RESEARCH ARTICLE

Correlation of inflammatory indices with staging of esophageal carcinoma: A prospective study at Dr. Ruth K. M. Pfau Civil Hospital, Karachi

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Abstract

Objective: To determine the correlation between inflammatory indices and the Tumour-Node-Metastasis stage of oesophageal carcinoma.

Method: The prospective study was conducted from January 2021 to January 2023 at the Department of Upper Gastrointestinal Surgery, Dr Ruth K.M. Pfau Civil Hospital, Karachi, and comprised patients of either gender aged 18-60 years with biopsy-proven oesophageal cancer. Blood samples were drawn and on the basis of plasma obtained, neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, C-reactive protein-to-albumin ratio, lymphocyte-to-monocyte ratio and platelet-to red cell distribution width ratio were calculated. Modified Glasgow Prognostic Score was calculated on the basis of C-reactive protein and albumin levels. Values were compared with tumour length, depth of invasion, lymph node status, vascular involvement, metastasis, pathological subtype and grade of differentiation. Data was analysed using SPSS 24.

Results: Of the 220 patients aged 46.1±14.2 years, 120(54%) were females and 100(46%) were males. C-reactive protein-to-albumin ratio demonstrated the highest predictive power for advanced disease stage (p=0.003). Elevated neutrophil-to-lymphocyte ratio and platelet-to-lymphocyte ratio (p=0.010 and p=0.044) were positively correlated with node stage, while elevated platelet-to-lymphocyte ratio was associated with advanced clinical stage (p=0.046). C-reactive protein-to-albumin ratio exhibited positive association with higher tumour stage (p=0.033), node stage (p<0.001) and clinical stage IV (p<0.001). Modified Glasgow Prognostic Score was significantly associated with advanced clinical stage (p<0.001).

Conclusion: Neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, C-reactive protein-to-albumin ratio, and Modified Glasgow Prognostic Score could be used effectively as a predictor of advanced oesophageal cancer.

Key Words: Oesophageal carcinoma, Inflammatory indices, TNM classification.

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Introduction

Global Cancer Observatory data showed that the oesophageal cancer is one of the most common cancers in the world, accounting for considerably high mortality[1]. More than two-thirds of the cases emerge from developing or under-developed countries[2]. In Pakistani males, it stands the 7th most common cancer, and, among females, it is the 4th most common malignancy[1]. Oesophageal cancer is characterised by highly aggressive nature with late presentation, having distant metastasis and poor prognosis. Tumour development, including cellular proliferation, lympho-vascular invasion and distant metastasis, is influenced by inflammatory responses of the host. Despite recent advancements in treatment strategies, the overall prognosis remains quite bleak[3].

Inflammation-based serum indices have been widely investigated, including neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), C-reactive protein (CRP)-to-albumin ratio (CAR), modified Glasgow Prognostic Score (mGPS), lymphocyte-to-monocyte ratio (LMR). These indices have shown some prognostic significance in several cancers, particularly in solid tumours, including oesophageal cancer.

A study concluded that high NLR and PLR were significantly associated with advanced tumour development and poor survival in oesophageal cancer[4]. Another study demonstrated better correlation of CAR with tumour size, local involvement, distant metastasis and histopathology compared to other inflammation-based markers[5]. Moreover, significant relevance of platelet-to-red cell distribution width (RDW) ratio (PRR)

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has been reported recently specifically for oesophageal carcinoma[6]. Mean corpuscular volume (MCV) was also found to be of prognostic importance in oesophageal cancer patients[7].

The current study aimed to determine the correlation between inflammatory indices and the Tumour-Node-Metastasis (TNM) stage of oesophageal carcinoma.

Patients and Methods

The prospective study was conducted from January 2021 to January 2023 at the Department of Upper Gastrointestinal (GI) Surgery, Dr Ruth K.M. Pfau Civil Hospital, Karachi, and comprised patients of either gender aged 18-60 years with biopsy-proven oesophageal cancer. Patients with other concomitant malignancies and having any other systemic inflammatory disease, like rheumatoid arthritis (RA), were excluded. Written informed consent was taken from all the participants.

Blood investigations were sent for the assessment of blood parameters. NLR (calculated by dividing the neutrophil in 10^9/L by the lymphocyte in 10^9/L), PLR (calculated by dividing the platelet in 10^9/L by the lymphocyte in 10^9/L), LMR (calculated by dividing the lymphocyte in 10^9/L by the monocyte in 10^9/L), CRP/Albumin ratio (calculated by dividing CRP in mg/L by albumin in g/L), and PRR (calculated by dividing the platelet count in 10^9/L by RDW [% * 100]) were worked out for each patient on the basis of complete blood count (CBC), CRP and albumin levels. The mGPS was calculated on the basis of CRP/Albumin ratio. Score of 0 was given for albumin <35g/L and CRP ≤10mg/L. Score of 1 was given for albumin ≥35g/L or CRP >10mg/L. Score of 2 was given with albumin <35g/L and CRP >10mg/L[8].

Clinical stages I, II and III were merged in one category, while stages IVa and IVb were merged in the second category. Values were compared for tumour length, depth of invasion, lymph node (LN) status, vascular involvement, metastasis, pathological subtype and grade of differentiation. Tumour length, tumour (T) stage, node (N) stage, metastasis (M) stage and vascular involvement were assessed with computed tomography (CT) scan of neck, chest and abdomen +/- endoscopic ultrasonography where clinically indicated. Histopathological subtype and grades of differentiation were determined by biopsy. Staging was conducted using the TNM classification system as outlined in the 8th edition of the American Joint Committee on Cancer (AJCC) guidelines to ensure standardisation and accuracy in staging assessment[9]. Effect modifiers, including age and gender, were determined. Data were recorded using a predesigned proforma.

The sample size was calculated using OpenEpi calculator [10] with NLR >3.0 as 19.9% for oesophageal cancer[11], margin of error 6% and confidence interval (CI) 95%.

Data was analysed using SPSS 24. Continuous variables were presented as mean ± standard deviation (SD) and median with interquartile range (IQR), whereas categorical variables were presented as frequencies and percentages. Receiver operating characteristic (ROC) curve analysis was used to calculate the area under the curve (AUC) to identify the optimal cut-off values of inflammatory markers for predicting the advanced stage of cancer. The association between inflammatory markers and clinico-pathological characteristics of patients was evaluated using chi-square test. Clinical characteristics, such as tumour length, site, LN status, metastasis and other pathological characteristics, including subtype and grade of differentiation, were assessed for their association with the inflammatory markers. Logistic regression model was used to determine the effect of inflammatory markers on cancer stage. Multivariate model was adjusted for variables having $p<0.250$ in univariate analysis. Odds ratios (ORs) were generated with 95% CI. $P\leq0.05$ was considered statistically significant.

Results

Of the 220 patients aged 46.1±14.2 years, 120(54%) were females and 100(46%) were males. There were 52(24%) patients with adenocarcinoma and 168(76%) with squamous cell carcinoma. There were 26(12%) well-differentiated cases, 139(63%) moderately-differentiated cases and 55(25%) poorly or undifferentiated cases. In TNM staging system, 96(44%) patients had T4 stage, 55(25%) N3 stage with 7 or more positive nodes, and 64(29%) had M1 stage with metastasis. According to clinical staging, 134(61%) patients had stage IV of oesophageal cancer. The AUC was largest for CAR (AUC: 0.62; 95% CI: 0.54-0.69, p=0.003) and mGPS (AUC: 0.63; 95% CI: 0.55-0.71, p=0.001). Optimal cut-off values of the inflammatory markers with the highest Youden's index were 2.4 for NLR, 154.8 for PLR, 2.9 for LMR, 0.2 for CAR and 4.7 for PRR.

Median values of inflammatory markers were; 3.2 (IQR: 2.2-5.2) for NLR, 181.2 (IQR: 138.7-227.6) for PLR, 3.8 (IQR: 2.6-5.0) for LMR, 0.4 (IQR: 0.2-1.4) for CAR, and 6.6 (IQR: 4.8-8.8) for PRR. Overall, 50(23%) patients had mGPS score 0, 83(38%) patients had score 1 and 87(39%) patients had score 2 (Table 1).

Raised NLR (≥2.4) was positively associated with N stage (p=0.010), while raised PLR (≥154.8) was associated with N

Table-1: Demographic and clinic-pathological characteristics (n=220).

Characteristics	n	%
Age in years, Mean ± SD, Median (Q_1-Q_3)	46.1 ± 14.2	45 (35 - 56)
Gender		
Male	100	45.5
Female	120	54.5
Tumour site		
Upper thoracic	23	0.5
Mid thoracic	82	37.3
Lower thoracic involving the junction	115	52.3
Histopathology		
Adenocarcinoma	52	23.6
Squamous cell carcinoma	168	76.4
Grade of differentiation		
Well differentiated	26	11.8
Moderately differentiated	139	63.2
Poorly differentiated	55	25
Tumour length		
< 5 cm	68	30.9
5 - 10 cm	119	54.1
> 10 cm	33	15
T stage		
T1 - T2	27	12.3
T3	97	44.1
T4	96	43.6
N stage		
No: No regional lymph node involved	21	9.5
N1: 1 to 2 positive nodes	71	32.3
N2: 3 to 6 positive nodes	73	33.2
N3: 7 or more positive nodes	55	25
M stage		
M0: No metastasis	156	70.9
M1: Metastasis	64	29.1
Clinical stage		
I – II	19	8.6
III	67	30.5
IV	134	60.9
Inflammatory markers modified Glasgow prognostic score (mGPS)		
0	50	22.7
1	83	37.7
2	87	39.5
Neutrophil-to-lymphocyte ratio (NLR)	4.5 ± 4.7	3.2 (2.2 - 5.2)
Platelet-to-lymphocyte ratio (PLR)	200.1 ± 100.2	181.2 (138.7 - 227.1)
Lymphocyte-to-monocyte ratio (LMR)	4.5 ± 4.3	3.8 (2.6 - 5.0)
C-reactive protein (CRP)-to-albumin ratio	1.2 ± 1.7	0.4 (0.2 - 1.4)
Platelet-to-RDW ratio (PRR)	6.9 ± 3.2	6.6 (4.8 - 8.8)

SD: Standard deviation, RDW" Red cell distribution width.

stage (p=0.044) and clinical stages III and IV (p=0.046). Significant associations were also observed between CAR ≥0.2 and higher T stage (p=0.033), N stage (p<0.001) and advanced clinical stage (p<0.001) of cancer. Higher mGPS ≥1 was significantly correlated with T stage (p=0.006), N stage (p<0.001), M stage (p=0.001) and clinical stage (p<0.001) (Tables 2-3). In contrast, LMR showed no significant correlation with clinical stage (p=0.073), T stage (p=0.201), N stage (p=0.744) and M stage (p=0.507). PRR displayed a similar trend with tumour length (p=0.791), T stage (p=0.686), N stage (p-value 0.548) and M stage (p=0.149).

Univariate binary logistic regression model demonstrated that patients with tumour length >10cm (p<0.001), PLR ≥154.8 (p=0.047), LMR ≥2.9 (p=0.074), CAR ≥0.2 (p<0.001), PRR ≥4.7 (p= 0.130) and mGPS ≥1 (p<0.001) were more likely to have stage IV cancer than those with tumour length <5, PLR <154.8, CAR <0.2 and mGPS <1. Tumour length remained consistent at multivariate analyses, whereas LMR ≥2.9 (p=0.019), CAR ≥0.2 (p<0.001) and mGPS ≥1 (p<0.001) were found to be independent risk factors in predicting stage IV cancer among the patients (Table 4).

Discussion

There are several factors influencing tumour development, its local spread, distant metastasis, response to chemo-radiotherapy, and recurrence rate of carcinoma oesophagus, which has very high mortality rate[8]. The most commonly used prognostic factor is the stage of the cancer that determines the treatment options as well as prognosis. It has been a common observation that individuals having the same stage of disease would have different response to treatment, prognosis and recurrence rate. As such, studies have looked at other pre-treatment markers for the purpose. The current study examined multiple markers to determine their correlation with the tumour stage, which is one of the most commonly used prognostic factors.

Cancer-related inflammation, including its cellular and humoral components, plays a key role in cancer development, spread and recurrence of the disease, and is thus considered a hallmark of carcinoma[12]. The current study observed both cellular and humoral markers, including NLR, PLR, LMR, PRR, CAR, and mGPS, and their correlation with cancer stage. In the past, NLR and mGPS individually and in combination showed non-significant findings[13]. However, in another study, NLR and PLR showed significant correlation with TNM staging, indicating the variability of findings may be due to diverse cohorts and sample sizes[3]. In the current cohort, two cellular markers, NLR and PLR, and two humoral markers, CAR and mGPS, were significantly associated with the TNM stage of the cancer.

The underlying mechanisms of how haematological/cellular and humoral/hepatic markers affect prognosis and recurrence remain unclear. Tumour invasion is closely related to cancer-related inflammation,

Table-2: Relationship between inflammatory markers and clinic-pathological characteristics.

	NLR		PLR		LMR	
	< 2.4 (n=64)	**≥ 2.4 (n=156)**	**< 154.8 (n=77)**	**≥ 154.8 (n=143)**	**< 2.9 (n=69)**	**≥ 2.9 (n=151)**
Age in years, Mean ± SD	44.9 ± 12.5	46.6 ± 14.9	43.4 ± 12.6	47.6 ± 14.9*	48.6 ± 15.1	44.9 ± 13.7
Gender						
Male	23 (35.9)	77 (49.4)	33 (42.9)	67 (46.9)	35 (50.7)	65 (43.0)
Female	41 (64.1)	79 (50.6)	44 (57.1)	76 (53.1)	34 (49.3)	86 (57.0)
Grade of differentiation						
Well differentiated	7 (10.9)	19 (12.2)	10 (13.0)	16 (11.2)	7 (10.1)	19 (12.6)
Moderately differentiated	41 (64.1)	98 (62.8)	50 (64.9)	89 (62.2)	41 (59.4)	98 (64.9)
Poorly differentiated	16 (25.0)	39 (25.0)	17 (22.1)	38 (26.6)	21 (30.4)	34 (22.5)
Tumour length						
< 5 cm	21 (32.8)	47 (30.1)	28 (36.4)	40 (28.0)	24 (34.8)	44 (29.1)
5 - 10 cm	37 (57.8)	82 (52.6)	40 (51.9)	79 (55.2)	32 (46.4)	87 (57.6)
> 10 cm	6 (9.4)	27 (17.3)	9 (11.7)	24 (16.8)	13 (18.8)	20 (13.2)
T stage						
T1 - T2	10 (15.6)	17 (10.9)	15 (19.5)	12 (8.4)	10 (14.5)	17 (11.3)
T3	33 (51.6)	64 (41.0)	31 (40.3)	66 (46.2)	35 (50.7)	62 (41.1)
T4	21 (32.8)	75 (48.1)	31 (40.3)	65 (45.5)	24 (34.8)	72 (47.7)
N stage						
No	10 (15.6)	11 (7.1)**	10 (13.0)	11 (7.7)*	8 (11.6)	13 (8.6)
N1	27 (42.2)	44 (28.2)	32 (41.6)	39 (27.3)	22 (31.9)	49 (32.5)
N2	18 (28.1)	55 (35.3)	21 (27.3)	52 (36.4)	20 (29.0)	53 (35.1)
N3	9 (14.1)	46 (29.5)	14 (18.2)	41 (28.7)	19 (27.5)	36 (23.8)
M stage						
M0	50 (78.1)	106 (67.9)	59 (76.6)	97 (67.8)	51 (73.9)	105 (69.5)
M1	14 (21.9)	50 (32.1)	18 (23.4)	46 (32.2)	18 (26.1)	46 (30.5)
Clinical stage						
I – III	31 (48.4)	55 (35.3)	37 (48.1)	49 (34.3)*	33 (47.8)	53 (35.1)
IV	33 (51.6)	101 (64.7)	40 (51.9)	94 (65.7)	36 (52.2)	98 (64.9)

NLR: Neutrophil-to-lymphocyte ratio, PLR: Platelet-to-lymphocyte ratio, LMR: Lymphocyte-to-monocyte ratio.
*p≤0.05, **p≤0.01.

Table-3: Relationship between inflammatory markers and clinic-pathological characteristics.

	CRP/Albumin		PRR		mGPS	
	< 0.2 (n=53)	**≥ 0.2 (n=167)**	**< 4.7 (n=52)**	**≥ 4.7 (n=168)**	**< 1 (n=50)**	**≥ 1 (n=170)**
Age in years, Mean ± SD	47.2 ± 12.6	45.7 ± 14.7	46.9 ± 15.4	45.8 ± 13.8	44.5 ± 13.4	46.6 ± 14.5
Gender						
Male	26 (49.1)	74 (44.3)	22 (42.3)	78 (46.4)	22 (44.0)	78 (45.9)
Female	27 (50.9)	93 (55.7)	30 (57.7)	90 (53.6)	28 (56.0)	92 (54.1)
Grade of differentiation						
Well differentiated	6 (11.3)	20 (12.0)	7 (13.5)	19 (11.3)	6 (12.0)	20 (11.8)
Moderately differentiated	33 (62.3)	106 (63.5)	31 (59.6)	108 (64.3)	36 (72.0)	103 (60.6)
Poorly differentiated	14 (26.4)	41 (24.6)	14 (26.9)	41 (24.4)	8 (16.0)	47 (27.6)
Tumour length						
< 5 cm	19 (35.8)	49 (29.3)	18 (34.6)	50 (29.8)	18 (36.0)	50 (29.4)
5 - 10 cm	29 (54.7)	90 (53.9)	27 (51.9)	92 (54.8)	28 (56.0)	91 (53.5)
> 10 cm	5 (9.4)	28 (16.8)	7 (13.5)	26 (15.5)	4 (8.0)	29 (17.1)
T stage						
T1 - T2	9 (17.0)	18 (10.8)*	8 (15.4)	19 (11.3)	9 (18.0)	18 (10.6)**
T3	29 (54.7)	68 (40.7)	21 (40.4)	76 (45.2)	29 (58.0)	68 (40.0)
T4	15 (28.3)	81 (48.5)	23 (44.2)	73 (43.5)	12 (24.0)	84 (49.4)

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N stage						
No	13 (24.5)	8 (4.8)**	7 (13.5)	14 (8.3)	11 (22.0)	10 (5.9)**
N1	21 (39.6)	50 (29.9)	18 (34.6)	53 (31.5)	22 (44.0)	49 (28.8)
N2	14 (26.4)	59 (35.3)	17 (32.7)	56 (33.3)	12 (24.0)	61 (35.9)
N3	5 (9.4)	50 (29.9)	10 (19.2)	45 (26.8)	5 (10.0)	50 (29.4)
M stage						
M0	43 (81.1)	113 (67.7)	41 (78.8)	115 (68.5)	45 (90.0)	111 (65.3)**
M1	10 (18.9)	54 (32.3)	11 (21.2)	53 (31.5)	5 (10.0)	59 (34.7)
Clinical stage						
I – III	34 (64.2)	52 (31.1)**	25 (48.1)	61 (36.3)	33 (66.0)	53 (31.2)**
IV	19 (35.8)	115 (68.9)	27 (51.9)	107 (63.7)	17 (34.0)	117 (68.8)

CPR: C-reactive protein, PRR: Platelet-to red cell distribution width ratio, mGPS: Modified Glasgow Prognostic Score.
*p≤0.05, **p≤0.01.

Table-4: Odds ratio for stage IV cancer with respect to significant risk factors..

Characteristics	Model 0 OR (95% CI)	Model 1 OR (95% CI)	Model 2 OR (95% CI)
Age in years	1.01 (0.99-1.03)	-	-
Gender			
Male	Ref		
Female	1.07 (0.62-1.85)	-	-
Grade of differentiation			
Well differentiated	Ref		
Moderately differentiated	0.72 (0.29-1.72)	-	-
Poorly differentiated	1.09 (0.41-2.91)	-	-
Tumour length, <5 cm	Ref	Ref	Ref
5 - 10 cm	1.96 (1.07-3.59)*	1.85 (0.97-3.53)	1.87 (0.98-3.57)
> 10 cm	8.65 (2.74-27.31)**	8.05 (2.45-26.43)**	7.86 .39-25.86)**
NLR <2.4	Ref	Ref	Ref
≥2.4	1.72 (0.96-3.11)	1.23 (0.59-2.56)	1.39 (0.67-2.86)
PLR <154.8	Ref	Ref	Ref
≥154.8	1.78 (1.01-3.12)*	1.66 (0.83-3.32)	1.59 (0.79-3.18)
LMR <2.9	Ref	Ref	Ref
≥2.9	1.69 (0.95-3.02)	2.19 (1.11-4.33)*	2.26 (1.14-4.48)*
CRP/Albumin <0.2	Ref	Ref	
≥0.2	3.96 (2.07-7.58)**	3.62 (1.76-7.46)**	-
PRR<4.7	Ref	Ref	Ref
≥4.7	1.62 (0.86-3.04)	1.06 (0.52-2.17)	1.09 (0.53-2.24)
mGPS <1	Ref		Ref
≥1	4.28 (2.19-8.37)**	-	3.86(1.87-7.97)**

NLR: Neutrophil-to-lymphocyte ratio, PLR: Platelet-to-lymphocyte ratio, LMR: Lymphocyte-to-monocyte ratio, CPR: C-reactive protein, PRR: Platelet-to red cell distribution width ratio, mGPS: Modified Glasgow Prognostic Score, OR: Odds ratio, CI: Confidence interval.
*p≤0.05, **p≤0.01. Model 0: Unadjusted, Model 1: Adjusted for tumour length, NLR, PLR, LMR, CRP Albumin ratio and PRR, with mGPS excluded due to multicollinearity, Model 2: Adjusted for tumour length, NLR, PLR, LMR, PRR and mGPS.

hypothesised to result from immune response dysregulation[13]. Albumin and CRP, components of mGPS, are linked to immune response derangement, angiogenesis and cachexia[12]. Systemic immune response (SIR), alongside TNM staging, is now recognised as a prognostic factor for survival. Inflammatory markers, like mGPS, NLR and PLR, are indicative of SIR [12,14].

Ideal cut-off values for various inflammatory markers have been determined in different studies differently. Optimal cut-off values for different markers are something that is still controversial. Several studies have used time-dependent ROC curve, while others have used median values or online cut-off-finding software to determine the cut-off values[15]. The current study also used the most commonly used ROC curve to determine the cut-off values of different markers.

TNM staging in the preoperative period is considered to have the most predictive power for determining the survival and prognosis of the oesophageal cancer. The current study showed significant association of high NLR, PLR with stage of the disease, especially N stage and clinical stage. Several studies have shown a less significant response of PLR on prognosis compared to other inflammatory markers in different cancers, which included oesophageal cancer, too[15-18]. A previously published systematic review and meta-analysis did not find PLR to be a significant prognostic marker for overall survival[15,16]. Similar to the current study, other studies did find NLR significantly associated with stage[3,12]. Particularly, Arfon et al., looking at these markers in 330 consecutive patients, revealed NLR to be the only significant inflammatory prognostic biomarker[12].

A meta-analysis by Gang Hu et al.[19] looked at the effect of LMR in carcinoma oesophagus. They evaluated the results of 1,701 patients from 7 studies and found that low LMR correlated with advanced stage and increased risk of tumour recurrence irrespective of cut-off values and treatment modality. The studies included in the analysis were all retrospective from China only [19]. Moreover the cut-off values taken were heterogenous, ranging from 2.93 to 5.3, which could limit its clinical application. Another study[20] found LMR to be a strong predictor of prognosis in oesophageal cancer. Contrary to all this, in the current study, LMR and PRR did not show significant

association with stage of the disease.

CAR and mGPS have been implicated in several studies to be associated with SIR and poor oesophageal cancer prognosis[15,16,21]. Several studies have proposed that mGPS may be used to identify cancers having higher post-operative morbidity and dismal prognosis,[22,23] and it can provide essential information regarding leucocyte and marrow responses and cytokine production, thus enabling identification of those who will have poor response to treatment and those who will have good response to aggressive treatment[24].

CAR and mGPS are based on serum concentrations of acute-phase proteins synthesised in liver which include CRP and albumin, and thus taken as markers of inflammatory process in SIR by affecting protein metabolism and cytokine production. CAR, if increased, reflects poor nutritional status and increased tumour-related inflammation, thus suggesting poor outcome. On its part, mGPS uses both these as categorical markers.

A meta-analysis reported data of 2,255 patients from 8 studies, concluding that high values of CAR were associated with poor survival in oesophageal cancer patients, which was independent of pathological type and cut-off values[25]. The finding was endorsed by Ishibashi et al[16]. Conversely, Yalcin Müsri F. et al. did not find such an association [26].

Moreover, a meta-analysis of 11 studies involving 2,930 patients with oesophageal cancer reported poor survival in patients with high CAR levels[27]. This was in line with the current results.

The strength of the study was its prospective design and a comprehensive sample size. Besides, maximum markers were evaluated in the study. The limitation of the current study is its restriction to a single centre.

The current findings will potentially facilitate tailoring of treatment plans in oesophageal carcinoma patients for better outcomes.

Conclusion

Routine measurements of high NLR, PLR, CAR and mGPS were found to be valuable tools for TNM stage and advanced clinical stage, whereas LMR and PRR did not show significant correlations.

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Authors' Contribution:
SQ: Concept, design, data collection, literature search, interpretation, drafting, critical appraisal, final approval.
SK: Concept, data collection and literature search.
KS: Data analysis, interpretation, critical appraisal and final approval.
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