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Serum albumin as an independent predictor of early mortality in metastatic gastric cancer

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ABSTRACT

Aims: This study aims to evaluate the prognostic value of baseline clinical and laboratory parameters in predicting six-month early mortality among patients with metastatic gastric cancer.

Methods: In this retrospective observational study, 91 patients diagnosed with metastatic (stage IV) gastric adenocarcinoma between January 2016 and January 2026 were evaluated. The primary endpoint was mortality within the first six months following diagnosis. Univariate and multivariable logistic regression analyses were utilized to identify early mortality predictors, while receiver operating characteristic (ROC) curve analysis evaluated the predictive performance of serum albumin.

Results: During the follow-up period, 29 patients (31.9%) died within the first six months. Patients experiencing early mortality presented with significantly lower baseline serum albumin levels (28.6±7.7 vs 36.7±5.6 g/L, $p<0.001$) and higher C-reactive protein (CRP) levels. Although the lack of response to first-line chemotherapy, serum albumin, and CRP were significant in the univariate analysis, multivariable logistic regression revealed that baseline serum albumin level ($p<0.001$, odds ratio (OR): 0.84) was the sole independent risk factor predicting six-month mortality. Furthermore, ROC analysis determined an optimal cut-off value of ≤35 g/L for albumin, which demonstrated an 80% sensitivity and a 53% specificity (area under the curve (AUC): 0.80).

Conclusion: Pre-treatment serum albumin level was independently associated with six-month mortality in patients with metastatic gastric cancer and may represent an accessible and potentially useful prognostic marker. Given the moderate specificity of the identified cut-off, serum albumin should be considered as a complementary risk-stratification parameter rather than a stand-alone predictor.

Keywords: Gastric neoplasms, prognosis, survival analysis, biomarkers, nutritional status

INTRODUCTION

Gastric cancer is one of the most common cancers. However, except in endemic regions, there are no routine screening programs; in countries where screening is conducted, the disease is detected at an earlier stage.[1] Because it is generally asymptomatic, it is often detected at a locally advanced or metastatic stage and has a poor prognosis.[2]

The prognosis is poor in advanced-stage gastric cancer. In fact, survival is quite short in some patient groups. Studies have identified various factors associated with short survival. Surgery is not beneficial in the metastatic stage, and factors influencing mortality are currently being investigated.[3] Although treatment regimens have improved, it remains a cancer type with a high mortality rate.[4]

Various factors have been examined to investigate the reasons for the poor prognosis in patients with stomach cancer. In these analyses, various scoring systems were developed based on patients' disease stage, laboratory parameters, and clinicopathological characteristics, and the impact of these scores on mortality was investigated.[5,6]

Among laboratory parameters, the effect of serum albumin level on survival has also been examined. Known to be a negative acute-phase reactant, serum albumin levels provide insight into the patient's nutritional status and physiological reserve; they have also been found to be closely associated with mortality in most gastrointestinal tract (GIT) cancers. In the meta-analysis conducted, albumin and globulin levels were examined, and a scoring system was applied. It was demonstrated that low albumin levels and high globulin levels have a negative impact on survival. The albumin-to-globulin ratio was analyzed, and it was found that the lower the albumin-to-globulin score, the worse the mortality outcome.[7]

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Early mortality remains a significant challenge in the treatment of metastatic gastric cancer, and identifying patients at high risk of early death may help guide treatment decisions and supportive care strategies. Although the prognostic value of serum albumin has been extensively reported in gastric cancer, most previous studies have focused on long-term overall survival across heterogeneous patient populations. Therefore, the present study aimed to evaluate the predictive role of baseline serum albumin and other clinical and laboratory parameters for short-term (six-month) mortality in patients with metastatic gastric cancer, including both de novo and recurrent metastatic disease.

METHODS

Ethics

This study was approved by the Non-interventional Clinical Researches Ethics Committee at the Van Yüzüncü Yıl University (Date: 17.04.2026, Decision No: 2026/04-04). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Due to the retrospective nature of the study, the requirement for written informed consent was waived by the ethics committee. All patient data were anonymized and analyzed in accordance with data protection and confidentiality principles.

Study Design and Patient Population

This retrospective observational study was designed to evaluate the predictive value of baseline clinical and laboratory parameters for six-month mortality in patients with metastatic gastric cancer. Patients with metastatic gastric adenocarcinoma, including both de novo metastatic disease and recurrent metastatic disease, who were followed at the Medical Oncology Department of Van Yüzüncü Yıl University between January 2016 and January 2026 were evaluated.

Inclusion criteria were as follows: (1) age ≥18 years; (2) histopathologically confirmed gastric adenocarcinoma; (3) presence of metastatic disease, either de novo or recurrent; (4) receipt of first-line systemic treatment for metastatic disease; and (5) availability of sufficient clinical and laboratory data for the assessment of six-month mortality.

Exclusion criteria were as follows: (1) age <18 years; (2) histopathological diagnosis other than gastric adenocarcinoma; (3) absence of metastatic disease; (4) patients who did not receive first-line systemic treatment; and (5) incomplete clinical or follow-up data required for the study.

Data Collection

Clinical and demographic data were retrospectively obtained from the hospital electronic medical record system.

The collected variables included: Age, gender, presence of comorbid diseases, smoking status, weight loss, Eastern Cooperative Oncology Group (ECOG) performance status, tumor location, histopathological differentiation, Lauren classification, human epidermal growth factor receptor 2 (HER2) status, metastatic sites, first-line chemotherapy regimen, response to first-line therapy.

Baseline laboratory parameters recorded at the time of diagnosis included: Serum albumin, C-reactive protein (CRP), lactate dehydrogenase (LDH), complete blood count parameters, tumor markers (CEA, CA19-9, and CA-125).

Treatment response was assessed radiologically according to the Response Evaluation Criteria in Solid Tumors (RECIST), version 1.1. Complete response (CR) and partial response (PR) were categorized as "response," whereas stable disease (SD) and progressive disease (PD) were categorized as "no response."

Study Endpoint

The primary endpoint of the study was mortality within the first six months after the diagnosis of metastatic disease. Accordingly, patients were divided into two groups:

- Patients who survived beyond 6 months after the diagnosis of metastatic disease
- Patients who died within 6 months after the diagnosis of metastatic disease

Statistical Analysis

The data analyses were performed using IBM SPSS Statistics software (version 25.0, IBM Corp., Armonk, NY, USA).

Categorical variables were expressed as numbers and percentages and compared using the Chi-square test or Fisher's exact test. The distribution of continuous variables was assessed for normality using the Shapiro–Wilk test and visual inspection of distribution plots. Normally distributed continuous variables were presented as mean±standard deviation and compared using the independent-samples t-test.

To identify predictors of six-month mortality, logistic regression analysis was performed. Initially, all variables were evaluated using univariate logistic regression analysis. Variables with a p value<0.10 in the univariate analysis were included in the multivariable logistic regression model. Multivariable analysis was performed using the forward stepwise likelihood-ratio (LR) method.

To evaluate the predictive performance of serum albumin for early mortality, receiver operating characteristic (ROC) curve analysis was conducted. The optimal cut-off value was determined using the Youden index. p value<0.05 was considered statistically significant for all analyses.

RESULTS

A total of 91 patients with metastatic gastric cancer were included in the study. During the follow-up period, 29 patients (31.9%) died within the first 6 months, whereas 62 patients (68.1%) survived beyond 6 months.

Baseline Characteristics

The comparison of categorical variables according to six-month mortality is presented in **Table 1**. Patients who died within 6 months had a significantly worse ECOG performance status (p=0.048). In addition, the distribution of first-line chemotherapy regimens differed between the groups (p=0.042). In this retrospective cohort, FLOT was

Table 1. Comparison of categorical variables according to six-month mortality

Variable	Survived beyond 6 months (n=62)	Died within 6 months (n=29)	p
Gender			0.722
Female	17	9	
Male	45	20	
Comorbidity			0.114
Absent	18	4	
Present	44	25	
Smoking			0.580
No	24	13	
Yes	38	16	
Weight loss			0.104
No	30	9	
Yes	31	20	
ECOG performance status			0.048
0–1	33	9	
2–3	29	20	
Tumor location			0.482
Non-cardia	39	16	
Cardia	23	13	
Tumor differentiation			0.137
Well–moderate	36	12	
Poor	26	17	
Lauren classification			0.947
Intestinal	32	16	
Diffuse	18	8	
Mixed	12	5	
HER2 status			0.092
Negative	49	27	
Positive	13	2	
Disease presentation			0.734
De novo	49	22	
Recurrent	13	7	
Liver metastasis			0.909
Absent	35	16	
Present	27	13	
Lung metastasis			0.218
Absent	50	20	
Present	12	9	
First-line chemotherapy			0.042
mDCF	12	8	
FOLFOX	19	7	
FLOT	12	0	
Other	19	14	
Response to first-line therapy			0.003
No response	36	26	
Response	26	3	
Trastuzumab use			0.011
No	50	29	
Yes	12	0	

ECOG: Eastern Cooperative Oncology Group, HER2: Human epidermal growth factor receptor 2, mDCF: Modified docetaxel–cisplatin–5-fluorouracil, FOLFOX: 5-fluorouracil/leucovorin/oxaliplatin, FLOT: 5-fluorouracil/leucovorin/oxaliplatin/docetaxel. Data are presented as n. P values were calculated using the Chi-square test or Fisher's exact test.

administered to selected patients with de novo metastatic disease who were considered clinically fit for an intensive triplet chemotherapy regimen, at the discretion of the treating physician. The use of FLOT in these patients represented an individualized first-line treatment decision rather than a perioperative treatment strategy. Most importantly, lack of response to first-line chemotherapy was significantly associated with early mortality (p=0.003). Moreover, trastuzumab use was observed only in patients who survived beyond 6 months (p=0.011). No significant differences were observed regarding gender, smoking status, tumor location, tumor differentiation, Lauren classification, disease presentation, or presence of liver or lung metastasis (Table 1).

Comparison of Continuous Variables

The comparison of continuous variables between the groups is shown in Table 2. Patients who died within the first 6 months had significantly lower serum albumin levels (28.6±7.7 vs 36.7±5.6 g/L, p<0.001) and higher CRP levels (52.8±59.0 vs 23.1±32.5 mg/L, p=0.016). No statistically significant differences were observed for age, BMI, tumor markers (CEA, CA19-9, CA-125), LDH, WBC, hemoglobin, platelet count, neutrophil count, lymphocyte count, or monocyte count. (Table 2).

Table 2. Comparison of continuous variables according to six-month mortality

Variable	Survived beyond 6 months (n=62) mean±SD	Died within 6 months (n=29) mean±SD	p
Age	62.0±10.0	66.1±8.8	0.065
BMI	22.26±2.06	23.05±2.90	0.194
CEA	510.6±2186.9	96.6±298.4	0.173
CA19-9	607.5±1822.1	402.0±1233.0	0.544
CA-125	241.0±1337.3	203.5±274.4	0.852
LDH	321.9±359.3	395.4±353.8	0.406
Albumin	36.7±5.6	28.6±7.7	<0.001
CRP	23.1±32.5	52.8±59.0	0.016
WBC	8132±3571	10802±11808	0.243
Hemoglobin	11.99±2.02	11.16±1.78	0.053
Platelet	318,414±142,553	311,759±111,018	0.812
Neutrophil	5524±2947	8086±11335	0.241
Lymphocyte	3464±13447	1547±851	0.284
Monocyte	786±832	752±492	0.813

SD: Standard deviation, BMI: Body-mass index, CEA: Carcinoembryonic antigen, CA19-9: Carbohydrate antigen 19-9, CA-125: Cancer antigen 125, LDH: Lactate dehydrogenase, CRP: C-reactive protein, WBC: White blood cell, HB: Hemoglobin, PLT: Platelet, NEU: Neutrophil, LYM: Lymphocyte. Data are presented as mean±standard deviation. P values were calculated using the independent-samples t-test

Logistic Regression Analysis

Univariate logistic regression analysis demonstrated that response to first-line chemotherapy (odds ratio (OR) 2.40, 95% CI 1.42–4.06, p=0.001), serum albumin level (OR 0.84, 95% CI 0.77–0.92, p<0.001), and CRP level (OR 1.02, 95% CI 1.00–1.03, p=0.010) were significantly associated with six-month mortality. Other clinical and laboratory parameters were not significantly associated with early mortality.

In the univariate logistic regression analysis conducted to identify risk factors for early mortality, variables with p<0.10 (age, ECOG score, chemotherapy response, serum

albumin, and CRP) were included in the multivariable analysis. Trastuzumab use, which was found to be significant in the between-group comparison, was not included in the regression model because the OR could not be calculated mathematically, as it was observed only in the survival group. In the multivariable logistic regression analysis using the forward stepwise (LR) method, baseline serum albumin was the only variable that remained independently associated with six-month mortality (OR 0.84, 95% CI 0.77–0.92, p<0.001) (Table 3).

Table 3. Univariate and multivariable logistic regression analyses for predictors of six-month mortality

	Univariate analysis			Multivariable analysis		
Variables	p value	OR	95% CI	p value	OR	95% CI
Gender	0.722	0.84	0.32–2.20			
Age at diagnosis	0.065	1.05	0.99–1.10			
Comorbidity	0.122	2.56	0.78–8.40			
Weight loss	0.108	2.15	0.85–5.47			
Body-mass index	0.144	1.15	0.95–1.38			
ECOG ≥2	0.051	2.53	1.00–6.42			
Tumor location (cardia)	0.483	1.38	0.56–3.37			
Poor differentiation	0.140	1.96	0.80–4.80			
HER2 positivity	0.109	0.28	0.06–1.33			
Liver metastasis	0.909	1.05	0.43–2.56			
First-line chemotherapy regimen	0.773	1.06	0.73–1.54			
Response to first-line chemotherapy	0.001	2.40	1.42–4.06			
CEA(ng/ml)	0.429	1	0.99–1.00			
LDH(U/L)	0.410	1	0.99–1.00			
Platelet	0.824	1	1.00–1.00			
Neutrophil	0.219	1	1.00–1.00			
Lymphocyte	0.345	1	0.99–1.00			
Albumin(g/L)	<0.001	0.84	0.77–0.92	<0.001	0.84	0.77–0.92
C-reactive protein(mg/L)	0.010	1.02	1.00–1.03			

BMI: Body-mass index, ECOG: Eastern Cooperative Oncology Group performance status, HER2: Human epidermal growth factor receptor 2, CEA: Carcinoembryonic antigen, LDH: Lactate dehydrogenase, OR: Odds ratio, CI: Confidence interval.*Multivariate analysis was performed using forward stepwise logistic regression including variables with p<0.10 in univariate analysis

ROC Analysis

ROC curve analysis demonstrated that serum albumin had good predictive performance for six-month mortality, with an area under the curve (AUC) of 0.80 (95% CI 0.68–0.92, p<0.001). The optimal cut-off value for albumin was ≤35 g/L, which yielded a sensitivity of 80% and a specificity of 53% for predicting early mortality (Table 4) (Figure).

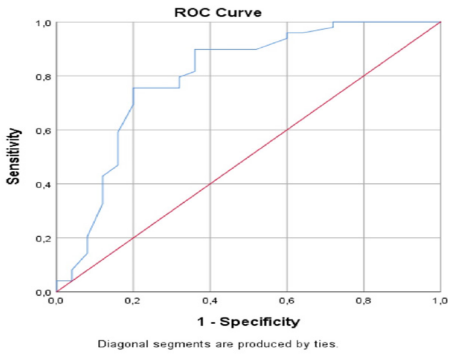


Figure. ROC analysis of serum albumin for prediction of 6-month mortality
ROC: Receiver operating characteristic

DISCUSSION

In our study, we investigated factors associated with six-month early mortality in patients with metastatic gastric cancer receiving systemic therapy. Mortality within the first six months was observed in 31.9% of the study population. In multivariable logistic regression analysis, baseline serum albumin remained independently associated with six-month mortality. ROC analysis demonstrated good discriminatory performance, with an AUC of 0.80. The identified cut-off value of ≤35 g/L yielded a sensitivity of 80% and a specificity of 53%. Although the relatively high sensitivity suggests potential usefulness for identifying patients at increased risk of early mortality, the modest specificity indicates that this threshold should not be used as a stand-alone clinical decision tool.

It has been shown that low albumin levels are associated with poorer survival in many types of cancer, particularly those of the GIT.[8] In a study conducted by Oñate-Ocaña and colleagues,[9] patients with gastric cancer were examined; the researchers noted that pre-treatment albumin levels are a strong prognostic factor and demonstrated that mortality increases as albumin levels decrease, alongside factors such as tumor stage (TNM), surgical resection, and type of lymphadenectomy. This finding is explained in a study by Almasaudi and colleagues on colorectal cancer not merely by simple nutritional deficiency but by increased systemic inflammation, disrupted body homeostasis, and the tumor's destructive power reducing the patient's physiological reserve.[10] In a study by Mao and colleagues,[11] it was emphasized that chronic inflammation suppresses albumin synthesis in the tumor microenvironment and that a decreased albumin-to-globulin ratio is a poor prognostic indicator in cancer patients. Consistent with previous literature, our findings indicate that lower pre-treatment serum albumin levels are associated with an increased risk of early mortality in patients with metastatic gastric cancer. This association may reflect the combined effects of systemic inflammation, nutritional impairment, and reduced physiological reserve.

Table 4. ROC analysis of serum albumin for prediction of six-month mortality

Variable	AUC (95% CI)	Cut-off	Sensitivity (%)	Specificity (%)	p value
Albumin	0.80 (0.68–0.92)	≤35 g/L	80	53	<0.001

ROC: Receiver operating characteristic, AUC: Area under the curve, CI: Confidence interval

Although response to first-line chemotherapy was significantly associated with six-month mortality in the univariate analysis, it did not remain significant in the multivariable model, whereas baseline serum albumin remained independently associated with mortality. This finding suggests that baseline albumin may provide additional prognostic information beyond treatment response; however, this observation should be interpreted cautiously given the limited sample size and number of events.

Because serum albumin is inexpensive and routinely available, it may serve as a practical complementary marker when assessing the risk of early mortality alongside established clinical and disease-related factors.

Although our study demonstrates that low albumin levels are a poor prognostic factor for early mortality in patients with metastatic gastric cancer, there are studies in the literature that do not support this finding. In a study by Crumley et al.,[12] while serum albumin levels were associated with poor survival in univariate analysis in patients with gastric cancer, this association lost its statistical significance in multivariable analysis. In that study, low albumin levels were thought to be secondary to systemic inflammation. In our study, however, the association between low serum albumin levels and increased mortality can be attributed not only to systemic inflammation but also to malnutrition, cachexia, and reduced physiological reserves. Therefore, it should not be forgotten that albumin levels may decrease not only as a result of systemic inflammation but also due to factors that negatively affect survival, such as impaired nutritional status and reduced physiological reserves, and that this condition may increase mortality.

A study by McMillan[13] supports the view that hypoalbuminemia is not merely a result of nutritional deficiency, but also serves as a significant marker of tumor-induced inflammation and cachexia in cancer patients. It emphasized that the chronic systemic inflammatory response occurring in cancer patients is the most important driving force behind cancer cachexia. This study found that objective scoring systems, such as the Glasgow Prognostic Score, which evaluates serum albumin levels in conjunction with CRP, serve as important predictors of nutritional deterioration and worsening survival in patients.[13] In our study, although CRP was found to be associated with early mortality in univariate analysis, serum albumin remained the sole independent predictor in multivariable analysis. This finding can be explained by the fact that albumin and CRP are acute-phase reactants and are correlated with each other. Albumin is an acute-phase reactant synthesized in the liver; while it decreases in chronic inflammation, reduced protein intake and increased cytokines (particularly interleukin-6 and tumor necrosis factor-alpha) contribute to this decrease. The reason albumin is a superior predictor in multivariable analysis is that it serves not only as a marker of tumor-induced systemic inflammation but also reflects the patient's nutritional status and cachectic wasting. Albumin's longer half-life compared to CRP may have allowed it to more stably reflect the physiological depletion observed in metastatic gastric cancer.

A study by Zhang and colleagues[14] demonstrated that tumor markers such as serum carcinoembryonic antigen (CEA) and CA19-9 are insufficient for predicting survival in gastric cancer. The study investigated the impact of the Modified Glasgow Prognostic Score—derived from serum albumin and CRP levels—on prognosis in patients with normal tumor marker levels. It was found that even in advanced-stage patients, those with normal tumor markers but low albumin levels had a poor prognosis for survival.[14] In our study, focusing on serum albumin in metastatic gastric cancer, we found that serum albumin showed good discriminatory ability for six-month early mortality, which supports the findings of Zhang and colleagues.[14] In advanced-stage patients, where tumor markers may not fully predict clinical course, even a low-cost serum albumin test alone is significant in determining the risk of early mortality. This suggests that the readily accessible serum albumin test may be more reliable than tumor markers in the clinical decision-making process.

A review of the literature on gastric cancer studies has shown that elevated serum CEA and CA19-9 levels are independent risk factors for poor survival.[15,16] In our study, no statistically significant difference was found in CEA (p=0.173) and CA19-9 (p=0.544) levels between patients who died within 6 months and those who survived. Similarly, studies have shown that laboratory values such as neutrophil, lymphocyte, and platelet counts—specifically the neutrophil-to-lymphocyte ratio and the platelet-to-lymphocyte ratio—have a poor prognostic effect on survival in gastric cancer.[17,18] In our study, however, these blood cell values (neutrophils p=0.241, lymphocytes p=0.284, platelets p=0.812) were found to lack statistical significance in predicting early mortality. Upon clinical and pathological examination, it was determined that poor tumor differentiation and the presence of liver metastases are factors that dramatically affect the patient's prognosis and significantly reduce survival.[19] In our study, however, major prognostic factors such as tumor differentiation grade (p=0.137) and the presence of liver metastases (p=0.909) did not result in differences between the six-month survival groups. The reason for this discrepancy may be that previous studies often included heterogeneous disease stages and evaluated long-term survival, whereas our study focused exclusively on patients with metastatic gastric cancer, including both de novo and recurrent metastatic disease, and evaluated short-term six-month mortality. Frail patients in the terminal stage of metastatic disease are influenced more by the patient's physiological reserve, malnutrition status, and systemic inflammation than by the location of the metastasis or the tumor's histological characteristics.

Limitations

The single-center and retrospective nature of our study are among its main limitations. In addition, the relatively small sample size and limited number of early mortality events should be considered when interpreting the multivariable analysis. Specifically, 29 early mortality events were observed, and five candidate variables were entered into the multivariable modeling process, corresponding to approximately 5.8 events per variable. This value is below the conventionally suggested threshold of 10 events per variable and may increase the risk of model overfitting and instability of the estimated associations. Furthermore, residual confounding due to unmeasured variables cannot be excluded, and detailed nutritional assessment tools or

dietary questionnaires were not available. Despite all these limitations, our study has demonstrated the prognostic significance of serum albumin levels, a test that is easily accessible and low-cost in clinical practice. The fact that a critical factor such as "response to first-line chemotherapy"—which was significant in univariate analysis—yields to serum albumin levels in multivariable analysis highlights just how important this parameter is. The finding that serum albumin is more reliable than tumor markers in predicting pre-treatment clinical course in patients with advanced gastric cancer will serve as a guide for developing supportive care strategies for albumin in clinical practice.

CONCLUSION

Pre-treatment serum albumin was independently associated with six-month mortality in patients with metastatic gastric cancer and may represent an accessible and potentially useful prognostic marker. Although an albumin level of ≤35 g/L demonstrated good overall discrimination and relatively high sensitivity, its modest specificity limits its use as a stand-alone predictor. Serum albumin may therefore complement clinical assessment when identifying patients at increased risk of early mortality. Prospective multicenter studies and external validation cohorts are needed to confirm these findings and validate the proposed cut-off.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was approved by the Non-interventional Clinical Researches Ethics Committee at the Van Yüzüncü Yıl University (Date: 17.04.2026, Decision No: 2026/04-04).

Informed Consent

This retrospective study used pre-existing anonymized patient data. No additional intervention was performed, and there was no direct patient contact. The study was approved by the Ethics Committee, and the requirement for written informed consent was waived by the ethics committee.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Financial Disclosure

The authors received no financial support for the conduct or publication of this research.

Author Contributions

Concept: MK, MÜ; Design: MK; Control: MÜ; Resources: MK; Materials: MK, MÜ; Data Collection and/or Processing: MÜ; Analysis and/or Interpretation: MK; Literature Review: MÜ; Writing the Article: MK; Critical Review: MK, MÜ.

REFERENCES

1. Leung WK, Wu MS, Kakugawa Y, et al. Screening for gastric cancer in Asia: current evidence and practice. *Lancet Oncol*. 2008;9(3):279-287. doi:10.1016/S1470-2045(08)70072-X
2. Wanebo HJ, Kennedy BJ, Chmiel J, et al. Cancer of the stomach: a patient care study by the American College of Surgeons. *Ann Surg*. 1993;218(5):583-592. doi:10.1097/00000658-199321850-00002
3. Feng Y, Guo K, Jin H, et al. A predictive nomogram for early mortality in Stage IV gastric cancer. *Med Sci Monit*. 2020;26:e923931. doi:10.12659/MSM.923931
4. Wagner AD, Syn NL, Moehler M, et al. Chemotherapy for advanced gastric cancer. *Cochrane Database Syst Rev*. 2017;8(8):CD004064. doi:10.1002/14651858.CD004064.pub4
5. Chau I, Norman AR, Cunningham D, et al. Multivariate prognostic factor analysis in locally advanced and metastatic esophago-gastric cancer: pooled analysis from three multicenter, randomized, controlled trials using individual patient data. *J Clin Oncol*. 2004;22(12):2395-2403. doi:10.1200/JCO.2004.08.154
6. McMillan DC. The systemic inflammation-based Glasgow Prognostic Score: a decade of experience in patients with cancer. *Cancer Treat Rev*. 2013;39(5):534-540. doi:10.1016/j.ctrv.2012.08.003
7. Wei C, Yu Z, Wang G, et al. Low pretreatment albumin-to-globulin ratio predicts poor prognosis in gastric cancer: insight from a meta-analysis. *Front Oncol*. 2021;10:623046. doi:10.3389/fonc.2020.623046
8. Gupta D, Lis CG. Pretreatment serum albumin as a predictor of cancer survival: a systematic review of the epidemiological literature. *Nutr J*. 2010;9:69. doi:10.1186/1475-2891-9-69
9. Oñate-Ocaña LF, Aiello-Crocifoglio V, Gallardo-Rincón D, et al. Serum albumin as a significant prognostic factor for patients with gastric carcinoma. *Ann Surg Oncol*. 2007;14(2):381-389. doi:10.1245/s10434-006-9093-x
10. Almasaudi AS, Dolan RD, Edwards CA, et al. Hypoalbuminemia reflects nutritional risk, body composition and systemic inflammation and is independently associated with survival in patients with colorectal cancer. *Cancers (Basel)*. 2020;12(7):1986. doi:10.3390/cancers12071986
11. Mao MJ, Wei XL, Sheng H, et al. Clinical significance of preoperative albumin and globulin ratio in patients with gastric cancer undergoing treatment. *BioMed Res Int*. 2017;2017:3083267. doi:10.1155/2017/3083267
12. Crumley AB, Stuart RC, McKernan M, et al. Is hypoalbuminemia an independent prognostic factor in patients with gastric cancer? *World J Surg*. 2010;34(10):2393-2398. doi:10.1007/s00268-010-0641-y
13. McMillan DC. Systemic inflammation, nutritional status and survival in patients with cancer. *Curr Opin Clin Nutr Metab Care*. 2009;12(3):223-226. doi:10.1097/MCO.0b013e32832a7902
14. Zhang S, Li JZ, Du T, et al. The Modified Glasgow Prognostic Score predicts survival in gastric cancer patients with normal CEA and CA19-9. *Can J Gastroenterol Hepatol*. 2022;2022:3953004. doi:10.1155/2022/3953004
15. Moriyama J, Oshima Y, Nanami T, et al. Prognostic impact of CEA/CA19-9 at the time of recurrence in patients with gastric cancer. *Surg Today*. 2021;51(10):1638-1648. doi:10.1007/s00595-021-02248-y
16. Marrelli D, Pinto E, De Stefano A, et al. Clinical utility of CEA, CA 19-9, and CA 72-4 in the follow-up of patients with resectable gastric cancer. *Am J Surg*. 2001;181(1):16-19. doi:10.1016/s0002-9610(00)00549-3
17. Kim EY, Lee JW, Yoo HM, et al. The platelet-to-lymphocyte ratio versus neutrophil-to-lymphocyte ratio: which is better as a prognostic factor in gastric cancer? *Ann Surg Oncol*. 2015;22(13):4363-4370. doi:10.1245/s10434-015-4518-z
18. Hirahara T, Arigami T, Yanagita S, et al. Combined neutrophil-lymphocyte ratio and platelet-lymphocyte ratio predicts chemotherapy response and prognosis in patients with advanced gastric cancer. *BMC Cancer*. 2019;19(1):672. doi:10.1186/s12885-019-5903-y
19. Cheon SH, Rha SY, Jeung HC, et al. Survival benefit of combined curative resection of the stomach (D2 resection) and liver in gastric cancer patients with liver metastases. *Ann Oncol*. 2008;19(6):1146-1153. doi:10.1093/annonc/mdn026