors greater than 3 cm size needed D4 dissection.

NEOADJUVANT CHEMOTHERAPY

To date, the datas from various studies indicate no increase in operative morbidity or mortality with neoadjuvant chemotherapy. Although neoadjuvant chemotherapy proves to improve disease free survival rate from trials like MAGIC trial using ECF regimen before and after surgery final results are yet pending.

6. PATIENTS AND METHODS

This study was carried out on 50 patients of Gastric Carcinoma in Surgical Wards of Government Kilpauk Medical College Hospital and Government Royapettah Hospital, Chennai, during the period, June 2004 to August 2007.

Initial work up included, clinical examination, hematological and biochemical parameters, barium studies, upper gastrointestinal endoscopy, Endoscopic biopsy and computerised tomography.

All deserving patients were explored with the basic intent of resection, even as a palliative measure. Patients however, found unresectable were subjected to palliative by pass.

Following surgery, histopathological examination of resected specimens, tumor morphology, differentiation, clearance of cut margins and level and status of lymphnodes studied.

Post operative adjuvant chemotherapy was given to patients, who after resection showed, involvement of lymphnodes, microscopic invasion of the cut margins, unfavorable histology and differentiation and presence of lymphatic or angio - invasion. Palliative chemotherapy was given to patients having unresectable disease.

Patients were followed up till the time of discharge from hospital. Post operative complication during the hospital stay were recorded.

GASTRIC CARCINOMA - PROFORMA

Name: Address:

Age: Occupation:

Sex: Hospital:

Spcioeconomic Status

I. Professional, Technical
II. Clerical skills, sales
III. Craftsman
IV. Semiskilled
V. Labourer
VI. Farm labourers

Symptoms

Epigastric pain
Dyspepsia
Vomiting
Early satiety
Dysphagia
Melena
Haematemesis
Jaundice
Ball rolling movements
Weight loss
Anorexia
Asymptomatic

Signs

Anemia
Jaundice
Malnourishment
Epigastric lump
Ascites
Visible gastric peristalsis
Secondaries liver
Troisier's sign
Sister joseph's nodule
Blumer's shelf

Past H/o:

Drug intake
Previous surgery

Investigations

Hb%
OBT in stools
Liver function test
Barium meal study

Personal H/o:
Smoking
Alcoholism
Diet H/o

UGI Scopy
USG Abdomen
CT scan abdomen
H-pylori study
Diagnostic laparoscopy

Family H/o:

MANAGEMENT:
OPERATIVE FINDINGS

1. Growth : Upper third
   Middle third
   Lower third
   Diffuse

2. Operability / resectability:

3. Extent of lymphnode metastasis:

   Perigastric (N1)
   Coeliac axis (N2)
   Root of mesentry (N3)
   Paraaortic Nodes

4. Extragastric spread:

   Fixation to pancrease
   Transverse colon
   Transverse mesocolon
   Pancreas
   Peritoneal deposits
   Blumers shelf
   liver

Chemotherapy:

Post operative complications: Wound infection
Anastomotic leak
Stomal obstruction
Respiratory infection
Haemorrhage
Mortality

7. OBSERVATIONS

1. EPIDEMIOLOGY, AGE AND SEX INCIDENCE

Out of 50 patients, there are 35 males and 15 females, their age ranging from 28 years to 77 years; common in 5th and 6th decade (54%) with a mean age of 53 years.

Age in Year	Male	Female	Number	Percent
<30	0	1	1	2
31-40	5	4	9	18
41-50	10	3	13	26
51-60	10	4	14	28
61-70	9	3	12	24
>70	1	0	1	2
Total	**35**	**15**	**50**	**100**

Range : 28 - 77 years

M : F Ratio = 3.5 : 1.5

2. SOCIOECONOMIC STATUS

In this study, class V and VI (Labourers and farmers) patients accounted for 70% while Class II, III and IV patients accounted for 24%. Only 6% of the patients belonged to class I (Professional, Technical Manager).

Class	Occupation	Number	Percent
I	Professional, Manager	3	6
II	Clerical Skills, Salesmen	6	12
III	Craftsmen	2	4
IV	Semiskilled	4	8
V	Labourer	20	40
VI	Farmer	15	30

3. PERSONAL HABITS

In this study, 72% of patients were smokers, smoked 4 cigarettes on average, for more than 10 years and 64% of patients were alcoholics, consumed at least once a week, 16% of patients were betelnut chewers. 68% of patients took spicy and salted foods regularly, 50% of patients had high starch diet derived from grains and tuberous roots. Only 12% of patients took vegetables and fruits regularly.

Sl.No.	Personal Habits	Number	Percent
1.	Smoking	36	72
2.	Alcohol	32	64
3.	Tobacco chewing	8	16
4.	Spicy & salted foods	34	68
5.	High starch diet	25	50
6.	Vegetables and fruits	6	12
7.	H.pylori (14 studied)	8 (Out of 14)	57%

Out of the 14 cases from which H-pylori study was done with biopsy material by staining with silver-starry stains 8 showed positive.

4. SYMPTOMS AND SIGNS

Majority of the patients presented with epigastric pain, anorexia, vomiting and weight loss. Haemorrhage in the form of haematemesis or malena was much less frequent. Lump and anemia were the most frequent signs. The frequency of various symptoms and signs are given below.

Symptoms	n	Percent
Epigastric pain	38	76
Dyspepsia	32	64
Weight Loss	40	80
Anorexia	20	40
Vomiting	35	70
Malena	12	24
Hematemesis	12	24

Signs	n	Percent
Anemia	42	84
Epigastric Mass	20	40
Visible Gastric Peristalsis	7	14
Palpable Liver	4	8
Jaundice	1	2
Ascites	2	4

The average duration of symptoms were 6 months to one year.

5. BLOOD GROUPING

In this study group `A' accounted for 50% of patients, while O,B,AB accounted 30%, 14% and 6% respectively.

Blood Group	Number	Percent
O	15	30
A	25	50
B	7	14
AB	3	6

6. BARIUM STUDY, ENDOSCOPY AND CT SCAN

In this study 50 patients were subjected to endoscopy and 20 patients were subjected to barium meal and 10 patients were subjected to CT scan. Their accuracy has been 89%, 70% and 90% respectively.

Investigated	Number Investigated	Number Contributory	Percent Accuracy
UGI Endoscopy	50	49	98%
Barium Meal	20	14	70%
CT Scan	10	9	90%

7. TREATMENT

Surgery	Number	Percent
Radical Total Gastrectomy	4	8
Radical Partial Gastrectomy	11	22
Palliative Total Gastrectomy	2	4
Palliative Partial Gastrectomy	4	8
Gastro Jejunostomy	19	38
Feeding Jejunostomy	7	14
Gastrostomy	1	2
Biopsy and Closure	2	4

Study	Resections		By Pass Procedures	No procedure attempted
	Curative	Palliative		
50	15	6	27	2

Out of the 50 patients, who underwent laparotomy 2 of them had disseminated metastasis and are not suitable for any surgery. Curative resection was possible in about 15 patients and they underwent D1 resection. Remaining 33 patients are suitable only for some palliative procedures. Obstruction, pain, Hematemesis were important reasons for palliation, being achieved by gastrectomy (6), gastrojejunostomy (19), feeding jejunostomy (7) and gastrostomy (1).

8. EXTENT OF TUMOR

Lower third of the stomach (Antrum) has been the most common site, 11 patients had involvement of more than one area. 7 patients had growth confined to cardia end of the stomach. In three patients whole stomach was involved.

Site	Number	Percnet
Cardia and Fundus	7	14
Body and Antrum	8	16
Confined to Body	5	10
Confined to Antrum	27	54
Diffuse Growth	3	6

9. EXTENT OF LYMPHNODE METASTASIS (OPERATIVE FINDING)

More than half of our patients had perigastric lymphnodes involved within 3 cms from the primary lesion, while about 16% had no lymphnode involvement.

Extent	Number	Percent
Node Negative (No)	8	16
Perigastric (G1)	36	72
Coeliac Axis (G2)	14	28
Root of Mesentery (G3)	5	10
Para Aortic	2	4

10. EXTENT OF EXTRAGASTRIC SPREAD

In our patients liver and pancreas were the frequently involved intra abdominal organs.

Extent	Number	Percent
Fixation to Pancreas	18	36
Transverse Mesocolon	4	8
Transverse Colon	1	2
Peritoneal Nodules	6	12
Pelvic Floor	6	12
Liver	12	24
Extension to duodenum	3	6

11. TUMOR MORPHOLOGY

Tumor morphology categorised based on Borrmann's Classification. ulcerative form (II) were most common.

Type	Number	Percent
Polypoid (I)	2	4
Ulcerative (II)	32	64
Crateriform (III)	10	20
Diffuse (IV)	4	8
Unclassified (V)	2	4

12. HISTOPATHOLOGY

Adenocarcinoma	Number	Percent
Well Differentiated ➢ Mucinous ➢ Papillary	26 23 3	52
Moderately Differentiated	9	18
Poorly Differentiated ➢ Signet Ring	15 3	30

About 52% were well differentiated, of which 46% were mucin-secreting type. About 30% were poorly differentiated of which 3 of them had signet ring pattern of cells.

13. POST-OPERATIVE COMPLICATIONS

Complications	Number	Percent
Wound Infection	7	14
Anastomotic Leak	1	2
Stomal Obstruction	1	2
Respiratory Infection	11	22
Haemorrhage	1	2
Mortality (within 10 days post operative)	3	6

Respiratory tract infection were the most common during their period of stay in our hospital, average stay being 12 days. About 3 patients died within 10 days after lapartomy. The other common complication commonly observed in wound infection.

8. DISCUSSION

The result of the present study, reflects the pattern of gastric carcinoma, tested in our hospital between June 2004 to August 2007. Most of the malignancies that occur are adenocarcinoma that shows a definite male predilection as with other studies. The highest age incidence was between 40 to 60 years of age. Sedgwick, G.R. Giles, Dupout and others have reported maximum age beyond 50-60 years of age. This shows that our patients are affected a decade or two earlier than patients abroad, confirming with other Indian studies on adenocarcinoma of stomach by Sarkar et al, B.R. Prabhakar and N. Rangabashyam..

Large proportion of patients were farmers and labourers belonging to low socioeconomic group, reported similarly by kneller et al, Lawrence w.way and other most of them showed that, high incidence in low socio economic patients were due to malnutrition, which may increase the sensitivity of gastric mucosa to carcinogens, like N-nitroso compounds, H.pylori and dietary habits.

Though positive association was seen with smoking and alcoholism in this study, role of alcohol in the etiology of gastric cancer is doubtful in south studies. M.E. Craanen and others like T.D. Picton, D.A. Owen, Mac Donald have shown that smoking and alcohol are related to proximal tumour of stomach.

Several studies have attempted to establish the etiologic role of various food items in gastric cancer. The high starch diet, high salt intake, food contaminated with polycyclic hydrocarbons and insecticide used in vegetable

cultivation have been incriminated. Soil nitrite levels appear to correlate well with gastric cancer frequency. Dried salted fish, pickled vegetables have excess salt which acts as co carcinogen, thus enhancing the effect of carcinogen. In our study more then 60% of patients were used to take salted and spicy foods and about 50% took high starch diet (Kanji) as breakfast daily. Only 12% of these patients regularly took vegetables and fruits. Fresh fruits and vegetables contain ascorbic acid which inhibits the chemical process of formation of nitrosamines and this may account for the reduced incidence of cancer.

A number of epidemiological studies seen to have shown that gastric cancer is more common in persons with blood Group A, than in those with blood group O and B. More than 55studies have supported this finding around the world. However the risk ratio for gastric cancer in persons with blood group A compared to those with blood group O is only a modest 1.2.

The following table compares symptoms and signs with various studies.

Symptoms and Signs	**Present Study**	**N.Rangabashyam**	**J.C.Hendricks**
Epigastric Pain	76	60	90
Dyspepsia	64	94	-
Weight Loss	80	82	80
Anorexia	40	-	60
Vomiting	70	34	50
Malena	24	10	20
Haematemesis	24	-	15
Asymptomatic	-	-	1
Anemia	84	-	85
Mass	40	72	30
Distant Spread	8	20	5

Majority of our patients presented with epigastric pain, vomiting either singly or in combination with dyspepsia, weight loss and anorexia. The number of patients, presenting with vomiting (70%) seems to be significantly high when compared with reports abroad. This shows that our patients report very late, after developing gastric outlet obstruction. Haemorrhage in the form of haematemesis was less frequent. No patient presented with metastatic disease as the presenting symptom.

Lump and anemia were the most frequent signs, confirming that our patients presented late with advanced disease. By the time physical signs of gastric cancer are present the disease is incurable.

In our study the percentage accuracy of various diagnostic investigations are comparable to the studies abroad. Computerized tomography was 90% accurate in diagnosing tumour and its extension. Upper gastro intestinal endoscopy diagnosed almost all the cases except one case from which biopsy was not conclusive. Barium meal was only 70% accurate compared with literature.

Compared to the western literatures, carcinoma of the antrum and body were more common in our study related by diet and environmental factors in our country which are more common in our country. However the percent of growth in the proximal stomach is about 14 percent and seems to be increasing in high socio-economic group patients in our country also.

The extent of the tumour in our study compared to various other studies is shown :

Extent of the Tumor	Present Study	Warren	Warwick
Fixation to pancreas	36	10	7
Transverse colon	2	6	4
Transverse mesocolon	8	-	-
Peritoneal nodules	12	28	20
Pelvic Floor	12	-	-
Liver	24	34	38

Surgical procedure for gastic cancer should be based on anatomical consideration, knowledge of natural history of disease and specific surgical goals curative or palliative - in a particular case. The extent of resection can be determined partly by the extent of the lesion and partly by the knowledge of its usual pathways of extension.

References	Year of Study	% all Operation	% all Resection	% Curative
Present Study	2004-2006	100	54	30
Sharma. India	1961	73	36	-
Cunningham et al., U.K.	1974-84	84	49	39
Cady et al., U.S.A.	1967-82	83	58	34
Imanaga and Nakazato.Japan	1964-73	100	80	61
Boku et al., Japan	1975-1986	100	100	100

The curative resection (Radical gastrectomy) is possible only in about 30% patients. Of the remaining 70% of patients, 12% underwent palliative

resection and 54% underwent some bypass procedure. In 4% only biopsy was taken due to extensive disease.

Randomized trials like bonenkamp et al and Cuschieri et al had proved there is no survival advantage of D2 resection over D1 resection, hence D2 resection is not in practice except in Japan. All the curative resections done in our patients are D1 type resection.

	Number of Patients	**Type of Surgery**	**Post operative complications**	**Post operative mortality**	**5 year survival**
Bonen Kamp et al.,	711	D1 D2	25 43	4 10	45 47
Cuschieri et al.,	400	D1 D2	28 46	6.5 13	35 33

Our resection rates in general, including both palliative and curative are comparable to most of western studies, but falls short by a significant margin when compared with the Japanese. This is because of the extensive screening methods developed in Japan, to detect early cancers.

The immediate post-operative complication rate during the period of study is very much comparable with most of the studies abroad, except for respiratory tract and wound infection. The probable reason for highest pulmonary and wound infection rate could be due to the poor nutritional status, and personnel hygiene of our patients. Anastomotic complication are less in our patients probably because most of them underwent only palliative surgery.

Complication	Present Study	Adashek et al	Diehl et al
Wound infection	14	-	5
Anastomotic leak	2	9	3
Stomal obstruction	2	-	-
Respiratory infection	22	11	3
Haemorrhage	2	4	0.5
Mortality	6	1	-

Predominant type of growth in this study was Type II ulcerative growth with everted margin, followed by Type III crateriform type of growth. In our country yet the most common site is distal third of stomach. In our study 54% of growth was confined to antrum and about 26% in the body and antrum. This is probably due to the low socioeconomic status, diet and environment factors and high prevalence of H.Pylori in our country.

T.D.Picton, J.W.Smith studies have observed a change in the site of origin of gastric carcinoma, with proximally located tumours becoming more prevalent. This relative increase is believed to be due to the decrease in the incidence of distally located tumor. M.E. craanen, W. Dekkar have observed that there is decrease in well differentiated adenocarcinoma and relative increase in the poorly differentiated type of adenocarcinoma. This is probably because of the relative increase in the involvement of cardia. In our study about 50% are well differentiated adenocarcinomas compared to 30% poorly differentiated types.

Because of the effective screening procedures about 50% of the gastric cancers detected in Japan are Early Gastric Cancer confined to mucosa and submucosa. In our country most of them present only in an advanced stage suitable only for some palliative procedures.

9. SUMMARY AND CONCLUSIONS

* Gastric adeno carcinomas most commonly occurred between 4th and 5th decades, which is one or two decades earlier, when compared with Western countries and Japan. Male - Female ratio is 3.5 : 1.5. Farmers and labourers belonging to low socio economic group and patients with blood group `A' are more susceptible to the disease.

* Strong association exists with smoking, alcohol, spicy and salted foods and high starch diet. Vegetables and fruits are associated with low incidence of gastric cancer.

* Our patients present very late with obstruction, tumor fixation and extragastric spread, when compared to patients abroad.

* Gastroscopy with biopsy, seems to be the most important investigation in the diagnosis of gastric cancer, with an accuracy 98% Barium meal has important role to play only in certain group of patients like linitis plastica, lymphomas and gastric stasis.

* The most common site of growth still in India is the Antrum followed by Body, but proximal stomach cancers seem to be increasing compared with previous studies.

* The most common type of growth is ulcerative type with everted margins (Type II Borrmann). Diffuse type is the least common.

* Most of our patients presented late with advanced disease amenable only for palliative resection or palliative by pass procedures.

* Only a few patients underwent D1 type curative resection with histopathology showing tumor free margins.

* Most of the tumor showed well differentiated mucinous type of adenocarcinoma which had good prognosis.

* Wound infections and respiratory infections were the most common postoperative complications.

* Early gastric cancer has a high percentage of curative resection rate but because of ineffective screening procedures the detection of early gastric cancer is almost nil.

Gastric Malignancy present us with many challenges. Even with the best surgical care available today, the advanced malignancy of stomach which we encounter will yield only poor results.

EARLY DIAGNOSIS, FULLY DEVELOPED PREOPERATIVE STAGING AND AN AGGRESSIVE SURGICAL APPROACH PROVIDE THE BEST HOPE OF IMPROVING THE OUTLOOK FOR PATIENT WITH GASTRIC CANCER.

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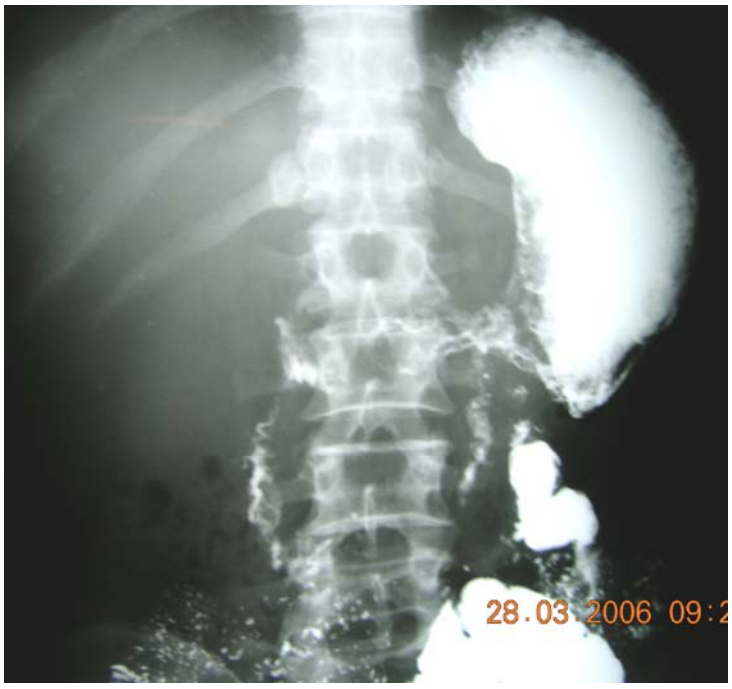
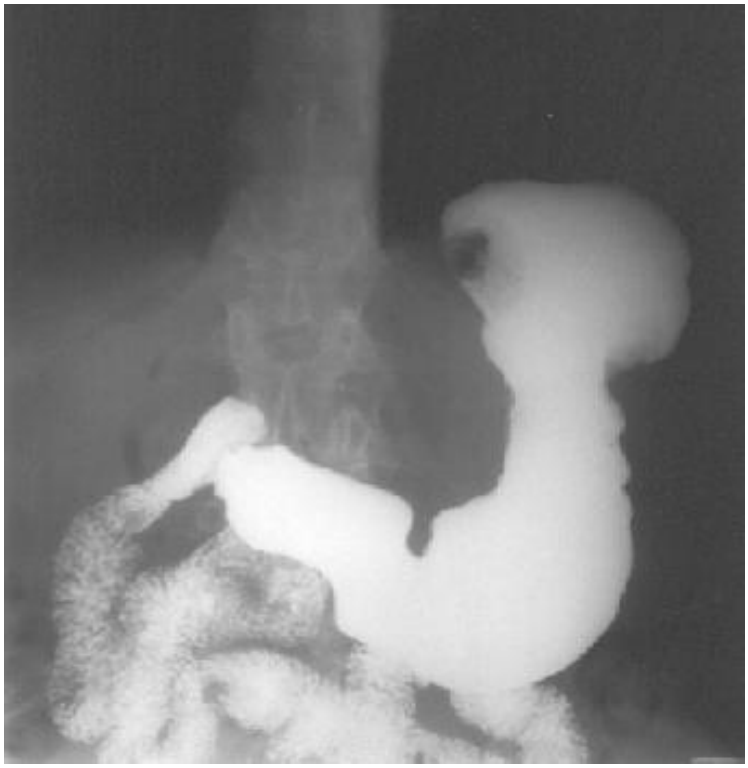
BARIUM MEAL STUDY

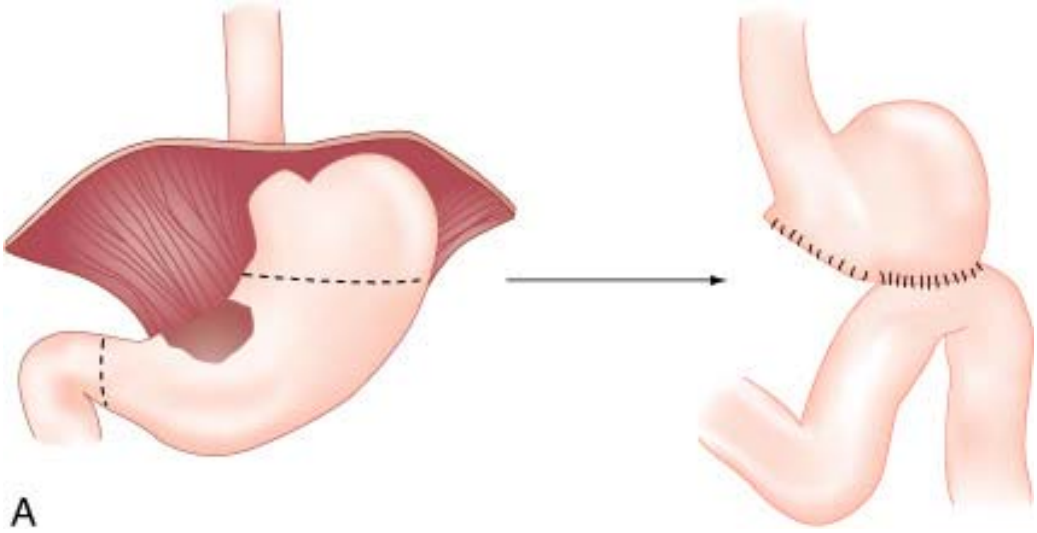
ANTRAL GROWTH



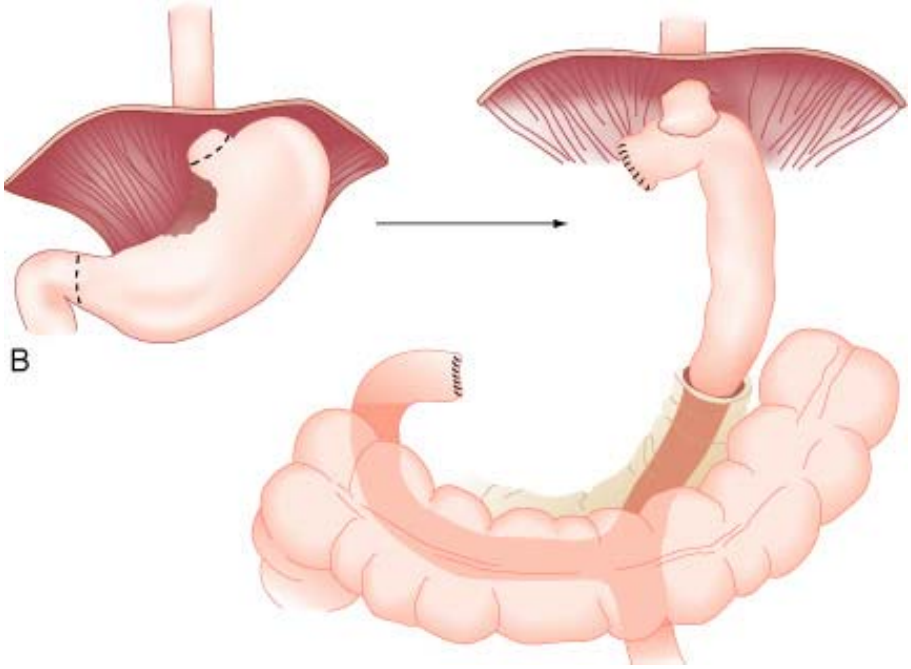
LINITIS PLASTICA



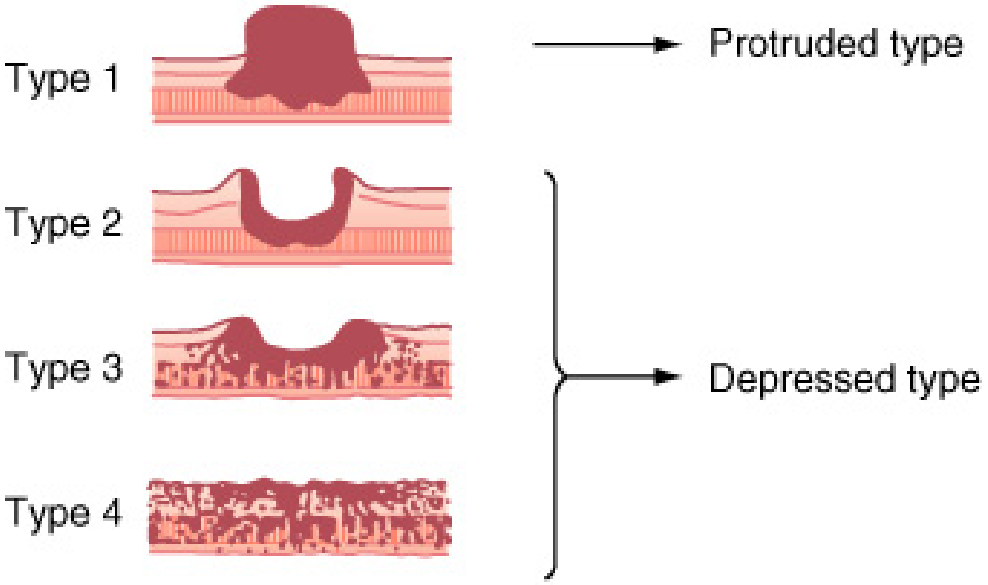
PARTIAL GASTRECTOMY WITH GASTRO JEJUNAL ANASTOMOSIS (BILLROTH - II)



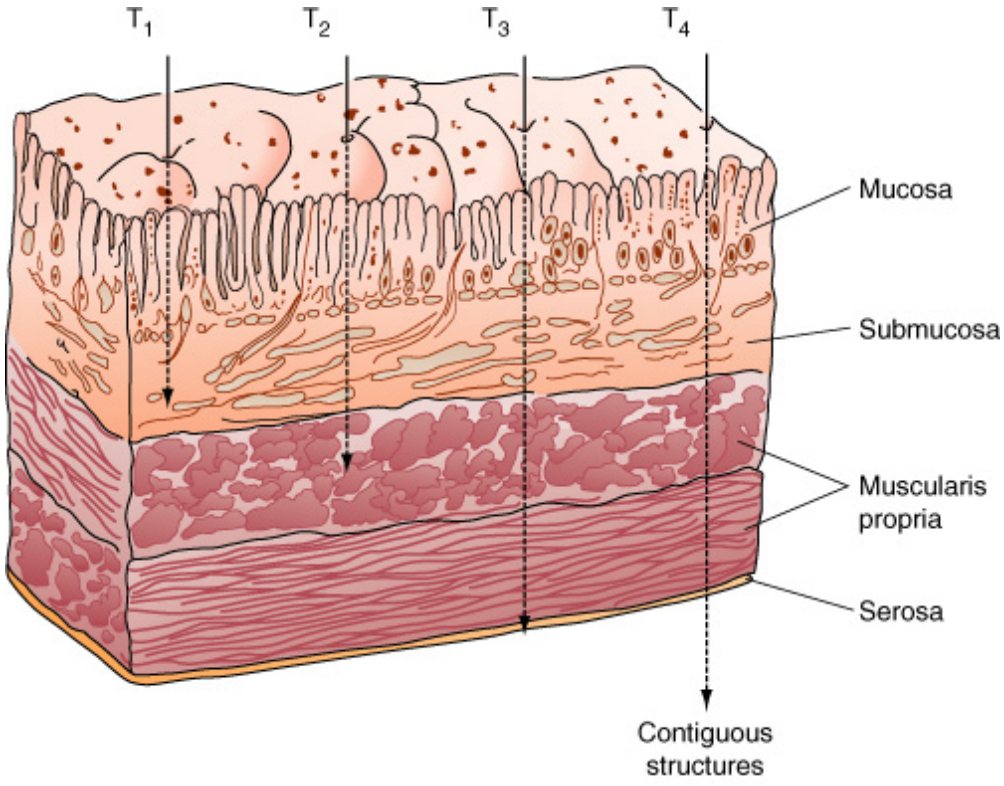
TOTAL GASTRECTOMY WITH ROUX - EN - Y LOOP FORMATION



BORRMANN'S CLASSIFICATION

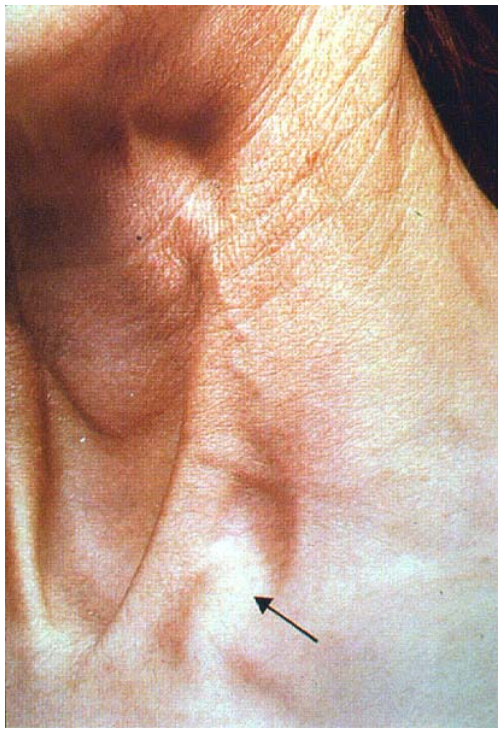


TUMOUR INVASION

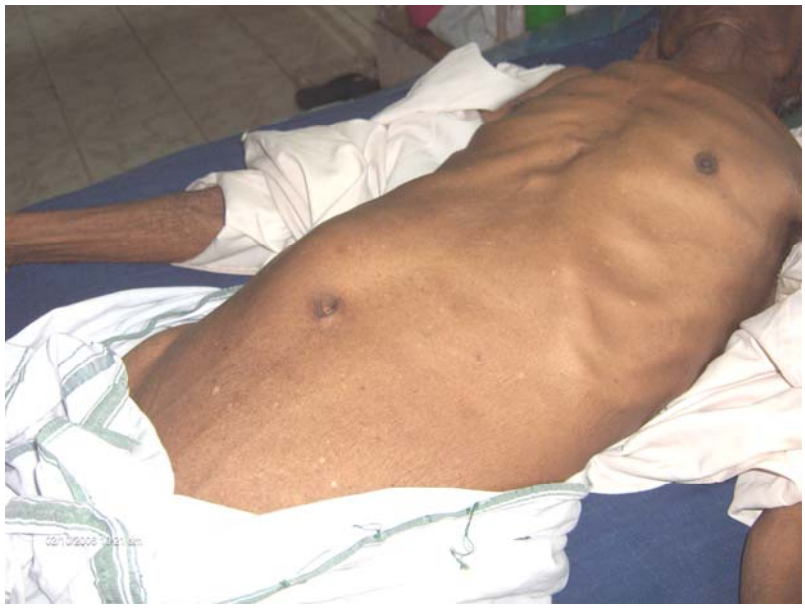


CLINICAL FEATURES

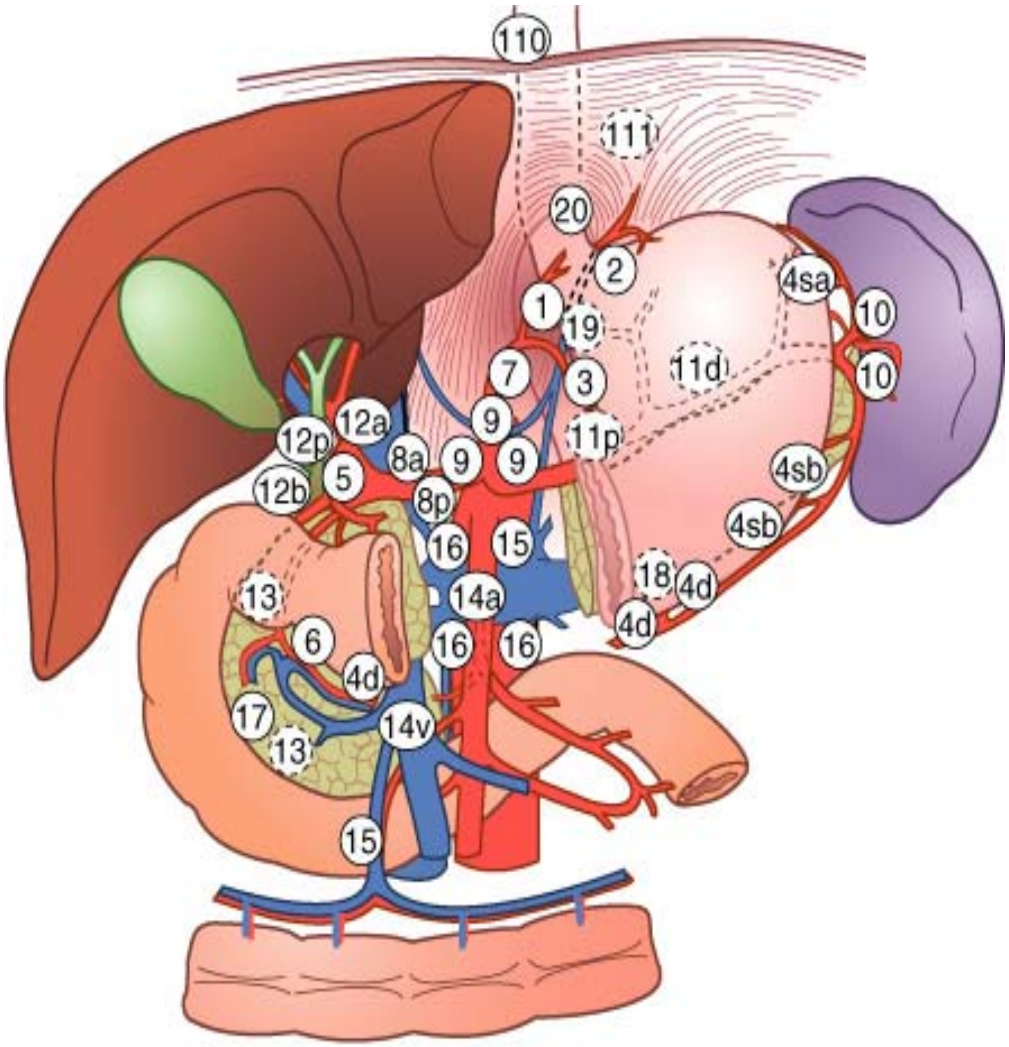
VIRCHOW'S NODE



LIVER SECONDARIES

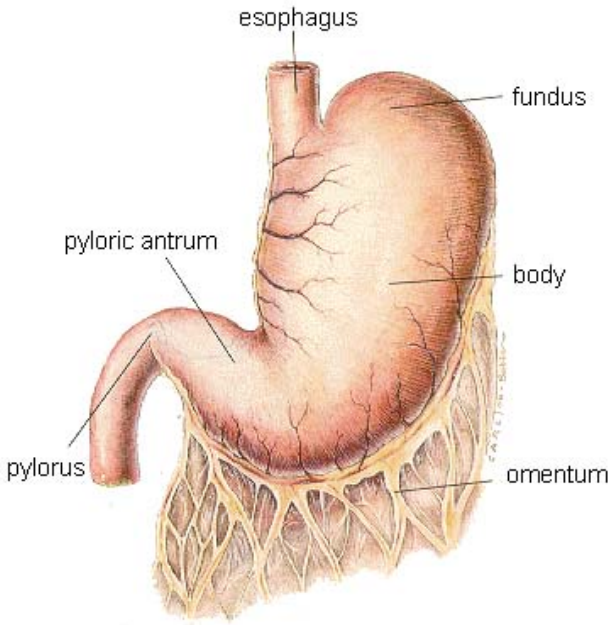


LYMPHATIC DRAINAGE OF STOMACH CARCINOMA

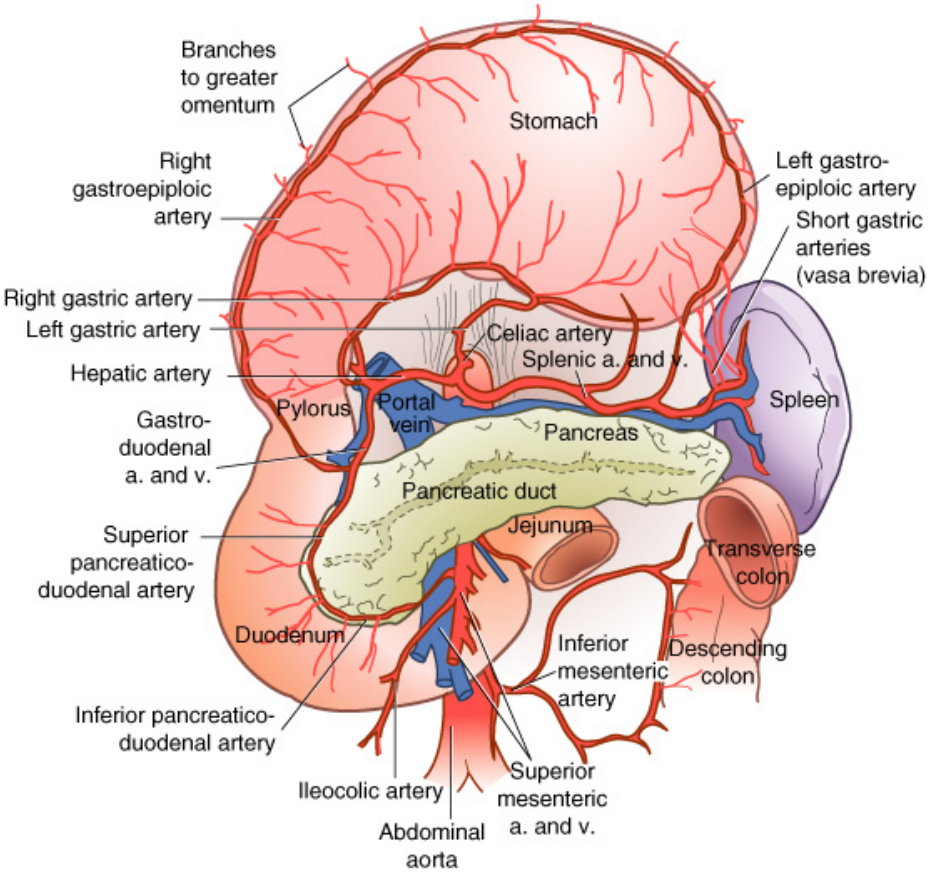


GROSS ANATOMY

p

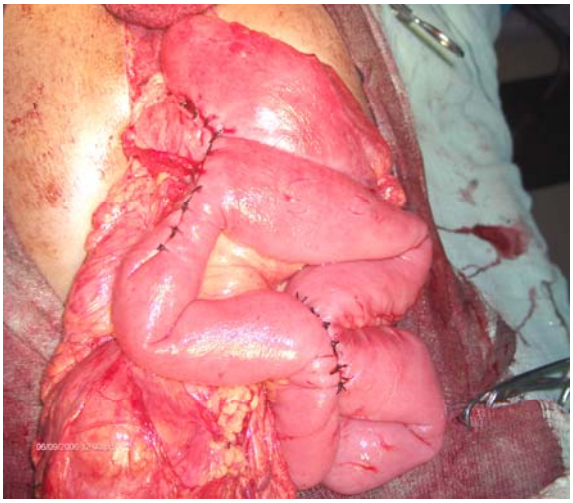


BLOOD SUPPLY OF STOMACH

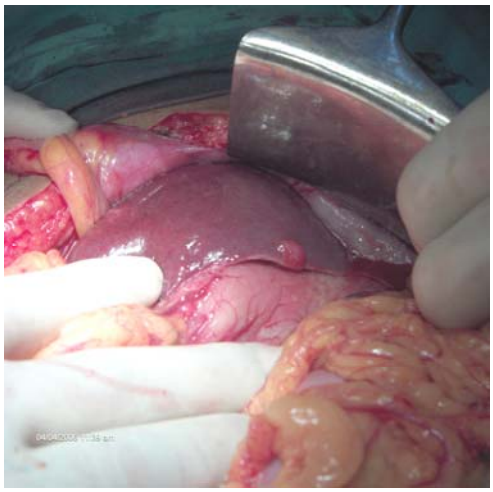


PROCEDURES FOR CARCINOMA STOMACH
(Contd..)

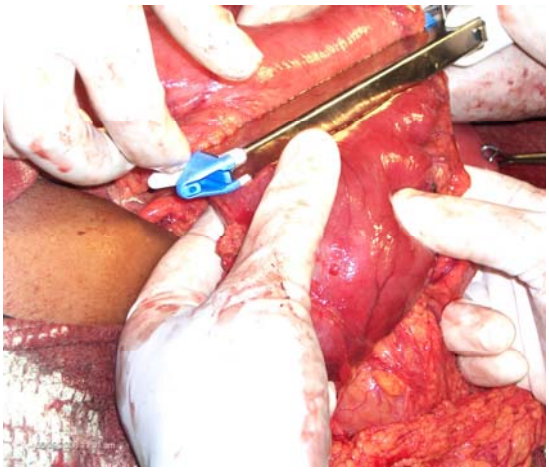
BILLROTH II GASTRECTOMY

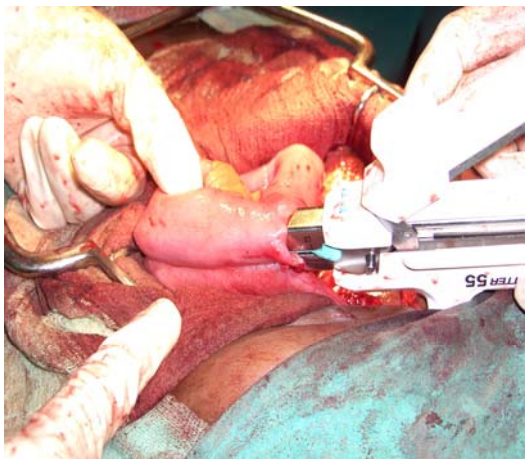


LIVER METASTASIS



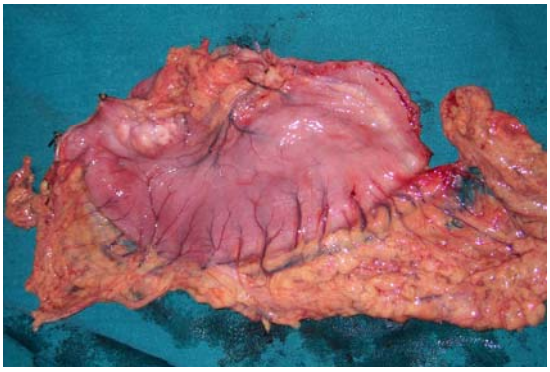
STAPLERS IN GASTRIC SURGERY

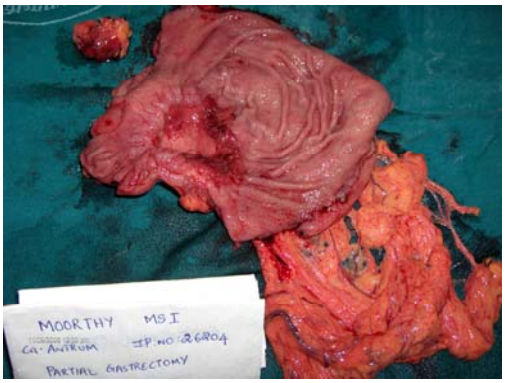




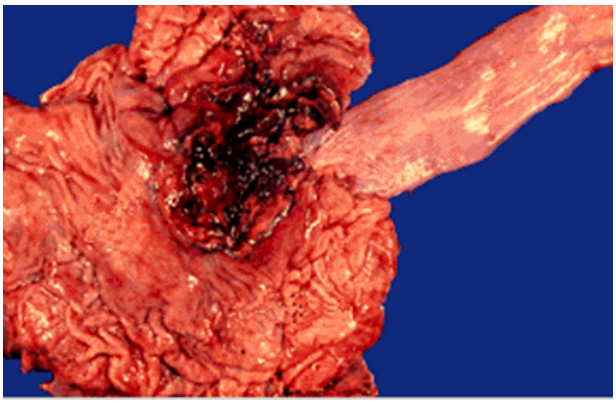
POST OPERATIVE SPECIMENS

RADICAL PARTIAL GASTRECTOMY

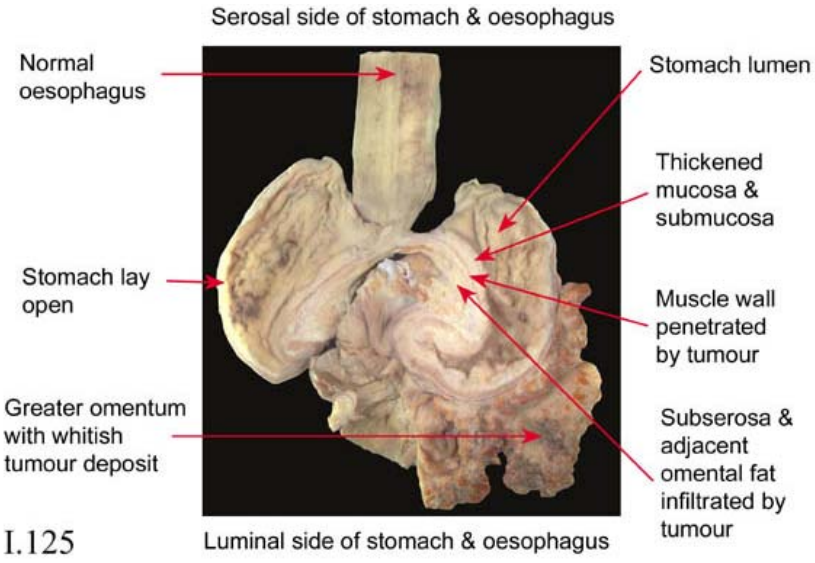




POLYPOIDAL GROWTH (FUNDUS)

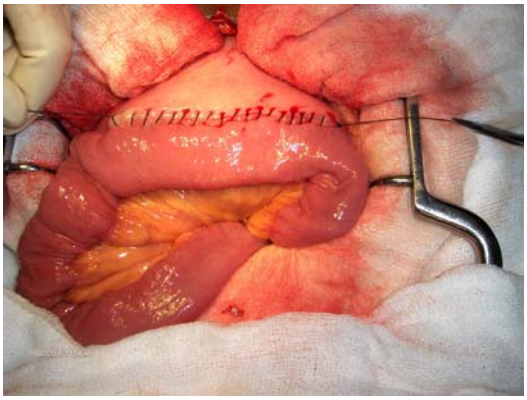


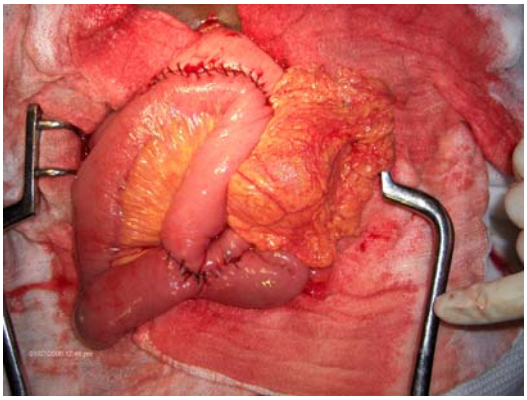
LINITIS PLASTICA



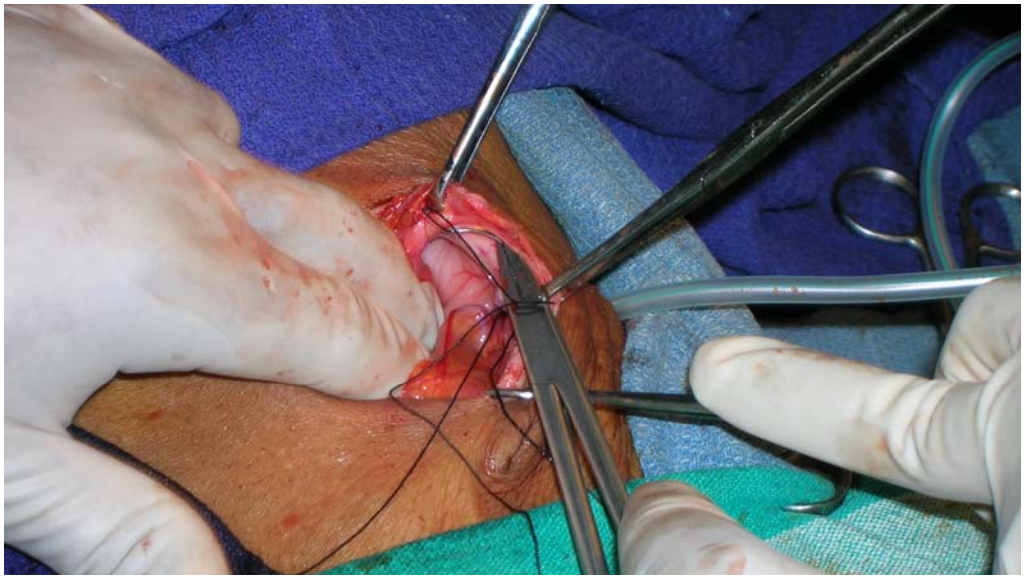
PROCEDURES FOR CARCINOMA STOMACH

PALLIATIVE GASTRO JEJUNOSTOMY
WITH JEJUNOJEJUNOSTOMY



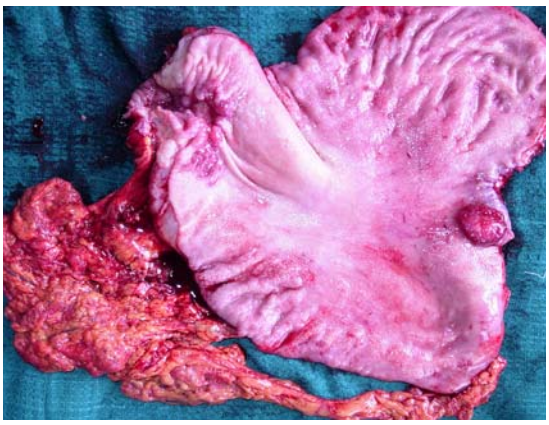


FEEDING JEJUNOSTOMY

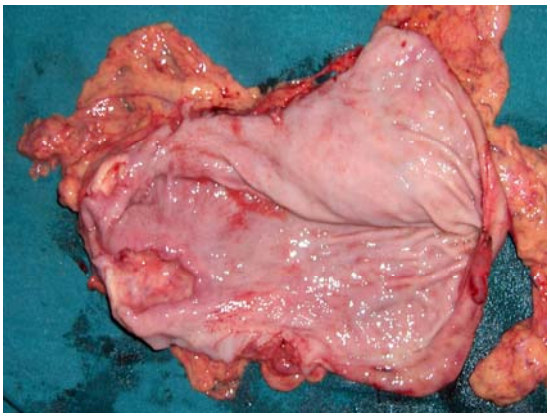


BORRMANN'S CLASSIFICATION

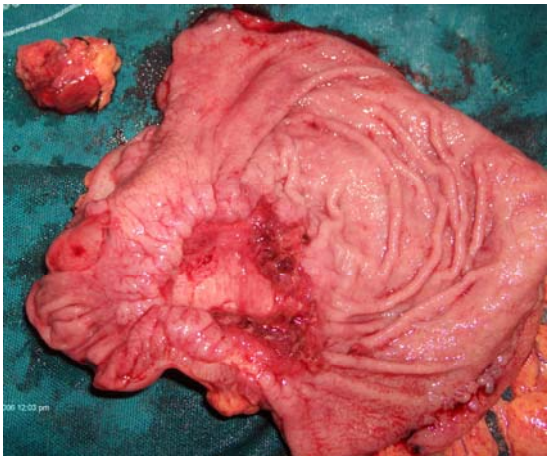
POLYPOIDAL (TYPE I)



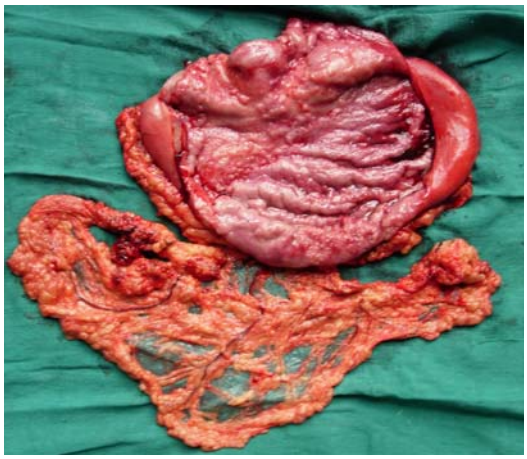
ULCERATIVE (TYPE II)



CRATERIFORM (TYPE III)

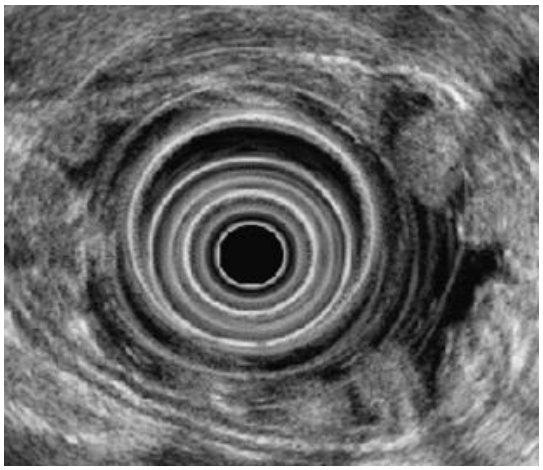


DIFFUSE (TYPE IV)

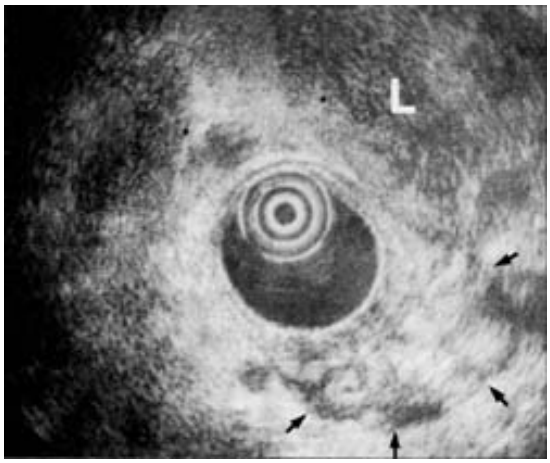


ENDOSCOPIC ULTRASONOGRAM

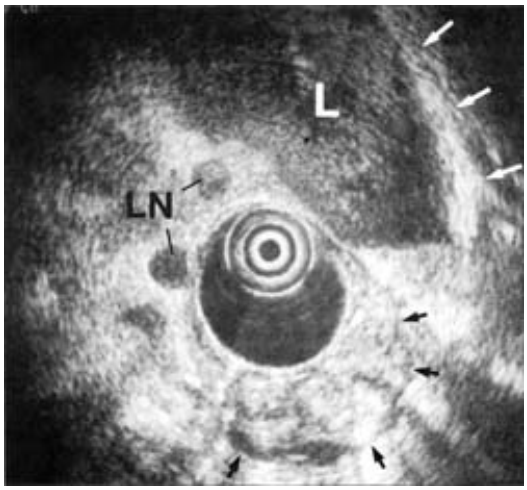
GASTRIC WALL (NORMAL)



ANTRAL GROWTH

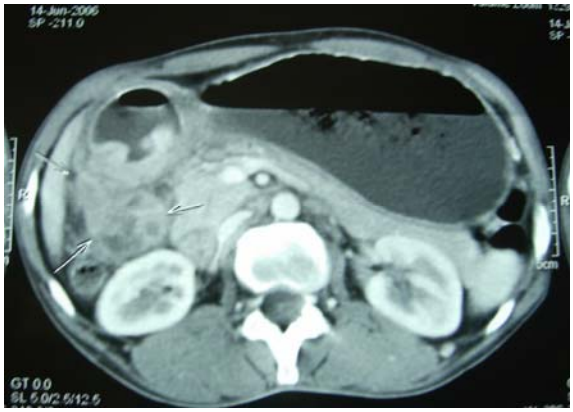


PERIGASTRIC NODES

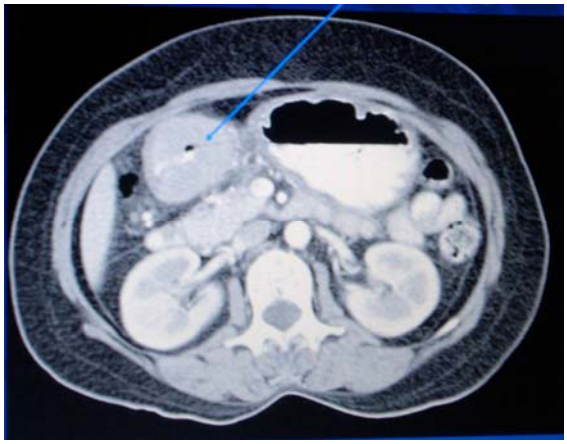


COMPUTERIZED TOMOGRAPHY

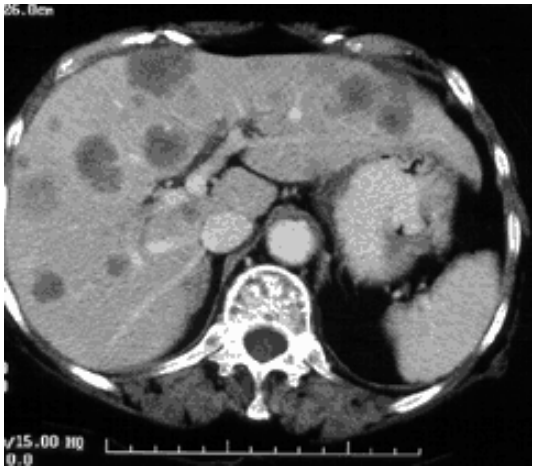
ANTRAL GROWTH

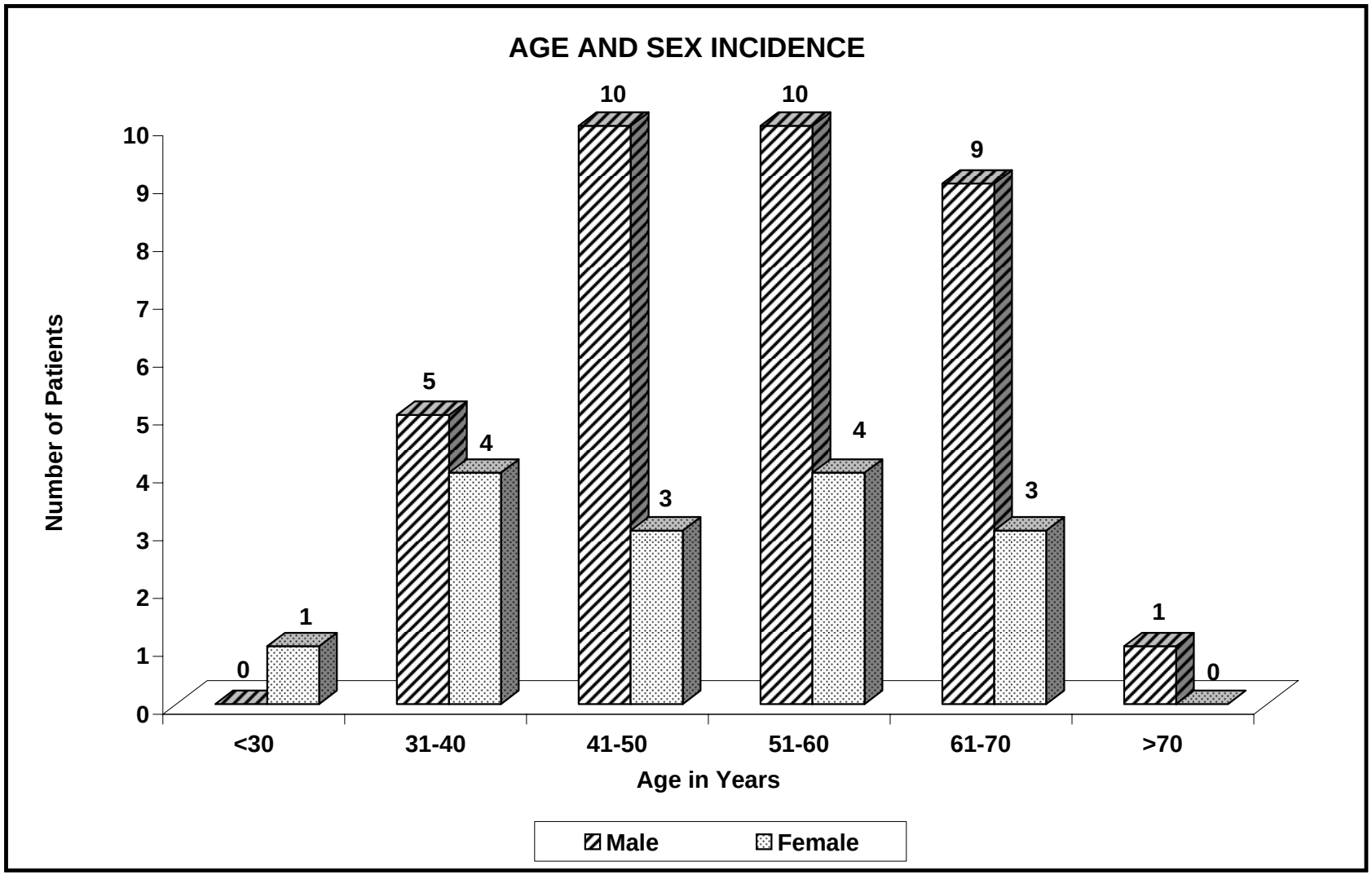


LINITIS PLASTICA

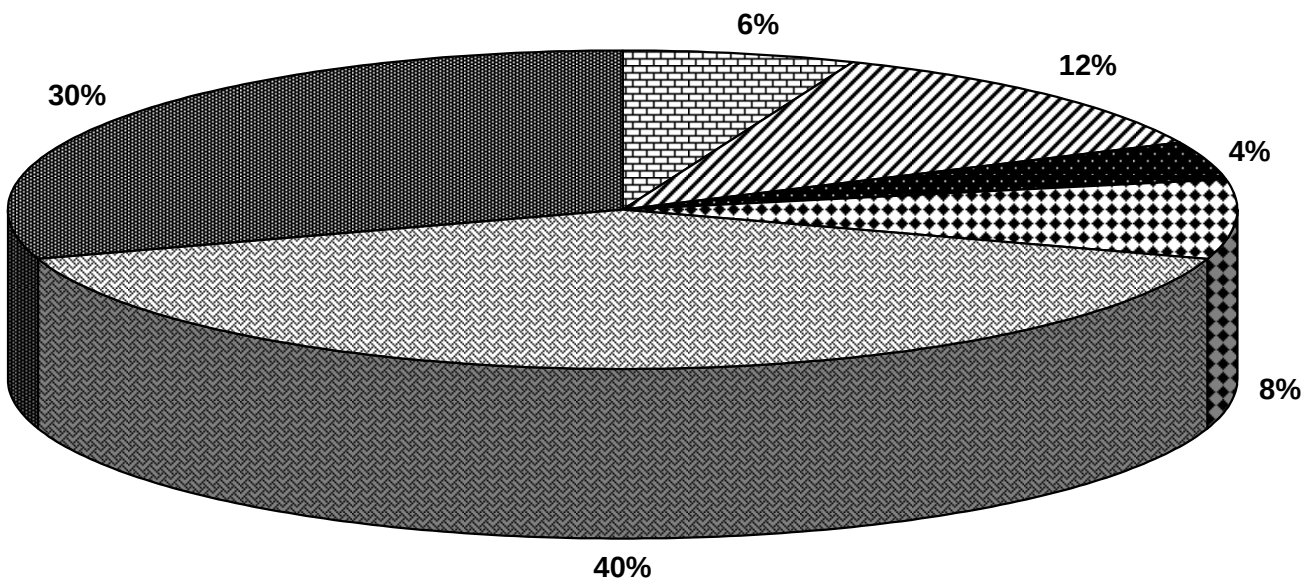


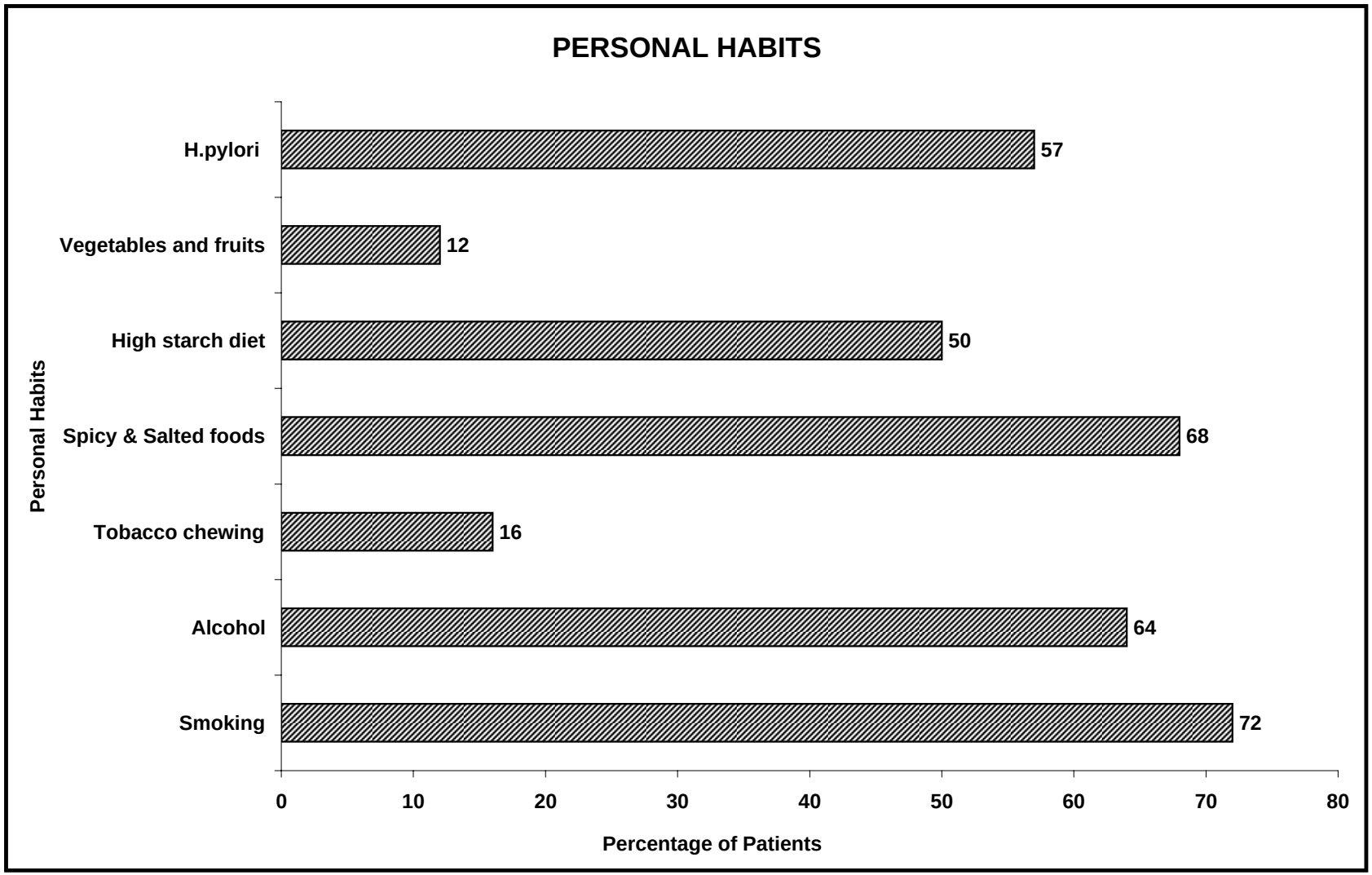
LIVER SECONDARIES

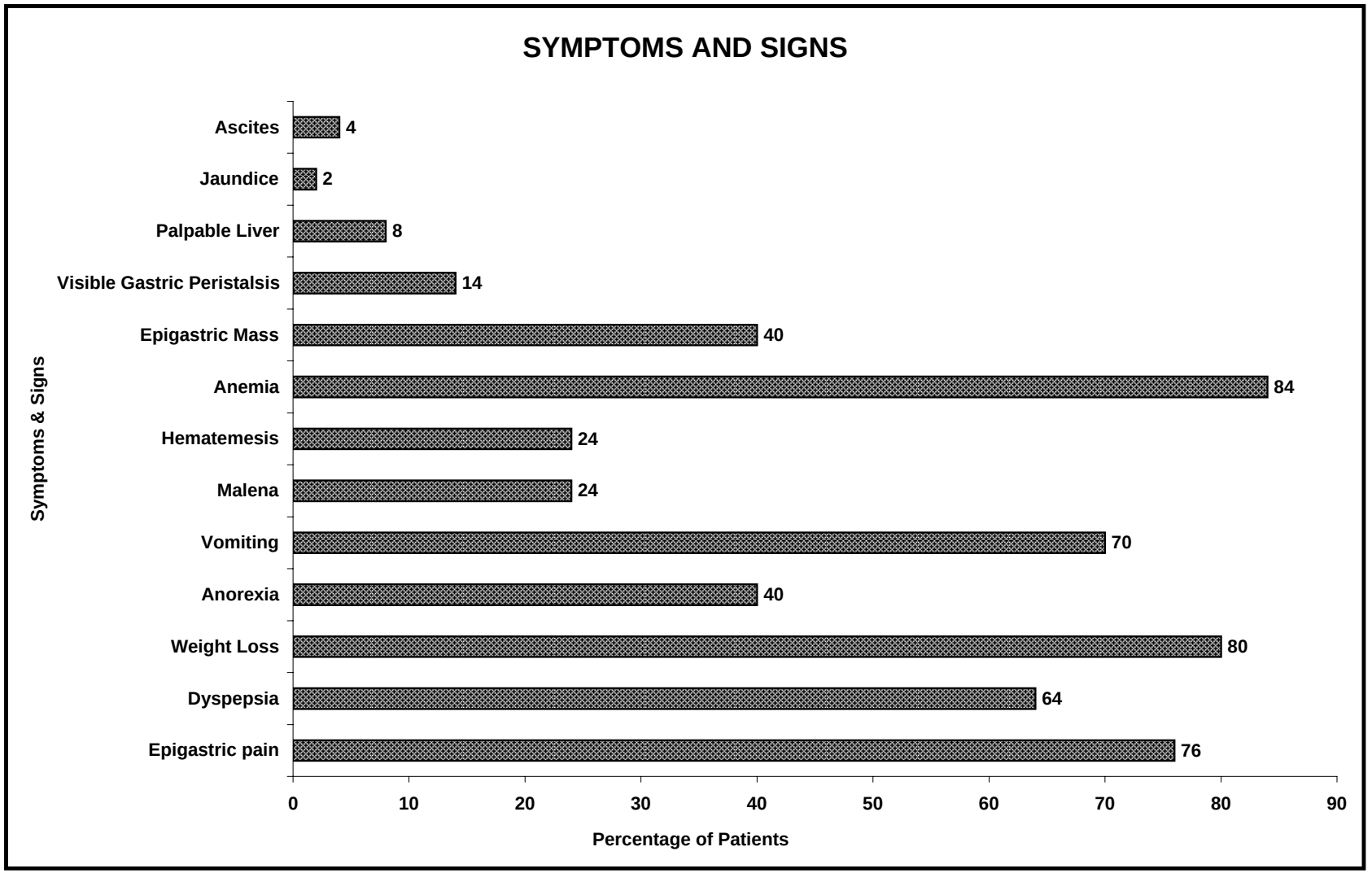


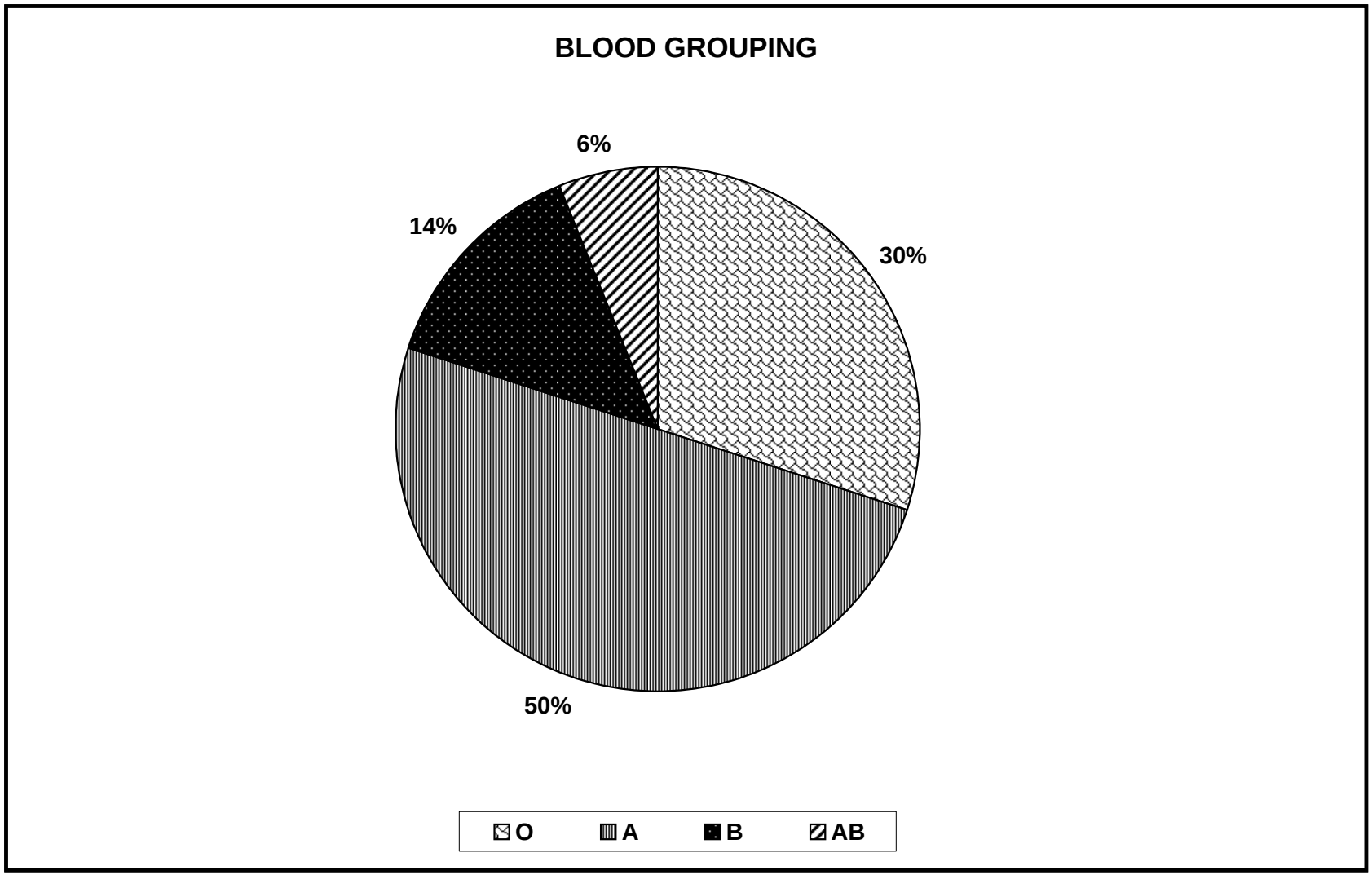

AGE AND SEX INCIDENCE
Number of Patients
0
1
2
3
4
5
6
7
8
9
10
0
1
5
4
10
3
10
4
9
3
1
0
<30
31-40
41-50
51-60
61-70
>70
Age in Years
Male
Female

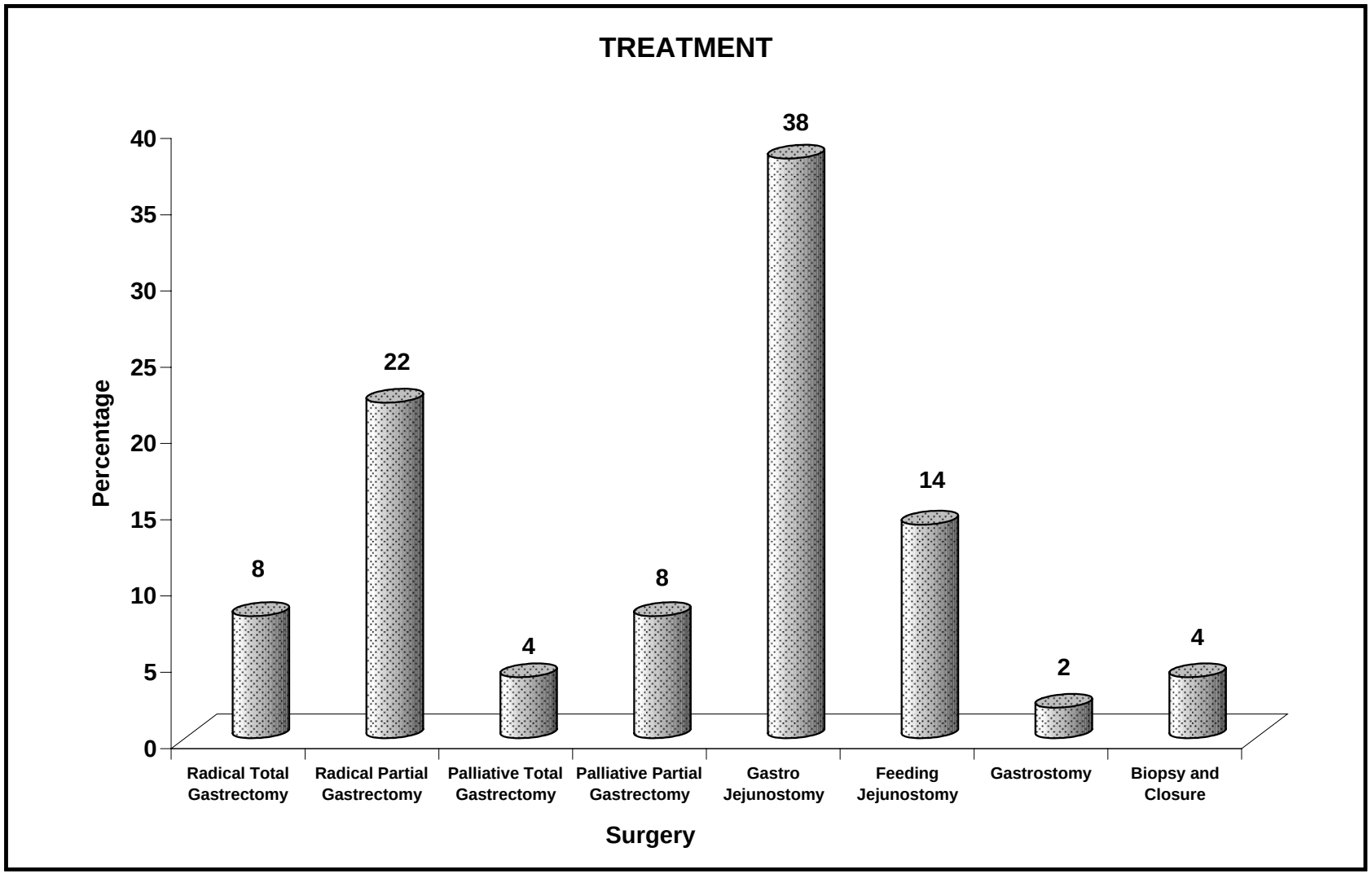
SOCIOECONOMIC STATUS

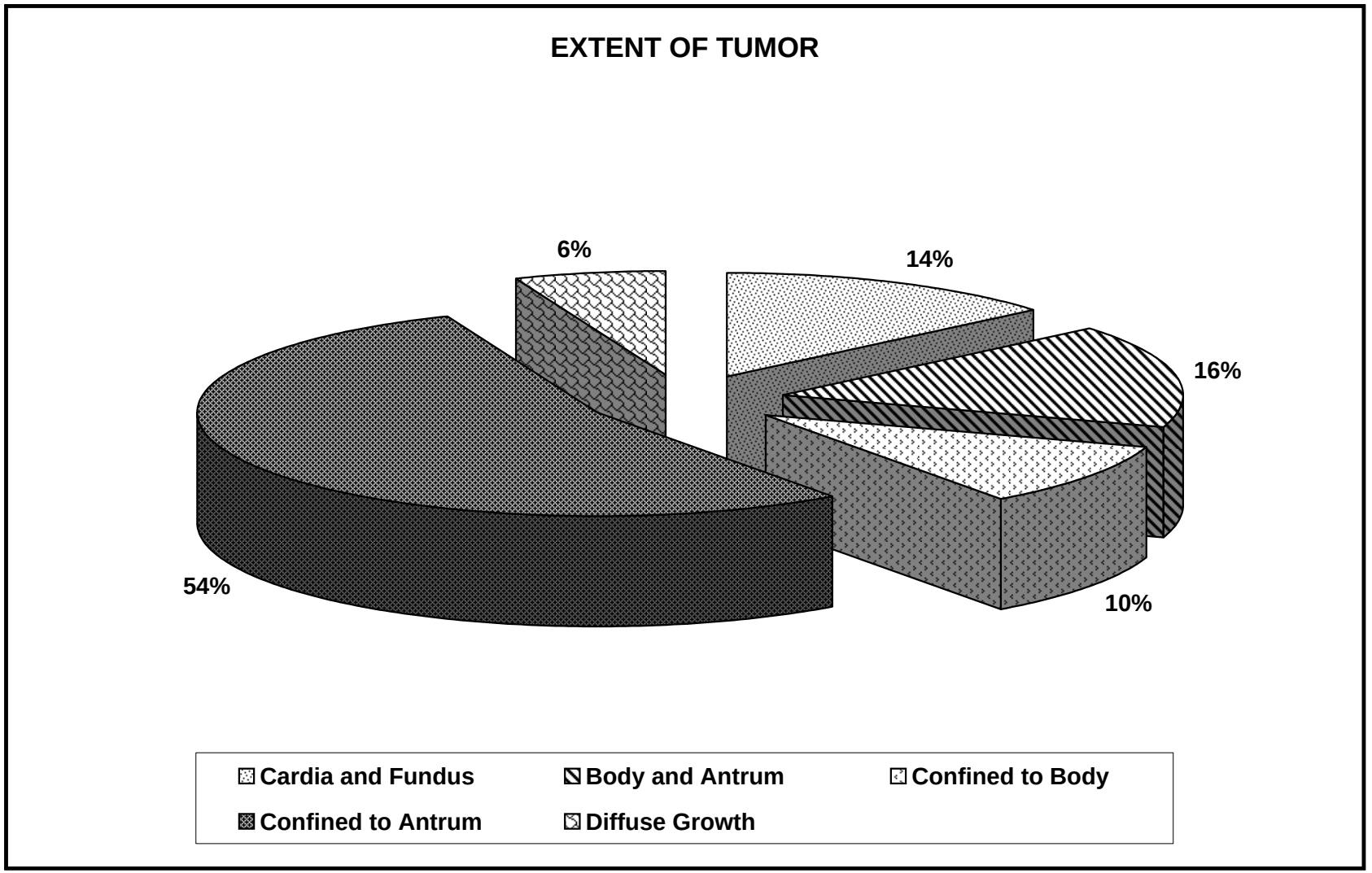


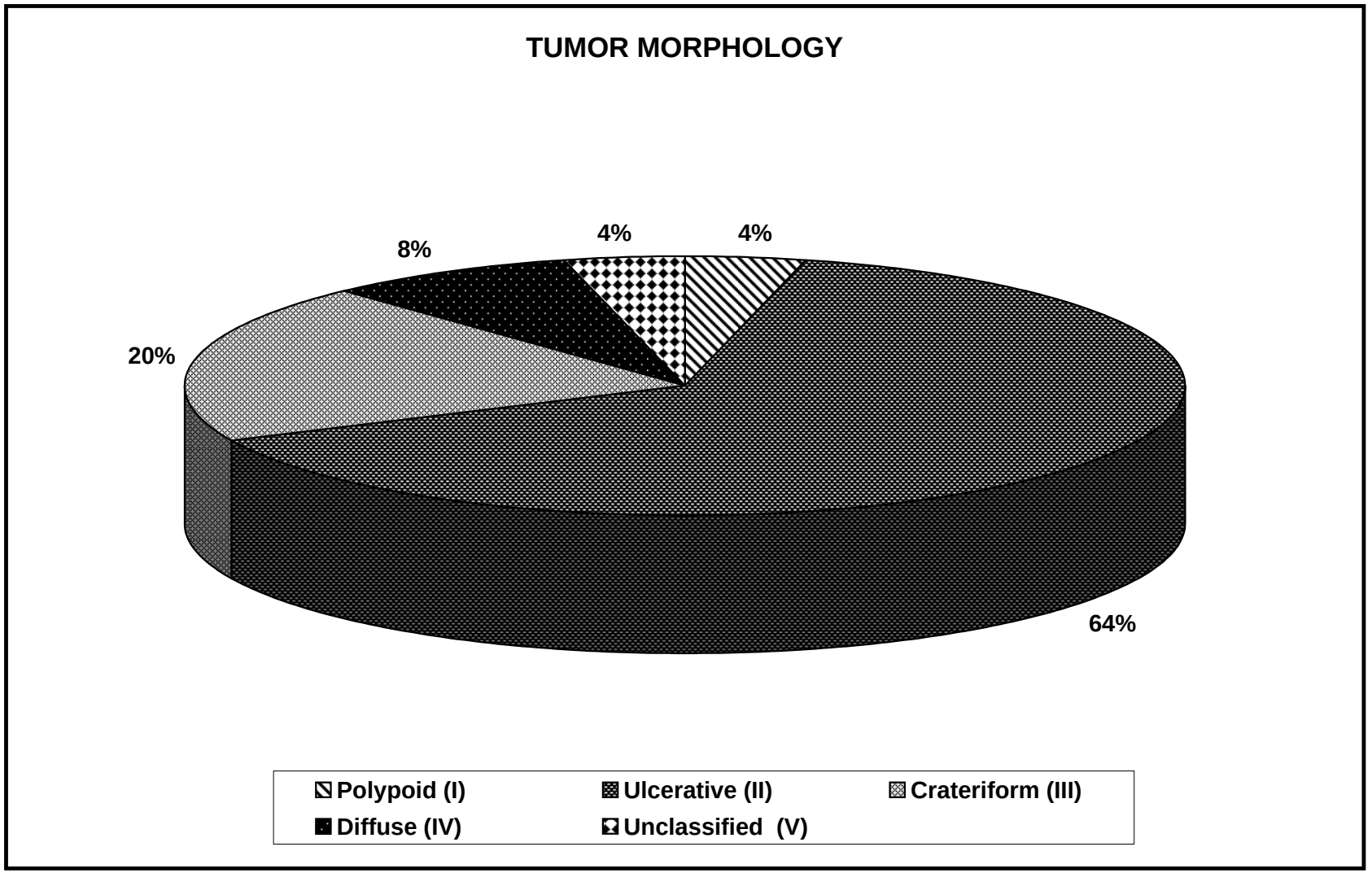

PERSONAL HABITS
H.pylori
Vegetables and fruits
High starch diet
Spicy & Salted foods
Tobacco chewing
Alcohol
Smoking
57
12
50
68
16
64
72
Personal Habits
0
10
20
30
40
50
60
70
80
Percentage of Patients


SYMPTOMS AND SIGNS
Symptoms & Signs
Ascites
4
Jaundice
2
Palpable Liver
8
Visible Gastric Peristalsis
14
Epigastric Mass
40
Anemia
84
Hematemesis
24
Malena
24
Vomiting
70
Anorexia
40
Weight Loss
80
Dyspepsia
64
Epigastric pain
76
0
10
20
30
40
50
60
70
80
90
Percentage of Patients

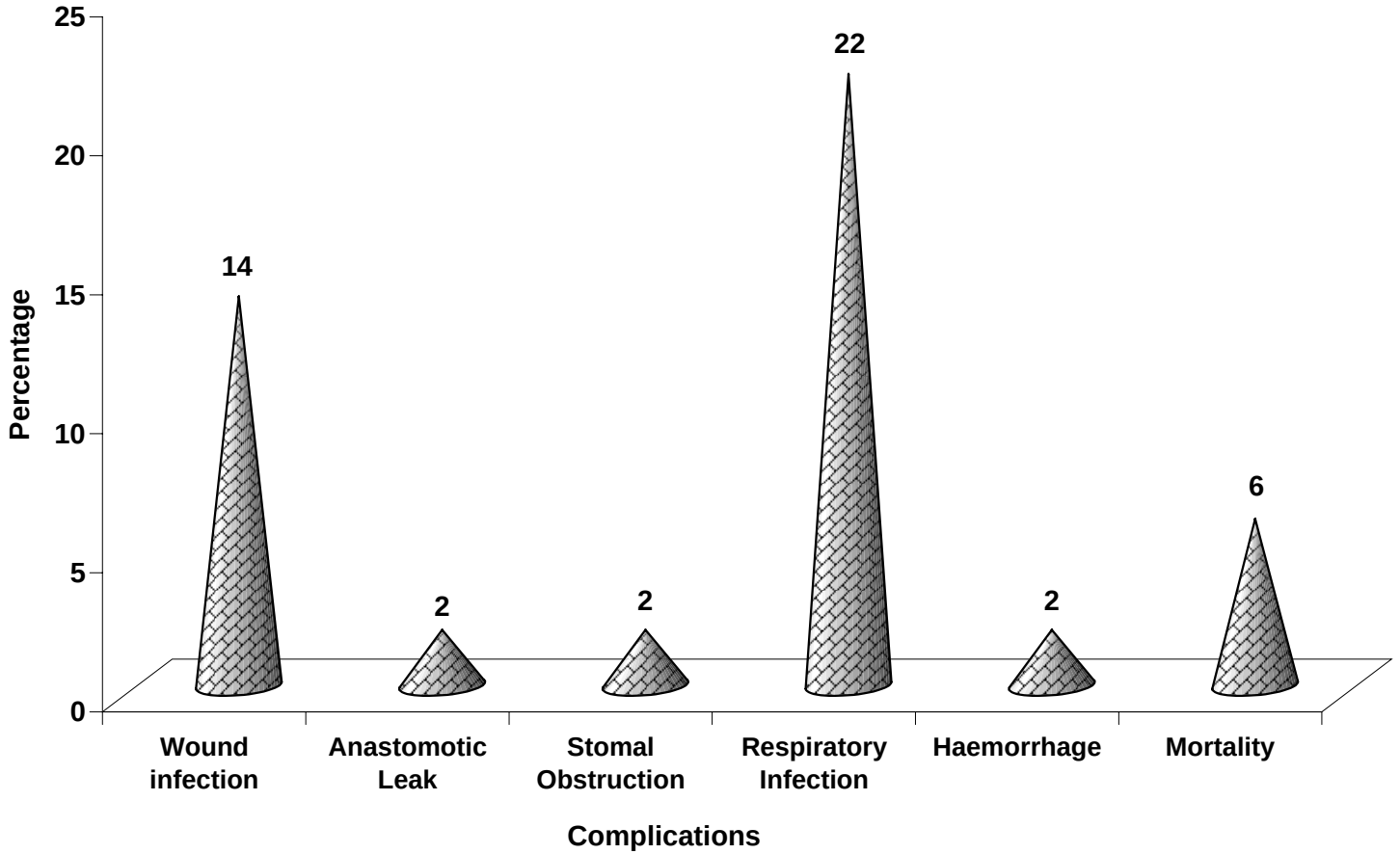

BLOOD GROUPING
6%
14%
30%
50%
O
A
B
AB


TREATMENT
Percentage
40
35
30
25
20
15
10
5
0
8
22
4
8
38
14
2
4
Radical Total Gastrectomy
Radical Partial Gastrectomy
Palliative Total Gastrectomy
Palliative Partial Gastrectomy
Gastro Jejunostomy
Feeding Jejunostomy
Gastrostomy
Biopsy and Closure
Surgery


EXTENT OF TUMOR
6%
14%
16%
54%
10%
Cardia and Fundus
Body and Antrum
Confined to Body
Confined to Antrum
Diffuse Growth


TUMOR MORPHOLOGY
4%
4%
8%
20%
64%
Polypoid (I)
Ulcerative (II)
Crateriform (III)
Diffuse (IV)
Unclassified (V)

POST OPERATIVE COMPLICATIONS



	Male	Female
<30	0	1
31-40	5	4
41-50	10	3
51-60	10	4
61-70	9	3
>70	1	0

Professional, Manager	6
Clerical Skills, Salesmen	12
Craftsmen	4
Semiskilled	8
Labourer	40
Farmer	30

Smoking	72
Alcohol	64
Tobacco chewing	16
Spicy & Salted foods	68
High starch diet	50
Vegetables and fruits	12
H.pylori	57

Epigastric pain	76
Dyspepsia	64
Weight Loss	80
Anorexia	40
Vomiting	70
Malena	24
Hematemesis	24
Anemia	84
Epigastric Mass	40
Visible Gastric Peristalsis	14
Palpable Liver	8
Jaundice	2
Ascites	4

O	30
A	50
B	14
AB	6

Radical Total Gastrectomy	8
Radical Partial Gastrectom	22
Palliative Total Gastrectom	4

Palliative Partial Gastrector	8
Gastro Jejunostomy	38
Feeding Jejunostomy	14
Gastrostomy	2
Biopsy and Closure	4
Cardia and Fundus	14
Body and Antrum	16
Confined to Body	10
Confined to Antrum	54
Diffuse Growth	6
Polypoid (I)	4
Ulcerative (II)	64
Crateriform (III)	20
Diffuse (IV)	8
Unclassified (V)	4
Wound infection	14
Anastomotic Leak	2
Stomal Obstruction	2
Respiratory Infection	22
Haemorrhage	2
Mortality	6

p