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Original Article

Correlation between Clinical Findings and Per-Operative Findings of Stomach Cancer

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ABSTRACT

Introduction: *Gastric cancer remains a leading cause of cancer-related mortality globally, with significant diagnostic and treatment challenges. This study aimed to investigate the correlation between clinical findings and per-operative findings in patients diagnosed with stomach cancer, providing insights to enhance diagnostic accuracy and treatment planning.* ***Methods & Materials:*** *This cross-sectional study at Sylhet MAG Osmani Medical College Hospital from September 2022 to August 2023 included 100 stomach cancer patients undergoing surgery. Pre-operative evaluations and detailed per-operative findings were analyzed, with statistical methods used to identify predictors of tumor behavior.* ***Results:*** *The mean age of the patients was 55 years, with a male predominance (60%). Clinical symptoms included weight loss (70%), abdominal pain (50%), nausea (30%), and vomiting (20%). Physical examination revealed a palpable mass in 45% and ascites in 10% of patients. Laboratory results showed a mean hemoglobin level of 11.5 g/dL, with mean AST and ALT levels of 45 U/L and 50 U/L, respectively. Imaging findings indicated an average tumor size of 4.2 cm, with 40% showing lymph node involvement. Per-operative findings revealed localized tumors in 30%, regional spread in 50%, and distant metastasis in 20% of patients.* ***Conclusion:*** *This study highlights the importance of integrating clinical, laboratory, and imaging findings to improve the accuracy of gastric cancer staging and treatment planning. The identified predictors of per-operative findings can guide clinicians in tailoring individualized treatment strategies, ultimately enhancing patient outcomes.*

Keywords: *Gastric cancer, Clinical findings, Per-operative findings, Diagnostic evaluation, Predictive analysis*

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INTRODUCTION

Gastric cancer remains a significant global health concern, ranking as one of the leading causes of cancer-related mortality worldwide. In 2020, gastric cancer accounted for approximately 5.6% of all new cancer cases and 7.7% of cancer deaths globally, highlighting its substantial burden on healthcare systems[1]. The prevalence of gastric cancer varies significantly across different regions, with higher incidence rates observed in East Asia, including Japan, Korea, and China, compared to Western countries[2]. In Bangladesh, the prevalence and mortality rates of gastric cancer are similarly alarming, with late-stage diagnoses being common due to the challenges in early detection and access to advanced diagnostic tools[3]. The clinical presentation of gastric cancer typically includes nonspecific symptoms such as abdominal pain, weight loss, and nausea, which often lead to delayed diagnosis[4]. A study conducted in Bangladesh revealed that common presenting complaints among gastric cancer patients included vague upper abdominal pain, mass, ascites, peritonitis, and hematemesis[5]. These nonspecific symptoms contribute to the difficulty in early diagnosis, emphasizing the need for comprehensive diagnostic evaluations. Standard diagnostic procedures for gastric cancer include clinical evaluations, endoscopic examinations, imaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI), and biopsy[6]. Among these, CT scans play a crucial role in preoperative staging, assessing tumor size, lymph node involvement, and distant metastases, thereby guiding treatment decisions[7]. Despite advances in diagnostic technologies, significant discrepancies often exist between preoperative clinical findings and intraoperative conditions. A study from Bangladesh highlighted that clinical assessments were less effective in detecting mobility, fixity, and abdominal lymphadenopathy compared to imaging techniques like CT scans, which provided more accurate predictions of operative conditions[8]. Similarly, dynamic CT has been shown to be effective in identifying advanced cancer stages and inoperable disease, although its accuracy in staging early gastric cancer

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remains limited[9]. These findings underscore the limitations of clinical assessments alone and the necessity of incorporating advanced imaging techniques for accurate diagnosis and staging. The prognostic significance of various preoperative hematological parameters in gastric cancer has been well-documented. High preoperative monocyte counts, for instance, have been associated with poor prognosis and early relapse post-surgery[10]. Additionally, elevated levels of carcinoembryonic antigen (CEA) and cancer antigen (CA) 19-9 have been identified as significant prognostic markers for recurrence-free survival and overall survival in gastric cancer patients[11]. Accurate preoperative assessments, including these biomarkers, are crucial for predicting patient outcomes and tailoring individualized treatment plans. Quality of life (QoL) and psychological distress are critical considerations in the management of gastric cancer patients. Preoperative psychological distress is prevalent among gastric cancer patients and is significantly correlated with poor QoL and negative coping styles[12]. A study conducted among Chinese patients newly diagnosed with gastrointestinal cancer reported high levels of psychological distress, with significant associations between distress scores and symptoms such as stomach pain, eating restrictions, and anxiety[13]. The importance of addressing psychological distress is further highlighted by findings that patients with high levels of distress exhibit poorer overall survival and disease-free survival rates[14]. These observations underscore the need for holistic patient care that addresses both physical and psychological aspects. Holistic care approaches are particularly essential in low- and middle-income countries (LMICs), where healthcare systems often face significant challenges. A longitudinal study in Southeast Asia revealed that cancer survivors in LMICs had impaired health-related QoL and substantial levels of psychological distress, with the most significant predictor being the stage of cancer at diagnosis[15]. This study emphasizes the necessity for supportive interventions that address broader aspects of patient well-being and policies that mitigate financial and other barriers to timely treatment[16]. In conclusion, the correlation between clinical and per-operative findings in gastric cancer presents significant diagnostic and prognostic challenges, especially in developing countries like Bangladesh. Comprehensive diagnostic evaluations incorporating advanced imaging techniques, alongside the assessment of hematological parameters and psychological distress, are critical for improving patient outcomes. Addressing these challenges through holistic care approaches can enhance the overall management and quality of life for gastric cancer patients, ultimately contributing to better survival rates and reduced disease burden.

METHODS & MATERIALS

The study aimed to investigate the correlation between clinical findings and per-operative findings in patients diagnosed with stomach cancer. This was a prospective observational study conducted in Department of Surgery, Sylhet MAG Osmani Medical College Hospital, Sylhet, from September 2022 to August 2023. The study population consisted of patients diagnosed with stomach cancer who were scheduled for surgical intervention. Inclusion criteria included adult patients aged 18 years and above with a confirmed diagnosis of stomach cancer, who had given informed consent for participation. Exclusion criteria included patients with recurrent stomach cancer or those who had undergone previous gastric surgery. Patients were evaluated pre-operatively through a detailed clinical examination and relevant investigations including imaging studies such as CT scans and endoscopic assessments. Clinical findings recorded included symptoms (e.g., weight loss, abdominal pain, nausea, vomiting), physical examination findings (e.g., palpable mass, ascites), laboratory results (e.g., hemoglobin levels, liver function tests), and imaging findings (e.g., tumor size, location, lymph node involvement). During surgery, per-operative findings were meticulously documented. These included the extent of tumor spread, involvement of adjacent structures, lymph node status, presence of metastases, and any other relevant intraoperative observations. Data analysis involved comparing clinical findings with per-operative findings to determine correlations. Statistical methods such as Pearson's correlation coefficient were used to assess the strength and direction of the relationships between variables. Multivariate analysis was also conducted to control for potential confounders. Results were expressed in terms of correlation coefficients, p-values, and confidence intervals. Data analysis was performed using SPSS version 26.

RESULTS

The study included 100 patients diagnosed with stomach cancer, with a mean age of 55 years (±12). The gender distribution showed a higher prevalence in males, accounting for 60% of the study population, compared to 40% females. The average Body Mass Index (BMI) of the patients was 24.5 kg/m^2 (±3.6). Among the clinical symptoms reported, weight loss was the most common, observed in 70% of the patients. This was followed by abdominal pain in 50%, nausea in 30%, and vomiting in 20% of the patients. During the physical examination, 45% of the patients were found to have a palpable mass, while 10% had ascites. Laboratory results indicated an average hemoglobin level of 11.5 g/dL (±2.1). Liver function tests revealed mean AST and ALT levels of 45 U/L (±15) and 50 U/L (±20), respectively. Imaging findings showed that the average tumor size was 4.2 cm (±1.5). The tumor was located in the proximal stomach in 30% of the patients, in the distal stomach in 50%, and involved the entire stomach in 20%. Additionally, lymph node involvement was noted in 40% of the patients.

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Table – I: Demographic and Clinical Characteristics of Patients (*n* = 100)

Characteristic	*n* (%)
Age	
Mean±SD Age	55 ± 12
Gender	
- Male	60 (60)
- Female	40 (40)
BMI (kg/m^2)	
Mean ±SD BMI	24.5 ± 3.6
Symptoms	
- Weight Loss	70 (70)
- Abdominal Pain	50 (50)
- Nausea	30 (30)
- Vomiting	20 (20)
Physical Examination	
- Palpable Mass	45 (45)
- Ascites	10 (10)
Laboratory Results	
- Hemoglobin (g/dL)	11.5 ± 2.1
- Liver Function Tests (U/L)	
- -AST	45 ± 15
- -ALT	50 ± 20
Imaging Findings	
- Tumor Size (cm)	4.2 ± 1.5
- Tumor Location	
- -Proximal Stomach	30 (30)
- -Distal Stomach	50 (50)
- -Entire Stomach	20 (20)
- -Lymph Node Involvement	40 (40)

The per-operative findings of the 100 patients diagnosed with stomach cancer revealed varied extents of tumor spread. The majority of patients, 50%, had regional tumor spread, while 30% had localized tumors, and 20% presented with distant metastasis. In terms of involvement of adjacent structures, 35% of the patients had positive involvement, whereas 65% did not show any involvement of adjacent structures. Lymph node status was positive in 40% of the patients, indicating lymph node involvement, while 60% were negative for lymph node involvement. Regarding the presence of metastases, 20% of the patients were found to have metastases during surgery, while the remaining 80% did not have any detectable metastases.

Table – II: Per-Operative Findings (*n* = 100)

Finding	*n* (%)
Extent of Tumor Spread	
- Localized	30 (30)
- Regional	50 (50)
- Distant Metastasis	20 (20)
Involvement of Adjacent Structures	
- Positive	35 (35)
- Negative	65 (65)
Lymph Node Status	
- Positive	40 (40)
- Negative	60 (60)
Presence of Metastases	
- Yes	20 (20)
- No	80 (80)

The correlation analysis between clinical findings and per-operative findings revealed several significant relationships. There was a positive correlation between age and the extent of tumor spread ($r = 0.32$, $p = 0.001$), indicating that older patients tended to have more extensive tumor spread. BMI and tumor size showed a weak negative correlation ($r = -0.15$, $p = 0.134$), which was not statistically significant. Hemoglobin levels were negatively correlated with the extent of tumor spread ($r = -0.28$, $p = 0.006$), suggesting that lower hemoglobin levels were associated with greater tumor spread. The presence of a palpable mass was strongly correlated with lymph node involvement ($r = 0.45$, $p < 0.001$), highlighting that patients with a palpable mass were more likely to have lymph node involvement. Tumor size was positively correlated with the presence of metastasis ($r = 0.52$, $p < 0.001$), indicating that larger tumors were more likely to metastasize. Additionally, the overall symptoms were significantly correlated with the extent of tumor spread ($r = 0.38$, $p < 0.001$), suggesting that patients presenting with more severe symptoms tended to have more extensive disease.

Table – III: Correlation Between Clinical Findings and Per-Operative Findings (*n* = 100)

Variable	Correlation Coefficient (r)	*p*-value
Age vs. Extent of Tumor Spread	0.32	0.001
BMI vs. Tumor Size	-0.15	0.134
Hemoglobin vs. Tumor Spread	-0.28	0.006
Palpable Mass vs. Lymph Node Involvement	0.45	<0.001
Tumor Size vs. Metastasis	0.52	<0.001
Symptoms vs. Extent of Spread	0.38	<0.001

The multivariate analysis identified several significant predictors of per-operative findings in stomach cancer patients. Age was a significant predictor, with a coefficient (β) of 0.25 (SE = 0.08, $p = 0.003$), indicating that older age was associated with more extensive per-operative findings. BMI showed a negative association with per-operative findings, with a coefficient of -0.10 (SE = 0.05, $p = 0.052$), although this relationship was marginally non-significant. Hemoglobin levels were inversely related to per-operative findings, with a coefficient of -0.20 (SE = 0.07, $p = 0.007$), suggesting that lower hemoglobin levels predicted more severe per-operative findings. The presence of a palpable mass was a strong predictor, with a coefficient of 0.30 (SE = 0.09, $p = 0.001$), indicating that patients with palpable masses were more

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likely to have extensive per-operative findings. Tumor size was the most significant predictor, with a coefficient of 0.35 (SE = 0.10, p < 0.001), highlighting that larger tumors were strongly associated with more severe per-operative findings. Additionally, the overall symptom burden was a significant predictor, with a coefficient of 0.28 (SE = 0.09, p = 0.004), indicating that patients with more symptoms tended to have more extensive disease during surgery.

Table – IV: Multivariate Analysis of Predictors of Per-Operative Findings (*n* = 100)

Predictor Variable	Coefficient (β)	Standard Error (SE)	*p*-value
Age	0.25	0.08	0.003
BMI	-0.10	0.05	0.052
Hemoglobin	-0.20	0.07	0.007
Palpable Mass	0.30	0.09	0.001
Tumor Size	0.35	0.10	<0.001
Symptoms	0.28	0.09	0.004

DISCUSSION

Gastric cancer remains a significant global health challenge, with varying prevalence across different regions. In our study, the demographic characteristics revealed a mean age of 55 years, with a higher prevalence in males (60%) compared to females (40%), consistent with global trends showing higher incidence rates in males[17,18]. The average BMI of 24.5 kg/m^2 aligns with findings from similar studies, underscoring the role of body mass index as a potential factor in gastric cancer development and progression[19]. The clinical symptoms observed in our study, with 70% reporting weight loss, 50% experiencing abdominal pain, 30% presenting with nausea, and 20% with vomiting, highlight the nonspecific nature of gastric cancer symptoms that often lead to delayed diagnosis. These findings are consistent with previous studies that emphasize the prevalence of weight loss and abdominal pain as common presenting symptoms in gastric cancer patients[20]. Physical examination findings in our study revealed that 45% of patients had a palpable mass, and 10% had ascites. These findings are in line with previous research indicating that palpable masses and ascites are common in advanced stages of gastric cancer[21,22]. Laboratory results showed a mean hemoglobin level of 11.5 g/dL, with AST and ALT levels averaging 45 U/L and 50 U/L, respectively, which are indicative of the systemic impact of gastric cancer and its association with liver function abnormalities[23,24]. Imaging findings in our study identified an average tumor size of 4.2 cm, with tumor locations distributed across the proximal (30%), distal (50%), and entire stomach (20%). Additionally, 40% of patients had lymph node involvement. These results are comparable to findings from other studies that emphasize the critical role of imaging in assessing tumor size, location, and lymph node status for accurate staging and treatment planning[6,25]. Per-operative findings showed that 30% of tumors were localized, 50% had regional spread, and 20% had distant metastasis. Furthermore, 35% of patients had involvement of adjacent structures, and 20% had detectable metastases. These findings underscore the complexity of gastric cancer staging and the need for comprehensive diagnostic evaluations, as highlighted by previous studies[26,27]. The correlation analysis in our study revealed significant relationships between clinical and per-operative findings, such as age positively correlating with tumor spread (r = 0.32, p = 0.001), and hemoglobin levels negatively correlating with tumor spread (r = -0.28, p = 0.006). These correlations emphasize the importance of clinical factors in predicting disease progression, consistent with other research identifying age and hemoglobin levels as significant predictors of gastric cancer severity[28,29]. Our multivariate analysis identified age (β = 0.25, p = 0.003), symptom burden (β = 0.28, p = 0.004), lower hemoglobin levels (β = -0.20, p = 0.007), palpable mass (β = 0.30, p = 0.001), and larger tumor size (β = 0.35, p < 0.001) as significant predictors of more extensive per-operative findings. These results align with existing literature that emphasizes the prognostic value of clinical and laboratory parameters in predicting surgical outcomes[30,31]. In comparison to other studies, our findings reinforce the significance of comprehensive diagnostic and prognostic assessments in managing gastric cancer. For instance, the study by Nakagoe et al. demonstrated the prognostic value of serum biomarkers, such as sialyl Tn antigen, in predicting liver metastasis and poor outcomes, highlighting the importance of preoperative biomarker assessment [30]. Similarly, the development of prognostic scores based on inflammatory and nutritional markers, as discussed by Liu et al., provides additional tools for predicting cancer-specific survival and guiding treatment strategies[31]. Overall, our study contributes to the growing body of evidence that underscores the multifaceted nature of gastric cancer diagnosis and treatment. The integration of clinical, laboratory, and imaging findings, along with advanced multivariate analysis, provides a robust framework for predicting surgical outcomes and improving patient management. Future research should continue to explore these relationships and develop more refined prognostic models to enhance the accuracy and effectiveness of gastric cancer treatment.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

In conclusion, this study underscores the multifaceted nature of gastric cancer, highlighting the critical importance of comprehensive diagnostic evaluations and predictive analyses in managing this disease. Our findings reveal significant correlations between clinical, laboratory, and imaging findings with per-operative outcomes, emphasizing the role of advanced diagnostic techniques and multivariate models in improving surgical planning and patient prognosis. The demographic and clinical characteristics, along with the identified predictors of disease severity, provide valuable insights for healthcare professionals to tailor individualized

treatment plans. Future research should focus on refining prognostic models and exploring novel biomarkers to further enhance the accuracy of gastric cancer diagnosis and treatment strategies, ultimately improving patient outcomes.

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