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Research Article

Evaluation of Prognosis of the Patients with Peritoneal Carcinomatosis in Gastric Carcinoma

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Abstract

Background: The aims of this study were to evaluate the prognostic significance of presence of peritoneal malignant cells in patients with gastric cancer and to assess the effect of peritoneal carcinomatosis on survival of gastric cancer patients.

Peritoneal carcinomatosis is a crucial factor for the prognosis in gastric cancer, but its diagnosis is difficult before laparotomy. Peritoneal metastasis have been shown to correlate with the clinical status of patients with advanced gastric cancer.

Peritoneal carcinomatosis is associated with a poor prognosis. Determining the peritoneal metastasis can help the selection of patients suitable for more aggressive treatment strategies.

Objective: This study is an evaluation of peritoneal carcinomatosis in gastric cancer patients in pre and per operative periods to assess the association of clinicopathological factors, staging and grading and outcome of the patients with peritoneal metastasis in gastric carcinoma.

Methods: A prospective analysis was done of 61 patients diagnosed with gastric cancer treated at a single institution in Bangladesh National Institute of Cancer Research and Hospital, Mohakhali, Dhaka, Bangladesh from July 2010 – December 2011. A total 61patients with gastric cancer were underwent diagnostic imaging with computed tomography (CT) or ultrasound (US) before laparotomy. Peritoneal involvement was confirmed by either ascites diagnosed by USG or CT, direct visualization of metastatic deposits during surgery and detection of cancer cell by peritoneal wash fluid taken after laparotomy. All patients were followed up upto December 2015.

Statistical Analysis: Analyses were performed to identify patient and tumor-related characteristics associated with the peritoneal carcinomatosis in gastric carcinoma.Data was compared by chi-squared test, and survival was calculated by the method of KaplanĐ-Meier method in SPSS.

Result: Peritoneal involvement were detected in 30(49.2 per cent) of 61 patients. The presence of peritoneal involvement significantly correlated with pT, pN, pM lymph and tumour stage (all $P < 0{\cdot}001$).Survival was worse in the cytology-positive group.

At 5-year follow-up, no patients with positive cytology had survived, compared with 7% of the cytology-negative group (logrank test = 28.31, 1 d.f., $P < 0.0001$). Favourable prognosis was also associated with early stage than in advanced stage carcinoma. (logrank test = 14.37, 1 d.f., $P < 0.0001$).

Conclusion: In conclusion, free peritoneal malignant cells in gastric cancer have a poor prognosis. Evaluation of peritoneal cytology have a role in the selection of patients with the poorest prognosis who may not be benefited from surgery.

Therefore, unnecessary exploration can be prevented and can refer the patient for alternative therapy when needed.

Keywords: *Peritoneal Carcinomatosis; Gastric Carcinoma; Ultrasonography; Computed Tomography*

Introduction

Worldwide Gastric cancer is the second leading cause of death from malignant disease. Mortality rates reported to be high in Asia, Central and Eastern Europe; and South America [1].

Peritoneal metastasis is considered as an important prognostic factor in gastric cancer. But accurate diagnosis is difficult before laparotomy. Methods for detection of peritoneal metastasis includes finding of ascites on physical examination or detection of ascites or indurations by digital rectal examination on the pouch of Douglas. Investigations such as abdominal ultrasonography or computed tomography (CT) are helpful for diagnosis. But predictive value of none of these methods is reported to be so high [2].

Peritoneal carcinomatosis is one of the common patterns of recurrence in gastric cancer. It is one of poor prognostic factor in gastric malignancy. , Peritoneal carcinomatosis occurs in as many as 20% cases even after undertaking curative resection in patients with gastric cancer. In up to 40% of cases the peritoneum is the only and first site of recurrence in gastric cancer [3].

Much emphasis to peritoneal cytology in gastric carcinoma have given by the Japanese but in the West it has not given so much importance. So previously, the detection of free peritoneal tumor cells (FPTCs) is not part of the tumor node metastasis (TNM) classification of the International Union against Cancer (UICC) 6th edition, 2002 [4]. But now in addition to gross, visible M1 disease, positive peritoneal cytology has recently been included in the American Joint Committee on Cancer staging system as M1 disease due to the importance of peritoneal cytology in gastric carcinoma (TNM classification of the International Union against Cancer (UICC) 7th edition, 2010 [5].

Though its sensitivity is relatively low, study reported that the gold standard for determining peritoneal spread of gastric carcinoma is peritoneal cytological washing. With this method 14% to 21% patients can be detected with peritoneal metastasis in gastric carcinoma with serosal invasion [6].

Diagnostic peritoneal lavage by laparoscopy has been proved to be rapid, safe, and effective with high sensitivity and specificity, but with some disadvantage. It may miss occult gross M1 disease. Most prospective trials omit assessments of peritoneal cytology, also because of the added cost and inconvenience [7].

Therefore direct observation of peritoneal cavity by laparotomy considered as an important tool for the diagnosis of peritoneal metastasis at any situation with low cost and with adequate safety specially in our situation.

This study was conducted to find out the relevance of peritoneal metastasis in gastric cancer with the factors age, sex, tumor infiltration, N-classification, staging, and grading in gastric carcinoma and the effect of peritoneal metastasis on survival in our contest.

Aim and Objectives

The aims of this study were to evaluate the prognostic significance of free peritoneal malignant cells in patients with gastric cancer and to ascess the effect of peritoneal carcinomatosis on survival of gastric cancer patients.

Objective is to assess and compare the relationship between staging and grading and the clinicopathological factors with peritoneal metastasis in gastric carcinoma, the effect of peritoneal metastasis on survival in gastric cancer patients.

Inclusion criteria for the study was histologically diagnosed cases of gastric adenocarcinoma and exclusion criteria were patients already received operative treatment, chemotherapy and radiotherapy and who do not want to include in the study.

Methodology

Methods

A prospective analysis was done of 61 patients diagnosed with gastric cancer treated at a single institution in Bangladesh National Institute of Cancer Research and Hospital, Mohakhali, Dhaka, Bangladesh from July 2010 – December 2011. Patients were followed up until December 2015.

To ensure accurate survival data, the hospital notes were clearly labelled and the address and telephone number of the patients were taken. That date of death was confirmed by communicating with the patients or relatives of the study group over telephone by the author. Some patients lost from follow up and they are recorded as non responder.

Patient evaluation

Patients with adenocarcinoma of the stomach diagnosed by endoscopy of upper GIT with biopsy were taken. Ascites fluid was sent for cytology preoperative and /or Peroperative. Peroperative peritoneal wash for cytology was taken in all the operative cases.

Specimen collection

Peritoneal washing for cytologic examination was performed immediately after the laparotomy or ascitic fluid before and in some cases after laparotomy. Saline (100 ml) was introduced into the abdomen and recovered after gentle stirring and then centrifuged. The centrifuged deposit was smeared and stained with Papanicolaou stains and examined by the experienced pathologists on the basis of the presence or absence of free cancer cells in peritoneal fluid.

Intraoperative staging

At operation, gastric cancers were staged for local, nodal and metastatic spread. A D1 (with left gastric) lymph node dissection was carried out in all patients undertaking curative resection. The resected specimens were examined by the pathologists for staging according to the TNM classification.

Observation and Results

Results

From July 2010 – December 2011, sixty one patients diagnosed as adenocarcinoma of stomach was undertaken for study from National Institute of Cancer Research and Hospital, Mohakhali, Dhaka, Bangladesh.

The patients' sex distribution were shown in Figure 1. In the study 46 patients was male (75%) and 15 patients was female (25%) with a male female ratio of 3:1. Among the patients histogram showed that most of the patients age was more than 45 years (19 patients' age was 45 - 54 years, 17 patients was 55 - 64 years and 12 patients was > 65 years) at the time of presentation.

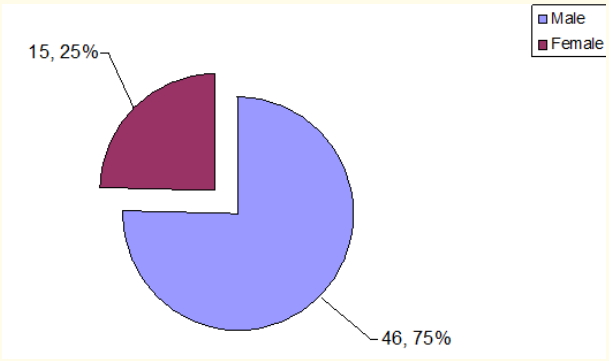


Figure 1: *Sex distribution of the patients.*

The patients' clinicopathological factors are shown in Table 1. In the study 37 patients' age was < 55 years (60.7%) and 24 patients' age was > 55 years (37.3%). The mean age of the patients was 52.89 years (± SD, 12.11 years; range, 20 - 80 years). Three fourth of the patients was male (46, 75.4%) with a male female ratio of 3:1. A total of 30(49.2%) patients were showed peritoneal involvement.

Variable	Number	%
Age		
< 55	37	60.7
> 55	24	39.3
Sex		
Male	46	75.4
Female	15	24.6
CA 125 level		
35 IU/L	44	72.1
> 35 IU/L	17	27.9
CA 19-9 level		
40 IU/L	47	77.0
> 40 IU/L	14	23.0
Pertoneal involvement		
Present	30	49.2
Absent	31	50.8
Stage I	4	6.6
II	8	13.1
III	18	29.5
IV	31	50.8
Resectability		
Resectable	33	54.1
Non resectable	18	29.5
Not operated	10	16.4
Type of operation		
Distal radical gastrectomy (D1)	24	39.3
Palliative distal radical gastrectomy	4	6.6
Total radical gastrectomy	5	8.2
Palliative gastrojejunostomy	9	14.8
Feeding jejunostomy	8	13.1
No operation	11	18.0

Table 1: *Patient Characteristics (n = 61).*

CA 125 (Cancer antigen 125) and CA 19-9 (Cancer antigen! 9-)

The tumor staging was completed according to AJCC classification of gastric carcinoma. Four patients were at tumor stage I (6.6%), 8 at stage II (13.1%), 18 at stage III (29.5%) and 31 at stage IV (50.8%). Total radical gastrectomy was performed in 5 patients, distal gastrectomy in 28, and gastric bypass surgery in 9 patients. Feeding jejunostomy was done in 8 cases and 11 cases was not operated (Figure 2).

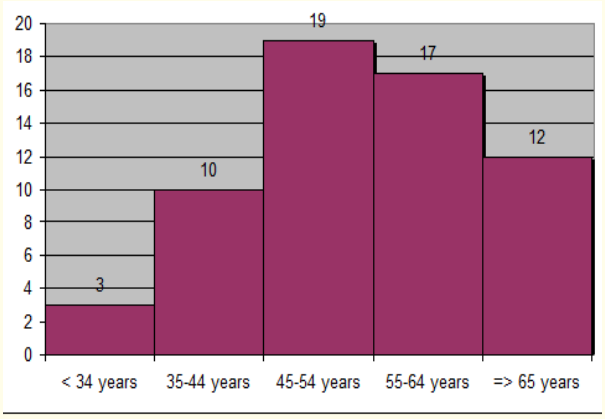


Figure 2: *HIstogram showing age distribution of the patients.*

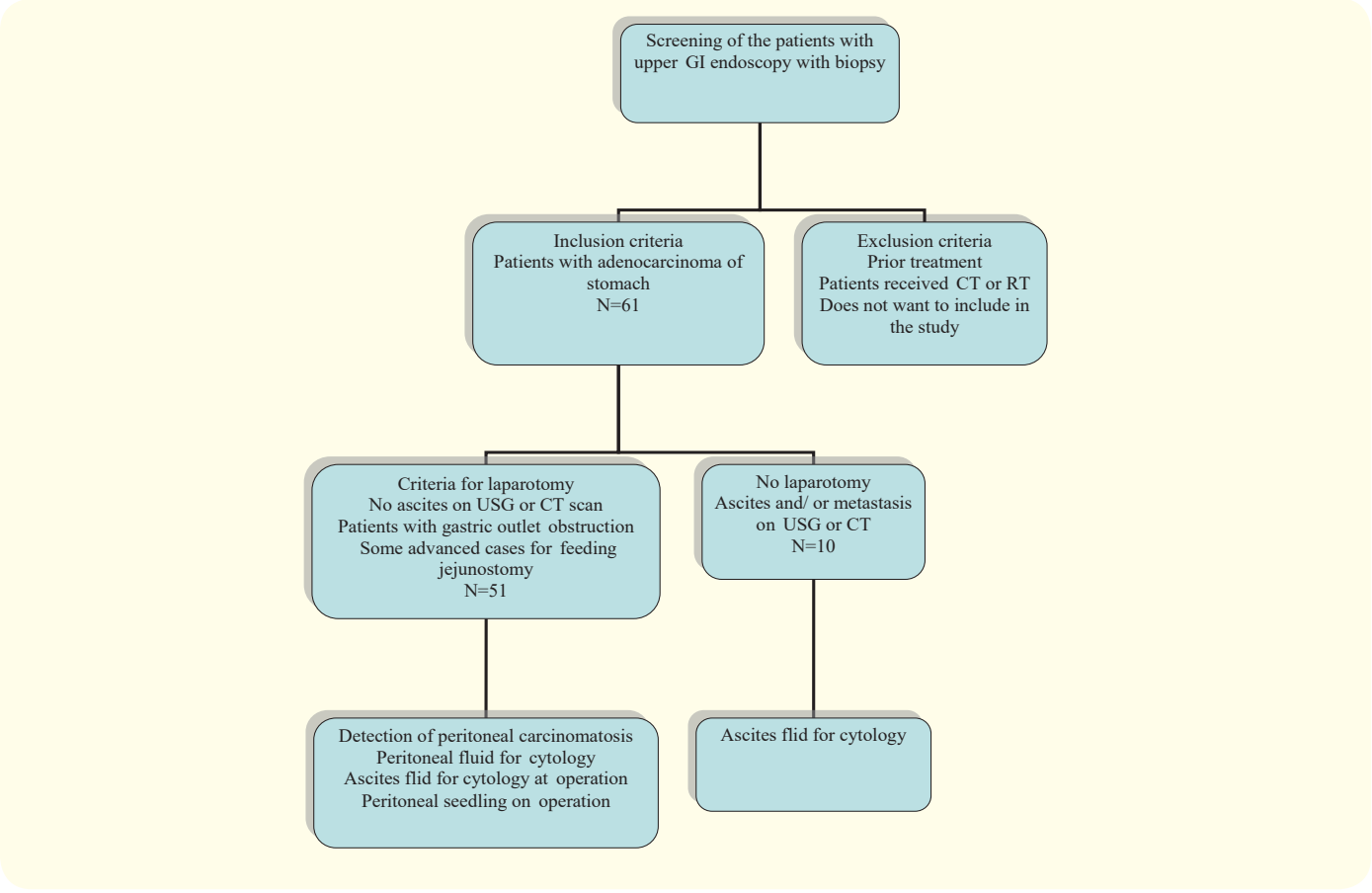
Table 2 showed the positive peritoneal cytology in 30 cases with clinico-pathologic variables of patients with gastric cancer. In this group of patients median age in was 54 years and range 20 - 70 years. Male sex was 22 (73.3%). Symptoms at presentation, were weight loss in 11 (36.7%), vomiting in 22 (73.3%). Pain on epigastrium was presented by 17 (56.7%), anorexia by 15 (50.0%), dysphagia by 2 (6.7%) of patients. Malena was presented in 5 (16.7%). Regarding haemoglobin level in 20 (66.7%) cases 7-10 gm/dl and > 10 gm/dl was preset in 8 (26.7%) cases. Nutritional Status poor in 15 (50.0%) cases. Anemia requiring transfusion in13 (43.3%) cases. History of smoking in this group was 18 (60.0%). Primary tumor site was the pyloric part 11 (36.7%) body and antrum in 9 (30.0%), body only in 7 (23.3%) patients.

Variable	Value
Age (y), median (range)	54 (20 - 70)
Male sex, n (%)	22 (73.3)
Symptoms at presentation, n (%)	
Weight loss	11 (36.7)
Vomiting	22 (73.3)
Pain on epigastrium	17 (56.7)
Anorexia	15 (50.0)
Dysphagia	2 (6.7)
Malena	5 (16.7)
Haemoglobin level	
5-7 gm/dl	2 (6.7)
7-10 gm/dl	20 (66.7)
> 10 gm/dl	8 (26.7)
Nutritional Status	

Poor	15 (50.0)
Average	13 (43.3)
Good	2 (6.7)
Anemia requiring transfusion	13 (43.3)
History of smoking, n (%)	18 (60.0)
History of alcohol use, n (%)	2 (6.7)
Primary tumor site	
Pyloric part	11 (36.7)
Body and antrum	9 (30.0)
Body	7 (23.3)
Diffuse involvement	3(9.9)

Table 2: *Demography of the patients with gastric cancer and positive peritoneal cytology (n = 30).*

Algorithm for detection of peritoneal involvement was shown in figure 3.



USG or CT diagnosed ascites in 10 cases only. Charaterstics of peritoneal dissemination shown below (Table)

Peritoneal dissemination	Number	%
Peritoneal fluid for cytology +ve	5	8.2
Visible seedling on OT	12	19.7
Ascites fluid for cytology positive	6	9.8
Ascites fluid for cytology positive on OT	7	11.5
Peritoneal dissemination –ve	31	50.8
Ascites on USG or CT	10	

Peritoneal involvement were detected in 30(49.2 per cent) of 61 patients. Comparison of Clinico-pathological Factors in Patients Positive and Negative for peritoneal involvement was presented in Table 3. The presence of peritoneal involvement significantly correlated with pT, pN, pM lymph and tumour stage (all P < 0·001). Resectability of the patients also significantly correlated with peritoneal involvement in this study.

Factor	Per. Inv + ve		Per. Inv - ve		*p* value
	n	%	n	%	
Sex					
Male	22	73.3	24	77.4	.77
Female	8	26.7	7	22.6	
Age					
≤ 55	18	60.0	19	61.3	.91
> 55	12	40.0	12	38.7	
Histological type					
Differentiated	11	36.6	26	83.9	.000
Undifferentiated	19	63.3	5	16.1	
Depth of invasion					
UptoSerosa(T1+T2+T3)	6	28.6	25	80.6	.000
Beyond Serosa(T4)	15	71.4	6	13.4	
Lymph node metastasis					
Perigastric(N0+N1)	8	38.1	24	77.4	.005
Beyond (N2+N3)	13	61.9	7	22.6	
Stage					
Early stage	2	6.7	10	33.3	.013
Advanced stage	28	93.3	21	67.7	
Resectability					
Resectable	6	20.0	27	87.1	.000
Not resectable	24	80.0	4	12.9	

Table 3: *Comparison of Clinico-pathological Factors in Patients Positive and Negative for peritoneal involvement.*

Chi- square test was done to detect significance

Survival

Survival according to stage was shown in figure 4. Favourable prognosis was also associated with early stage than in advanced stage carcinoma. (log-rank test = 14.37, 1 d.f., P < 0.0001).

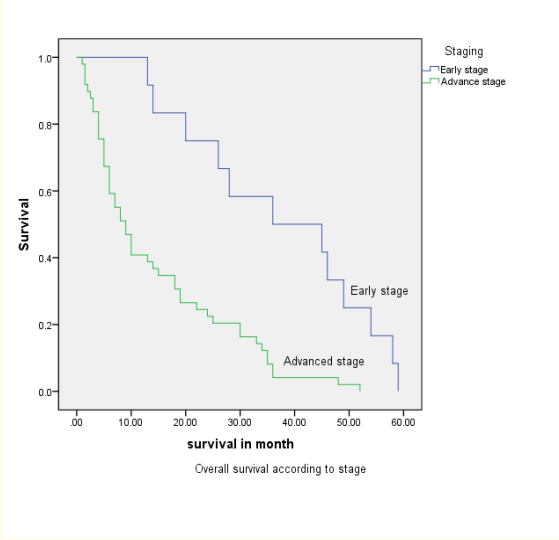


Figure 4: *Overall survival according to stage.*

Overall survival according to presence or absence of peritoneal involvement was shown in figure 5. Survival was calculated by the method of Kaplan Đ Meier, by the log-rank test. Significance was assumed if P < 0.0001.

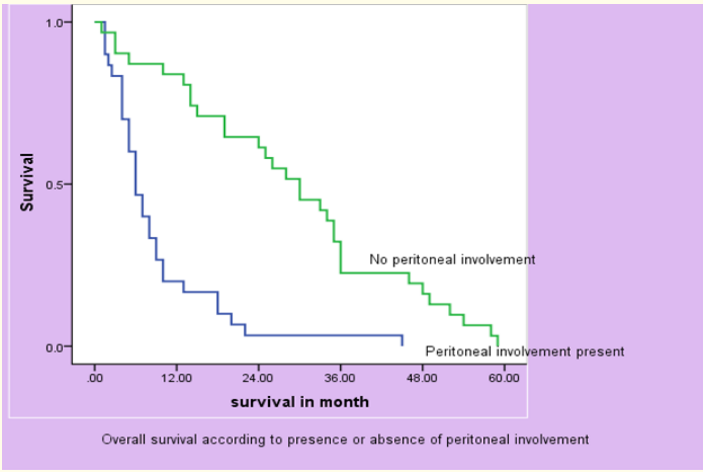


Figure 5: *Overall survival according to presence or absence of peritoneal involvement.*

Survival was calculated by the method of KaplanĐMeier, by the log-rank test. Significance was assumed if P < 0.05.

At 5-year follow-up, survival was significantly reduced if cytology was positive (log-rank test = 28.31; 1 df, P = 0.000), no patients with positive cytology had survived, compared with 6% of the cytology-negative group (log rank test = 28.31, 1 d.f., P < 0.0001).

Discussion

Despite progress towards the early detection of gastric cancer in the western country and Japan in recent years, most patients already have advanced disease at diagnosis in our country. The majority of patients will die of recurrent disease, even if surgery is thought to be curative at the time.

Ultrasonography can give Information on peritoneal metastasis which is much more available now a day and with the advances of recent investigation, computed tomography can provide much more before operation. However, these methods are not so effective to obtain information about small peritoneal metastasis preoperatively.

The majority of patients who have recurrent disease in carcinoma stomach mostly detected as peritoneal metastases on postmortem studies or during undertaking laparotomy for recurrence [8].

Observation and palpation and imaging by USG or CT in patients with advanced gastric cancer can detect macroscopic peritoneal involvement. But in order to detect microscopic free cancer cells, peritoneal washing cytology (PWC) has been recommended.

According to the recommendations of the Japanese Classification of Gastric Carcinoma (JCGC) positive peritoneal cytology is a poor prognostic factor. They incorporated the results of Peritoneal Wash for Cytology into the local stage classification as the CY category. Positive cytology is designated by CY1 which is considered as stage IV disease [9,10].

Though it has not given much in the West but it has given more importance by the Japanese workers. Peritoneal cytological evaluation is very helpful in predicting recurrence after curative radical operation. Japanese worker also used peritoneal cytology to determine the effect of adjuvant chemotherapy on gastric cancer [8].

Present study based on the prediction of peritoneal dissemination in patients with carcinoma stomach by detection of peritoneal involvement and compare with the staging and clinicopathological factors with peritoneal carcinomatosis in carcinoma stomach.

In the study Patients < 55 years of age was 37 (60.7%) and > 55 years of age was 24 (37.3%). The mean age of the patients was 52.89 years (SD, 12.11 years; range, 20 - 80years). Number of male 46 (75.4%) female 15 (24.6%) ratio was 3/1.

Of the 46 patients in the study, 29 (63.0%) were males and 17 (37.0%) females (Filho RC., *et al*) [11]. Mean age was 63.6 ± 11.7 years (31 to 91 years). Study of Ucar E., *et al*. [12], The mean age of the patients was 58 years (SD, 10 years; range, 31 - 75 years) and the male/female ratio was 1.9/1 and according to Kodera Y., *et al*. [13], the mean age of the patient was 61.4 years (range, 33 - 88), with a male-to-female ratio of 3:2.

The incidence of perinoneal cytology-positive cases seems to vary considerably among institutions. Study by Hayes N., *et al* [8]. Malignant cells were diagnosed in Preoperative peritoneal lavage n 16 out of 85 cases (19%). Kodera Y., *et al.* [13] in their study, cytology was positive in 21% patients. Hwang GI et al1 in his study of 88 patients peritoneal metastasis were diagnosed with by laparotomy, CT or USG revealed peritoneal dissemination in 15 of 88 patients. Study by Rosenberg R., *et al.* [14] out of 346 patients seventy-four (21·4 per cent) had immunocytochemically detected free perinoneal cytology-positive in the peritoneal lavage. The cytological study of peritoneal washing conducted by Filho RC., *et al*. [11] was negative for neoplastic cells in 39 (84.8%) and positive in 7 (15.2%) patients. Mezhir JJ., *et al*. [15], 2011studied a total of 1241 patients with gastric cancer underwent laparoscopy with peritoneal washings; 291 (23%) had positive cytology. There were 198 patients (68%) who had visible metastases discovered at laparoscopy (M1), and 93 patients (32%) were without gross evidence of advanced disease (M1Cyt).

A total of 30(49.2%) patients were showed peritoneal involvement in our study. It seems to be higher as we included noncurative resected and also nonresectable cases in our study. The presence of peritoneal involvement was diagnosed though one of the following means: ultrasonography or computed tomography, a positive cytology after peritoneal aspiration or lavage, ascitic fluid aspiration or direct visualization through open surgery. Fanelli F., *et al*. [3] also include same criteria for peritoneal metastasis.

The tumor staging was completed according to AJCC classification of gastric carcinoma. Four patients were at tumor stage I (6.6%), 8 at stage II (13.1%), 18 at stage III (29.5%) and 31 at stage IV (50.8%). Strikingly most of the patients in the study group was in advanced stage and a significant proportion was not suitable for operation. Among the resectable 33(54.1%) cases, total gastrectomy was performed in 5 patients, subtotal gastrectomy in 28, among the non resectable cases gastric bypass surgery in 9 patients. Feeding jejunostomy was done

in 8 cases and 11 cases was not operated. Similar to the current study most of the patients of Fanelli F., *et al.* [3] advanced disease, 61.5% had T3 or T4 tumors, and 18.5% presented with visceral metastasis at diagnosis. Forty percent of the patients underwent gastrectomy. Ucar E., *et al.* [12], were retrospectively examined in 95 gastric cancer patients thirteen patients were at tumor stage I, 15 at stage II, 26 at stage III and 41 at stage IV. Total gastrectomy was performed in 58 patients, subtotal gastrectomy in 25, and gastric bypass surgery in 12.

So our study matches the Treatment Guidelines for Gastric Cancer for Stage IV gastric cancer which are palliative surgery that includes gastrectomy for bleeding, and by-pass surgery or ileostomy for those patients with obstruction of the gastrointestinal tract in addition to chemotherapy, radiotherapy and supportive care [16,17].

Basoglu M., *et al.* [18] conducted study on 35 patient's. Each patient's disease was classified according to tumor node metastasis (TNM) system (5), with the following stages: I (n = 2), II (n = 5), III (n = 10) and IV (n = 18).

Study by Hayes N., *et al.* [8] out of 85 patients thirteen cases were unsuitable for resection and simple bypass was performed in five of these, 11 cases with advanced disease had palliative resections whereas the remainder underwent potentially curative D1 (47) or D2 (14) gastrectomy. Most of the patients were also in stage IV in all these study.

Comparing the positive peritoneal cytology in 30 cases with clinico-pathologic variables of patients with gastric cancer, median age in was 54 years and range 20 - 70 years. Male sex was 73.3%. Study by Mezhir JJ., *et al*. [15] median age was 65 and range 31 - 87, male sex 61%. In our study main Symptoms at presentation, were weight loss in (36.7%), vomiting in (73.3%). pain on epigastrium (56.7%) and anorexia (50.0%). Dysphagia was presented only by 6.7% of patients. On the contrary study by Mezhir JJ., *et al*. [15], symptoms at presentation were weight loss 69%, dysphagia 28%. In the present study group Anemia requiring transfusion was much higher than study by Mezhir JJ., *et al*. [15] (43.3% vs 11%).History of smoking in this group was 60.0% vs 42% and of alcohol use in 6.7% vs 14%. Primary tumor site was the Antrum 36.7% Body and Antrum in 30.0%, Body only in 23.3%, diffuse involvement of stomach in 9.9% patients. Whereas according to Mezhir JJ., *et al*. [15], Primary tumor site Body 30%, Cardia 22%, Antrum 22%Gastroesophageal junction 14% Diffuse 13%.

Those finding demarcate that most of our patients had tumors on pyloric part, most of them suffer from anaemia requiring blood transfusion. They had tendency of smoking but less alcohol intake. As most of the patients had tumors on pyloric part so vomiting was more presented by our patients than dysphagia.

On comparing Clinico-pathological Factors in patients with peritoneal involvement detected in 30(49.2 per cent) of 61 patients, there was no difference in sex ratio or age between the cytology-positive and-negative groups. This correlate well with study by Hayes N., *et al* [8].

Peritoneal involvement were detected in with stage I tumours, 2 (6·7 per cent) in stage II, 3(10.0 per cent) in stage III and 25(83.3 per cent) in stage IV patients.

Resectability of the patients also significantly correlated with peritoneal involvement in this study by Hayes N [8].

In total, 23 patients out of 85 patients (27%) had positive peritoneal malignant cytology. Peritoneal lavage alone yielded unequivocal malignant cytology in 16 out of 85 (19%) cases. In the present study 8.2% cases detected by Peritoneal lavage alone and visible Peritoneal seedling was present in 16.4%cases after laparotomy. Hayes N [8] eight patients had ascites at the time of laparotomy or laparoscopy and all were shown to have free malignant cells, similarly five cases had ascites at the time of laparotomy in the present study.

Conventional cytologic examination of the peritoneal washes for Detection of free cancer cells in the peritoneal cavity through Papanicolaou staining favoured in Japan as a tool for the prediction of prognosis and considered to be a one of the key components of their staging system [17]. The similar method was carried out in this study to detect free cancer cell.

Study by Rosenberg R., *et al.* [14], stated it is generally assumed that as a result of shedding of tumour cells from the serosal surface of the primary tumour peritoneal carcinomatosis occur. This is followed by metastases due to invasion of the subperitoneal connective tissue and proliferation into the peritoneal cavity.

The presence of peritoneal involvement significantly correlated with pT and tumour grade($P < 0{\cdot}001$) , pN ($P < 0{\cdot}005$) in our study which was similar to Rosenberg R., *et al*. but they were detected free tumor cells in the peritoneal lavage fluid only in 74 patients (21·4 per cent) and correlated with increasing pathological tumour depth (pT) and lymph node (pN) status ($P < 0{\cdot}001$).On the other hand Jonas S., *et al*. [19], in their study, the rates of microscopic tumor cell dissemination did not correlate with tumor stage, histopathological grading, lymph node infiltration, or the presence of distant metastases at the time of the operation.

Several study stated that there may be presence of free cancer cells even without microscopic evidence of serosal involvement. Reason behind this is due to the fact that as histological examination is done by macroscopic examination it may not always easy to perform histopathology from a spot where there is more infiltration of cancer cells. Another explanation suggested that there may be shedding of cancer cells through the lymphatics, from the metastatic lymph nodes or through the lymphatic canals via the omentum [13,14,16].

Previous studies demonstrating that despite R0 resection, patients with positive peritoneal cytology have a median survival measured only in months. Positive cytology is a strong independent preoperative predictor of survival in patients undergoing R0 resection for gastric cancer. Despite attempts at curative resection and multimodality therapy, long-term survival in this group of patient is exceedingly rare [15].

The prognostic value of positive cytology findings was recently confirmed also in the West, and a new stage classification for gastric carcinoma, recently published by Japanese Gastric Cancer Association, employs the result of cytologic examination (Cy categories) as one of the key prognostic factors [13].

Figure 4 displays the overall survival in the two groups of patients with or without positive peritoneal cytology; there was a highly significant difference between the survival experience of patients who did not peritoneal involvement. This study coincides with the other study done by Fenalli M F [3].

At 2-year follow-up, 6% of patients with positive cytology had survived, compared with 70% of the cytology-negative group (log rank test = 28.31, 1 d.f., $P < 0.0001$). Favourable prognosis was also associated with a low TNM stage (log-rank test = 14.37, 1 d.f., $P < 0.0001$).

In comparison study by Hayes N., *et al*. [6] showed that At 2-year follow-up, 22% of patients with positive cytology had survived, compared with 66% of the cytology-negative group (logrank test = 25.10, 1 d.f., $P < 0.0001$). Survival rate was much higher in positive cytology group 22% versus 6% in the present study probably due to the fact that we had taken more patients with ascites. So overall survival in cytology positive group was much lower. Favourable prognosis with cytology negative was also depicted in their study as ours.

Study by Kodera Y [14] showed that all patients with positive cytology have died. Their median time to death, 386 days; range, 109 - 736 days), except for 1 patient who has palpable recurrent tumor in the Douglas.

In the present study median time of survival in cytology positive group was 180 days; range 120 days to 221 days. One patients of our study was survived and under follow up. It was an early case with radical surgery done having peritoneal fluid for cytology positive. This may be due to the reason that there may be chance of false positivity in peritoneal wash for cytology [20].

According to Suzuki O unfavorable predictors of survival among patients with CY1 gastric cancer include noncurative gastrectomy, poorer performance status, clinical N3, and type 4 disease which was actually the scenario for poor prognosis of our study group [17].

Peritoneal dissemination is one of the most lethal events in patients with gastric carcinoma. Gastrectomy generally is not indicated for cases of severe peritoneal dissemination because it does not improve prognosis and can impair the patient's quality of life [21]. Ac-

cordingly, the accurate prediction of peritoneal dissemination is essential to ensure appropriate surgical referral or to plan appropriate treatments.

Conclusion

In conclusion, patients with gastric cancer having peritoneal involvement have a poor prognosis. Even if the peritoneal involvement is microscopic which can only be detected only by peritoneal wash for cytology. Though it can be diagnosed by CT scan, ultrasonogram but sometimes free peritonel cell can only diagnosed after having peritoneal wash for cytology. Evaluation of peritoneal cytology by these methods helps in detecting the patients with poorest prognosis who have not benefited from surgery.Therefore, unnecessary exploration can be prevented and refer the patient for the alternative therapy when needed.

A potential strength of our study is prospective nature and the homogeneity of the clinical, radiologic, and pathologic assessment, since all patients were treated at the same institution. On the other hand, a potential weaknesses are brief study period, small sample size and lack of standardization of the treatment. The use of diagnostic laparoscopy, which might allow more complete and reliable staging of recurrent abdominal disease, is rarely performed. Further research will be required to rectify these problems.

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