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REVIEW ARTICLE

Complete Blood Count Test in Rheumatology: Not Just a Screening Test

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SUMMARY

Background: **Rheumatic disorders are chronic and common diseases, which especially involve connective tissue and may be associated with the damage to vital organs such as heart and kidney. Diagnosis, prognosis, determining the probability of severe complications, monitoring and evaluation of the response to treatment in such patients require specialized, expensive and time-consuming laboratory tests.**
Methods: **In this review article, we assessed the value of parameters of routine, inexpensive, and available Complete Blood Count (CBC) in detecting disease activity and explaining the prognosis of a number of rheumatic disorders, including systemic lupus erythematosus and rheumatoid arthritis by reviewing the results of searching Google Scholar search engine and PubMed databases over 2000 - 2021.**
Results: **Review of previous articles showed that while traditional Erythrocyte Sedimentation Rate (ESR) and C-Reactive Protein (CRP) tests do not have sufficient specificity to appraise disease activity, CBC derived inflammatory biomarker Neutrophil-to-Lymphocyte Ratio (NLR) is able to assess disease activity and response to treatment in Rheumatoid Arthritis (RA). Also, Mean Platelet Volume (MPV) and NLR can determine the prognosis of renal involvement in Systemic lupus erythematosus (SLE).**
Conclusions: **Although CBC-based parameters are not completely specific and sensitive to rheumatic disorders, but based on the results of previous studies, these parameters, particularly red cell distribution width (RDW), MPV, NLR and platelet to lymphocyte ratio (PLR) are inflammatory biomarkers with a prognostic role in rheumatic disorders that can also assess activity of the disease.**
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Supplementary Data

Table S1. Summary of previous studies on the association of CBC parameters with rheumatic disorders.

Parameter	Disease	Mean Age	M/F (%)	Patient No.	Results	Ref.
RDW	RA	-	24/76	20,810	- the proportion of RA patients with MI was significantly increased in the high RDW group compared to low RDW group ($p < 0.001$)	[19]
	RA	-	-	670	- RDW level was significantly increased in RA patients compared to osteoarthritis (OA) patients and healthy group ($p < 0.001$)	[20]
	OA FM RA SpA	52	13/87	699	- a significant increase in RDW within RA versus OA group ($p < 0.001$), active SpA versus OA ($p < 0.001$), RA versus FM ($p < 0.001$) and active SpA versus FM group ($p = 0.001$)	[27]
	SLE	35	10/90	131	- increased RDW level was observed in patients RDW was positively correlated with levels of serum IgM, CRP, ESR ($p < 0.05$ for all)	[32]
	SLE	42 41	7/93 7/93	105 patients 105 controls	- RDW was increased in patients compared to controls ($p < 0.001$) and was higher in patients with anemia compared with patients without anemia ($p < 0.01$) or controls ($p < 0.001$)	[33]
	Sjogren's syndrome	53 51	6/94 12/88	52 patients 58 controls	- RDW was increased in Sjogren's syndrome patients (both $p < 0.01$)	[37]
	AS	36 34	68/32 72/28	44 patients 113 controls	- AS patients showed increased RDW compared to controls ($p < 0.01$)	[40]
	CD	41	-	63,520	- high RDW was associated with increased risk of cardiovascular diseases ($p < 0.001$)	[36]
	TA	40 40	13/87 13/87	156 patients 156 controls	- RDW was significantly increased in patients with anemia compared with patients without anemia ($p < 0.001$) and controls ($p < 0.001$) regardless of the anemia factor, RDW showed correlation with CRP (both $p < 0.05$) RDW was higher in active TA patients without anemia compared with inactive TA without anemia ($p = 0.001$)	[38]
MPV	RA	51 51	20/80 20/80	97 patients 33 controls	- at baseline, MPV of patients was significantly higher compared with controls - at the end of therapy, mean MPV was significantly decreased in RA patients ($p < 0.001$) while they were unchanged in the control group	[91]
	RA AS	46 41	30/70 17/83	88 patients 29 controls	- MPV was significantly lower in both AS and RA patients with active disease as compared to controls ($p < 0.001$) - after treatment, MPV significantly increased in AS and RA ($p < 0.001$)	[52]
	SLE	33 45	8/92 20/80	51 patients 55 controls	- the MPV was higher in SLE group than the RA group ($p < 0.05$)	[53]
	SLE	34 39	10/90 0/100	78 patients with renal complication 30 patients with renal complication	- mean MPV ($p = 0.001$) was significantly higher in SLE patients with nephritis	[61]
	SLE	-	-	376 active patients 270 inactive patients	- active SLE patient and inactive SLE patient results showed no significant difference in MPV levels and significant publication bias as a whole ($p > 0.05$)	[64]

Table S1. Summary of previous studies on the association of CBC parameters with rheumatic disorders (continued).

Parameter	Disease	Mean Age	M/F (%)	Patient No.	Results	Ref.
MPV	CD	32 34	66/34 70/30	61 patients 50 control	- a significant MPV decrease was seen in patients compared with controls ($p < 0.0001$) no statistical difference was found between active and inactive CD groups	[69]
	AS	42 40	60/40 60/40	133 patients 133 controls	- MPV was significantly higher in patients than in controls ($p = 0.03$) - MPV was negatively correlated with ESR ($p = 0.03$), CPR ($rP = 0.004$) and PLT levels ($rP \leq 0.0001$)	[9]
	BD	45 45	33/67 33/67	198 patients 800 controls	- MPV at diagnosis was significantly lower in patients than controls ($p < 0.0001$) - lower MPV was only related to skin involvement and BD flare	[76]
NLR	RA	52 48	89/11 63/37	1,550 patients 1,128 controls	- NLR was significantly higher in patients compared to controls ($p < 0.001$)	[92]
	RA	44 43	65/35 65/35	317 patients 104 controls	- a significant difference in the NLR was seen between the patient and control groups ($p < 0.001$) - a significant difference in NLR was seen between the remission and active groups ($p < 0.001$)	[93]
	SLE	34 39	10/90 0/100	78 patients with renal complication 30 patients without renal complication	- NLR level was significantly higher in lupus nephritis group ($p < 0.001$)	[61]
	BD	37 45	38/62 20/80	53 patients 55 controls	- NLR was higher in the active patients than inactive patients ($p = 0.008$) - NLR was higher in patients with neuro-BD and patients with active genital ulcers compared to patients without neurological involvement ($p < 0.01$) and active genital ulcers ($p< 0.05$)	[53]
	TA	39 38	19/81 16/84	32 patients 32 controls	- NLR was significantly higher in patients compared to controls ($p < 0.001$) - NLR was decreased in remission ($p < 0.001$)	[78]
	CD	32 35	70/30 63/37	103 patients 103 controls	- the NLR was elevated in patients compared to controls ($p < 0.01$)	[88]
PLR	RA	52 48	89/11 63/37	380 patients 305 controls	- PLR was significantly higher in patients compared to controls ($p < 0.001$)	[92]
	RA	44 43	65/35 65/35	317 patients 104 controls	- a significant difference in the PLR was seen between the patient and control groups ($p < 0.001$) - a significant difference in the PLR was seen between the remission and active groups ($p < 0.001$)	[93]
	TA	39 38	19/81 16/84	32 patients 32 controls	- PLR was significantly higher in patients compared to controls ($p < 0.036$) - PLR was decreased in remission ($p < 0.009$)	[78]

Table S1. Summary of previous studies on the association of CBC parameters with rheumatic disorders (continued).

Parameter	Disease	Mean Age	M/F (%)	Patient No.	Results	Ref.
PLR	CD	32 35	70/30 63/37	103 patients 103 controls	- PLR was elevated in patients compared to controls ($p < 0.01$)	[88]

Abbreviations: CBC - complete blood count, M/F - male to female ratio, RDW - red cell distribution, RA - Rheumatoid arthritis, MI - myocardial infarction, OA - Osteoarthritis, FM - Fibromyalgia, SpA - Spondyloarthritis, SLE - Systemic lupus erythematosus, CRP - C-reactive protein, ESR - erythrocyte sedimentation rate, AS - Ankylosing spondylitis, CD - Crohn's disease, TA - Takayasu arteritis, MPV - Mean platelet volume, PLT - Platelet, BD - Behcet's disease, NLR - neutrophil to lymphocyte ratio, PLR - platelet to lymphocyte ratio.