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Preoperative albumin-bilirubin score is a prognostic factor for gastric cancer patients after curative gastrectomy

Szor DJ *et al*. ALBI score in gastric cancer

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INTRODUCTION

Gastric cancer (GC) is a solid gastrointestinal tumor with elevated incidence and mortality, represented by more than 1 million diagnosed cases and 768000 deaths reported worldwide in 2020[1]. Currently, staging is based only on TNM classification, which plays a crucial role in predicting the prognosis. However, it is well known that patients with same stage disease can have different outcomes[2], which indicate that additional parameters can play a role in staging and prognosis.

Thus, the search for alternative parameters that, integrated into staging systems, can provide further information about the prognosis are a constant target of investigation. Due to its potential to allow risk stratification and tailor individual treatment and follow-up, some of the research on additional prognostic variables has focused on inflammatory and nutritional-based biomarkers, based on the fact that tumor development is a complex process dictated by a series of intercellular and its sub product interactions[3]. Over the past years, many articles have been published demonstrating the correlation of inflammatory biomarkers, such as neutrophil-lymphocyte and platelet lymphocyte ratio, with prognosis of patients with GC[4]. The main advantages of these methods are the low cost, the need for simple tests such as a complete blood count, and the reproducibility between different centers.

It is also known that nutritional characteristics and liver function, represented by serum albumin and bilirubin, can interfere with prognosis and cancer survival. The decreased albumin level, which is produced in the liver, could be a sign of malnutrition

or liver synthesis dysfunction. In turn, increased serum bilirubin levels usually suggests liver dysfunction[5]. Therefore, the albumin-bilirubin score (ALBI) was created to evaluate both levels together and estimate the extent of liver dysfunction[6,7]. It was first described by Johnson *et al*[6], where were evaluated patients with hepatocarcinoma (HCC) in a way to overcome the limitation of Child-Pugh grade on assessing hepatic function[7]. ALBI was initially developed to assess HCC, and represents a prognostic factor in these patients, irrespective of the degree of underlying liver fibrosis[8].

However, it has also been extensively investigated in patients who do not have HCC, and some studies demonstrated that ALBI score represents a prognostic factor even in patients without HCC, including patients with non-small cell lung carcinoma, pancreatic, colon, and esophageal cancer[9-12].

Despite the interest in ALBI score, few studies have considered its role in patients with GC. Kanda *et al*[13] were the first to recognize ALBI grade as a predictor of survival after radical gastrectomy. Furthermore, ALBI was also identified as a predictor of postoperative complications (POC) after gastrectomy for GC[14]. However, the clinical impact of the preoperative ALBI score in patients with GC who received curative treatment remains unclear.

Thus, the aim of this study was to investigate the prognostic value of the ALBI score in in patients with GC, and its clinical applicability for risk stratification. We also evaluated the clinicopathological characteristics associated with ALBI score groups.

MATERIALS AND METHODS

Patients and study design

This is a retrospective cohort. All GC treated with curative intent gastrectomy at our Hospital between 2009 and 2021 were evaluated from a prospectively maintained database. Only histologically proven gastric adenocarcinoma and patients who underwent gastrectomy with lymphadenectomy were considered eligible. Emergency gastrectomy or patients who had underlying chronic liver disease were excluded. The

study was approved by the ethics committee of the hospital (CAAE: 50971821.8.0000.0068).

Preoperative evaluation and ALBI score

Preoperative staging consisted of upper gastrointestinal endoscopy with biopsy, chest, abdominal and pelvic computed tomography scans, and laboratory tests. The clinical characteristics evaluated included the American Society of Anesthesiologists (ASA) classification and the Charlson-Deyo Comorbidity Index (CCI)[15]. CCI was considered without including age and GC as comorbidity. The neutrophil-lymphocyte ratio was evaluated by the division between serum neutrophil and lymphocytes.

Peripheral blood was obtained after diagnosis and within 1 mo before surgery, at the time the patient had no sign of infection and was not under systemic chemotherapy. The ALBI score was calculated by the formula (log10 bilirubin × 0.660) + (albumin × -0.085), where bilirubin was expressed in µmol/L and albumin in g/L.

Surgery and postoperative

The extent of gastrectomy and lymph node dissection were performed in accordance with Japanese Gastric Cancer Association recommendations[16]. Tumor stage was determined based on the TNM/UICC (8th edition)[17]. Clavien-Dindo's classification was applied to grade POC, when Clavien III-IV was considered as major POC[18].

Follow-up was performed every 3 mo in the first year and every 6 mo after this period, with clinical evaluation. Studies to detect relapse were performed based on the presence of symptoms.

Statistical analysis

Descriptive statistics included frequencies with percent for nominal variables, and mean (with standard deviation, SD) or median (with interquartile range, IQR) for continuous variables. Comparison of clinicopathological characteristics was performed using chi-square tests for categorical variables and *t* test or Mann-Whitney *U* test for continuous

variables. The receiver operating characteristic (ROC) curves with area under the ROC curve (AUC) were used to evaluate the ability of ALBI in predicting disease-free survival (DFS) (recurrence/death). The optimal cutoff value was determined by maximizing Youden's index (sensitivity + specificity - 1). Patients were divided into "low-ALBI" and "High-ALBI" groups based on the cutoff value.

Overall survival (OS) and DFS were estimated using the Kaplan-Meier method, and the comparison of curves was obtained through the log-rank test. Multivariate Cox proportional hazard analysis was performed to determine independent risk factors for survival. Only variables that were significant on univariate analysis ($P < 0.05$) were included as co-variable in the multivariate model. Survival time was calculated from the date of diagnosis until the date of death or recurrence for DFS, and until death for OS. The patients alive were censored at the date of the last contact. A P value of < 0.05 was considered statistically significant. Statistical analyses were performed using SPSS software, version 20.0 (SPSS Inc, Chicago, IL, United States).

RESULTS

A total of 565 GC patients underwent curative intent gastrectomy in the referenced period. After excluding those with a lack of laboratory tests within one month before surgery, 361 patients met the inclusion criteria and were enrolled in the study. The mean age was 63.5 years-old (± 12.1), and the majority of patients were male (65%).

The mean value of albumin and bilirubin of all cases was 3.9 g/L (SD 0.6; median of 4, IQR: 3.70-4.30) and 0.43 μmol/L (SD 0.27; median of 0.37, IQR 0.26-0.55), respectively. After ALBI calculation, the median ALBI value obtained was -2.89 (IQR -3.13; -2.59; median of -2.82, SD -0.48).

The ROC curve with the ALBI metric performance is shown in Figure 1. The AUC for ALBI score was 0.617 (95%CI 0.556-0.673, $P < 0.00171$), and the optimal cutoff value was - 2.82.

Thus, based on the cutoff value determined by ROC curve, 211 (58.4%) patients were classified as low-ALBI group (ALBI < -2.82); and 150 (41.6%) as high-ALBI group (ALBI ≥ -2.82).

Clinical and surgical characteristics of both groups are presented in Table 1. Older age (P = 0.005), lower hemoglobin level (P < 0.001), and ASA III/IV (P = 0.001) were associated with the High-ALBI group. Also, D1 Lymphadenectomy was more frequent in the High-ALBI group (P = 0.003). There was no difference regarding sex, BMI, type of gastrectomy, and preoperative chemotherapy between the groups.

Regarding the pathological characteristics (Table 2), there was no significant difference between the ALBI groups in terms of histological type, depth of tumor invasion (pT), presence of lymph node metastasis (pN), and final pathologic (pTNM) stage.

The postoperative outcomes according to ALBI group are presented in Table 3. The occurrence of major POC (P = 0.029) and the mortality rate at 30 d and 90 d were more frequent in the high-ALBI group (P = 0.023 and P = 0.030, respectively). The frequency of patients undergoing adjuvant chemotherapy was similar between both groups (P = 0.917).

Survival analysis

The median follow-up period was 40.1 mo. During this period, 81 patients had recurrence and 142 died. The 5-years DFS and OS rates for the entire cohort were 53.7% and 55.6%, respectively. In the survival analysis (Figure 2), DFS and OS rate was worse for patients with high-ALBI levels compared to the low-ALBI patients (P < 0.001 for both). The median DFS and OS for high-ALBI group were of 28.0 mo and 39.5 mo, respectively.

Similarly, when stratified by pTNM stage (Figure 3), pTNM I/II GC with high-ALBI had significantly worse DFS and OS compared to with low-ALBI pTNM I/II patients (P < 0.001).

Also, among pTNM III GC, DFS and OS in high-ALBI was shorter compared to low-ALBI group ($P = 0.021$ and $P = 0.063$, respectively).

In multivariate analysis, total gastrectomy, advanced pT stage, presence of lymph node metastasis and high-ALBI were independent factors associated with worse DFS (Tables 4 and 5). For OS, ASA, type of gastrectomy, pT, pN, and ALBI-groups were factors significantly associated with survival in multivariate model.

DISCUSSION

The aim of the present study was to evaluate the impact of the ALBI status in GC patients who received curative treatment. Accordingly, we found that ALBI score was an independent prognostic factor for patients with GC, and may be useful in predicting patient survival after gastrectomy. Furthermore, ALBI groups were able to stratify survival of patients in the same pTNM stage.

ALBI score has been considered a useful marker for hepatic dysfunction based only the two variables, albumin and bilirubin, which are related to nutrition and liver function[6,19]. Classically, it is a biomarker intended to evaluate prognosis in patients with HCC, and the majority of available studies address this disease[20]. Even so, some articles report results of its application in other diseases[9,10,21]. For instance, Matsukane et al[22] reports that ALBI is an independent prognostic factor for patients with non-small cell lung cancer, and Lee et al[9] found that ALBI can predicted disease recurrence and survival in stage III colon cancer.

Considering the two parameters that comprise the ALBI score, albumin is synthesized in the liver, and its serum level is usually used to assess nutritional status and hepatic function[5]. Nutritional status is something that has already been shown to be related to the immune system and prognosis in GC, where a deficient nutritional condition can suppress the immune response against tumor, accelerating the cancer progression[5,23]. Thus, preoperative serum albumin level and prognostic nutritional index are factors already related to outcomes in GC[23]. But considering the evaluation

of bilirubin levels alone, the association between serum levels of bilirubin and GC are poorly described[24].

The present study evaluated the ALBI through the ROC curve based on the DFS for GC, and we set the cut-off value for the ALBI score at -2.82. Our cutoff score was similar to reported by Ju *et al*[21], that include only curative GC patients, where based on OS rates at 3 years and 5 years they determined an ALBI cutoff value of -2.78. Interestingly, a similar value was also found in a study with patients with esophageal cancer, where the cutoff value for the ALBI score was -2.7[10]. This suggests that setting a single cut-off value for esophagogastric tumors may be appropriate.

In our cohort, ALBI groups were different in terms of some clinical characteristics, as age, hemoglobin levels and ASA, indicating a clinically impaired patient who might present a worse prognosis. However, no difference regarding the rate of comorbidity in relation to the ALBI groups were found in this study. Likewise, Kanda *et al*[13] evaluated 283 patients with pT2-4 resected GC and also demonstrated that high-ALBI group patients were older, but without reflecting on the comorbidity rate.

Considering the pathological characteristics, we expected that the high-ALBI group would have deeper gastric wall invasion and more nodal involvement, suggesting that a more advanced disease could cause impaired liver function and possible hepatic hilar compression due to nodal enlargement. However, similar than Kanda *et al*[13], we did not find this association.

Despite not influencing the pTNM stage, in the preset cohort ALBI score was related to patient survival. Patients with high-ALBI were related to both lower DFS and OS when compared to low-ALBI groups, even in the same TNM stages. Similar results have been reported by Zhu *et al*[14] that demonstrated worse OS for patients with GC and high ALBI values, especially those with stage disease II and III. Likewise, Ju *et al*[21] evaluating 244 patients with resected GC showed that increasing in ALBI levels was an independent factor related to OS, with a HR of 2.2. ALBI score was also related to recurrence in advanced GC stage as pT2-T4 after gastrectomy[13]. The association of ALBI with decreased survival can be explained by the prolonged damage caused by a

deficient nutritional status, with lower albumin levels and anemia (both seen in our cohort). In addition to debilitating the patient, decreasing adherence to chemotherapy[25,26], malnutrition also affects cell-mediated immunity by T cells, which impairs anti-tumor response and accelerates tumor progression[5,23,27].

Noteworthy, some authors also demonstrated differences in relation to the incidence of POC according to the ALBI score, as described by Aoyama *et al*[10], where the incidence of postoperative anastomotic leakage in patients with esophageal cancer was 46.3% in the ALBI-high group compared with 27.5% in the ALBI-low group (*P* = 0.038). In patients with GC, some authors reported that there was no significant differences in morbidity and POC rate between ALBI groups[13]; whereas other found that in patients who underwent radical resection, the rate of POC were also higher in patients with high-ALBI than low-ALBI levels[14]. Similarly, in our cohort, we also observed that the incidence of major POC was higher in the high-ALBI group, including the mortality at 30 d and 90 d. One of the justifications for this result is probably related to the age of patients, since high-ALBI group are generally older, as seen in our study. So, it may represent a frail group of patients with a higher risk of complications[28]. Still, poor nutritional status can contribute to a higher risk of POC[29], since preoperative hypoproteinemia has already been reported as a risk factor for postoperative infection in gastrointestinal surgery[30]. So, in our study, ALBI had a clinical impact on both short-term and long-term outcomes.

Overall, we proposed a risk stratification in two groups based on ALBI values, which was independently associated with survival and may serve as an additional parameter to predict patient outcomes. Both DFS and OS were clearly separated according to the ALBI status, where those classified as high-ALBI had worse survival outcomes. In addition, the preoperative ALBI was found to be a promising marker for predicting disease relapse and survival even in GC with the same TNM stage. As well as other previously described pretreatment serum-based inflammatory indicators, such as the neutrophil to lymphocyte ratio[31], the ALBI score can be determined using routine tests and has potential to be an useful biomarker for patients with GC.

Some limitations should be mentioned in this study. Firstly, this is a retrospective research; therefore, some confounders and selection bias were not absolutely adjusted. Although ALBI grade has been related to the tolerability and introduction of postoperative adjuvant chemotherapy[21,32], since hepatic dysfunction are one of the main factors for adverse reactions to chemotherapy (CMT), it was not possible to assess the influences of the ALBI score on adherence to regimens and/or duration of chemotherapy. However, we believe that this limitation did not affect the results, since no difference in the frequency of patients treated with CMT between low and high-ALBI groups was seen in our cohort. Also, the lack of a predefined cutoff value limits the comparison between studies. Instead, some studies utilized ALBI cutoff value set for patients with HCC, and maybe this is the reason that some results are different from ours. Nonetheless, as strengths, we included a homogeneous cohort consisted by patients who received curative surgery, minimizing the risk of impaired liver function due to the extension of the disease. To our knowledge, this is the first study to assess the prognostic impact of ALBI score in Western GC patients in the real-world setting, treated at a single referral center. Accordingly, our findings should be validated in other series of cases, and a larger scale multicentric validation study to confirm the relationship between ALBI score in GC is warranted.

CONCLUSION

Preoperative ALBI scores were able to predict short- and long-term outcomes in patients with GC who received curative treatment. High-ALBI patients had poor clinical conditions and worse outcomes compared to those with low-ALBI. Also, the ALBI status allowed the risk stratification of patients within the same pTNM stage, and was an independent risk factor associated with survival. Thus, it is a simple and reproducible parameter, which may serve as an additional prognostic factor for GC.

Figure 1 Receiver operating characteristic for the diagnostic accuracy of albumin-bilirubin score, and the cutoff value. The area under the receiver operating

characteristic curve was 0.614. 95%CI: 95% confidence interval; AUC: Area under the curve; ALBI: Albumin-bilirubin.

Figure 2 Disease-free survival and overall survival of patients with gastric cancer **according to** the albumin-bilirubin groups (low-albumin-bilirubin and high-albumin-bilirubin).** A: Disease-free survival; B: Overall survival. ALBI: Albumin-bilirubin.

Figure 3 Disease-free survival and overall survival of patients with gastric cancer **according to the** albumin-bilirubin groups, stratified by pathologic stage.** A and B: Disease-free survival; C and D: Overall survival. PTNM: Pathologic; ALBI: Albumin-bilirubin.

Table 1 Clinical and surgical characteristics of patients with gastric cancer according albumin-bilirubin risk groups

Variables	Low-ALBI group (< -2.82)	High-ALBI group (≥ -2.82)	
	n = 211 (%)	*n* = 150 (%)	*P* value
Sex			0.712
Female	72 (34.1)	54 (36.0)	
Male	139 (65.9)	96 (64.0)	
Age (yr)			**0.005**
Mean (SD)	62.0 (12.0)	65.6 (12.2)	
BMI (Kg/cm²)			0.856
Mean (SD)	25 (4.5)	25.2 (16.5)	
Hemoglobin (g/dL)			**< 0.001**
Mean (SD)	12.7 (2.1)	11.1 (2.1)	
Albumin (g/dL)			**< 0.001**
Mean (SD)	4.3 (0.3)	3.5 (0.5)	
Bilirubin (mg/dL)			0.072
Mean (SD)	0.41 (0.22)	0.47 (0.33)	
Neutrophil to lymphocyte ratio			0.092
Mean (SD)	2.48 (2.29)	2.91 (2.56)	
American Society of Anesthesiologists			**0.001**
I/II	178 (84.4)	105 (70.0)	
III/IV	33 (15.6)	45 (30.0)	
Charlson–Deyo Comorbidity Index*			0.344
0	141 (66.8)	93 (62.0)	
≥ 1	70 (33.2)	57 (38.0)	
Type of gastrectomy			0.562
Subtotal	126 (59.7)	85 (56.7)	
Total	85 (40.3)	65 (43.3)	
Lymphadenectomy			**0.003**
D1	34 (16.1)	44 (29.3)	
D2	177 (83.9)	106 (70.7)	

Preoperative chemotherapy			0.477
No	175 (82.9)	120 (80)	
Yes	36 (17.1)	30 (20)	

P values in bold are statistically significant. SD: Standard deviation; BMI: Body mass index; ALBI: Albumin-bilirubin.

Table 2 Pathological characteristics of patients with gastric cancer according albumin-bilirubin groups

Variables	Low-ALBI group (< -2.82)	High-ALBI group (≥ -2.82)	P value
	n = 211 (%)	n = 150 (%)	
Lauren type			0.367
Intestinal	124 (58.8)	81 (54.0)	
Diffuse/mixed	87 (41.2)	69 (46.0)	
Histological differentiation			0.993
Well/moderately differentiated	107 (59.7)	76 (50.7)	
Poorly differentiated	104 (49.3)	74 (49.3)	
Lymphatic invasion			0.132
No	121 (57.3)	74 (49.3)	
Yes	90 (42.7)	76 (50.7)	
Venous invasion			0.196
No	150 (71.1)	97 (64.7)	
Yes	61 (28.9)	53 (35.3)	
Perineural invasion			0.743
No	112 (53.1)	77 (51.3)	
Yes	99 (46.9)	73 (48.7)	
T status			0.105
pT1/T2	91 (43.1)	52 (34.7)	
pT3/T4	120 (56.9)	98 (65.3)	
No of dissected lymph nodes			0.543
Mean (SD)	40.9 (17.7)	39.8 (17.2)	
pN status			0.239
pN0	99 (46.9)	61 (40.7)	
pN+	112 (53.1)	89 (59.3)	
pTNM			0.222
I/II	122 (57.8)	77 (51.3)	

III	89 (42.2)	73 (48.7)

SD: Standard deviation; ALBI: Albumin-bilirubin; pN: Presence of lymph node metastasis; pTNM: Pathologic.

Table 3 Postoperative and surgical outcomes of patients with gastric cancer according albumin-bilirubin groups

Variables	Low-ALBI group (< -2.82)	High-ALBI group (≥ -2.82)	P value
	n = 211 (%)	*n* = 150 (%)	
Length of hospital stay (d)			0.673
Mean (SD)	12.4 (10.2)	12.9 (9.0)	
Median (IQR)	9 (6.0-13.3)	10 (7.0-13.8)	
Postoperative complications (Clavien)			**0.029**
Non/minor POC (I-II)	183 (86.7)	117 (78)	
Major POC (III-IV)	28 (13.3)	33 (22)	
Postoperative chemotherapy			0.917
No	117 (55.5)	84 (56)	
Yes	94 (44.5)	66 (44)	
Chemotherapy-all (pre or postoperative)			0.766
No	99 (46.9)	68 (45.3)	
Yes	112 (53.1)	82 (54.7)	
30-d motality			**0.023**
No	206 (97.6)	138 (92.6)	
Yes	5 (2.4)	11 (7.4)	
90-d motality			**0.030**
No	198 (94.7)	130 (88.4)	
Yes	11 (5.3)	17 (11.6)	

P values in bold are statistically significant. SD: Standard deviation; IQR: Interquartile range; ALBI: Albumin-bilirubin; POC: Postoperative complications.

Table 4 Univariate and multivariate analysis for disease-free survival

Disease-free survival	Univariate			Multivariate		
Variables	HR	95%CI	*P* value	HR	95%CI	*P* value
Male (*vs* female)	1.15	0.81-1.61	0.438	-	-	-
Age > 65 yr (*vs* < 65 yr)	1.18	0.86-1.62	0.312	-	-	-
Charlson >1 (*vs* 0)	1.48	1.07-2.04	**0.019**	1.39	0.94-2.06	0.102
ASA III/IV (*vs* ASA I/II)	1.84	1.29-2.64	**0.001**	1.43	0.93-2.21	0.106
Total gastrectomy (*vs* distal)	1.43	1.04-1.97	**0.030**	1.43	1.03-1.98	**0.031**
Diffuse/mixed (*vs* others)	1.21	0.87-1.67	0.255	-	-	-
pT3/T4 (*vs* pT1/T2)	2.57	1.76-3.76	**< 0.001**	2.03	1.33-3.12	0.001
pN+ (*vs* pN0)	2.26	1.60-3.19	**< 0.001**	1.54	1.04-2.27	**0.030**
non-CMT (*vs* CMT)	1.15	0.83-1.58	0.399	-	-	-
Low-ALBI (*vs* High-ALBI)	2.09	1.51-2.88	**< 0.001**	1.83	1.32-2.53	**< 0.001**

P values in bold are statistically significant. 95%CI: 95% confidence interval; HR: Hazard ratio; ASA: American Society of Anesthesiologists; ALBI: Albumin-bilirubin; pN: Presence of lymph node metastasis; CMT: Chemotherapy.

Table 5 Univariate and multivariate analysis for overall survival

Overall survival	Univariate			Multivariate		
Variables	HR	95%CI	*P* value	HR	95%CI	*P* value
Male (*vs* female)	1.20	0.85-1.71	0.306	-	-	-
Age > 65 yr (*vs* < 65 yr)	1.28	0.94-1.79	0.137	-	-	-
Charlson > 1 (*vs* 0)	1.42	1.02-1.98	**0.041**	1.25	0.83-1.89	0.282
ASA III/IV (*vs* ASA I/II)	1.94	1.35-2.80	**< 0.001**	1.60	1.02-2.52	**0.041**
Total gastrectomy (*vs* distal)	1.50	1.08-2.08	**0.016**	1.56	1.12-2.18	**0.009**
Diffuse/mixed (*vs* others)	1.29	0.93-1.79	0.133	-	-	-
pT3/T4 (*vs* pT1/T2)	2.44	1.65-3.61	**< 0.001**	1.87	1.20-2.91	**0.006**
pN+ (*vs* pN0)	2.24	1.57-3.20	**< 0.001**	1.58	1.06-2.37	**0.026**
non-CMT (*vs* CMT)	1.18	0.85-1.64	0.327	-	-	-
Low-ALBI (*vs* High-ALBI)	1.97	1.41-2.74	**< 0.001**	1.68	1.20-2.35	**0.003**

P values in bold are statistically significant. 95%CI: 95% confidence interval; HR: Hazard ratio; ASA: American Society of Anesthesiologists; ALBI: Albumin-bilirubin; pN: Presence of lymph node metastasis; CMT: Chemotherapy.

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8   Andre R. Dias, Marina A. Pereira, Rodrigo J. Oliveira, Marcus F. K. P. Ramos et al. "Multivisceral resection vs standard gastrectomy for gastric adenocarcinoma", Journal of Surgical Oncology, 2020
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16 MARCUS FERNANDO KODAMA PERTILLE RAMOS, MARIA CLAUDIA MACHADO PEREIRA, YARA SOUZA OLIVEIRA, MARINA ALESSANDRA PEREIRA et al. "Surgical results of remnant gastric cancer treatment", Revista do Colégio Brasileiro de Cirurgiões, 2020
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18 Hiroaki Saito, Yusuke Kono, Yuki Murakami, Yuji Shishido et al. "Prognostic Significance of the Preoperative Ratio of C-Reactive Protein to Albumin and Neutrophil–Lymphocyte Ratio in Gastric Cancer Patients", World Journal of Surgery, 2017
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31 Tao Ma, Qing-Shan Li, Yue Wang, Bo Wang, Zheng Wu, Yi Lv, Rong-Qian Wu. "Value of pretransplant albumin-bilirubin score in predicting outcomes after liver transplantation", World Journal of Gastroenterology, 2019
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34	Ce Zhu, Xiang Wang, Sian Chen, Xinxin Yang, Jing Sun, Bujian Pan, Weiteng Zhang, Xiaodong Chen, Yingpeng Huang. " Efficacy of the Preoperative Albumin–Bilirubin Grade for Predicting Survival and Outcomes of Postoperative Chemotherapy for Advanced Gastric Cancer ", Cancer Management and Research, 2020 Crossref	8 words — < 1%

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38	Jitao Liu, Min Wu, Enmin Xie, Lyufan Chen, Sheng Su, Hongke Zeng, Qingshan Geng, Fan Yang, Jianfang Luo. "Assessment of Liver Function for Evaluation of Short- and Long-Term Outcomes in Type B Aortic Dissection Patients Undergoing Thoracic Endovascular Aortic Repair", Frontiers in Cardiovascular Medicine, 2021 Crossref	7 words — < 1%

39	Jérôme Meunier, Livia Lumbroso-Le Rouïc, Rémi Dendale, Anne Vincent-Salomon et al. "Conjunctival low-grade non-Hodgkin's lymphoma: a large	7 words — < 1%

single-center study of initial characteristics, natural history and prognostic factors", Leukemia & Lymphoma, 2009
Crossref

40   Shinya Yamada, Takashi Kaneshiro, Akiomi Yoshihisa, Minoru Nodera, Kazuaki Amami, Takeshi Nehashi, Yasuchika Takeishi. "Albumin-Bilirubin Score for Prediction of Outcomes in Heart Failure Patients Treated with Cardiac Resynchronization Therapy", Journal of Clinical Medicine, 2021
Crossref

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