

Hematological Changes in Rheumatic Heart Disease Patient in Port Sudan

Manal Hamed Awad¹, Mohammed Gorashi Ahmed², Hwida Abdelmageid³, Adam A. Hussein⁴,
Maha Awad Alkarim⁵

¹Department of Physiology, Faculty of Medicine, Red Sea University, Port Sudan, Sudan
Corresponding Author Email: manalelmadih@hotmail.com

²Department of Cardiology, Faculty of Medicine, Red Sea University and Digna Price Hospital, port Sudan, Sudan
Email: mohamed.medani@yahoo.com

³Department of Cardiology, Digna Price Hospital, Port Sudan, Sudan
Email: hwidaa789@gmail.com

⁴Department of Statistic and Population Study, Red Sea University, Port Sudan, Sudan
Email: adam.adooma@yahoo.com

⁵Department of Cardiology, Digna Price Hospital, Port Sudan, Sudan
Email: mahaawadelkarim93@gmail.com

Abstract: ***Introduction:** Rheumatic heart disease (RHD), a chronic acquired disorder, is a major cause of morbidity and mortality in developing and impoverished countries, Red blood cell distribution width, platelet distribution width, mean platelet volume, and C-reactive protein levels were all significantly higher in patients with rheumatic heart disease compared to healthy controls (p 0.01). Several studies have looked at the correlations between neutrophil, lymphocyte, and platelet count, NLR (relation between neutrophil, lymphocyte), and mean platelet volume values with the severity of cardiovascular disease. Acute rheumatic fever is commonly associated with anemia. **Methodology:** The subjects of this convenience study are the 115 patients with rheumatic heart disease who visited the cardiology referral clinic at Digna Price Hospital in Port Sudan, Sudan, between 2018 and 2020. After explaining the study to each participant, their signed informed consent was obtained, 4.5 mL of blood from each participant's cubital vein. A complete blood count was performed using a hematological analyzer (Sysmex X P 300). **Results:** the mean of Hemoglobin (Hb), total white blood counts (TWBCs) and platelets were 11.8 g/dl (\pm std 1.64), 6.9 (\pm std 10.5), 294.9 (\pm std 85.6) respectively.*

Keywords: Hematological, rheumatic heart disease patients, port Sudan

1. Introduction

Rheumatic heart disease (RHD), a chronic acquired disorder, is a major cause of morbidity and mortality in developing and impoverished countries. ⁽¹⁾ RHD, an inflammatory and immunological condition, is a consequence of Group A-hemolytic Streptococcal pharyngitis. ⁽²⁾ The inflammatory reaction might accelerate valvular degeneration. ⁽³⁾ Lymphocyte accumulation and complement deposition were present in the cardiac tissues of RHD patients. ⁽⁴⁾ Also, it was demonstrated that there is immunologic cross-reactivity between streptococcal antigens and the glycoproteins of heart valves. ⁽⁵⁾ The endocardium is the main site of involvement in RHD, despite the fact that carditis, pericarditis, and valvulitis are symptoms. A gradual and irreversible valve disease is the result of this ongoing inflammation in the valvular apparatus. An imaging technique for detecting rheumatic valve disease is an echocardiographic examination ⁽⁶⁾. Inflammation and platelet activation are important factors in the initiation and development of atherosclerosis. ⁽⁷⁾ Because of the negative correlation between lymphocyte count and inflammation, a low blood lymphocyte count has been associated with worse cardiovascular outcomes. ⁽⁸⁾ The majority of research was focused on pediatrics

Red blood cell distribution width, platelet distribution width, mean platelet volume, and C-reactive protein levels were all

significantly higher in patients with rheumatic heart disease compared to healthy controls (p 0.01). Red blood cell distribution width and C-reactive protein both exhibited positive relationships ($r=0.271$, $p=0.035$ and $r=0.308$, $p=0.006$). When single valve involvement was compared to both aortic valve and mitral valve involvement in the study group, red blood cell distribution width and platelet distribution width were higher in individuals with double valve involvement, however this was not statistically significant ($p>0.05$). ⁽⁹⁾

The study included 30 healthy children and 45 ARC sufferers. Leukocyte, neutrophil, and platelet counts, as well as hemoglobin, RDW, mean corpuscular volume (MCV), and were the whole blood parameters that the study set out to investigate. Leukocyte, neutrophil, and platelet counts were all considerably greater in the acute rheumatic patients group than in the healthy control group ($p0.0001$, $p = 0.000$, and $p0.000$, respectively). ⁽¹⁰⁾

Several studies have looked at the correlations between neutrophil, lymphocyte, (NLR) and platelet count, and mean platelet volume values with the severity of cardiovascular disease. Akboga et al study. 's involved adults. ⁽¹¹⁾ Red cell distribution width (RDW) values were found to be higher in people with chronic rheumatic mitral valve stenosis compared to the healthy control group, which is a marker of continued chronic inflammation. ⁽¹²⁻¹⁴⁾

Volume 12 Issue 5, May 2023

www.ijsr.net

Licensed Under Creative Commons Attribution CC BY

Acute rheumatic fever is commonly associated with anemia, and the severity of the anemia and the rate at which it develops are proportionate to the illness's severity. During observation, the quick onset of anemia in those with acute rheumatic fever has been particularly apparent. The current research, which checks to see if a hemolytic process is active during the acute stage of the illness, is the result of this. Evidence of hemolysis was sought in a study using the Ashby technique to look at the survival of transfused normal red cells in the circulation of people with acute rheumatic fever.⁽¹⁵⁾

2. Methods

The subjects of this convenience study are the 115 patients with rheumatic heart disease who visited the cardiology referral clinic at Digna Price Hospital in Port Sudan, Sudan, between 2018 and 2020. Age, gender, ethnicity, and blood pressure were among the crucial variables that an interview questionnaire collected. After explaining the study to each participant, their signed informed consent was obtained.

The usual vacutainer blood collection method was utilized to take 4.5 mL of blood from each participant's cubital vein. A tourniquet was placed 5-8 cm above the venipuncture, alcohol was swabbed over the area, and the investigation was then finished with the rheumatoid patients sitting upright in the chair. A complete blood count was performed using a hematological analyzer (Sysmex X P 300). Before the machine could begin counting, 50µl were manually transferred or mixed from each labeled tube to the Sysmex container. The instrument automatically counts Hb, TWBCs, and platelets. The reagents Rinse and Diluent were employed with this device, The device's operation is powered by electricity. Eg TWBCs count, for instance, depends on volumetric study Laser light that scatters forward is used to measure each cell. As each cell passes through the aperture in the electrical system, they displace a portion of their volume in a conductive fluid, changing the electrical resistance. This variation relates to the cell volume.

IBM SPSS for Windows version 21.0 was used for data analysis, the study was described using means.

The Digna Price Hospital provided a letter of authorization for the ethics committee.

3. Results

Table 1 shows the study's average TWBCs, and hemoglobin (Hb), platelets.

Value	Mean	± std
Hb	11.8	1.64
TWBCs	294.9	85.6
Platelets	6.9	10.5

In the presence and absence of mitral stenosis, mitral regurgitation, and aortic regurgitation, there were normal mean hemoglobin, TWBCs, and platelets (table 2)

Table 2: The relation of mean Hemoglobin (Hb), TWBCs, and platelets and presence or absence of mitral stenosis, mitral and aortic regurgitation

Mean		MS	MR	AR
Hb	Absence	11.7	11.6	11.7
	Presence	11.9	11.9	12
TWBCs	absence	7.5	6.6	7.1
	presence	6.1	7.1	6.5
Platelets	absence	307.4	293.2	296.6
	Presence	271.7	293.3	283.6

4. Discussion

In this study, patients with rheumatic heart disease had normal Hb, TWBCs, and platelet counts. The means of all these parameters did not alter depending on whether the patients had the most prevalent valvular defects or not.

When compared to individuals with single valve involvement and both the aortic valve and the mitral valve, red blood cell distribution width and platelet distribution width were found to be higher in patients with double valve involvement in some worldwide research on rheumatic heart disease⁽⁹⁾ but Preoperative anemia was very common in individuals having heart surgery for RHD. Moderately anemic patients exhibited greater transfusion rates but significantly reduced Hb on cardiopulmonary bypass (CPB) and in the postoperative term. Packet cell transfusion during surgery was strongly linked to death⁽¹⁶⁾. Inflammation can be easily, cheaply, and universally detected using the total white blood cell count. The majority of leukocytes in peripheral blood are neutrophils. Recently, it was shown that the neutrophil to lymphocyte ratio (NLR), a measure of thrombosis and inflammation, was connected to the severity and prognosis of numerous cardiovascular illnesses.^(17, 18) Oxygen radicals generated by active neutrophils and low-grade inflammation can both be seen circulating in the coronary sinus.⁽¹⁹⁻²¹⁾ The white blood cell count can be used to calculate NLR, a novel indicator of systemic inflammation. NLR offers a combined neutrophil and lymphocyte indication of the state of inflammation. The enhanced lymphocyte apoptosis brought on by the elevated inflammatory condition in rheumatic mitral stenosis (RMS) was most likely the primary factor contributing to the higher NLR. Higher NLR was linked to spontaneous echocardiographic contrast in RMS, according to a recent study by ztürk et al.⁽²²⁾

5. Conclusions

Patients with chronic rheumatic heart disease who were seen at the digna prize hospital in Port Sudan, Sudan, had normal levels of Hb, TBCs, and platelets.

To evaluate NLR in rheumatic patients in port Sudan, more research is required

References

- [1] Stollerman GH. Rheumatic fever. The Lancet.1997; 349 (9056): 935– 42. [https://doi.org/10.1016/S0140-6736\(96\)06364-7](https://doi.org/10.1016/S0140-6736(96)06364-7)

- [2] Allen HD, Driscoll DJ, Shaddy RE, Feltes TF. Moss & Adams' Heart Disease in Infants, Children, and Adolescents: Including the Fetus and Young Adult. Lippincott Williams & Wilkins; 2013.929 p
- [3] Gölbasi Z, Uçar Ö, Keles T, Sahin A, Çağlı K, Çamsarı A, et al. Increased levels of high sensitive C-reactive protein in patients with chronic rheumatic valve disease: evidence of ongoing inflammation. *Eur J Heart Fail.*2002 Oct 1; 4 (5): 593–5. doi: 10.1016/S1388-9842 (02) 00102-2
- [4] Guilherme L, Cury P, Demarchi LMF, Coelho V, Abel L, Lopez AP, et al. Rheumatic Heart Disease. *Am J Pathol.*2004 Nov; 165 (5): 1583–91. doi: 10.1016/S0002-9440 (10) 63415-3
- [5] Kaplan MH, Meyesian M. An Immunological Cross-Reaction between Group-A Streptococcal Cells and Human Heart Tissue. *Lancet.*1962; 706–10
- [6] Bonow RO, Carabello BA, Chatterjee K, de Leon AC, Faxon DP, Freed MD, et al.2008 Focused Update Incorporated Into the ACC/AHA 2006 Guidelines for the Management of Patients With Valvular Heart Disease. *J Am Coll Cardiol.*2008 Sep; 52 (13): e1–142. doi: 10.1016/j. jacc.2008.05.007
- [7] Balta S, Celik T, Mikhailidis DP, Ozturk C, Demirkol S, Aparci M, et al. The relation between atherosclerosis and the neutrophil–lymphocyte ratio. *Clin Appl Thromb.*2016; 22 (5): 405–11. doi: 10.1177/1076029615569568
- [8] Ommen SR, Gibbons RJ, Hodge DO, Thomson SP. Usefulness of the Lymphocyte Concentration as a Prognostic Marker in Coronary Artery Disease. *Am J Cardiol.*1997 Mar; 79 (6): 812–4. doi: 10.1016/S0002-9149 (96) 00878-8
- [9] Demirbağ, R, Sade, LE, Aydın, M, Bozkurt, A, Acartürk, E. The Turkish registry of heart valve disease. *Turk Kardiyol Dern Ars* 2013; 41: 1–10. Google ScholarPubMed
- [10] Yeter Duzenli Kar, Ufuk Utku Gullu, The Role of Whole-blood Parameters in Predicting the Severity of Acute Rheumatic Carditis in Children, Original article, DOI: 10.4274/haseki. galenos.2021.6860 *Med Bull Haseki* 2021; 59: 178-183
- [11] Akboğa MK, Abacı A, Canpolat U, et al. Kırmızı kan hücreleri dağılım genişliğinin romatizmal mitral kapak darlığının varlığı ve ciddiyetiyle ilişkisi [Association of red blood cell distribution width with presence and severity of rheumatic mitral valve stenosis]. *Turk Kardiyol Dern Ars* 2015; 43: 227-33
- [12] Öztürk D, Erturk M, Celik O, et al. The role of the neutrophil/ lymphocyte ratio in patients with rheumatic mitral stenosis as an indicator of spontaneous echocardiographic contrast. *Kardiologia Polska (Polish Heart J)* 2014; 72 (10): 969-76.
- [13] Polat N, Yildiz A, Yuksel M, et al. Association of neutrophillymphocyte ratio with the presence and severity of rheumatic mitral valve stenosis. *Clin Appl Thromb Hemost* 2014; 20: 793-8.
- [14] Ozdemir R, Karadeniz C, Doksoz O, et al. Are mean platelet volume and platelet distribution width useful parameters in children with acute rheumatic carditis? *Pediatr Cardiol* 2014; 35: 53-6.
- [15] JOHN REINHOLD. THE SURVIVAL OF TRANSFUSED RED CELLS IN ACUTE RHEUMATIC FEVER WITH REFERENCE TO A LATENT HAEMOLYTIC MECHANISM, *Arch Dis Child*: first published as 10.1136/adc.29.145.201 on 1 June 1954.
- [16] panelBorde Deepak, Asegaonkar Balaji Apsingekar Pramod, Khade Sujit MD, Futane Savani, Khod e Bapu, Puranik Manish, Belapurkar Yogesh, MCh ‡, Joshi Shreedhar, The Prevalence and Impact of Preoperative Anemia in Patients Undergoing Cardiac Surgery for Rheumatic Heart Disease August 2016, Pages 896-900, Volume 30, Issue 4.
- [17] Shen XH, Chen Q, Shi Y, Li HW. Association of neutrophil/lymphocyte ratio with long-term mortality after ST elevation myocardial infarction treated with primary percutaneous coronary intervention. *Chin Med J.*2010; 123: 3438–3443. [PubMed] [Google Scholar].
- [18] Kaya H, Ertas F, Islamoglu Y, et al. Association between neutrophil to lymphocyte ratio and severity of coronary artery disease. *Clin Appl Thromb Hemost.*2014; 20: 50–54. [PubMed] [Google Scholar]
- [19] Drakopoulou M, Toutouzas K, Stefanadi E, Tsiamis E, Tousoulis D, Stefanadis C. Association of inflammatory markers with angiographic severity and extent of coronary artery disease. *Atherosclerosis.*2009; 206: 335–339. [PubMed] [Google Scholar]
- [20] Tanındı A, Şahinarslan A, Elbeg S, Cemri M. Relationship between MMP-1, MMP-9, TIMP-1, IL-6 and risk factors, clinical presentation, extent and severity of atherosclerotic coronary artery disease. *Open Cardivasc Med J.*2011; 5: 110–116. [PMC free article] [PubMed] [Google Scholar]
- [21] Ricevuti G, Mazzone A, De Servi S, Specchia G, Fratino P. New trends in coronary artery disease: the role of granulocyte activation. *Atherosclerosis.*1989; 78: 261–265. [PubMed] [Google Scholar].
- [22] Öztürk D, Erturk M, Celik O, et al. The role of the neutrophil/lymphocyte ratio in patients with rheumatic mitral stenosis as an indicator of spontaneous echocardiographic contrast. *Kardiol Pol.*2014; 72 (10): 969–976. [PubMed] [Google Scholar].