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Investigation of hemogram parameters in pneumoconiosis patients: A case-control study

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Abstract:

BACKGROUND AND AIM: Pneumoconiosis occurs as a result of an inflammatory response. Despite precautions, it continues to be an important public health issue worldwide. Monitoring prognosis in pneumoconiosis is particularly important because no effective disease-modifying treatment currently exists. In recent years, hemogram parameters have been increasingly investigated as prognostic indicators across various diseases. This study aimed to compare hemogram parameters between patients with pneumoconiosis and workers with similar occupational exposure who had not been diagnosed with pneumoconiosis.

METHODS: A total of 207 patients with pneumoconiosis and 193 controls were included in the study. Collected data included demographic characteristics, occupational history, hemogram parameters, neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), systemic immune-inflammation index (SII), and radiological imaging findings.

RESULTS: Lymphocyte (Lym), hemoglobin (Hb), mean corpuscular volume (MCV), and mean platelet volume (MPV) levels were found to be significantly lower, whereas white blood cell (WBC) count, red cell distribution width (RDW), platelet count (PLT), platelet distribution width (PDW), NLR, PLR, and SII levels were significantly higher in the pneumoconiosis group compared to the control group. Statistically significant differences were also observed in WBC, neutrophil (Neu), Lym, PLT, NLR, PLR, and SII levels across different International Labour Organization (ILO) profusion categories and large opacity sizes. When a cut-off value of 2.4 was applied for NLR among pneumoconiosis cases, the presence of complicated pneumoconiosis was 3.8-fold more prevalent ($p<0.001$). Similarly, using a PLR cut-off value of 131.2, the likelihood of complicated pneumoconiosis increased 3.0-fold ($p=0.002$). In addition, applying an SII cut-off value of 522.06 resulted in a 3.6-fold higher detection rate of complicated pneumoconiosis ($p=0.001$).

CONCLUSIONS: Pneumoconiosis may continue to progress even after exposure has ended. In addition to radiological imaging and pulmonary function tests, routine monitoring of hemogram-derived inflammatory markers such as NLR, PLR, and SII could provide important prognostic insights. These parameters could serve as accessible, cost-effective indicators to support clinical follow-up in affected individuals.

Keywords:

Hemogram parameters, neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, pneumoconiosis, systemic immune-inflammation index

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Introduction

Pneumoconiosis is one of the most common occupational diseases caused by mineral dust.[1] It develops through a process that begins with alveolitis and progresses to fibrosis, following the phagocytosis of dust particles by alveolar macrophages and the release of inflammatory mediators and cytokines.[2] There is often a long period between exposure and the onset of disease, which is sometimes diagnosed after retirement. Diagnosing an employee with pneumoconiosis is important to protect other workers through dust control measures. At the same time, the disease may progress even if exposure ceases after diagnosis. Therefore, these patients should be closely monitored.[3]

In recent years, there has been a growing search for simple, effective, and inexpensive prognostic factors in disease follow-up, with particular attention focused on hemogram parameters due to their easy accessibility.

Although there is widespread awareness worldwide regarding the incidence of pneumoconiosis, its risk factors, early diagnosis, prevention, and intervention, the disease remains a major public health problem. Furthermore, disease-specific treatment options are under investigation, but there is no specific treatment yet. This situation makes preventive measures and prognosis monitoring of the disease even more important. In this study, hemogram parameters in patients with pneumoconiosis were compared with those of workers who had occupational exposure but were not diagnosed with pneumoconiosis, and the potential contribution of these parameters to prognosis during follow-up was investigated.

Materials and Methods

This study was initiated after receiving approval from Ankara Atatürk Sanatorium Training and Research Hospital (Approval Number: 2012-KAEK-15/2780, Date: 03.08.2023). It was conducted in full compliance with the ethical principles outlined in the Declaration of Helsinki.

This study employed a retrospective design, and all analyzed data were anonymized to ensure the absence of personally identifiable information. Since there was no risk to individual privacy, informed consent was not obtained.

Study population

Sample size calculation and power analysis were performed using the G*Power 3.1 program. The data reported by Uygur et al.[4] in the study entitled "Platelet Indices in Patients with Coal Workers' reference.[4] In that study, the platelet levels of coal workers with pneumoconiosis and control subjects were presented with means and standard deviations, and a statistically significant difference was reported. Based on these data, the effect size was calculated as 0.375. Power analysis indicated that, with 95% power and a two-sided α error of 5%, a minimum of 310 participants would be required.

Patients who presented to the Occupational Diseases Department of a Tertiary Training and Research Hospital between January 2020 and June 2023 and who had an occupational history of exposure to inorganic dust were included in the study. Posteroanterior chest X-rays were evaluated by two pneumoconiosis readers according to the International Labour Organization (ILO) classification, and patients diagnosed with pneumoconiosis were assigned to the case group (n=438), while individuals without pneumoconiosis formed the control group (n=321).[5] Patients with autoimmune diseases such as collagen tissue disease (n=37), malignancy (n=34), acute infection findings (n=104), use of anti-inflammatory drugs (n=108), and a history of hematological diseases (n=76) were excluded from the study. A total of 207 patients diagnosed with pneumoconiosis were included in the case group, and 193 patients with inorganic dust exposure but without pneumoconiosis were included in the control group. Participants in the case group were divided into two groups: those with simple pneumoconiosis (size of nodules <1 cm) and those with complicated pneumoconiosis (size of nodules ≥1 cm). In addition, the simple pneumoconiosis group was divided into three groups according to profusion categories (category 1, category 2, and category 3). The complicated pneumoconiosis group was divided into three groups: A, B, C, according to the size of the large opacity.[5]

Laboratory tests

Data were obtained through the hospital's automation system. For this research, demographic data were extracted from patient files, including age, sex, prior disease diagnoses, occupational history, duration of employment, laboratory test results, such as WBC: White blood cell ($\times 10^3/\mu L$), Lym: Lymphocyte ($\times 10^3/\mu L$), Neu: Neutrophil ($\times 10^3/\mu L$), Hb: Hemoglobin (g/dL), MCV:

Mean Corpuscular Volume (fL), MCHC: Mean Corpuscular Hemoglobin Concentration (g/dL), RDW: Red Cell Distribution Width (%), PLT: Platelet (×103/μL), MPV: Mean Platelet Volume (fL), PCT: Platelet Crit (%), PDW: Platelet Distribution Width (%), and radiological imaging results. NLR was calculated as the ratio of neutrophils to lymphocytes, and PLR as the ratio of platelets to lymphocytes. The Systemic Immune-Inflammation Index (SII) was calculated using the formula neutrophil × platelet / lymphocyte.[6]

Statistical analysis

Data were analyzed using SPSS version 20.0 (Statistical Package for the Social Sciences, IBM Corp., Armonk, NY, USA). The distribution of the data was assessed using the Kolmogorov–Smirnov test. Depending on distribution characteristics, appropriate parametric or non-parametric tests were applied. For the analysis of quantitative variables, the Mann–Whitney U test and Kruskal–Wallis analysis of variance, followed by relevant post hoc tests, were used.

Receiver Operating Characteristic (ROC) curve analysis was performed to determine optimal cut-off values for inflammatory markers. Although the neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), and SII were all associated with pneumoconiosis severity, their inclusion together in a multivariate binary logistic regression model was avoided due to the risk of multicollinearity, as the SII is mathematically derived from the other two parameters. Instead, separate univariate logistic regression analyses were conducted to evaluate the individual diagnostic value of each marker in identifying complicated pneumoconiosis. A p-value of <0.05 was considered statistically significant in all analyses.

Results

The average age of participants included in the study was 46.2 years (24–82). Of the pneumoconiosis cases, 30.92% (n=64) were silicosis, 27.54% (n=57) were mixed dust pneumoconiosis, 24.64% (n=51) were coal workers' pneumoconiosis, and 16.91% (n=35) were diagnosed with welder's pneumoconiosis. Sociodemographic data are presented in Table 1.

Table 1: Sociodemographic data of the participants

Sociodemographic data	n=400	%
Gender		
Female	2	0.5
Male	398	99.5
Cigarette use		
None	101	25.2
Active smoker	169	42.2
Quit	130	32.6
Occupation		
Smelter	198	49.5
Miner	56	14.0
Welder	59	14.8
Construction/road worker	25	6.2
Dental technician	17	4.2
Ceramic worker	13	3.2
Sandblasting worker	7	1.8
Stone worker	16	4.0
Other	9	2.2

Participants were divided into three groups according to radiological findings: those with simple pneumoconiosis, those with complicated pneumoconiosis, and the control group. Comparison of hemogram parameters among the groups is presented in Table 2. Lym, Hb, MCV, and MPV measurements were found to be statistically significantly lower (all p<0.001). Post hoc analysis showed that Lym and Hb values were highest in the control group and significantly lower in cases with complicated pneumoconiosis (p<0.001). However, although MCV and MPV values were higher in the control group than in the pneumoconiosis group (p<0,001), no significant difference was detected between simple and complicated pneumoconiosis cases (p=0.078 and p=0.99, respectively). WBC, RDW, PLT, PDW, NLR, PLR, and SII measurements were significantly higher in the pneumoconiosis group than in the control group (p=0.001, p<0.001, p=0.036, p<0.001, p<0.001, p<0.001, and p<0.001, respectively). When post hoc analysis was performed, it was found that the differences in WBC, RDW, PLT, and PDW levels were due to higher values in both complicated and simple pneumoconiosis cases compared with the control group (p<0.001). No statistically significant difference was observed between simple and complicated pneumoconiosis cases (p>0.05). However, both NLR and PLR were significantly higher in the pneumoconiosis group compared to the control group and were also significantly elevated in complicated cases relative to simple cases (p<0.001). Similarly, SII was significantly higher in complicated pneumoconiosis cases than in both simple cases and the control group (p<0.001). No significant difference was detected between simple pneumoconiosis cases and the control group (p=0.196). Statistically significant differences

Table 2: Comparison of hemogram parameters among groups

	Groups			
	Control group n=193	Case group n=207		
	Median (IQR)	Simple pneumoconiosis n=165 Median (IQR)	Complicated pneumoconiosis n=42 Median (IQR)	p*
WBC	7.1 (5.7–8.2)	7.3 (6.0–9.1)	7.6 (6.3–9.2)	0.001[a]
Lym	2.5 (2.4–3.2)	1.9 (1.4–2.6)	1.5 (1.09–1.85)	<0.001[b]
Neu	4.1 (3.1–5.1)	4.4 (3.3–5.6)	4.7 (4.0–6.6)	0.102
Hb	16.1 (15.7–17.1)	15.5 (14.5–16.3)	14.0 (12.3–15.7)	<0.001[b]
MCV	91.9 (88.4–94.0)	89.3 (85.7–92.4)	86.8 (82.5–90.7)	<0.001[a]
MCHC	33.0 (32.8–34.2)	33.4 (32.6–34.0)	33.3 (32.3–33.9)	0.662
RDW	13.2 (12.9–13.7)	14.0 (13.4–15.5)	15.3 (13.4–16.6)	<0.001[a]
PLT	219.5 (213.0–267.0)	231.0 (192.0–266.0)	245.0 (207.0–327.0)	0.036[a]
MPV	9.6 (8.7–10.2)	8.80 (8.0–9.9)	8.85 (7.0–9.9)	<0.001[a]
PCT	0.2 (0.2–0.3)	0.2 (0.17–0.24)	0.2 (0.16–0.28)	<0.001[a]
PDW	16.1 (15.8–16.3)	16.5 (16.1–17.2)	16.8 (16.1–17.5)	<0.001[a]
NLR	1.8 (1.3–2.14)	2.08 (1.63–2.62)	2.8 (2.2–5.2)	<0.001[b]
PLR	85.2 (68.4–132.8)	111.9 (89.1–148.7)	180.3 (114.1–277.3)	<0.001[b]
SII	412.5 (308.4–642.6)	470.1 (335.3–659.1)	781.0 (517.4–1.305.2)	<0.001[c]

*: p<0.05 was considered statistically significant. [a]: Difference arises from variation of simple and complicated pneumoconiosis values compared with the control group, [b]: Difference arises from variation of simple and complicated pneumoconiosis values both from each other and from the control group, [c]: In complicated pneumoconiosis, there is a difference compared with both the control group and simple pneumoconiosis. WBC: White blood cell (×10³/μL), Lym: Lymphocyte (×10³/μL), Neu: Neutrophil (×10³/μL), Hb: Hemoglobin (g/dL), MCV: Mean corpuscular volume (fL), MCHC: Mean corpuscular hemoglobin concentration (g/dL), RDW: Red cell distribution width (%), PLT: Platelet (×10³/μL), MPV: Mean platelet volume (fL), PCT: Platelet crit (%), PDW: Platelet distribution width (%), NLR: Neutrophil-to-lymphocyte ratio, PLR: Platelet-to-lymphocyte ratio, SII: Systemic immune-inflammation index

were identified in NLR, PLR, and SII levels across different types of pneumoconiosis (p=0.013, p=0.013, and p=0.003, respectively). The difference in NLR levels was attributed to significantly higher NLR values in silicosis cases compared to welder's pneumoconiosis (p=0.013). Similarly, the difference in PLR levels was due to significantly higher PLR values in silicosis cases than in welder's pneumoconiosis (p=0.007). The observed difference in SII levels resulted from significantly higher SII values in silicosis cases compared to both welder's pneumoconiosis (p=0.005) and mixed dust pneumoconiosis (p=0.031).

Patients diagnosed with pneumoconiosis were classified according to the extent of the disease and the size of large opacities, and the comparison of hemogram parameters is presented in detail in Table 3. A significant relationship was observed between patients' ILO profusion categories and hemogram parameters. When post hoc analysis was performed, it was determined that the differences in WBC, Neu, Hb, PLT, and NLR levels were due to the difference between category 1 and category 2 (p=0.03, p=0.006, p=0.04, p=0.03, and p=0.021, respectively). The difference in PLR levels was due to the difference between categories 1 and 3 (p=0.044), and the difference in SII was due to the difference between both category 1 and category 2 and category 2 and category 3 (p<0.001 and p=0.03, respectively). In complicated pneumoconiosis cases, a significant relationship was detected between the size of large opacities and hemogram parameters. When post hoc analysis was performed, it was determined that the NLR, PLR, and SII of complicated pneumoconiosis patients with size B opacity were higher than those with size A opacity (p=0.045, p=0.038, and p=0.047, respectively).

Receiver operating characteristic curve analysis was performed to evaluate the diagnostic performance of NLR, PLR, and SII in distinguishing complicated pneumoconiosis from simple cases (Table 4). Univariate logistic regression demonstrated that elevated NLR, PLR, and SII values were significantly associated with the presence of complicated pneumoconiosis. Each parameter above its respective cut-off increased the odds of complicated pneumoconiosis approximately 3- to 3.8-fold, and all models showed acceptable calibration (Table 5).

Table 3: Evaluation of International Labour Organization (ILO) density degrees and large opacity sizes in relation to hemogram parameters of patients diagnosed with pneumoconiosis

Parameters	ILO profusion				Large opacity			
	Category 1 n=79 Median (IQR)	Category 2 n=62 Median (IQR)	Category 3 n=24 Median (IQR)	p*	A n=23 Median (IQR)	B n=9 Median (IQR)	C n=10 Median (IQR)	p*
WBC	7.20 (5.38–8.60)	7.70 (6.60–9.10)	7.56 (6.10–9.40)	0.040[a]	6.75 (5.90–7.91)	8.10 (6.60–11.20)	8.68 (7.90–10.20)	0.037[d]
Lym	1.87 (1.40–2.59)	1.80 (1.40–2.65)	1.78 (1.19–2.26)	0.490	1.75 (1.40–1.93)	1.20 (0.80–1.50)	1.30 (0.90–2.26)	0.422
Neu	4.10 (2.77–5.40)	4.78 (3.99–6.02)	4.80 (3.86–5.90)	0.007[a]	4.31 (3.90–5.67)	6.60 (4.04–7.50)	6.00 (5.34–6.80)	0.029[e]
Hb	15.60 (14.40–16.40)	15.10 (13.75–16.00)	15.15 (14.00–15.80)	0.015[a]	14.00 (13.10–15.10)	14.10 (11.90–15.70)	15.40 (12.30–15.90)	0.911
MCV	88.70 (84.90–92.00)	90.00 (86.80–93.10)	87.65 (83.50–90.70)	0.088	89.35 (84.40–93.50)	78.30 (76.90–86.80)	85.40 (84.60–85.80)	0.058
MCHC	33.50 (32.20–34.00)	33.40 (32.70–33.90)	33.25 (32.20–33.80)	0.465	33.25 (32.60–33.70)	33.60 (31.50–34.40)	33.20 (32.20–34.10)	0.922
RDW	14.10 (13.50–15.50)	13.90 (13.05–15.45)	14.70 (13.70–16.10)	0.081	15.00 (13.40–15.90)	15.60 (13.10–17.80)	15.30 (13.50–16.20)	0.904
PLT	224.00 (179.00–263.00)	237.00 (207.50–293.50)	235.50 (209.00–285.00)	0.024[a]	236.00 (194.00–272.00)	243.00 (220.00–327.00)	303.00 (241.00–363.00)	0.020[d]
MPV	8.80 (7.80–10.30)	8.80 (7.70–9.80)	8.80 (7.70–9.80)	0.526	8.04 (7.21–9.90)	9.30 (7.02–9.70)	8.95 (6.55–10.05)	0.986
PCT	0.19 (0.17–0.22)	0.20 (0.19–0.28)	0.20 (0.19–0.23)	0.260	0.20 (0.15–0.27)	0.22 (0.20–0.30)	0.22 (0.16–0.38)	0.335
PDW	16.50 (16.20–17.60)	16.35 (16.00–17.00)	16.40 (16.10–17.00)	0.490	17.10 (16.20–17.80)	16.00 (15.90–17.00)	16.55 (16.25–16.85)	0.251
NLR	2.08 (1.61–2.53)	2.38 (2.03–3.24)	2.39 (1.66–3.46)	0.023[a]	2.64 (2.19–3.39)	3.66 (2.59–6.07)	3.46 (2.36–7.83)	0.015[e]
PLR	110.00 (85.19–148.75)	128.20 (95.93–161.60)	135.28 (92.73–213.64)	0.032[b]	124.06 (111.76–213.64)	261.25 (200.00–282.14)	201.67 (118.78–331.67)	0.044[e]

*: p<0.05 was considered statistically significant. [a]: The observed statistical difference is attributable to the variation between category 1 and category 2, [b]: The observed statistical difference is attributable to the variation between category 1 and category 3, [c]: The observed statistical difference is attributable to variations between category 1 and category 2, and between category 2 and category 3, [d]: The observed statistical difference is attributable to the variation between A and C opacities, [e]: The observed statistical difference is attributable to the variation between A and B opacities. WBC: White blood cell (×10^3/µL), Lym: Lymphocyte (×10^3/µL), Neu: Neutrophil (×10^3/µL), Hb: Hemoglobin (g/dL), MCV: Mean corpuscular volume (fL), MCHC: Mean corpuscular hemoglobin concentration (g/dL), RDW: Red cell distribution width (%), PLT: Platelet (×10^3/µL), MPV: Mean platelet volume (fL), PCT: Platelet crit (%), PDW: Platelet distribution width (%), NLR: Neutrophil-to-lymphocyte ratio, PLR: Platelet-to-lymphocyte ratio, SII: Systemic immune-inflammation index

Discussion

In this case-control study investigating hemogram parameters in patients with pneumoconiosis, WBC, RDW, PLT, PDW, NLR, PLR, and SII values were significantly elevated, whereas Lym, Hb, MCV, and MPV levels were significantly reduced in individuals with pneumoconiosis compared to healthy controls. Furthermore, it was determined that NLR, PLR, and SII, when assessed using the established cut-off values, may serve as useful parameters for distinguishing simple pneumoconiosis cases from complicated pneumoconiosis subtypes. Pneumoconiosis is characterized by progressive pulmonary inflammation, fibrotic changes, and eventual respiratory failure.

Studies have found that the number of leukocytes (macrophages, neutrophils, and lymphocytes) and proinflammatory cytokines such as tumor necrosis factor-alpha (TNF-α), interleukin-1β (IL-1β), interleukin-6 (IL-6), and transforming growth factor-β1 (TGF-β1) increases in bronchoalveolar lavage fluid.[7–9] Since the recognition of pneumoconiosis, efforts have focused on reducing silica exposure through preventive interventions. However, millions of workers around the world, especially in developing countries, are still exposed to silica.[10] In a meta-analysis examining 19 studies, the incidence of pneumoconiosis was found to be 0.093, although there was heterogeneity among studies.[11] Although pneumoconiosis is a well-known occupational disease in Türkiye, published statistics are compiled from insurance records and indemnified cases, thus preventing the full picture from being seen.[12] Pneumoconiosis is a preventable disease, but it still accounts for a significant portion of deaths due to occupational diseases.[13]

Although treatments are still being studied for their safety and effectiveness, there is currently no effective treatment for silicosis, and lung transplantation remains the only option for patients with terminal silicosis.[14] Unfortunately, the average survival after transplant is only 6–7 years.[15] It is important to follow up workers exposed to inorganic dust with periodic examinations, ensuring early diagnosis and preventive measures to both terminate exposure and safeguard co-workers. In recent years, hemogram parameters have been frequently studied in determining the prognosis of systemic diseases because they are economical and easily accessible. It is known that inflammatory

Table 4: Diagnostic performance of neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), and systemic immune-inflammation index (SII) for detecting complicated pneumoconiosis at the specified cut-off values

	Cut-off	Sensitivity	Specificity	AUC	95% CI	p*	PPV (%)	NPV(%)
NLR	2.40	0.675	0.658	0.728	0.645–0.812	<0.001	18.8	94.5
PLR	131.2	0.625	0.652	0.736	0.646–0.827	<0.001	17.4	93.7
SII	522.06	0.750	0.576	0.746	0.663–0.829	<0.001	17.2	95.2

*p<0.05 was considered statistically significant. AUC: Area under the curve, CI: Confidence interval, PPV: Positive predictive value, NPV: Negative predictive value.

Table 5: Univariate binary logistic regression analysis of neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), and systemic immune-inflammation index (SII) for predicting complicated pneumoconiosis

	B	SE	Wald	OR (Exp(B))	95% CI (lower–upper)	p*	Model performance
NLR ≥2.4	1.358	0.377	13.006	3.82	1.827–7.985	<0.001	Hosmer–Lemeshow p=0.64; Nagelkerke R^2=0.12
PLR ≥131.2	1.138	0.367	9.628	3.06	1.495–6.286	0.002	Hosmer–Lemeshow p=0.59; Nagelkerke R^2=0.09
SII ≥522.06	1.405	0.399	12.392	3.61	1.689–7.713	0.001	Hosmer–Lemeshow p=0.63; Nagelkerke R^2=0.11

*p<0.05 was considered statistically significant. B: Regression coefficient, SE: Standard error, OR: Odds ratio, CI: Confidence interval

processes cause thrombocytosis through various signaling pathways, activate platelet functions, increase adhesion and aggregation, reduce lymphocyte levels, and, in some studies, low lymphocyte levels are associated with poor prognosis.[16–18] On the other hand, cytokines that emerge in inflammatory conditions may induce anemia by impairing bone marrow function and reducing erythrocyte lifespan.[19] A study showed that NLR and PLR values may contribute to prognosis in breast cancer patients.[20] Another study found that NLR measurement could be useful in the diagnosis of Hashimoto's thyroiditis, especially in complicated cases where the diagnosis is uncertain.[21] NLR and PLR values were identified as prognostic markers in pneumoconiosis patients with hilar lymphadenopathy.[22] It was concluded that NLR and PLR values were significantly related to disease activity, and that NLR reflected disease activity better than PLR in a study comparing patients diagnosed with silicosis and healthy controls.[23] It was also observed that silicosis patients, particularly those in categories 2 and 3, exhibited significantly higher NLR and PLR values in a study from the ceramic industry.[24] It was found that platelet count, MPV, PDW, and PCT were higher in miners with pneumoconiosis compared to miners without pneumoconiosis and to the control group. Platelet count, MPV, and PCT values were determined to independently predict pneumoconiosis.[4] In our study, WBC, RDW, PLT, PDW, NLR, PLR, and SII levels were elevated in both complicated and simple pneumoconiosis cases compared with the control group. It was stated that if the NLR cut-off value is 2.40, the PLR cut-off value is 131.2, and the SII cut-off value is 522, complicated pneumoconiosis cases can be detected approximately three times more frequently. Compared with controls, Lym, Hb, MCV, and MPV were lower in pneumoconiosis, while in simple cases, WBC, Neu, PLT, and NLR were higher in category 2 than in category 1, and PLR was higher in category 3 than in category 1. In complicated pneumoconiosis cases, NLR, PLR, and SII values were found to be significantly higher in the B-size opacity group than in the A-size opacity group. The reason why NLR, PLR, and SII levels do not increase linearly as the size of large opacities increases may be that classification is based only on large opacity size, while the accompanying profusion categories of these groups differ. The comparison of hemogram parameters across different stages of pneumoconiosis is consistent with findings from other inflammatory diseases. Previous research has likewise shown that these parameters are reliable indicators of inflammatory disease severity. This study was conducted in our hospital, which is one of the reference centers in our country for the diagnosis and follow-up of pneumoconiosis. Findings suggest that hemogram parameters should be incorporated into follow-up examinations, with emphasis on individualized monitoring rather than reliance on universal cut-off values.

Limitations

The retrospective design limited the ability to evaluate baseline and follow-up hemogram parameters, restricting longitudinal assessment. As the research was conduct-

ed in a single tertiary center, the generalizability of the findings may be limited. Although potential confounders such as infections, autoimmune conditions, and hematologic disorders were excluded, unmeasured variables may still have influenced inflammatory markers. To minimize the risk of multicollinearity, only univariate logistic regression was applied, which precluded the assessment of combined models. Prospective multicenter studies are warranted to confirm and expand upon these findings.

Conclusion

In this study, hemogram-derived inflammatory markers, including NLR, PLR, and SII, were found to be significantly elevated in patients with pneumoconiosis compared with healthy controls, while Lym, Hb, MCV, and MPV levels were reduced. These parameters were also associated with disease stage. Cut-off analyses showed that NLR ≥2.40, PLR ≥131.2, and SII ≥522 predicted complicated pneumoconiosis and increased the likelihood of detection by approximately threefold. These findings suggest that routine evaluation of hemogram parameters, alongside radiological assessment, may serve as a practical and cost-effective tool for prognosis and disease monitoring in pneumoconiosis.

Ethics Committee Approval

The study was approved by the Ankara Atatürk Sanatorium Training and Research Hospital Ethics Committee (No: 2012-KAEK-15/2780, Date: 03/08/2023).

Informed Consent

Written informed consent was not required due to the retrospective nature of this study.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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Author Contributions

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References

1. Cohen RA. Is the increasing prevalence and severity of coal workers' pneumoconiosis in the United States due to increasing silica exposure? Occup Environ Med 2010;67(10):649–50. [CrossRef]
2. Perret JL, Plush B, Lachapelle P, Hinks TS, Walter C, Clarke P, et al. Coal mine dust lung disease in the modern era. Respirology 2017;22(4):662–70. [CrossRef]
3. Barber C, Fishwick D. Pneumoconiosis. Medicine 2016;44(6):355–8. [CrossRef]
4. Uygur F, Ornek T, Tanriverdi H, Altuntas M, Altinsoy B, Erboy F, et al. Platelet Indices in Patients with Coal Workers' Pneumoconiosis. Lung 2016;194(4):675–9. [CrossRef]
5. International Labour Organization. Guidelines for the use of the ILO International Classification of Radiographs of Pneumoconioses Accessed December 18, 2025. https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---lab_admin/documents/publication/wcms_867859.pdf
6. Tuzimek A, Dziedzic EA, Beck J, Kochman W. Correlations Between Acute Coronary Syndrome and Novel Inflammatory Markers (Systemic Immune-Inflammation Index, Systemic Inflammation Response Index, and Aggregate Index of Systemic Inflammation) in Patients with and without Diabetes or Prediabetes. J Inflamm Res 2024;17:2623–32. [CrossRef]
7. Karkale S, Khurana A, Saifi MA, Godugu C, Talla V. Oropharyngeal administration of silica in Swiss mice: A robust and reproducible model of occupational pulmonary fibrosis. Pulm Pharmacol Ther 2018;51:32–40. [CrossRef]
8. Cao Z, Song M, Liu Y, Pang J, Li Z, Qi X, et al. A novel pathophysiological classification of silicosis models provides some new insights into the progression of the disease. Ecotoxicol Environ Saf 2020;202:110834. [CrossRef]
9. Salahuddin M, Cawasji Z, Kaur S, Martin R, Cherian S. Current Concepts in Pathogenesis, Diagnosis, and Management of Silicosis and Its Subtypes. Curr Pulmonol Rep 2021;10(12):135–42. [CrossRef]
10. GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet 2018;392(10159):1789–858. Erratum in: Lancet 2019;393(10190):e44.
11. Su X, Kong X, Yu X, Zhang X. Incidence and influencing factors of occupational pneumoconiosis: a systematic review and meta-analysis. BMJ Open 2023;13:e065114. [CrossRef]
12. Sarı G, Şimşek C. A Descriptive Study of a Turkish Pneumoconiosis Case-Series. Med Lav 2023;114(1):e2023003. [CrossRef]
13. Sarı G, Gökçek A, Koyuncu A, Şimşek C. Computed Tomography Findings in Progressive Massive Fibrosis: Analyses of 90 Cases. Med Lav 2022;113(1):e2022002. [CrossRef]

14. Joubert KD, Awori Hayanga J, Strollo DC, Lendermon EA, Yousem SA, Luketich JD, et al. Outcomes after lung transplantation for patients with occupational lung diseases. Clin Transplant 2019;33(1):e13460. [CrossRef]
15. Hoy RF, Chambers DC. Silica-related diseases in the modern world. Allergy 2020;75(11):2805–17. [CrossRef]
16. Swieringa F, Heemskerk JWM, Assinger A. Platelet activation and signaling in thrombus formation. Blood 2025;146(12):1400–11. [CrossRef]
17. Ibrahim AM, El-Nahal AS, Ahmed HA, Youssif ZA, Abdelsalam MA. Hematological indices: potential markers of disease activity in ankylosing spondylitis patients treated with biological drugs. Egypt J Intern Med 2024;36(1):74. [CrossRef]
18. Chen WA, Boskovic DS. Neutrophil Extracellular DNA Traps in Response to Infection or Inflammation, and the Roles of Platelet Interactions. Int J Mol Sci 2024;25(5):3025. [CrossRef]
19. Wacka E, Nicikowski J, Jarmuzek P, Zembron-Lacny A. Anemia and Its Connections to Inflammation in Older Adults: A Review. J Clin Med 2024;13(7):2049. [CrossRef]
20. Wen Y, Tang Y, Zou Q. Association between systemic immune-inflammatory biomarkers (SII, NLR, PLR, LMR) and breast cancer. Crit Public Health 2025;35(1):2535091. [CrossRef]
21. Aktas G, Sit M, Dikbas O, Erkol H, Altinordu R, Erkus E, et al. Elevated neutrophil-to-lymphocyte ratio in the diagnosis of Hashimoto's thyroiditis. Rev Assoc Med Bras (1992) 2017;63(12):1065–8. [CrossRef]
22. Hasanlı YS, Türk M. The Prevalence of Hilar Lymphadenopathy and Related Factors in Pneumoconiosis Patients of a University Hospital Occupational Diseases Polyclinic. Acta Medica 2021;52(4):289–95. [CrossRef]
23. He G, Wu PF, Peng YH, Feng J, Zhong DM, Zhang GH, et al. Modified Glasgow Prognostic Score, and Neutrophil/lymphocyte and Platelet/lymphocyte Ratios in Different Stages of Silicosis. Biomed Environ Sci 2019;32(5):376–9.
24. Karataş M, Gündüzöz M, Öziş TN, Özakıncı OG, Ergün D. Neutrophil to lymphocyte ratio and platelet to lymphocyte ratio as haematological indices of inflammatory response in ceramic workers' silicosis. Clin Respir J 2019;13(3):159–65. [CrossRef]