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Utility of cellular indices in abdominal pain of probable surgical etiology in pediatrics

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Dear Editor,

Abdominal pain is one of the leading causes of consultation in pediatrics, accounting for up to 10% of emergency department visits (1). The patient's age, medical history, and physical examination are critical in diagnosing and differentiating between surgical, non-surgical, and extra-abdominal etiologies (2). However, this distinction can be challenging, leading to diagnostic delays with therapeutic and prognostic implications.

This study evaluates the utility of novel biomarkers, specifically cellular indices, in the diagnostic assessment of abdominal pain suspected to have a surgical etiology. A diagnostic study was conducted, including patients aged 0–15 years who presented to the emergency department of a pediatric hospital between 2021 and 2022 (Reg. 3318-0000200). Patients were categorized into three groups: acute appendicitis (AA), Meckel's diverticulitis (MD), and non-surgical abdominal pain (NSAP). The neutrophil-to-lymphocyte ratio (NLR=Neutrophils/Lymphocytes), derived neutrophil-to-lymphocyte ratio (dNLR=Neutrophils/[Leukocytes – Neutrophils]), and platelet-to-lymphocyte ratio (PLR=Platelets/Lymphocytes) were compared among the three groups. Diagnostic accuracy and mean differences of these indices were assessed using ROC curve analysis and the Games-Howell multiple comparison test.

A total of 60 patients were included: AA (n = 24), MD (n = 12), and NSAP (n = 24). NLR, dNLR, and PLR were higher in patients with MD, with dNLR demonstrating the best diagnostic profile for distinguishing between AA and MD[®]. The optimal cutoff value for dNLR was 5.2, with an AUC of 0.747 and an OR of 66.8 (**Table 1**). The inflammatory response during appendicular infection or Meckel's diverticulitis results in leukocytosis, neutrophilia, and thrombocytosis, theoretically supporting the utility of these cellular indices in the diagnostic workup (3). Unfortunately, we could not compare our findings with existing literature, as this is the first study to evaluate these indices in the diagnosis of MD and NSAP. However, other authors have demonstrated the utility of NLR, dNLR, and PLR in various inflammatory, infectious, and neoplastic conditions (4,5). Our results suggest that dNLR is a novel, cost-

effective biomarker with potential utility in assessing surgical abdominal pain. This could aid in the timely initiation of antibiotic therapy, prioritization of surgical intervention, and reduction of morbidity and mortality associated with abdominal sepsis. Nevertheless, prospective, multicenter studies with larger sample sizes are necessary to validate these findings.

Accepted Article

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TABLES

Table 1. Demographic, clinical, and analytical characteristics of the study population. Diagnostic performance and multiple comparisons of NLR, dNLR, and PLR among patients with acute appendicitis (AA), Meckel's diverticulitis (MD), and non-surgical abdominal pain (NSAP).

	AA (n = 24)	MD (n = 12)	NSAP (n = 24)
Age (years)	11.2 IQR 3.9	8.5 ± 4.4	10.1 ± 2.6
Female n (%)	7 (29 %)	2 (16.7 %)	13 (54 %)
Male n (%)	17 (70.8 %)	10 (83 %)	11 (45.8 %)
Perforation n (%)	3 (12.5 %)	5 (41.7 %)	–
NLR	6.03 IQR 5.7	9.8 ± 6.0	1.13 ± 0.34
dNLR	3.29 ± 1.16	5.82 ± 3.08	0.80 ± 0.17
PLR	139.4 IQR 76.2	206.9 IQR 98.7	94.4 ± 28.5
Discriminatory capacity of NLR, dNLR, and PLR			
	NLR	dNLR	PLR
AUC ROC (95 % CI)	0.646 (0.444-0.847)	0.747 (0.543-0.950)	0.719 (0.534-0.904)
AUC p-Value	0.159	0.017	0.035
Cut-Off	6.56	5.21	183.3
Sensitivity (95 % CI)	75 % (42,8-94,5)	58,3 % (27,6-84,8)	66,6 % (34,8-90)
Specificity (95 % CI)	54 % (32.8-74.4)	100 % (85.7-100)	79 % (57.8-92.8)

PPV (95 % CI)	45 % (32.2-58.5)	100 % (59-100)	61.5 % (39.9-79.3)	
NPV (95 % CI)	81 % (60.3-92.5)	82.7 % (71-90.3)	82.6 % (67.5-91.5)	
OR (95 % CI)	3.5 (0.76-16.4)	66.8 (3.29-1353.4)	7.6 (1.60-35.9)	
Multiple Comparisons (Games-Howell)				
Dependent variable	(I) NSAP_AA_MD	(J) NSAP_AA_MD	Mean difference (I-J)	p-Value
NLR	NSAP	AA	-5.55*	0.000
		MD	-8.70*	0.001
	Acute appendicitis	NSAP	5.55*	0.000
		MD	-3.15	0.267
	Meckel's diverticulitis	NSAP	8.70*	0.001
		AA	3.15	0.267
dNLR^{&}	NSAP	AA	-2.50*	0.000
		MD	-5.03*	0.000
	Acute appendicitis	NSAP	2.50*	0.000
		MD	-2.53*	0.042^{&}
	Meckel's diverticulitis	NSAP	5.03*	0.000
		AA	2.53*	0.042^{&}
PLR	NSAP	AA	-65.37*	0.003
		MD	-180.43	0.052
	Acute appendicitis	NSAP	65.37*	0.003
		MD	-115.06	0.258
	Meckel's diverticulitis	NSAP	180.43	0.052
		AA	115.06	0.258

AUC ROC: Area Under the Receiver Operating Characteristic Curve; **IQR:** Interquartile range; **95 % CI:** 95% confidence interval; **PPV:** Positive predictive value; **NPV:** Negative predictive value; **OR:** Odds Ratio.