Original Research Article

Albumin, prealbumin and CRP levels can be used to predict prognosis in gastric cancer

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ABSTRACT

Background: malnutrition and systemic inflammatory response in cancers result in a shorter survival rate, reduced treatment response and a higher rate of complications associated with therapy. Prealbumin, albumin and CRP Levels has utility as a prognostic indicator of cancer survival in cancer. The objective of this study was to albumin, pre-albumin and CRP levels of the patients who underwent surgery for gastric cancer were prospectively recorded and retrospectively evaluated.

Methods: Study was done for period of 1 year in patients underwent surgery for gastric cancer. Details noted from records are as age, gender, duration of hospital stay, TNM stage, and preoperative albumin, pre-albumin and CRP levels.

Results: A total number of 44 patients, 32 (72.7%) men and 12 (27.7%) women, were included in the study. The mean age was 64.1 (43-89) years. The mean duration of hospital stay was 12.8 (4-46) days. Preoperative albumin levels were below the expected range in 16 (41%) of 44 patients. Mean age of the patients with normal and decreased albumin levels was 62.7 ± 12.8 and 65.3 ± 12.3 years, respectively; albumin levels were insignificantly associated with the age ($p = 0.54$). When these 16 cases were evaluated in terms of disease stage-3 had 11(68.7%). Preoperative pre-albumin levels were decreased in 23 (53%) of 44 cases. Among the cases with decreased pre-albumin levels, stage 1 and 3 had 5 (21.7%) cases. There was a significant correlation between the TNM stage and pre-albumin levels ($P = 0.014$). CRP levels were elevated in 19 (43.2%) of 44 cases with CRP. Among these Stage-3 had 8 cases, 4 (42.1%). There was no significant correlation between disease stage, presence of metastatic lymph nodes and albumin levels ($p > 0.05$).

Conclusions: Preoperative albumin, pre-albumin and CRP levels can be useful to predict prognosis of patients with gastric cancer.

Keywords: Albumin, CRP, Gastric cancer, Pre-albumin

INTRODUCTION

Cancer is a major public health problem in the United States (US) and many other parts of the world. The World Health Organization (WHO) estimates that by 2020, globally, more than 15 million people will experience cancer and 10 million will die from it each year.¹ Malnutrition and cachexia in cancer is common problems observed due to involvement of host response

to the tumor, and anticancer therapies.² Malnutrition has been associated with a number of clinical consequences, including deteriorated quality of life, decreased response to treatment, increased risk of chemotherapy-induced toxicity and a reduction in cancer survival.³

Surgery is the best treatment of choice in efficacy in gastric cancer. Tumor node metastases (TNM) staging is important tool for the estimation in cancer prognosis, but

it is limited by the individual variability of gastric cancer. Therefore, there is need to establish the optimum methods to predict prognosis.⁴ Inflammation is one of the most important indicators of cancer. In cancer, there is Chronic inflammation is the risk factor in development of cancer, so inflammatory proteins associated with process can be used as predictors of the severity or aggressiveness of certain cancer types. Biomarkers can help in establishing risk of metastasis or recurrence of the disease.⁵

Although individual prognostic Systemic inflammatory response and the effects of cytokines associated with inflammation increase CRP levels which, in turn, enhance cancer progression.⁶ Biochemical markers such as albumin, pre-albumin and C-reactive protein (CRP) are currently used to predict prognosis in several types of cancer, So present study is aimed to assess the correlation between tumor stage and the levels of pre-albumin, albumin and CRP in patients underwent surgery for gastric cancer.³

METHODS

Total 44 patients with Gastric carcinoma was recruited in this prospective study before the onset of chemotherapy between February 2014 and March 2015 in department of oncology. Ethics committee has approved the study and written informed consent was obtained from all the patients before the commencement of the study.

Patients with history of other malignancies, autoimmune disease, chronic renal or hepatic disease, diabetes, and

thyroid disorders and those who were taking anti-inflammatory drugs.

The tumor-node-metastasis (TNM) classification of malignant tumors was used for staging the tumors. All patients received the same chemotherapy regimen as described below. Albumin, pre-albumin and CRP levels of the patients who underwent surgery for gastric cancer in our division, were prospectively recorded and retrospectively evaluated. Age, gender, duration of hospital stay, TNM stage, and preoperative albumin, pre-albumin and CRP levels were recorded. Albumin levels lower than 3.5 mg/dL and pre-albumin levels lower than 20 mg/dL were considered to be below the normal range. CRP levels higher than 5 mg/L were considered to be elevated. Albumin, CRP and pre-albumin levels; TNM stage, metastatic lymph node positivity, number of metastatic lymph nodes, age, gender and duration of hospital stay were compared separately. IBM SPSS Statics version 22 software package (IBM SPSS, Inc., USA) was used for the statistical analysis. For the comparison of categorical variables between groups, Pearson Chi-Square test, and Fisher's exact test were used. Values of $p < 0.05$ were considered significant.

RESULTS

A total number of 44 patients, 32 (72.7%) men and 12 (27.7%) women, were included in the study. The mean age was 64.1 (43-89) years. The mean duration of hospital stay was 12.8 (4-46) days. Preoperative albumin levels were below the expected range in 16 (41%) of 44 patients with albumin measurements.

Table 1: Variables according to albumin levels.

Albumin	Normal (N = 28)		Low (N = 16)		P- Value
	N	%	N	%	
TNM staging					
0	1	3.5	0	0	0.65
1	2	7	1	6.2	
2	8	28.5	3	18.7	
3	14	50	11	68.7	
4	1	3.5	1	6.2	
Total	28	59	16	41	
	Mean±SD	Min-Max	Mean±SD	Min-Max	P
Age	62.7±12.8	44-89	65.3±12.3	48-88	0.54
Duration of hospital stay					
	12.2±9.5	4.0-46	12.9±7.1	9.0-29	0.35
Number of metastatic lymph nodes					
	11.6±12.1	1.0-44	13.5±15	4.-52	0.67

Mean age of the patients with normal and decreased albumin levels was 62.7±12.8 and 65.3±12.3 years, respectively; albumin levels were insignificantly

associated with the age ($p = 0.54$). When these 16 cases were evaluated in terms of disease stage-3 had 11 (68.7%). There was no significant correlation between

disease stage, presence of metastatic lymph nodes and albumin levels ($p>0.05$). Preoperative pre-albumin levels were decreased in 23 (53%) of 44 cases with pre-albumin measurements. Among the cases with decreased pre-albumin levels, stage 1 and 3 had 5 (21.7%) cases. There

was a significant correlation between the TNM stage and pre-albumin levels ($P = 0.014$). No significant correlation was demonstrated between pre-albumin levels and the other parameters ($P>0.05$) (Table 2).

Table 2: Variables according to pre-albumin levels.

Pre-albumin	Normal (N = 21)		Low (N = 23)		P- Value
	N	%	N	%	
TNM staging					
0	1	4.7	1	4.3	0.014
1	3	14.1	5	21.7	
2	8	38	6	26	
3	7	33.3	5	21.7	
4	2	9.5	6	26	
Total	21	47	23	53	
	Mean±SD	Min-Max	Mean±SD	Min-Max	P
Age	58±8.8	47-6.1	75±11.8	51-89	0.071
Duration of hospital stay					
	19±21.4	8-43	15.1±8.9	8-38	0.62
Number of metastatic lymph nodes					
	1±1	1-2	12.1±3.9	8-15	0.31

Table 3: Variables according to CRP levels.

Pre-albumin	Normal (N = 25)		Low (N = 19)		P- Value
	N	%	N	%	
TNM staging					
0	2	8	1	5.2	0.72
1	3	12	3	15.7	
2	9	36	5	26.3	
3	7	30.4	8	42.1	
4	4	16	2	10.5	
Total	25	56.8	19	43.2	
	Mean±SD	Min-Max	Mean±SD	Min-Max	P
Age	62.2±15.3	40-81	67.7±14.5	8-89	0.31
Duration of hospital stay					
	14±8.1	8-45	15.7±7.4	8-38	0.88
Number of metastatic lymph nodes					
	15±8	7.0-35	14±7.	4.0-37	0.74

CRP levels were elevated in 19 (43.2%) of 44 cases with CRP measurements. Among these Stage-3 had 8 cases, 4 (42.1%). No significant correlation was demonstrated between pre-albumin levels and the other parameters. ($P>0.05$).

DISCUSSION

There is evidence that support the significant role of systemic inflammatory response in carcinogenesis and tumor progression.⁷ There are studies which show correlation between proliferative activity and systemic

inflammatory response associated with the tumor.⁸ Hypo-albuminemia is a typical index of malnutrition and has been associated with poor prognosis in patients with advanced cancers.⁹ Decreased pre-albumin level is known to be an independent risk factor in cancer patients and its use is recommended in terminal cancer patients.¹⁰

CRP appeared to be a valuable prognostic predictor particularly in digestive tumors. It may also help predict tumor recurrence and treatment response in disease. CRP is an acute phase protein that is known to be an independent risk factor for several cancer types.¹¹ Studies

are evident that CRP can be used as an important parameter to predict prognosis in cases of gastric cancer.^{12,13} Albumin, pre-albumin and CRP have been separately or simultaneously investigated in several previous studies which is done by Gao and Huang.¹⁴ They recommended the use of albumin and CRP in prognosis estimation, but they still underlined the need for further research. Pan et al, performed a survival analysis based on low albumin and high CRP levels.⁴ They found that these parameters were associated with the survival rates in 1, 3 and 5 years, in addition to the mean survival and disease free survival. Moreover, increasing TNM stages were found to be associated with shorter survival time in there study.

Esfani et al, reported a significant correlation of decrease prealbumin and increased CRP levels with the presence of metastatic disease, while no such correlation was found with albumin levels.¹⁵ Sensitivity and specificity of decreased pre-albumin levels for predicting metastases in inoperable patients were found to be 77.1% and 52.2%, respectively was observed. Moreover, the authors argued that the pre-albumin/CRP ratio could be a more useful predictor of metastasis. The present study correlates with association between increasing disease stage and decreased pre-albumin levels. However, such a correlation was not found with CRP levels. Albumin levels were also not found to be related to the disease stage.

Since the half-life of pre-albumin in blood circulation is as short as 2 days, it is a much more sensitive marker of nutritional status than albumin. Ho et al suggested that a decreased pre-albumin level is an independent risk factor in cancer patients and recommended its use for the patients with terminal cancers. Pre-albumin is also currently used to evaluate treatment outcome and nutritional status in colon, esophagus, ovarian and lung cancers.^{10,16,17} Another study suggested that pre-albumin levels can be used to predict the early recurrence of colorectal cancer. In there study, albumin was found to be more sensitive than pre-albumin in predicting the recurrence of colorectal cancer.

CRP is a marker of systemic inflammatory response and increased CRP levels represent in independent risk factor for the prognosis of gastro-esophageal cancers. Baba et al. 6, showed that CRP levels per se are a prognostic factor in cases of Stage IV gastric cancer. In another study investigating the roles of inflammatory proteins in gastric cancer. Similarly, Tang et al reported that elevated CRP levels are associated with increasing disease stages. Study demonstrated that CRP is produced at a larger amount as the disease progresses.¹⁸ Wang et al, found that elevated CRP levels were only associated with metastatic disease and, contrary to the above referred studies, elevated CRP levels were not related to Stage I, Stage II and Stage III disease.⁵

Liu et al, reported a significant correlation of decreased albumin and increased CRP levels with shorter survival, and CRP/albumin ratio as an independent prognostic marker, particularly in cases with Stage I and Stage III disease.⁷ The authors proved that this ratio might be related to the nutritional status; but they could not demonstrate its correlation with weight loss and body mass index. Administration of anti-inflammatory therapy and nutritional support was also recommended for cases with increased CRP/albumin ratio. In the present study, CRP levels were elevated in Stage III cases but the difference was not statistically significant. Our study need further studies as it is done in limited number of patients available.

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