

Initial Neutrophil/Lymphocyte and Lymphocyte/Monocyte Ratios Can Predict Future Insulin Need in Newly Diagnosed Type 1 Diabetes Mellitus

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INTRODUCTION

- The severity of the inflammation at the time of diagnosis may have an impact on the occurrence or duration of partial clinical remission in type 1 diabetes mellitus (T1DM).¹
- Neutrophils can have significant effects on the onset and continuation of T1DM.²
- Neutrophil/lymphocyte ratio (NLR), lymphocyte/monocyte ratio (LMR), and platelet/lymphocyte ratio (PLR) are used as inflammatory markers in autoimmune diseases.^{3,4}

AIM

- To investigate the relationship between hematological inflammatory parameters at the time of T1DM diagnosis and;
 - the need for insulin during the first year,
 - the presence of partial clinical remission period as determined according to insulin dose-adjusted HbA1c levels (IDAA1c).

METHODS

- A single-center retrospective study was conducted including patients with T1DM aged 1-18 years between 2010-2020.
- Patients with any concomitant acute or chronic diseases and infections at the time of diagnosis were excluded.
- Partial clinical remission was considered when IDAA1c ≤ 9. An insulin dose of <0.5 units/kg of body weight per day was defined as a low insulin requirement.

RESULTS

- Serum insulin and C-peptide levels at the time of diagnosis were significantly higher in remitters than non-remitters (p = 0.026 and p = 0.004, respectively) (**Table 1**).
- Initial NLR and derived-NLR (d-NLR) levels were significantly lower (p = 0.011 and p = 0.033, respectively) and LMR levels significantly higher (p = 0.005) in patients who showed a low insulin requirement at the 3rd month after diagnosis (**Table 2**).
- Daily insulin requirement at the 3rd month was correlated positively with initial NLR levels (r = 0.271, p = 0.025) and negatively with initial LMR levels (r = -0.302, p = 0.012) (**Figure 1**).
- The sensitivity of a cut-off NLR value of 1.64 was 69.2% and the specificity was 59.5%, whereas these were found as 69.2% and 54.8% for the best threshold value (1.17) of d-NLR, respectively.
- An LMR of 4.71 was found to be the best cut-off value for estimating a low daily insulin requirement on the 3rd month after diagnosis (sensitivity; 66.7%, specificity; 61.5%) (**Figure 2**).

- However, all parameters were similar when analyzed in terms of HbA1c levels or partial remission status. In addition, there was no significant difference in any of these hematological parameters at the 6th, 9th, and 12th months after the diagnosis (p > 0.05).

Table 1. Comparison of the remitters and non-remitters according to clinical characteristics and initial laboratory results.

	Remitters (n=38)	Non-remitters (n=30)	p
Age (year)	8.9 ± 3.8	7.9 ± 4.7	0.340
Girls [n (%)]	21 (55.3)	17 (56.7)	0.908
Prepubertal [n (%)]	24 (63.2)	20 (66.7)	0.764
Blood glucose (mg/dL)	375 (319 – 460)	404 (310.3 – 513.5)	0.374
DKA [n (%)]	14 (36.8)	12 (40)	0.790
Blood pH	7.30 (7.22 – 7.37)	7.31 (7.25 – 7.39)	0.885
HCO ₃ (mmol/L)	17.2 ± 6.0	16.6 ± 6.1	0.726
Insulin (mU/L)	2.1 (0.9 – 3.5)	1.3 (0.9 – 1.8)	0.026
C-peptide (ng/mL)	0.46 (0.33 – 0.70)	0.33 (0.21 – 0.52)	0.004
HbA1c (%)	11.7 ± 2.3	12.0 ± 2.5	0.656
CRP (mg/L)	1.1 (0.4 – 3.4)	1.9 (0.8 – 3.1)	0.359
NLR	1.6 (1.2 – 2.5)	2.1 (1.4 – 3.8)	0.110
d-NLR	1.2 (1.0 – 2.0)	1.5 (0.9 – 2.8)	0.258
LMR	5.0 (3.4 – 6.2)	4.9 (3.5 – 6.7)	0.474
PLR	111.2 (79.3 – 141.9)	116.8 (79.1 – 161.1)	0.990

Data were presented as mean ± standard deviation or median (25 - 75p). CRP; C-reactive protein, d-NLR; derived neutrophil/lymphocyte ratio, DKA; diabetic ketoacidosis.

Figure 1. The correlation between neutrophil/lymphocyte ratio (NLR), lymphocyte/monocyte ratio (LMR), and daily insulin requirement.

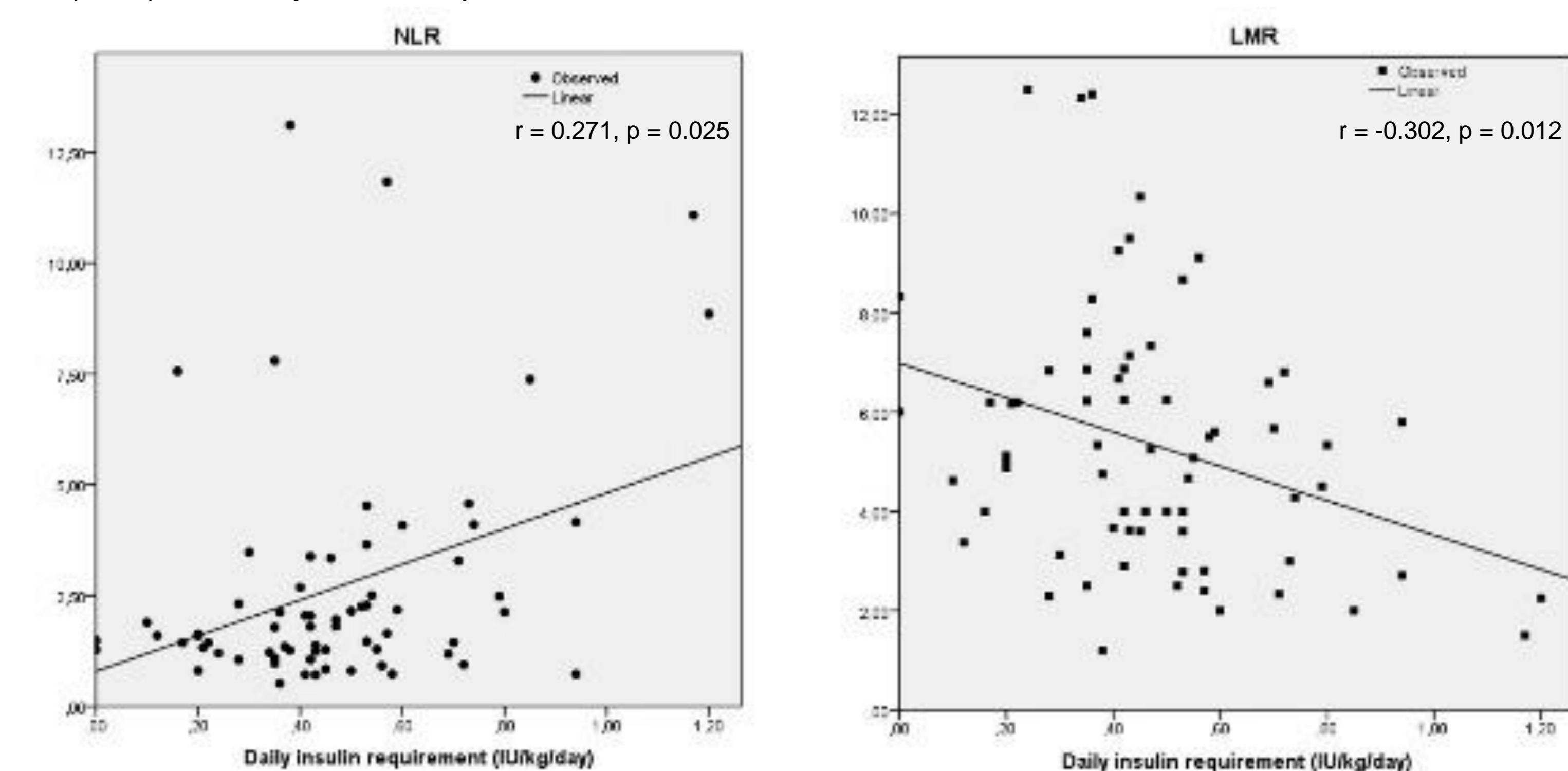
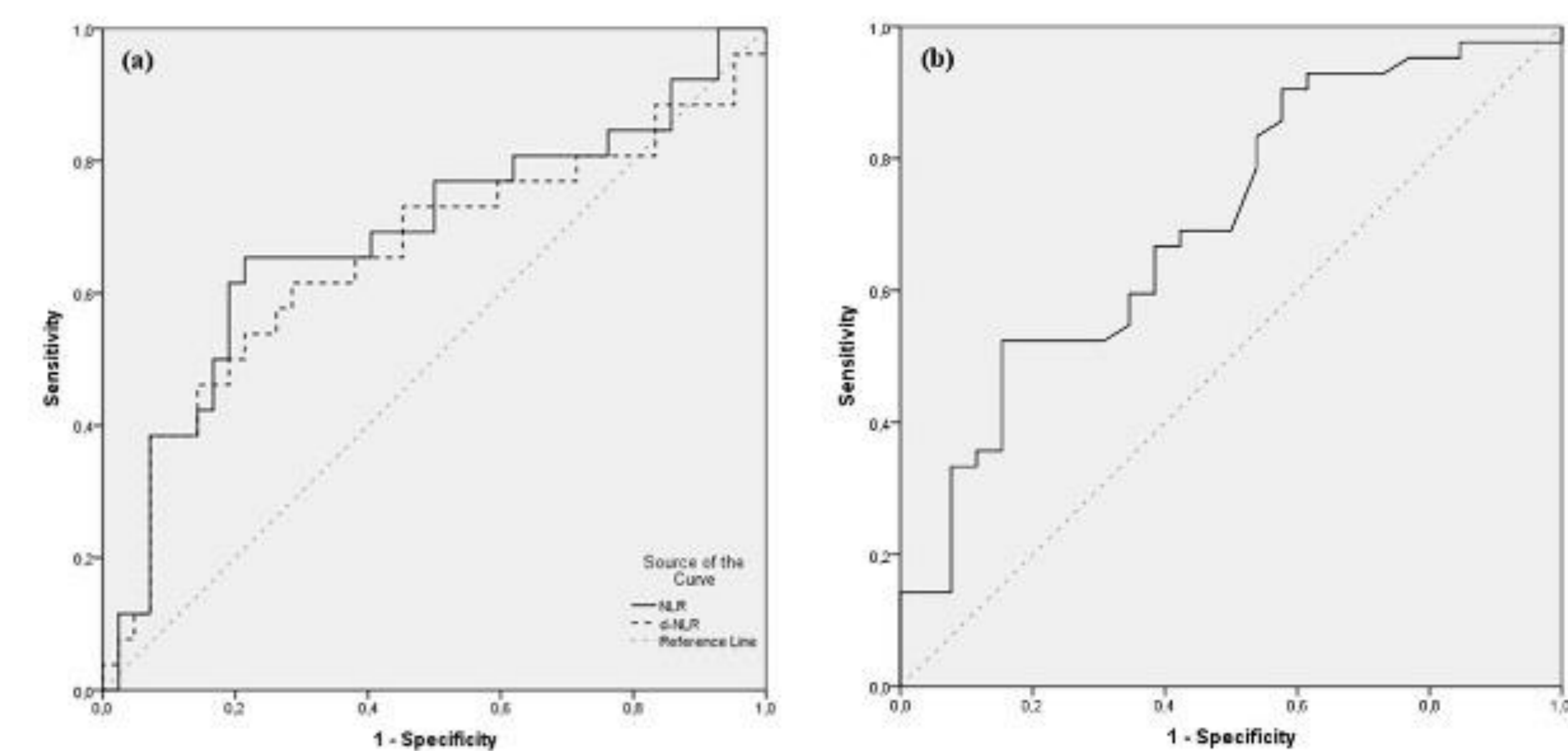


Figure 2. The receiver operating characteristics (ROC) curve showing sensitivity and specificity of (a) neutrophil/lymphocyte ratio (NLR), derived-NLR (d-NLR), and (b) lymphocyte/monocyte ratio (LMR) in determining daily insulin requirement.



CONCLUSIONS

- For the first time in literature, lower NLR and d-NLR or a higher LMR at the time of diagnosis were shown as predictors for a low need of daily insulin at the 3rd month of T1DM.

CONTACT INFORMATION

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Table 2. Comparison of initial hematological parameters of the patients according to the daily need of insulin at the 3rd month after the diagnosis.

	Need of insulin <0.5 IU/kg/day		p
	Yes (n=42)	No (n=26)	
NLR	1.5 (1.2-2.1)	2.4 (1.4-4.3)	0.011
d-NLR	1.1 (0.9-1.7)	1.7 (1.0-3.2)	0.033
LMR	6.1 (4.0-7.2)	4.1 (2.5-5.6)	0.005
PLR	101.9 (70.4-144.3)	114.1 (82.7-163.9)	0.441