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Role of CT scan in diagnosis and staging of upper gastro intestinal malignancy

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Abstract
Introduction: The Gastrointestinal tract tumors are one of commonest cancers accounting for 11% of all cancer. Carcinoma of upper GI tract remains one of the most lethal of all cancers. The use of CT scanning has empowered the modern surgeon to treat patients more effectively, facilitating reduced morbidity and complications. This dissertation emphasizes the radiological findings for proper diagnosis and staging of upper GI malignancy based upon the revised international system classification scheme TNM.
Methods: 72 patients referred to the radiology department with chief complain of dysphagia, odynophagia, hematemesis, upper abdominal pain was evaluated by CTscan, referred from both IPD and OPD departments of Dhiraj Hospital. A follow up study of the diagnosis made by the CT scan was thence correlated with the histopathological diagnosis.
Results: The present study on 72 patients of upper GI malignancy with various risk factors were evaluated by CT scan. Staging was done to determine which patients may be suitable for surgical resection and finally the subtype of the carcinoma was confirmed by histopathological diagnosis. The most common site for Ca oesophagus is middle oesophagus (31.94%). Carcinoma lower one third of oesophagus was most commonly adenocarcinoma (94.1%), whereas carcinoma upper and middle one third of oesophagus was most commonly squamous cell carcinoma (78.3%). Upper GI malignancy, involving the stomach, comprises majority of the cases in fundal region (85.7 %).Upper GI malignancy involving duodenum is very less. Involvement of the adjacent structure was seen in 25%; Mediastinal nodes were seen in 6.94% Distant metastasis is present in 26%, most commonly involving the liver (19.4%).
Conclusion: CT is a useful diagnostic modality in the evaluation of the staging of carcinoma of upper GI tract and also for surgical planning to create Intra-operative road maps.

Keywords: CT scan, gastro intestinal malignancy

Introduction

Discussion

- The present study was conducted on 72 patients of upper GI malignancy with various risk factors and their evaluation by CT scan, along with staging and histopathological correlation.
- The main purpose of cross-sectional imaging studies in patients with known upper GI carcinoma is to stage the disease as accurately as possible to determine which patients may be suitable candidates for surgical resection.
- CT is considered complementary to barium studies and may be used to stage and follow up for tumors. CT may be used to define the local extent of tumor by showing the extent of involvement of the tumor and tumor invasion of the peripheral fat. All patients had undergone CT scan for assessment, the extent of involvement of wall of upper GI tract, tumour invasion of peri structural fat, adjacent structures, and involvement of regional or distant lymph nodes, and finally metastases to distant organs.
- CT scan cannot reliably delineate the individual layers of the wall and thus cannot differentiate T1 from T2 neoplasms, microscopic infiltration of wall (T3) can be present but not evident on CT scan.
- Tumour infiltration in to the adjacent structure (T4) is critical for patient management decisions; i.e.-direct invasion of the aorta and trachea, bronchial tree precludes surgical resection.
- CT scan is highly sensitive for detecting metastatic disease to liver, lungs, bone,

- suprarenal and ovaries.
- In the present study, most common age group is 50-60yrs (37.5%) followed by 25% in 60-70yrs age group, which was also seen with
- Cancer research UK (May 2012) and National Cancer Registry Ireland (2011) which showed upper GI malignancy is most common above 60 yrs. And also in study of Epidemiologic features of upper gastrointestinal tract cancers in Northeastern Iran. F Islami [1], F Kamangar [2], K Aghcheli [1], S Fahimi [1], S Semnani [3], N Taghavi [1], H A Marjani[1], where Oesophageal and gastric cancers occur mainly in people over 55 years of age.
- Upper GI malignancy is more common in males (59.7%) than in females (40.4%), comprising a ratio of

2.1. Same result was also seen by

- Cancer research UK (May 2012) and National Cancer Registry Ireland (2011) male/female ratio is almost 2:1.
- Most common presenting compliant seen was dysphagia (87.5%) and odynophagia (80.6%), followed by weight loss (52.8%), regurgitation (38%), loss of appetite (16.7%) and hematemesis (11.1%).
- Amongst the etiological factors, history of tobacco smoking/chewing have an high incidence of squamous cell carcinoma (53.1%) and incidence of adenocarcinoma (37.5 %.) Incidence of tobacco smoking/chewing in patients with upper GI malignancy is 44.44%. In males it is 90.6% and in females it is 9.4%.
- Similar study also shows most common etiology for esophageal SCC is attributed to alcohol and tobacco consumption- Cancer risk associated with alcohol and tobacco use: focus on upper aerodigestive tract and liver Claudio Pelucchi, Sc.D.; Silvano Gallus, Sc.D.; Werner Garavello, M.D.; Cristina Bosetti, Sc.D.; and Carlo La Vecchia.
- In the present study gastro-oesophageal reflux disease (GERD) is most common etiological factor for Adeno carcinoma involving GE junction. Incidence of GERD in patients with upper GI malignancy is 36.11%. In males it is 76.9% and in females it is 23.1%.There was low incidence of squamous cell carcinoma (11.5%) as in comparison to incidence of adenocarcinoma (88.5%) on histology. Same result was also seen in
- Study of -Management of oesophageal and gastric cancerA national clinical guideline;Scottish Intercollegiate Guidelines Network ISBN 1 899893 59 8.
- The most common site for Ca oesophagus is middle oesophagus (31.94%) followed by lower-GE junction (23.61%), and upper (8.33%); mid-lower (6.97%), seen in the present study. Carcinoma lower one third of oesophagus was most commonly adenocarcinoma (94.1%), whereas carcinoma upper and middle one third of oesophagus was most commonly squamous cell carcinoma (78.3%) on histopathological reports.
- Same result was also seen in - Epidemiologic features of upper gastrointestinal tract cancers in Northeastern IranF Islami [1], F Kamangar [2], K Aghcheli [1], S Fahimi [1], S Semnani [3], N Taghavi [1], H A Marjani [1] Among the initial 682 patients seen at Atrak Clinic, 370 were confirmed histologically to have cancer, including 223. (60%) oesophageal squamous cell cancers (ESCC), 22 (6%) oesophageal adenocarcinomas (EAC), 58 (16%) gastric cardia adenocarcinomas (GCA), and 58 (16%) gastric noncardia adenocarcinomas.
- In the present study of Upper GI malignancy, involving the stomach, most common Carcinoma of stomach is adenocarcinoma, in which fundus region comprises majority of the cases (85.7 %).
- **Similar study was seen in:** Case study of stomach adenocarcinoma conducted at a cancer referral hospital in northern Brazil. Vinagre RM[1], Campos BP, Sousa RM- shows Adenocarcinoma accounted for 95.4% of all cases.
- In Upper GI malignancy involving duodenum is very less (1.41%).
- In present study, esophageal wall thickness of less than 10mm was seen in 4 patients, between 10-20 mm in 45 patients and more than 20mm in 5 patients. Wall thickening involving stomach was seen in most of the patients, involving more than 20 mm.
- Gastro-esophageal junction involvement was seen in 30% and on histology it was mostly adenocarcinoma (90.9%).
- Involvement of the adjacent structure was seen in 25%; most commonly having loss of fat plane to adjacent structure (8.33%), followed by descending aorta in 6.94% of patients.
- Mediastinal nodes were seen in 6.94% in patients involving upper GI malignancy. Peritoneal nodes were seen in 32%, most commonly involving the celiac nodes (14.67%).
- Distant metastasis is present in 26%. Most commonly involving the liver (19.4%), Pulmonary metastasis in 12.5%, followed by bony metastasis (3%).
- **Similar study was seen in:** Preoperative staging of esophageal cancer: comparison of endoscopic US and dynamic CT.Botet JF[1], Lightdale CJ, Zauber AG, Gerdes H, Urmacher C, Brennan MF. CT was more accurate [90%] than endoscopy US to detect distant metastases.
- In the present study ascitis is seen in 6.9%, Pleural effusion in 4.2%.
- In the present study most of the patients of carcinoma stomach were in the stage IV. Same result was also seen in -
- Case study of stomach adenocarcinoma conducted at a cancer referral hospital in northern Brazil. Vinagre RM[1], Campos BP, Sousa RM. In which most patients had stage IIIB and IV tumors.
- Histologically most common subtype involving upper GI malignancy in the present study was adenocarcinoma (47%), followed by squamous cell carcinoma (44%).
- **Same result was seen in:** Study done by Cancer research UK (May 2012) and National Cancer Registry Ireland (2011) which showed that histologically most common subtype was squamous cell carcinoma followed by adenocarcinoma.
- In the present study, most common staging among squamous cell carcinoma was in stage I (34.4%), whereas in adenocarcinoma type, most common staging was in stage IV (44.1%) involving the upper GI malignancy.

Table 1: Demographic Profile

Age group	Frequency	Percent
30-40	7	9.7
40-50	15	20.8
50-60	27	37.5
60-70	18	25.0
70-80	3	4.2
>80	2	2.8
Total	72	100.0

Most common age group in our study is 50-60 yrs (37.5%) followed and 60-70yrs having incidence of 25%. Same result was also seen with Cancer research UK (May 2012) and National Cancer Registry Ireland (2011) shows upper GI malignancy is most common above 60 yrs.

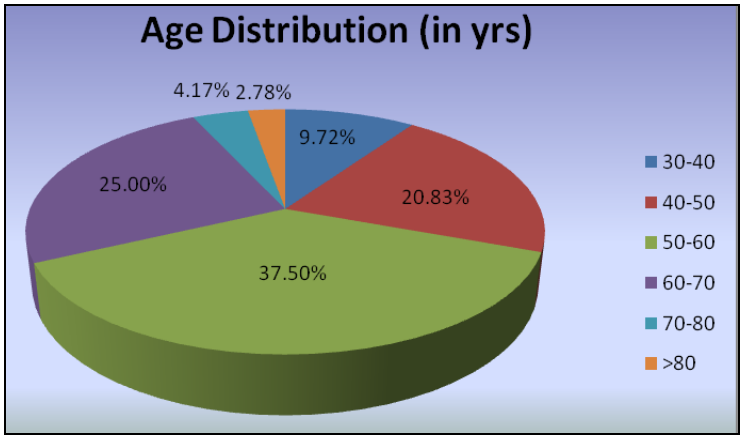


Chart 1: Demographic Profile

Table 2: Sex Distribution

Sex	Frequency	Percent
F	29	40.3
M	43	59.7
Total	72	100.0

1. In our study upper GI malignency is more common in males (59.7%) than in females (40.4%) which is a ratio of 2:1.
   - The study done by Cancer research UK (May 2012) and National Cancer Registry Ireland (2011) shows male/female ratio is almost 2:1.

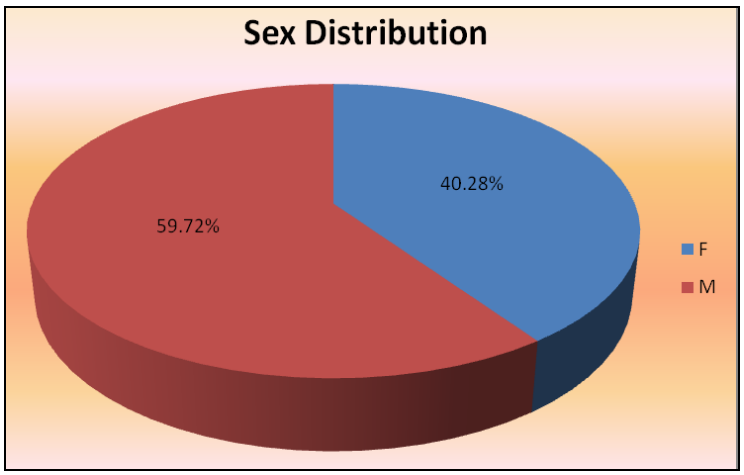


Chart 2: Sex Distribution

Table 3: Incidence of Chief Complaints

Chief complaints	Present	Percentage
Dysphagia	63	87.5
Odyaphagia	58	80.6
Weight Loss	38	52.8
Regurgitation	28	38.9
Loss of appetite	12	16.7
Haematemesis	8	11.1

1) Most common presenting compliant is dysphagia (87.5%) and odynophagia (80.6%) followed by weight loss (52.8%) followed by regurgitation (38%), loss of appetite (16.7%), hematemesis (11.1%)

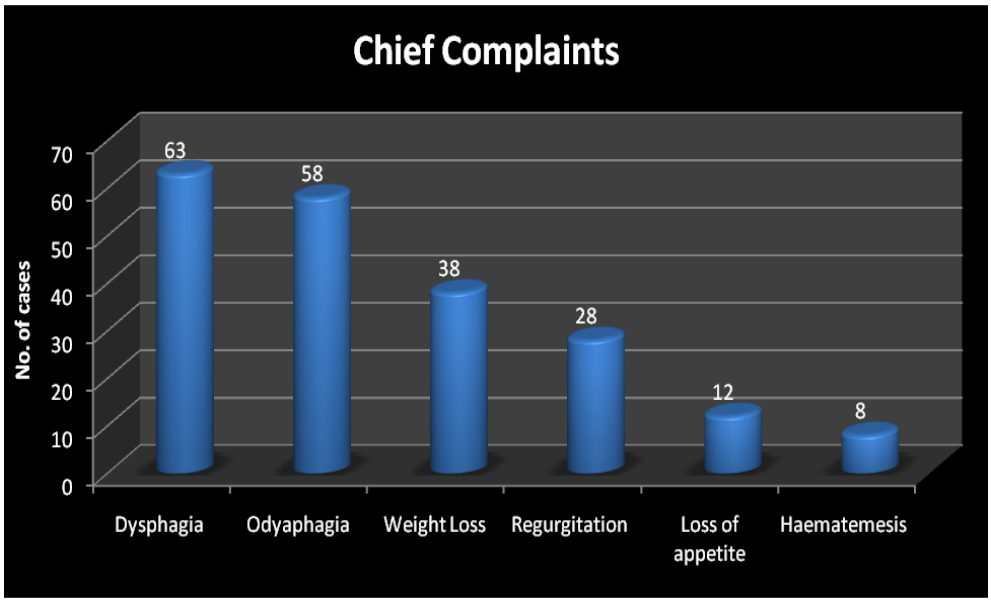


Chart 3: Incidence of Chief Complaints

Table 4: History of Tobacco Chewing/ Smoking in Upper Gi Malignency

Tobacco addiction	Total	Male	Female	Squamous Cellcarcinoma	Adenocarcinoma
Present	32(44.44)	29(90.6)	3(9.4)	17(53.1)	12(37.5)
Absent	40(55.56)	14(35.0)	26(65.0)		

1) In our study tobacco smoking/chewing is the most common etiological factor for squamous cell carcinoma.
2) In our study patients having history of tobacco smoking/chewing have an incidence of squamous cell carcinoma as 53.1% and incidence of adenocarcinoma as 37.5%.
3) Incidence of tobacco smoking/chewing in patients with upper GI malignancy is 44.44%. In males it is 90.6% and in females it is 9.4%.

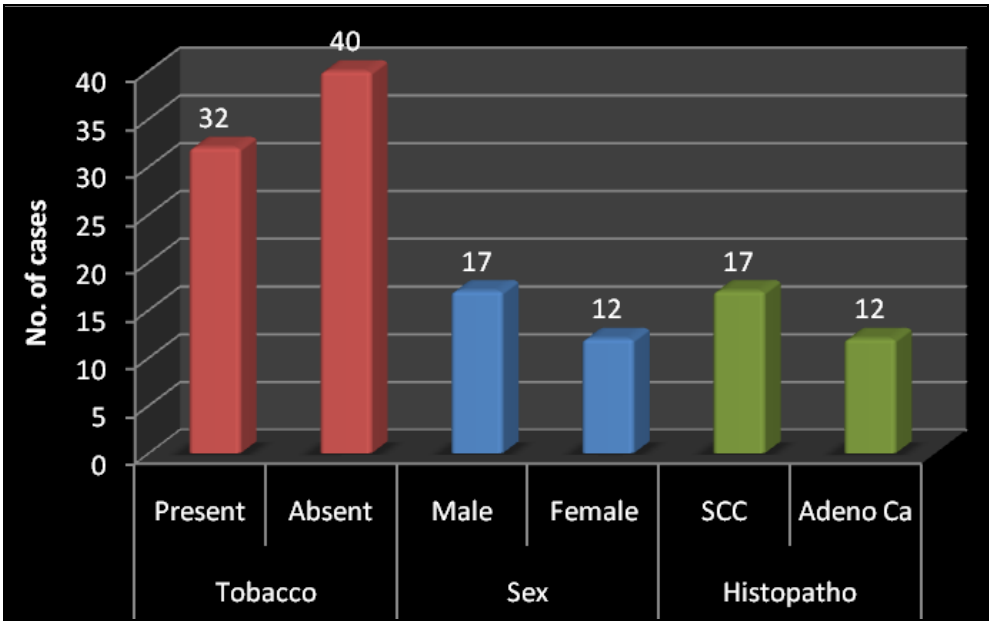


Chart 4: History of Tobacco Chewing/ Smoking in Upper Gi Malignancy

Table 5: Incidence of Gastro -Oesophageal Reflux Disease in Upper Gi Malignancy

GERD	Total	Male	Female	Squamous Cell carcinoma	Adenocarcinoma
Present	26(36.11)	20(76.9)	6(23.1)	3(11.5)	23(88.5)
Absent	46(63.89)	23(50.0)	23(50.0)		

In our study gastro-oesophageal reflux disease (GERD) is most common etiological factor for Adeno carcinoma.

1) incidence of 11.5% as squamous cell carcinoma and incidence of 88.5% as adenocarcinoma on histology.
2) In our study incidence of GERD in patients with upper GI malignancy is 36.11%. In males it is 76.9% and in females it is 23.1%.

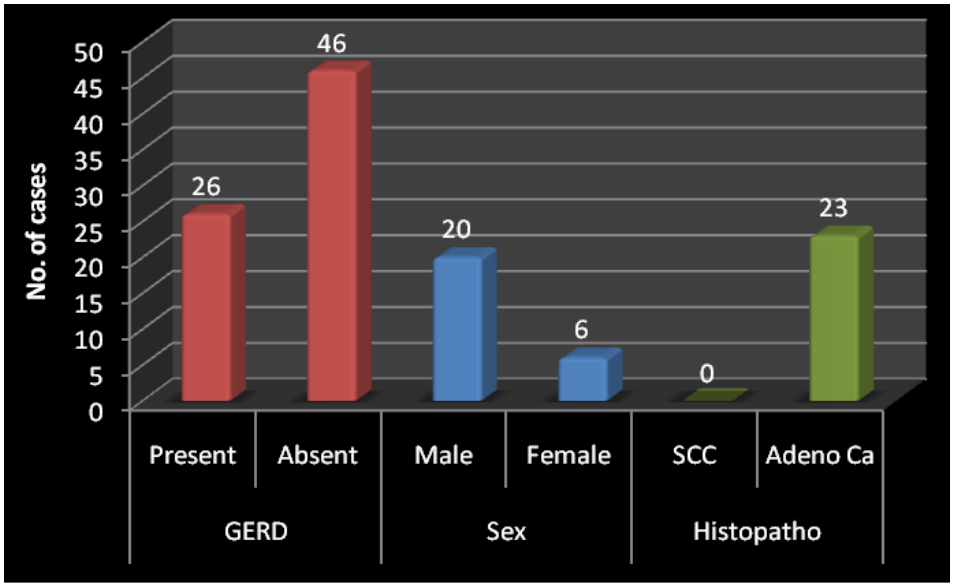


Chart 5: Incidence of Gastro -Oesophageal Reflux Disease in Upper Gi Malignancy

Table 6: Different Sites of Carcinoma Oesophagus

esoPhagus Sites	Total	Male	Female	Squamous Cellcarcinoma	Adenocarcinoma
A	6(8.33)	5(83.3)	1(16.7)	4(66.7)	1(16.7)
B	23(31.94)	14(60.9)	9(39.1)	18(78.3)	4(17.4)
C	4(5.56)	3(75.0)	1(25.0)	3(75.0)	1(25.0)
D	2(2.78)	0(0)	2(100)	0(0)	2(100)
AB	1(1.39)	0(0)	1(100)	1(100)	0(0)
BC	5(6.94)	2(40.0)	3(60.0)	5(100)	0(0)
CD	17(23.61)	10(58.8)	7(41.2)	0(0)	16(94.1)
BCD	4(5.56)	2(50.0)	2(50.0)	1(25.0)	3(75.0)

A: Upper, B:Middle, C:Lower, D:GE Junction

1) In my study, the most common site for Ca oesophagus is middle oesophagus (31.94%) followed by lower-GE junction (23.61%), and upper (8.33%); mid-lower (6.97%)
2) In our study carcinoma lower one third of oesophagus was most commonly adenocarcinoma (94.1%) whereas carcinoma middle one third of oesophagus was most commonly squamous cell carcinoma (78.3%) on histopathological reports.
3) In our study Ca middle oesophagus shows an incidence of 60.9% in males and 39.1% in females.
4) In our study Ca lower-GE junction oesophagus shows an incidence of 58.8% in males and 41.2% in females.

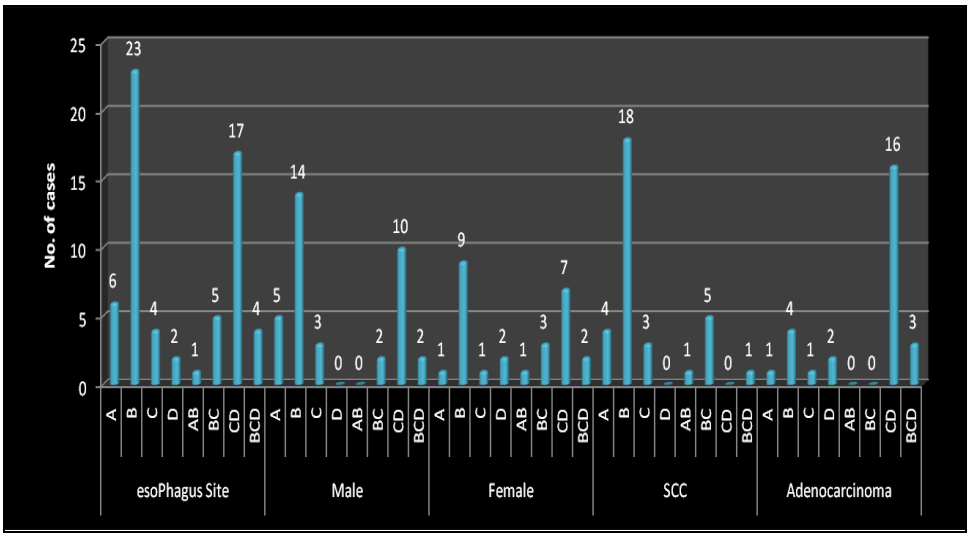


Chart 6: Different Sites of Carcinoma Oesophagus

Table 7: Different Sites of Carcinoma of Stomach

Stomach Sites	Total	Male	Female	Squamous Cell carcinoma	Adenocarcinoma
A	1(1.39)	1(100)	0(0)	0(0)	0(0)
C	7(9.72)	3(42.9)	4(57.1)	0(0)	6(85.7)
D	4(5.56)	3(75.0)	1(25.0)	0(0)	4(100)
AB	1(1.39)	0(0)	1(100)	0(0)	0(0)
AD	1(1.39)	1(100)	0(0)	0(0)	1(100)
BD	1(1.39)	1(100)	0(0)	0(0)	1(100)
ABD	1(1.39)	0(0)	1(100)	0(0)	1(100)
ABCD	2(2.78)	1(50.0)	1(50.0)	0(0)	1(100)

A: Body, B:Antrum, C: Fundus, D:Pylorus

In my study of Upper GI malignancy, the most common Ca of stomach is adenocarcinoma, in which fundus region of stomach comprises majority of the cases (85.7 %).

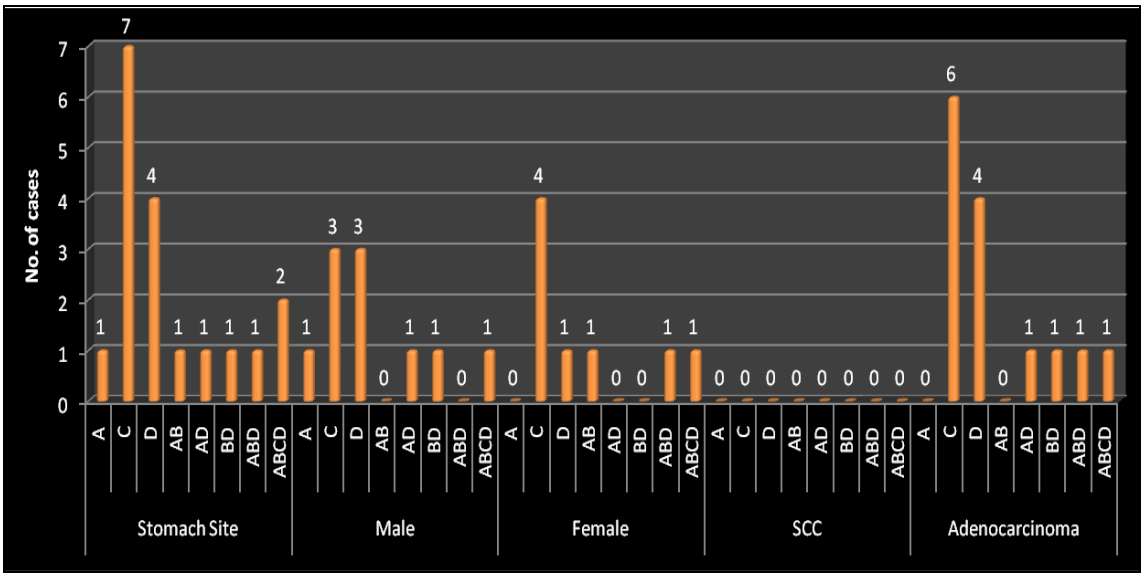


Chart 7: Different Sites of Carcinoma of Stomach

Table 8: Incidence of Carcinoma of Duodenum

Duodenum Sites	Total	Male	Female	Squamous Cellcarcinoma	Adenocarcinoma
Absent	71(98.59)				
Present	1(1.41)	1(100)	0(0)	0(0)	1(100)

1) In my study of Upper GI malignancy involving duodenum is very less (1.41%), which was confirmed on histopathology as adenocarcinoma.

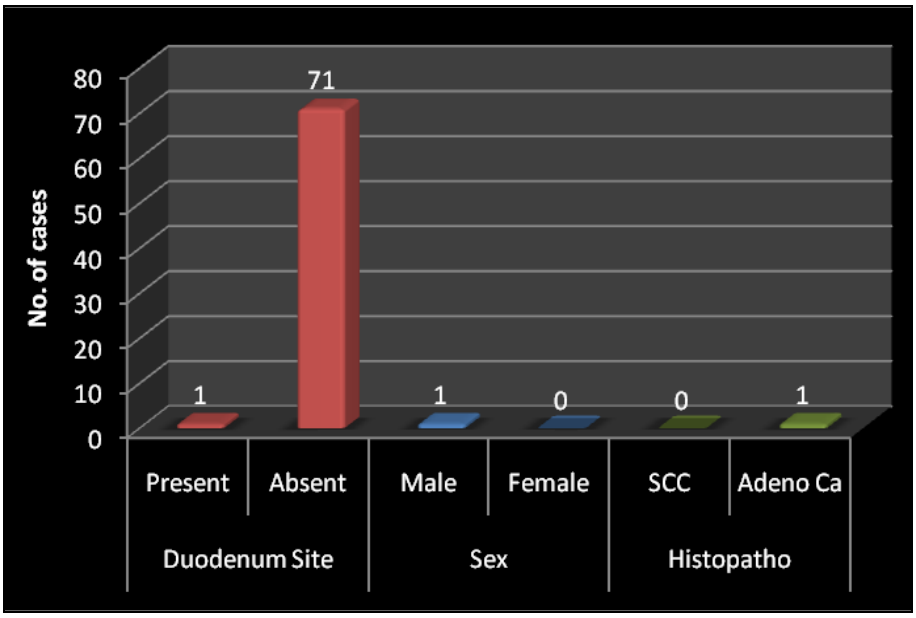


Chart 8: Incidence of Carcinoma of Duodenum

Table 9: Incidence of Wall Thickening In Ct Finding

No. of cases	Wall Thickning	<10mm	10-20mm	>20mm
1.	ESOPHAGUS	4(7.40%)	45(83.3%)	5(9.25%)
2.	STOMACH		5(23.53%)	13(76.47)
3.	DUODENUM			1(100%)

In present study, esophageal wall thickness of less than 10mm was seen in 4 patients, between 10-20 mm in 45 patients and more than 20mm in 5 patients. Wall thickening involving stomach was seen in most of the patients, involving more than 20 mm.

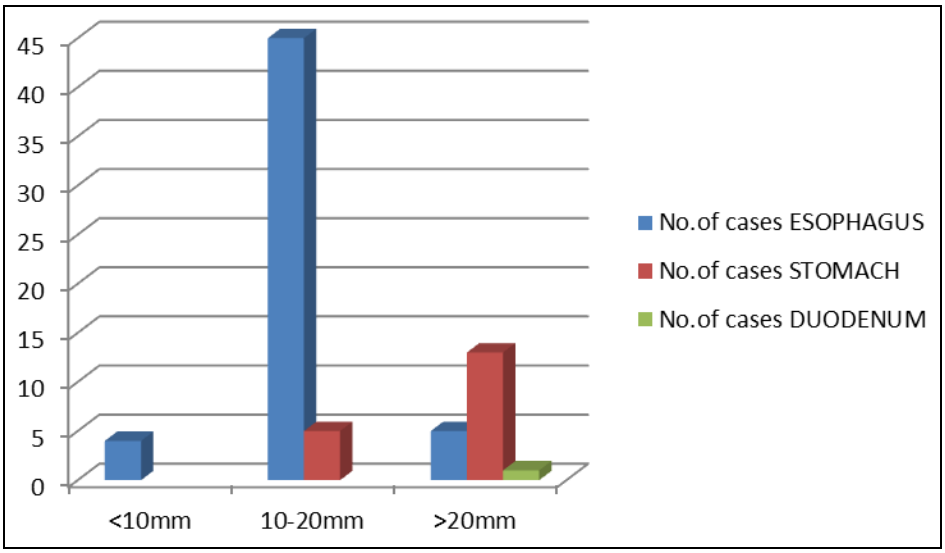


Chart 9: Incidence of Wall Thickening In Ct Finding

Table 10: Incidince of Proximal Dilatation on Ct Findings

Proximal Dilatation OF	Positive cases	Percentage
esophagus	57	76.0
Stomach	1	1.33

In present study, proximal dilationation present in mostly in esophagal region

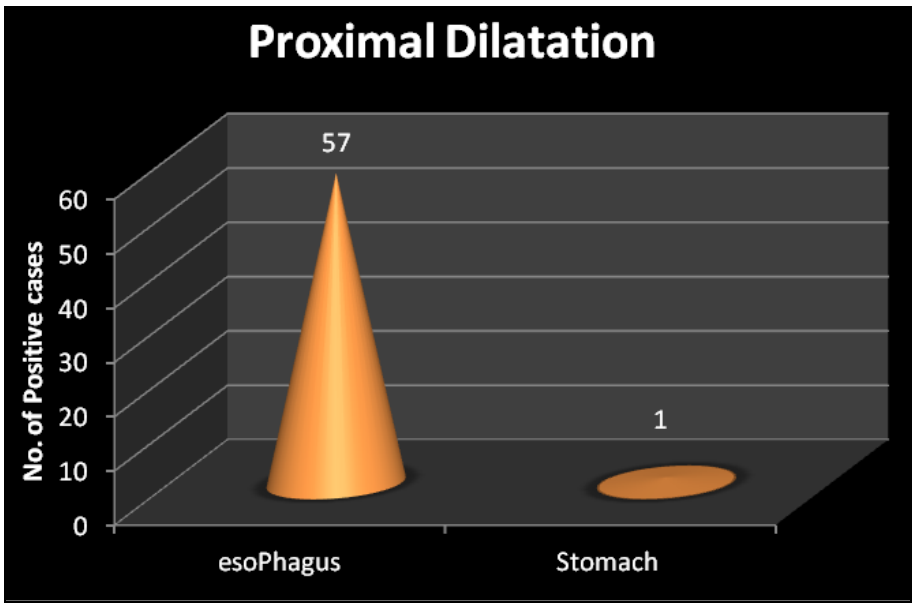


Chart 10: Incidince of Proximal Dilatation on Ct Findings

Table 11: Incidence of Gasto-Oesophageal Junction Involvement and Prevelance of Adeno Carcinoma in Them.

GE Junction	SCC	Adenocarcinoma
Involved	1(4.55)	20(90.9)

1) Gastro-oesophageal junctional involvement was seen in 30% of our cases and on histology it was mostly adenocarcinoma having an incidence of 90.9%.

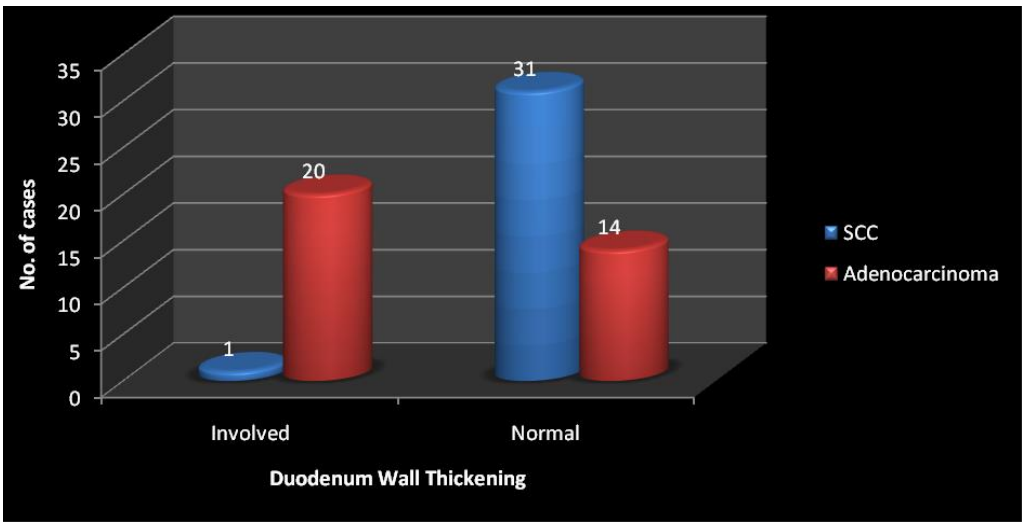


Chart 12: Incidence of Gasto-Oesophageal Junction Involvement and Prevalence of Adeno Carcinoma in Them.

Table 13: Incidence of Adjacent Structure Involvement

Adjacent structure involvement	No. of cases	Percentage
Descending aorta	5	6.94
Lt Atrium	2	2.78
Inferior venacava	1	1.39
Lobe of liver	1	1.39
Posterior pericardium	1	1.39
Narrowing of Rt main bronchus	1	1.39
Duodenum	1	1.39
Loss of fat plane	6	8.33

1) Involvement of the adjacent structure was seen in 25% of our cases; most commonly having loss of fat plane to adjacent structure 8.33% of cases followed by descending aorta 6.94% of cases.

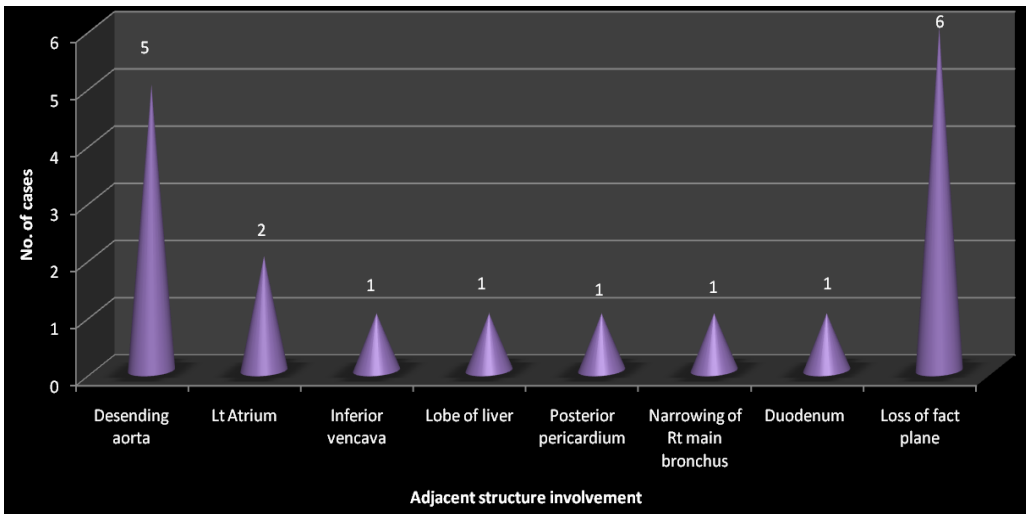


Chart 13: Incidence of Adjacent Structure Involvement

Table 14: Incidence of Involvement of Mediastinal Nodes

Mediastinal Nodes	No. of cases	Percentage
Present	5	6.94
Absent	67	93.06

1) Mediastinal nodes were seen in 6.94% of cases, in 72 patients involving upper GI malignancy.

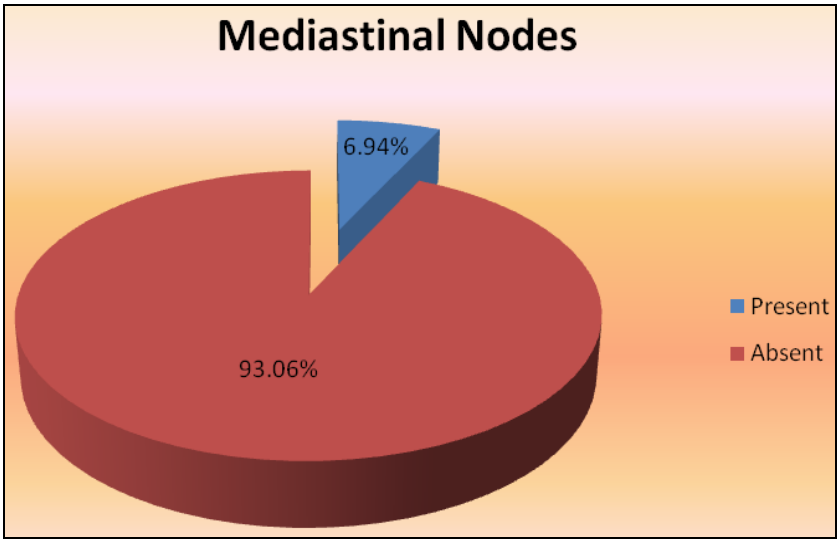
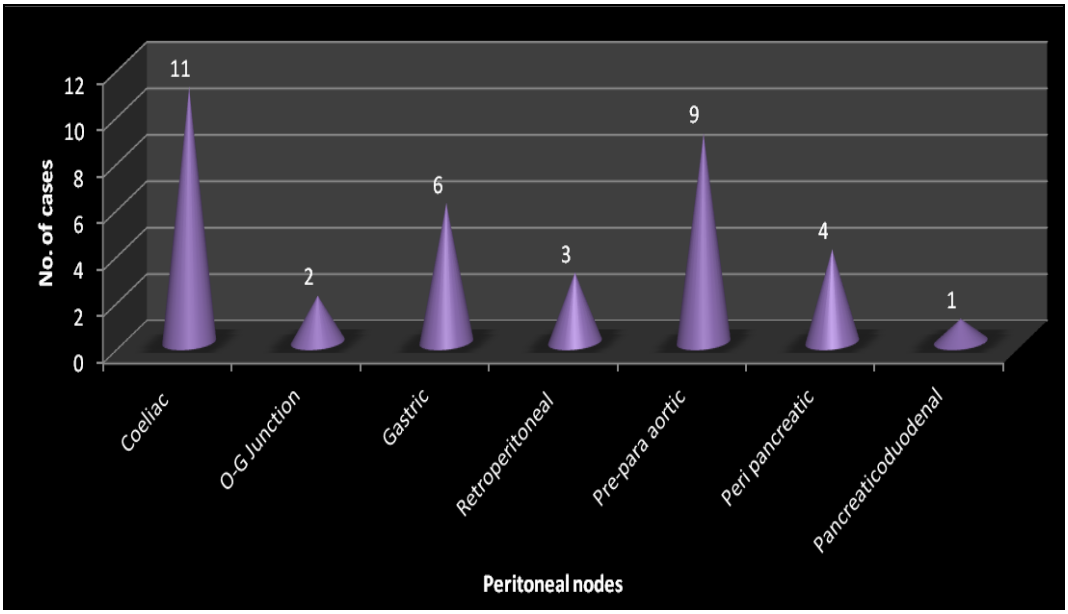


Chart 14: Incidence of Involvement of Mediastinal Nodes

Table 15: Incidence of Involvement of Peritoneal Nodes

Peritoneal nodes	Frequency	Percentage
Coeliac	11	14.67
O-G Junction	2	2.67
Gastric	6	8.0
Retroperitoneal	3	4.0
Pre-para aortic	9	12.0
Peri pancreatic	4	5.33
Pancreaticoduodenal	1	1.33

1) Peritoneal nodes were seen in 31% of our cases. 14.67% of cases. Most commonly involving the celiac nodes seen in



Peritoneal Nodes

Chart 15: Incidence of Involvement Of

Table 16: Incidence of Distant Metastasis and Most Commonly Involved Sites in Upper Gi Malignancy

Distant Metastasis	No. of cases	Percentage
Liver Mets	14	19.44
Bony Mets	2	2.78
Ovarian Mets	1	1.4
Peritoneal Mets	1	1.4
SuPrarenal Mets	1	1.4

Distant metastasis is present in 26% of our cases; Most commonly involving the liver seen in 19.4% of cases followed by bony metastasis seen in 3% of cases.

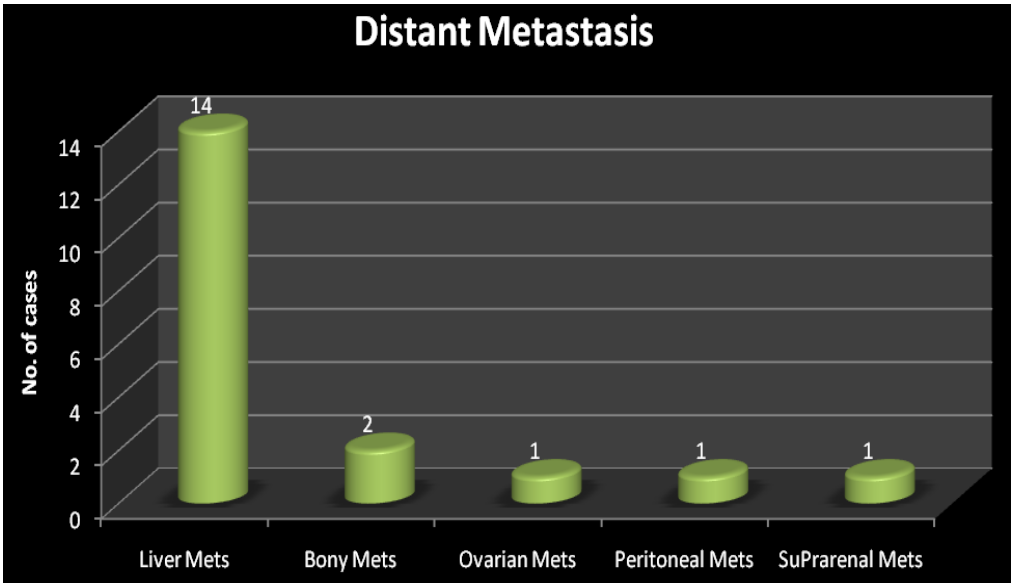


Chart 16: Incidence Of Distant Metastasis And Most Commonly Involved Sites In Upper Gi Malignancy.

Table 17: Incidence of Presence of Pulmonary Metastasis

Pulmonary Metastasis	No. of cases	Percentage
Present	9	12.5
Absent	63	87.5

1) In our study pulmonary metastasis is seen in 12.5% of cases.

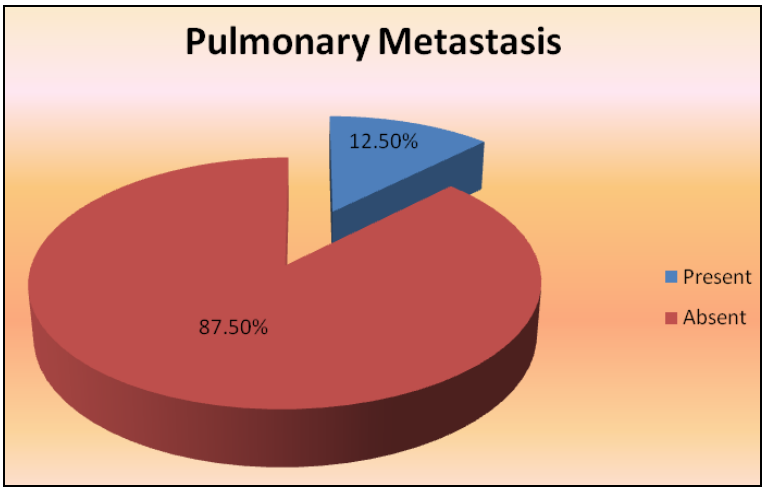


Chart 17: incidence of presence of pulmonary metastasis

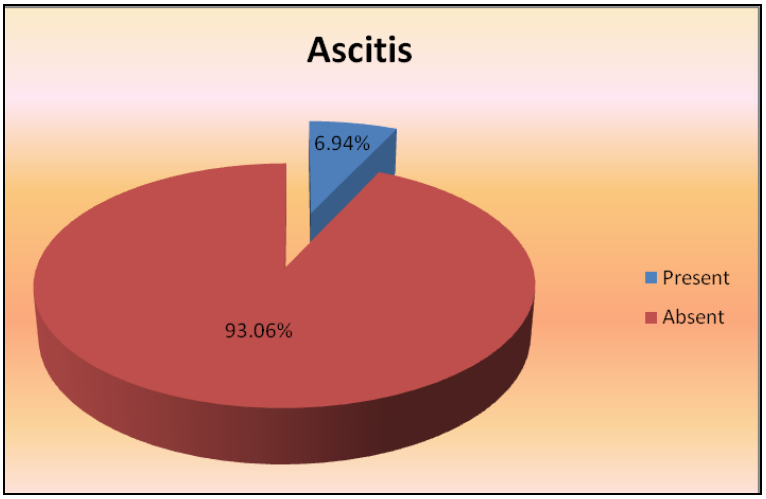


Chart 18: Incidence of Presence of Ascitis

Table 19: Incidence of Pleural Effusion in Upper Gi Malignancy

Pleural Effusion	No. of cases	Percentage
Bilateral	1	1.4
Right Side	2	2.8
Absent	69	95.8

Pleural effusion is seen in 4.2% of cases most commonly on right side.

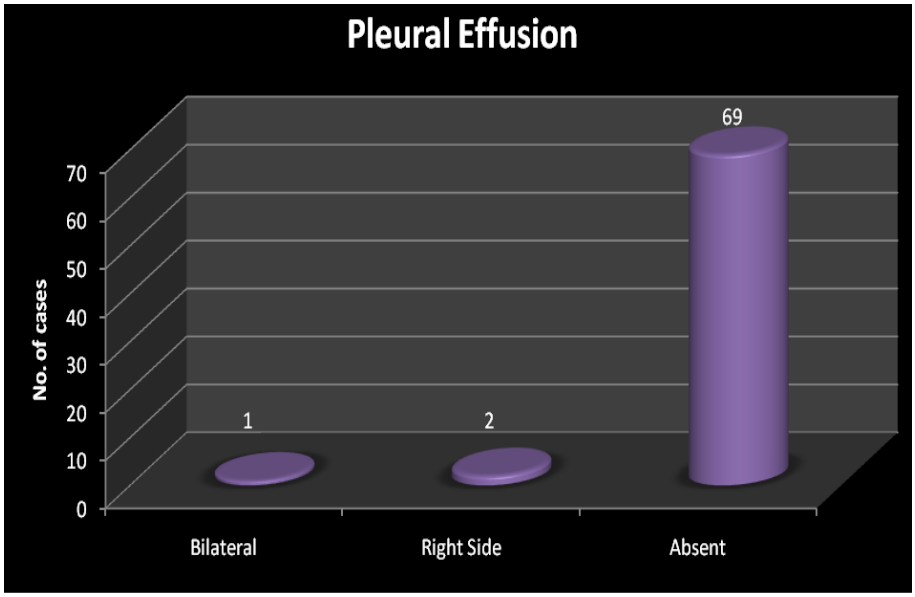


Chart 19: Incidence of Pleural Effusion in Upper Gi Malignancy

Table 20: Staging of Upper Gi Malignancy

Staging	Frequency	Percent
I	18	25.0
II	13	18.1
III	15	20.8
IV	26	36.1
Total	72	100.0

1) Patients coming to our department were mostly in stage IV (36.1%) of disease followed by stage I(25%).

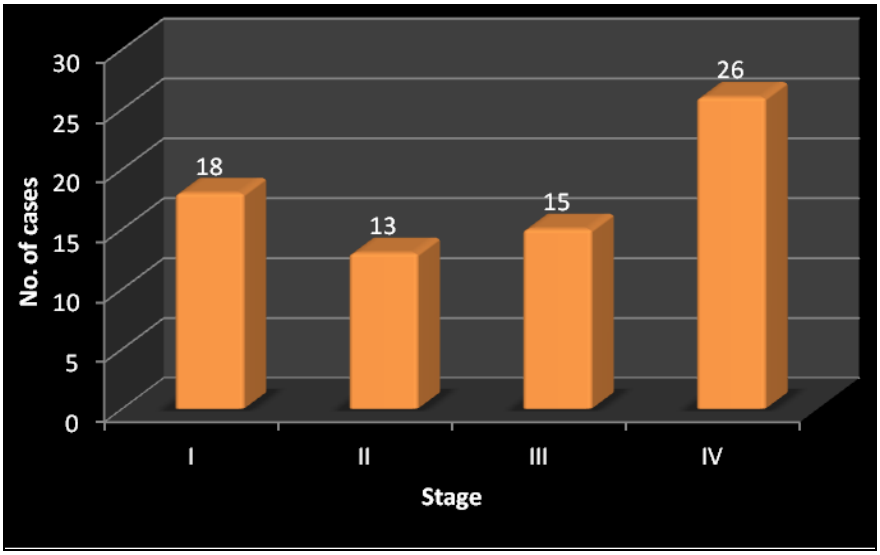


Chart 20: Staging of Upper Gi Malignancy

Table 21: Prevelance of Histological Subtypes in Upper Gi Malignancy With Respect To Sex Distrubution

HistoPathology	Total	Male	Female
Adeno Ca	34(47.22)	22(64.7)	12(35.29)
Gastrointestinal cell tumour	4(5.56)	3(75)	1(25)
linitus Plastica	1(1.39)	1(100)	0(0)
LymPhoma	1(1.39)	0(0)	1(100)
Squamous cell Ca	32(44.45)	17(53.13)	15(46.88)

1) In our study histologically most common subtype was adenocarcinoma in 47% of cases, followed by squamous cell carcinoma having incidence of 44%.

- Study done by Cancer research UK (May 2012) and National Cancer Registry Ireland (2011) show that histologically most common subtype was squamous cell carcinoma followed by adenocarcinoma.

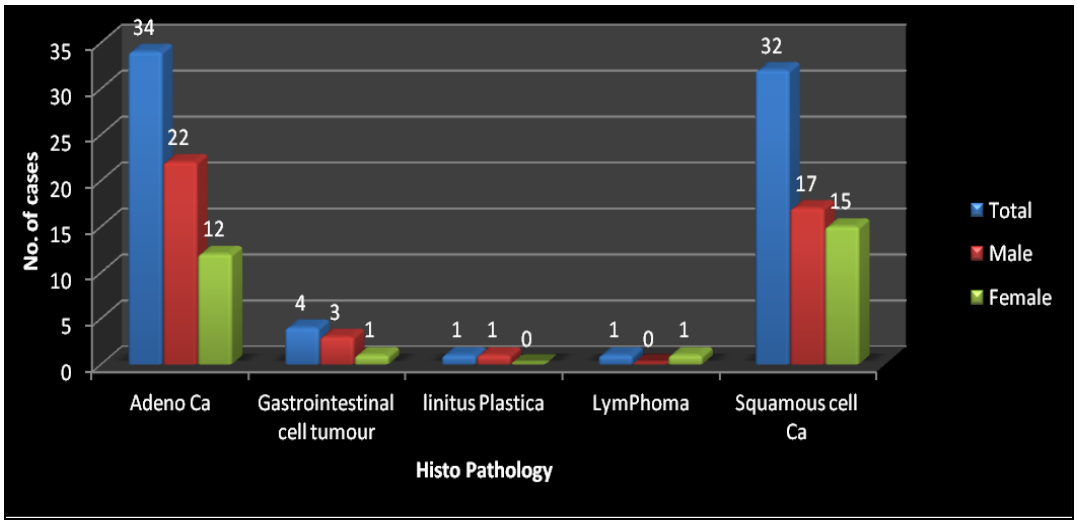


Chart 21: Prevelance of Histological Subtypes in Upper Gi Malignancy With Respect To Sex

Table 22: Comarison of Staging System by Ct Scan In View of Histopatholgical Diagnosis

Histopathological Type		Staging				Total
		I	II	III	IV	
	SCC	11	7	6	8	32
		34.4%	21.9%	18.8%	25.0%	100.0%
	Adenocarcinoma	6	6	7	15	34
		17.6%	17.6%	20.6%	44.1%	100.0%
	Others	1	0	2	3	6
		16.7%	.0%	33.3%	50.0%	100.0%
Total		18	13	15	26	72
		25.0%	18.1%	20.8%	36.1%	100.0%

In the present study, most common staging among squamous cell carcinoma was in stage I (34.4%), whereas in adenocarcinoma type, most common staging was in stage IV (44.1%)

Conclusion

CT is a useful diagnostic modality in the evaluation of the staging of carcinoma of upper GI tract and also for surgical planning to create Intra-operative road maps.

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