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Original Article

Surgery Section

Pretreatment Platelet-to-Lymphocyte Ratio- A Marker for Chronic Limb Threatening Ischaemia

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ABSTRACT

Introduction: Peripheral Artery Occlusive Disease (PAOD) is a common global health condition. Delay in initiating treatment often leads to increased morbidity and mortality linked to the development of Chronic Limb Threatening Ischaemia (CLTI). Despite advances in revascularisation techniques, amputation and death rates remain high in PAOD cases. The conventional use of Ankle-Brachial Pressure Index (ABPI) as a diagnostic indicator for CLTI may not always be reliable. The Platelet-Lymphocyte Ratio (PLR) can aid in identifying CLTI cases due to its involvement in atherosclerosis pathogenesis in arteries.

Aim: To compare the proportions of high PLR (PLR >150) and low PLR (PLR <150) among CLTI cases and their association with ABPI in PAOD patients.

Materials and Methods: This was a hospital-based cross-sectional study conducted in the General Surgery Department at Government Medical College Thiruvananthapuram, Kerala, India, from June 2021 to July 2022. A total of 170 subjects with CLTI who visited the Surgery Outpatient Department (OPD) were included. Variables like age, smoking habits, Body Mass Index (BMI), C-Reactive Protein (CRP), and ABPI were examined. PLR and Neutrophil Lymphocyte Ratio (NLR) were calculated. The data were analysed, and significance testing was performed using Chi-square test and Pearson correlation with Statistical Package for Social Sciences (SPSS) INC 27.

Results: The mean age was 65±8 years. The majority had a normal BMI (110, 65%), with only 10 (6%) classified as obese (BMI >30). Of the study subjects, 148 (87%) with PLR >150 had ABPI below 0.4 on the right side (p-value 0.001), and similarly, 138 (81%) cases with PLR >150 had ABPI below 0.4 on the left side (p-value 0.001). There was a direct and strong association between PLR value and ABPI. High PLR and low ABPI on the right side showed a statistically significant moderate negative correlation (-0.443), and low ABPI on the left side exhibited a statistically significant weak negative correlation (-0.287).

Conclusion: High PLR (PLR >150) and low ABPI (less than 0.4) indicate CLTI in a PAOD case. PLR >150 can serve as a marker of CLTI. PLR was elevated in patients with increased CRP, highlighting the role of inflammatory markers as well.

Keywords: Arterial, Atherosclerosis, Peripheral artery occlusive disease

INTRODUCTION

Peripheral occlusive arterial disease is a common global health condition. Patients often overlook any claudication symptoms and frequently present late, typically with complicated cases. Late diagnosis often leads to delayed medical or surgical interventions. The later the intervention occurs, the higher the associated Major Adverse Cardiac Events (MACE) [1,2]. This delay in the onset of treatment often contributes to increased morbidity and mortality linked to the development of CLTI, the most feared complication in PAOD. CLTI signifies a poor outcome for the patient in terms of morbidity and mortality [2,3].

An accurate and sensitive metric for detecting PAOD is the ABPI. ABPI has been shown to independently predict mortality and unfavourable cardiovascular events. In cases with femoro-popliteal segment stenosis, the accuracy of ABPI in detecting significant arterial disease on angiography is superior, with a sensitivity of 97% and specificity of 89% for oscillometric ABPI, and a sensitivity of 95% and 56% for Doppler [4].

Recently, the Society for Vascular Surgery introduced the Lower Extremity Threatened Limb Classification System in response to the need for improved staging to more precisely characterise amputation risk and compare treatment success and limb prognosis, known as the Wound Ischaemia and Foot Infection (WIfI) system. The wound (the presence and depth of the ulcer), ischaemia (based on ABI, toe pressure, or transcutaneous oximetry ($TcPO_2$), and infection are each assigned a unique grade (local to systemic). These grades are combined to estimate the benefits of revascularisation and the risk of amputation. WIfI staging (Wound, Ischaemia, and foot Infection) significantly predicts amputation and wound-healing outcomes [3].

While conventional methods like ABPI, toe pressure, transcutaneous partial pressure of oxygen, and others are used for detecting CLTI in established centres, it may not always be straightforward to explain the prognosis of such a limb with these techniques. Imaging modalities such as Duplex scan and angiography aid in management planning rather than diagnosis [5,6].

Lymphocyte count, NLR, and PLR are simple laboratory parameters that reflect the systemic inflammatory response in patients with atherosclerotic diseases. The derived platelet-to-lymphocyte ratio can serve as a straightforward marker for critical limb ischaemia in PAOD cases [1,2]. In a retrospective data analysis study of 2121 participants by Gary T et al., they demonstrated PLR >150 as a strong predictor for CLTI in PAOD cases [1].

They demonstrated statistical significance among groups (PLR ≤150 and PLR >150) for vascular endpoints like myocardial infarction. Even after adjustments for age, diabetes, NLR >3.95, PLR >150 was found to have a 1.9-fold increased association with CLTI risk [1]. PLR can aid in the early detection of CLTI cases due to its role in the pathogenesis of atherosclerosis and thrombosis in arteries. This study was conducted with aim to assess the utility of this simple blood test parameter index in the early detection of CLTI in PAOD cases.

MATERIALS AND METHODS

This hospital-based cross-sectional study was conducted in the General Surgery Department at Government Medical College

Thiruvananthapuram, Kerala, India, from June 2021 to July 2022. A total of 170 subjects who met the inclusion criteria among the patients who visited the Surgery OPD were included. Institutional Ethics Committee approval was obtained prior to data collection (HEC No. 05/26/2021/MCT).

Inclusion criteria: Peripheral Artery Occlusive Disease (PAOD): A condition with reduced blood flow to the extremities, diagnosed.

A condition in PAOD cases characterised by pain at rest lasting at least two weeks, requiring opioid painkillers, AND/OR ulcer/gangrene/major tissue loss AND/OR doppler ultrasonography showing a monophasic spectrum of flow (severe compromise) [7].

Exclusion criteria: Patients who were not willing to provide consent, those with any malignancy or previous haematological disorders were excluded from the study.

PLR was obtained from routine blood examinations. PLR-150 was taken as the cutoff value [1]. PLR=150-High PLR and PLR <150-Low PLR.

Sample size: Formula for comparing two proportions was used:

$n=(Z1\text{-}a/2+Z1\text{-}ß)\ 2\ (p^1q^1+p2q^2)/(p1\text{-}p2)^2$; Z1-a/2=1.96 (standard normal variate with 5% error)

Z1-ß=0.84 (power 80%) $(Z1\text{-}a/2+Z1\text{-}ß)^2=(1.96+0.84)^2$; p1-Proportion of cases with PLR >150 and CLI (critical limb ischaemia)=46%; p2-Proportion of cases with PLR 150 and CLI=22%

The values have been obtained from the reference study by Gary T et al., [1]. $q^1=1\text{-}p^1$, $q^2=1\text{-}p^2$; $n=(1.96+0.84)^2\ (46\times54+22\times78)/(46\text{-}22)2=58$ (minimum sample size needed in the study)

Procedure

Information from patients was collected using an interviewer-administered questionnaire after obtaining informed consent. History taking and physical examination were conducted with due respect to the patient's privacy and recorded in the case proforma. The history included present complaints, past history, treatment history, and details regarding co-morbidities. During the physical examination, a general examination including height, weight, pulse rate, blood pressure, all peripheral pulses, ABPI, and local examination of the affected limb(s) were performed and documented in the case proforma. Laboratory results, such as blood routine, RBS, CRP of the patients, including the duplex ultrasonography/angiography results, were also recorded. CLTI was determined based on the history, clinical examination, laboratory values, and imaging evidence as per the operational definition.

ABPI, Arterial Doppler, PLR, NLR (ABPI is one of the determinants of CLTI as well as the severity of PAOD. PLR and NLR are the outcome variables under study).

STATISTICAL ANALYSIS

The data was entered into an excel sheet. Categorical variables were expressed as proportions, and quantitative variables were presented as mean and standard deviation. Chi-square test and Fisher-exact test were used as tests of significance to determine the association between proportions. Pearson's correlation (linear by linear correlation) test was used to test the significance between continuous variables. Data was analysed using SPSS Inc 27.

RESULTS

The mean age group was 65±8 years. 45% of patients were between 55-65 years of age. The majority had a normal BMI (65%). Only 6% were found to be obese (BMI >30) [Table/Fig-1].

Ulceration of extremities and blackish discolouration were the predominant symptoms in patients with CLTI (20% and 21%, respectively). Most patients had multiple symptoms simultaneously at their first presentation [Table/Fig-2].

Most commonly, 35% of patients had all three co-morbid states together [Table/Fig-3].

Variable	Groups	Frequency (percentage)	Variability
Age distribution (in years)	45-55	20 (12)	Mean±SD 65±8
	55-65	77 (45)	
	65-75	50 (29)	
	75-85	22 (13)	
	>85	1 (1)	
Sex distribution	Male	114 (67)	
	Female	56 (33)	
Smoking profile	Smoker (current or past)	110 (65)	
	Non Smoker	60 (35)	
Body Mass Index (BMI) (Kg/m²)	Normal	110 (65)	Mean±SD 23.13±4.14
	Obese	10 (6)	
	Overweight	50 (29)	

[Table/Fig-1]: Biophysical profile.
*BMI (kg/m²): Normal- 18.5-24.9, overweight- 25-29.9; Obese- >/=30

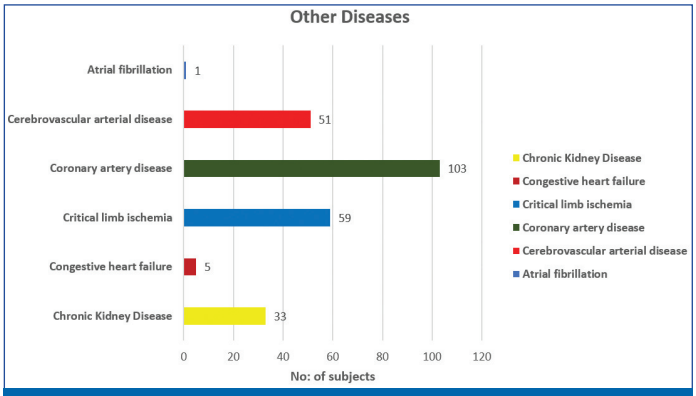
		N	Percentage	Percentage of cases
Chief complaints	Pain on walking	64	13%	38%
	Pain at rest	81	16%	48%
	Lack of sleep due to pain	69	14%	41%
	Ulcer over extremities	97	20%	57%
	Blackish discolouration	102	21%	60%
	Paresthesia/Numbness/ Absent sensation	83	17%	49%

[Table/Fig-2]: Symptomatology of PAOD.

Co-morbidities	Frequency	Percentage
Systemic hypertension	8	5
Type II diabetes, dyslipidemia	9	5
Type II diabetes	14	8
Dyslipidemia	15	9
Type II diabetes, systemic hypertension	18	11
Systemic hypertension, dyslipidemia	46	27
Type II diabetes, systemic hypertension, dyslipidemia	60	35

[Table/Fig-3]: Co-morbidities in PAOD.

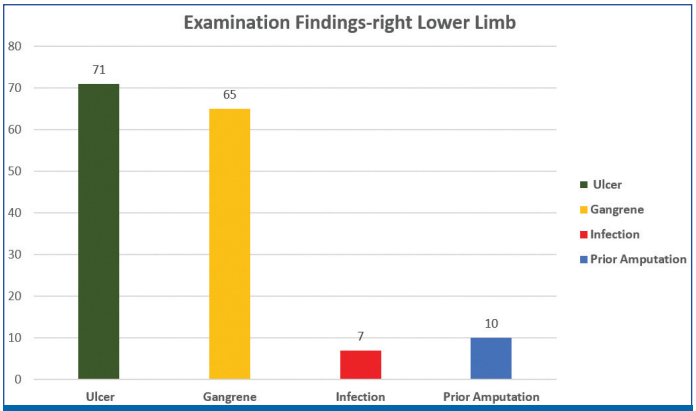
A total of 103 patients among the study population had Coronary Artery Disease (74%), and 51 patients had cerebrovascular disease (36.7%) [Table/Fig-4].



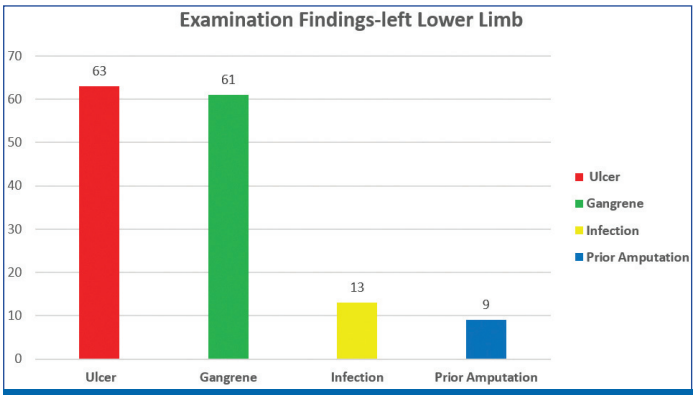
[Table/Fig-4]: Other diseases.

In 144 (85%) of patients, the upper limb pulsations of both sides were palpable. While in the lower limb, all patients with CLTI didn't have peripheral pulsations, in addition to other clinical signs of PAOD.

Ulceration at extremities and gangrene formation account for the most common presenting findings in a PAOD patient. Some patients did not have any other findings [Table/Fig-5,6].



[Table/Fig-5]: Examination of right lower limb.



[Table/Fig-6]: Examination of left lower limb.

AABPI was calculated from the collected data (Highest of systolic ankle pressures among Anterior Tibial Artery (ATA) or Posterior Tibial Artery (PTA) divided by highest systolic brachial pressure) [Table/Fig-7,8].

The mean RBS value was 169 mg/dL±52.7 [Table/Fig-9].

ABPI* right	Frequency	Percentage
Below 0.4	107	63
Above 0.4	63	37
Mean±SD	0.45±0.3	

[Table/Fig-7]: ABPI right.
*ABPI: Ankle brachial pressure index

ABPI* left	Frequency	Percentage
Below 0.4	114	67
Above 0.4	56	33
Mean±SD	0.48±0.13	

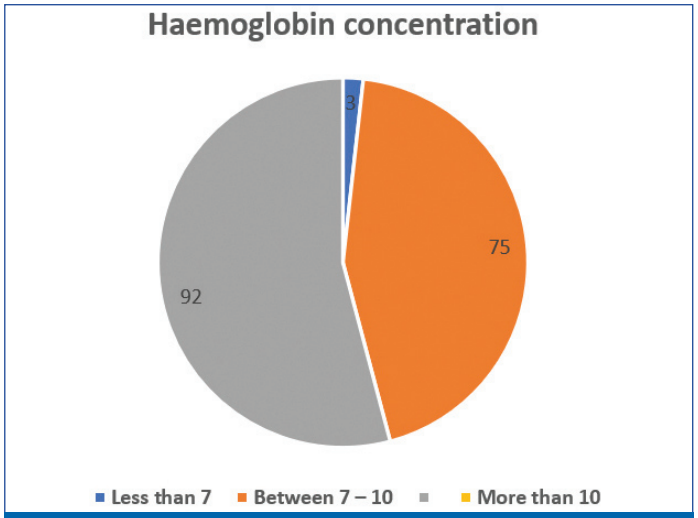
[Table/Fig-8]: ABPI left.
*ABPI: Ankle brachial pressure index

	Frequency	Percent
RBS* in mg/dL		
Below 200	124	73
Above 200	46	27
Mean±SD	169±52.7	
CRP* in mg/dL		
Below 0.5	25	15
Above 0.5	145	85
Mean±SD	4.8±4.8	

[Table/Fig-9]: RBS and CRP in PAOD.

Haemoglobin levels of the study subjects were analysed after grading them into three categories: less than seven (severe anaemia), 7-10 (moderate anaemia), and more than 10. The mean haemoglobin concentration was 10.4±2.23 [Table/Fig-10].

In a reference study [1], by Gart T et al., they have demonstrated PLR >150 as a strong predictor for CLTI in PAOD cases. In the present study, the authors calculated PLR from the available blood reports and tested the significance between having PLR >150 in a subject with CLTI.



[Table/Fig-10]: Haemoglobin concentration.

PLR=No. of platelets per mm^3 of blood (from Complete blood count report)÷No. of lymphocytes per mm^3 of blood (from total and differential blood counts).

NLR, being a known inflammatory marker, was also calculated from the data.

NLR=No: neutrophils per mm^3 of blood (from total and differential blood counts)÷No: of lymphocytes per mm^3 of blood (from total and differential blood counts).

NLR >3.75 as a cutoff was obtained from the reference study [1,8]. Only 36% had NLR >3.75 [Table/Fig-11] [1].

	Frequency	Percent
PLR*		
Below 150	62	36
Above 150	108	64
Mean±SD	182.31±65.08	
NLR*		
Below 3.75	109	64
Above 3.75	61	36

[Table/Fig-11]: Platelet Lymphocyte Ratio and Neutrophil Lymphocyte Ratio.
*PLR: Platelet-lymphocyte ratio; *NLR: Neutrophil lymphocyte ratio

The association between PLR and ABPI was analysed using 2×2 contingency tables. In the right lower limb, 94 subjects had PLR >150 and ABPI <0.4. Similarly, in the left lower limb, 87 subjects had PLR >150 and ABPI <0.4. On Chi-square test, Fischer's exact test, and linear by linear association, the p-value was found to be 0.001 on both lower limbs [Table/Fig-12,13].

PLR*	ABPI† (Right)		Chi-square test (p)	Fisher's exact test significance	Linear-by-linear association
	Below 0.4	Above 0.4			
Below 150	13	49	0.001	0.001	0.001
Above 150	94	14			

[Table/Fig-12]: PLR and ABPI right.
*PLR: Platelet-lymphocyte ratio; †ABPI: Ankle brachial pressure index

PLR*	ABPI† (Left)		Chi-square test (p)	Fisher's-exact test significance	Linear-by-linear association
	Below 0.4	Above 0.4			
Below 150	26	36	0.001	0.001	0.001
Above 150	87	21			

[Table/Fig-13]: PLR and ABPI left.
*PLR: Platelet-lymphocyte ratio; †ABPI: Ankle brachial pressure index

On comparing PLR with the arterial Doppler pattern of lower limbs below the knee, on the right side, 71 subjects with PLR >150 had a monophasic pattern of flow while 37 subjects with PLR <150 also had a monophasic type of flow. Similarly, on the left side, 64 subjects with PLR >150 had a monophasic pattern of flow while 45 subjects with PLR <150 also had a monophasic type of flow. On the Chi-square test, the p-value was found to be not significant, and the likelihood ratio was less than one on both sides [Table/Fig-14,15].

PLR*	Right lower limb below knee			Chi square test (p)	Likelihood ratio
	Triphasic	Biphasic	Monophasic		
Below 150	-	25	37	0.109	**0.048**
Above 150	5	32	71		

[Table/Fig-14]: PLR and doppler (Right Lower Limb).
*PLR: Platelet-lymphocyte ratio

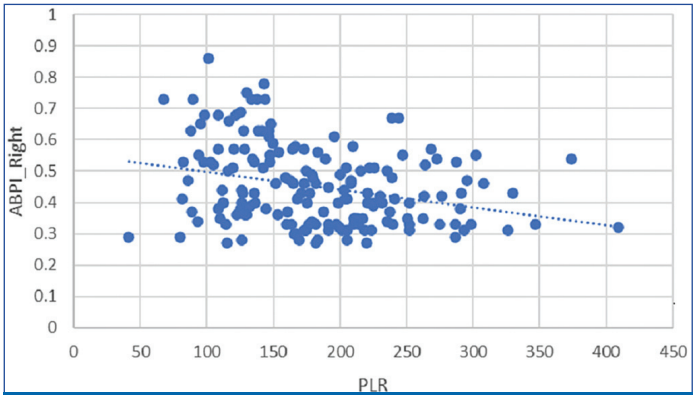
PLR*	Left lower limb below knee			Chi square test (p)	Likelihood ratio
	Triphasic	Biphasic	Monophasic		
Below 150	-	17	45	0.185	0.153
Above 150	1	43	64		

[Table/Fig-15]: PLR and doppler (left lower limb).
*PLR: Platelet-lymphocyte ratio

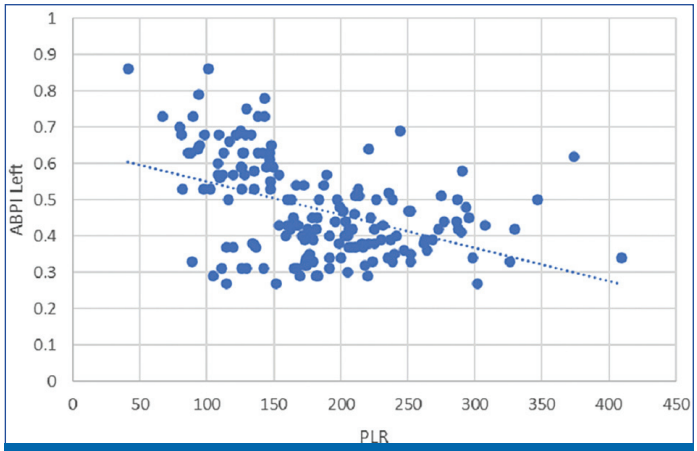
The main variables under study were analysed for their correlative association. PLR and ABPI of both legs were tested against their correlative association, and it was -0.443 on the right and -0.287 on the left. This suggested that PLR and ABPI had an inverse correlation, i.e., high PLR (>150) and low ABPI (<0.4) had a correlative association. Similarly, PLR vs. RBS was also tested, and it was noted to be 0.488. High blood sugars were associated with high PLR values [Table/Fig-16-19].

PLR*	RBS† in mg/dL	ABPI‡_right	ABPI_left
Pearson correlation	0.488	-0.443	-0.287
Significance (p-value)	**0.001**	**0.001**	**0.001**

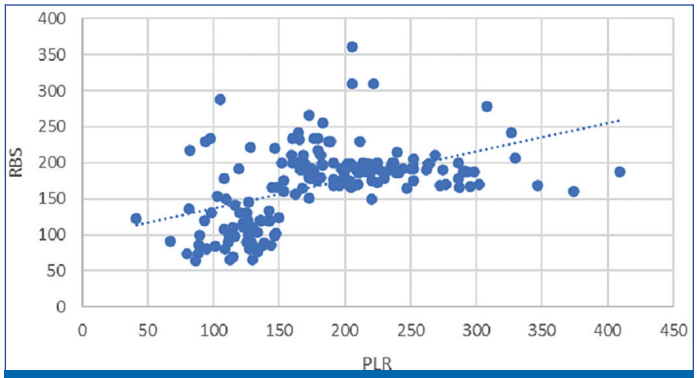
[Table/Fig-16]: Correlation of PLR with RBS and ABPI.
*PLR: Platelet-lymphocyte ratio; †RBS: Random blood sugar; ‡ABPI: Ankle brachial pressure index



[Table/Fig-17]: PLR* v/s ABPI† right.
*PLR: Platelet-lymphocyte ratio; †ABPI: Ankle brachial pressure index



[Table/Fig-18]: PLR* v/s ABPI† left.
*PLR: Platelet-lymphocyte ratio; †ABPI: Ankle brachial pressure index



[Table/Fig-19]: PLR* v/s RBS†.
*PLR: Platelet-lymphocyte ratio; †RBS: Random blood sugar

DISCUSSION

The mean age at presentation was 65.06±8.36 years. Incidence is higher in males, with a male-to-female ratio of 1.7:1. In a study by Gary T et al., the median age was 71, and 59% of the subjects were men [1]. The adjusted Odds Ratio (OR) for age ≥75 years was 2.1 (95% CI: 1.9-2.3, p<0.001) in subjects with PLR >150 [1]. In another study, the age-adjusted prevalence of PAOD was 26.7% (95% CI: 24.3, 29.4) [2], suggesting the prevalence of PAOD in the elderly male population and the direct non-modifiable risk factors of atherosclerosis. Smoking was present in 65% of patients with CLTI in this study.

In a prospective multicenter study by Bertomeu V et al., on the prevalence and prognostic influence of peripheral arterial disease in patients ≥40 years old admitted to the hospital following an acute coronary event [3], age (OR: 1.04; 95% CI: 1.03-1.06; p<0.001) and smoking (OR: 1.88; 95% CI: 1.41-2.49; p<0.0001) were independently related to PAOD among several other factors like Diabetes mellitus, previous cardiac, and previous cerebrovascular diseases [3]. In a systematic review and analysis study by Fowkes FGR et al., on the comparison of global estimates of prevalence and risk factors for peripheral arterial diseases, smoking was an important risk factor in both High-Income Class (HIC) and Lower Middle-Income Class (LMIC), with a meta-OR for current smoking of 2.72 (95% CI 2.39-3.09) in HIC and 1.42 (1.25-1.62) in LMIC [8]. Modifiable risk factors like smoking definitely add to the morbidity in PAOD and increase the chances of developing CLTI [2,3].

Though obesity can be a risk factor for atherosclerosis and its sequelae, in this study, only 6% were noted to be obese, and the rest 29% were merely overweight. Perhaps the overweight category falls within the spectrum towards obesity. However, the predominance of the normal weight category may be because the majority of study subjects were unemployed and belonged to a low socio-economic strata. The median BMI in the reference study was 26 (24-28) kg/m^2 [1]. Physical inactivity and BMI might increase the risk of atherosclerosis but not always directly be a risk for PAOD.

The chief complaints as seen in this study were ulceration of extremities, blackish discolouration, paresthesia, and pain at rest. According to a descriptive study on the definition and natural history of critical limb ischaemia by Novo S et al., the majority had ischemic rest pain with ulcers or gangrene in one or both legs [7]. Multiple factors like diabetes mellitus, prior amputations, and the presence of other concomitant diseases may intensify the severity of these symptoms and signs but do not individually meet the defined criteria for CLTI [4,7]. In the present study, diabetes mellitus, hypertension, and dyslipidemia were the most common and consistently associated co-morbidities in PAOD cases. Similar studies on PAOD indicate that diabetes mellitus and dyslipidemia are significant risk factors for CLTI and are linked to increased morbidity [2-5,7-9].

Additionally, other diseases resulting from atherosclerosis, such as coronary artery disease and cerebrovascular accidents, were prominent among this study subjects. In a referenced study [1], 35% had CAD, 69% had CVA, and 32% were previously diagnosed with CLTI. In the same study, among subjects with PLR >150, 37.4% had CAD (p-value 0.1), 70.5% had CVA (p-value 0.1), and 45.9% had CVA (p<0.001) [1]. In the study by Bertomeu V et al., previous cardiac disease (OR: 1.54; 95% CI: 1.22-1.95; p<0.001) and previous cerebrovascular disease (OR: 1.90; 95% CI: 1.28-2.80; p<0.001) were independently related factors to PAOD [3]. Various studies have established the connection between diabetes, hypertension, prior CAD, and CVA with the risk and onset of PAOD and its complications [10-13].

It was found that in 85% of cases, upper limb pulsations were palpable, while in all cases with CLTI, lower limb distal pulsations were absent, along with other signs of PAOD. Non-palpable pulsations can indicate the severity of ischaemia, but sometimes a grossly calcified vessel, especially in the elderly, may also be non-palpable. Additionally, roughly 30% of the general population may not have palpable popliteal pulse, and distal vessel pulses may not always be present even in the normal general population [4]. In a meta-analysis of 78 studies on PAOD by Duff S et al., it was shown that early clinical detection of PAOD by surgeons greatly impacted limb salvage [14].

Atherosclerosis and thrombi formation are associated with inflammatory responses in blood vessels, and thus a positive CRP value may correlate with other relevant findings suggesting CLTI. Mozos I et al., in their study on inflammatory markers for arterial stiffness in cardiovascular diseases, strongly concluded the relationship between elevated CRP, NLR, and the incidence of central and peripheral vascular disease through the inflammatory mechanism [15]. In another study by Ross R et al., similar supporting results in favor of the inflammatory nature of atherogenesis and the role of CRP and other cytokines in thrombi formation are clearly defined [16]. In another study by Belaj K et al., a high derived NLR was associated with an increased rate of CLTI in PAOD cases [17].

Kwon HC et al., in their study about the clinical significance of preoperative neutrophil-lymphocyte versus PLR in patients with operable colorectal cancer, have recommended that the NLR and PLR were positively correlated (p<0.001). Both the NLR and PLR were shown to be good prognostic biomarkers of Overall Survival (OS) (p=0.002 and p=0.001, respectively). The PLR was an independent prognostic factor of OS based on multivariate analysis (hazard ratio, 1.971; 95% Confidence Interval (CI), 1.102-3.335; p=0.021) [18].

Balta S and Ozturk C, in their study 'The PLR: A simple, inexpensive, and rapid prognostic marker for cardiovascular events', suggested that PLR is a novel inflammatory marker and a high PLR suggests inflammation, platelet activation, and atherosclerosis [19]. Taşoğlu I et al., in their prospective study, 'NLR and the PLR predict the limb survival in critical limb ischaemia', noticed that admission NLR levels of ≥3.2 and a PLR of ≥160 were found to represent the optimal cutoff values for the risk stratification of patients with critical limb ischaemia [20].

González-Fajardo JA et al., in their prospective 31-month follow-up study, noticed that five-year mortality was lower in the NLR <5 group (33%) than in the NLR >5 group (49%) (p-value ≤0.001), and the Amputation-Free Survival (AFS) was significantly higher in the NLR <5 group (50%) than in the NLR >5 group (26%) (p-value ≤0.001) among 561 CLTI patients who underwent infrainguinal revascularisation. In a multivariate analysis, preoperative NLR >5 was independently associated with 5-year AFS (hazard ratio 2.325, 95% CI 1.732-3.121) [21].

Cosarcă MC et al., in a retrospective study of 203 patients, noticed that the NLR cut-off value for the prediction of amputation in PAOD was 3.485 (sensitivity, 60.42%; specificity 72.44%), whereas the PLR value was 152 (sensitivity, 54.17%; specificity, 71.79%), and 2.55 for the LMR; sensitivity, 56.25%; specificity, 66.88% [22].

Russu E et al., in their retrospective study, have shown that an NLR of 3.95 (82.6% sensitivity and 89.9% specificity), and PLR of 142.13 (79.1% sensitivity and 82.6% specificity), had a higher incidence of all adverse outcomes. Moreover, a multivariate analysis showed that a high baseline value for NLR and PLR was an independent predictor of all outcomes for all recruited patients [23].

Arbănaşi EM et al., in a retrospective cohort study with longitudinal follow-up to confirm the relevance of preoperative inflammatory biomarkers NLR and PLR in predicting the 30-day poor prognosis of patients with Rutherford Classification (RC) grades II and III Acute Limb Ischaemia (ALI), suggested that high baseline values for NLR (4.33) and PLR (143.34) were independent predictors of amputation (p-value=0.0001), mortality (p-value=0.0001), and the composite endpoint (p-value=0.0001), respectively. They also added that NLR and PLR are excellent predictors of risks associated with ALI for primary and secondary prevention [24].

Spark JI et al., in a prospective study of 149 patients, suggested that an elevated neutrophil/lymphocyte ratio (>5.25 according to the ROC curve) and a high troponin level (>0.1) were the only two factors independently associated with shorter survival (43.4%) on multivariate analysis [25].

Erturk M et al., divided the patients into two groups according to their NLR as follows: high NLR (NLR >3.0) and low NLR (NLR ≤3.0) groups. Cardiovascular mortality was significantly higher in the elevated NLR group (n=43) compared to the low NLR group (n=32) (23.6% vs 9.8%, respectively; p<0.001). Even after adjusting for various risk factors, NLR >3 and age were found to be independent predictors of long-term cardiovascular mortality in Cox regression analysis {hazard ratios (95% CI), 2.04 (1.26-3.30) and 1.04 (1.01-1.07), p=0.004 and p=0.004, respectively} [26].

Wang Q et al., in a retrospective observational study among 270 post-amputation patients with CLTI, noted that NLR ≥8.08 (OR 26.228, 95% CI: 5.801-118.583, p<0.001), PLR ≥237.14 (OR: 3.464, 95% CI: 1.289-9.308, p=0.014), and coronary heart disease (OR: 2.739, 95% CI: 1.060-7.082, p=0.038) were independent prognostic indicators for the patients [27].

Aykan AC et al., in a retrospective study to evaluate the relationship between Peripheral Artery Disease (PAD) severity and complexity, as evaluated by the TransAtlantic Inter-Society Consensus-II (TASC-II) classification, and N/L ratio. This study showed the lymphocyte count was weakly correlated (r=-0.169, p=0.002), whereas the neutrophil count and NLR were moderately correlated with the TASC score (r=0.432, p<0.001 and r=0.470, p<0.001). NLR (OR=1.914, 95% CI=1.515-2.418, p<0.001) was an independent factor for predicting a higher TASC class in multiple logistic regression analysis. The cutoff value of the N/L ratio for predicting TASC C&D class was >3.05 (sensitivity=75.0%, specificity=62.9%, area under the curve=0.678, 95% CI=0.688-0.784, p<0.001) in ROC curve analysis [28].

Pizzimenti M et al., in a single-centre retrospective study, suggested that sarcopenia is a factor of poor prognosis for patients with CLTI, and a PLR >292.5 was shown to be a diagnostic marker for sarcopenia with a specificity of 91.7%. The 30-day morbidity and mortality in the sarcopenia group were 56.3% and 12.5%, respectively (p<0.001) [29].

In this study, through correlative analysis, the authors were able to depict that PLR and ABPI had an inverse and significant correlation i.e., high PLR (PLR >150) and low ABPI (less than 0.4) point to CLTI in a PAOD case. Hence, the authors can derive that PLR is another simple tool to predict CLTI in PAOD cases.

Limitation(s)

The study duration was limited to a year, and the sample size was just 170. An ROC curve was not plotted as in the reference study.

CONCLUSION(S)

The PLR is a simple blood count test that may provide an important clue about critical limb ischaemia in PAOD cases in the pretreatment period. This study proves that the PLR ratio can be used as an inflammatory marker to assess limb ischaemia in acute infection and predict gangrene and limb outcome in chronic PAOD patients.

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