

This journal is the official publication of Bangladesh Society of Physiologists (BSP)  
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Abstracted /indexed in Index Copernicus, Director of Open Access Journal, Index Medicus for South East Asia Region, Google Scholar, 12OR, infobse index, Open J gate, Cite factor, Scientific indexing services

pISSN-1983-1213; e-ISSN-2219-7508

## Article

### Article information:

Received on 23/4/2018

Accepted on 12/8/2018

DOI: <https://doi.org/10.3329/jbsp.v13i2.39476>

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### Cite this article:

Abira M, Akhter QS. Relationship between CBC and ESR and duration of disease in patients with systemic lupus erythematosus (SLE)

J Bangladesh Soc Physiol 2018;13(2): 41-46

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## Relationship between CBC and ESR and duration of disease in patients with systemic lupus erythematosus (SLE)

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### Abstract

**Background:** Systemic lupus erythematosus (SLE) is an autoimmune disease and is associated with considerable morbidity. Hematological abnormalities may be the initial manifestation. Duration may have impact on their hematological parameters. **Objective:** To observe the relationship of Complete Blood Count (CBC) and Erythrocyte sedimentation Rate (ESR) with duration of disease in patients with SLE. **Methods:** This cross sectional study was conducted in the Department of Physiology, Dhaka Medical College, Dhaka from July 2016 to June 2017. Total 60 subjects including both sexes were selected with age ranging from 18 to 55 years. Among them, 30 subjects with SLE were study group and 30 age matched healthy subjects were control group. Total count of RBC, WBC, Platelet and ESR were estimated by automated hematology analyzer. Statistical analysis was done by unpaired Students “t” test, Chi Square test and Pearson’s correlation coefficient (r) test. **Results:** In this study, ESR was significantly ( $p < 0.001$ ) higher and RBC, WBC and platelet counts were significantly ( $p < 0.001$ ) lower in SLE patients in comparison to that of control. On correlation analysis, RBC and WBC showed significant negative correlation with duration of disease in patients with SLE. **Conclusion:** This study concludes that CBC and ESR were altered in SLE patients and it was related to duration of disease.

**Keywords:** SLE, ESR, RBC, WBC, Platelet.

### Introduction

**S**ystemic lupus erythematosus (SLE) is an autoimmune disease in which cells and organs undergo damage and initially mediated by tissue-binding auto-antibodies<sup>1</sup>. These antibodies form immune complexes which may contribute to formation of all clinical and laboratory manifestations<sup>2</sup>.

Every tissues and cells in the body could be involved in SLE. The involved systems are hematological, musculoskeletal, cutaneous, renal, nervous system, vascular, pulmonary, gastrointestinal and ocular. Hematological manifestations are more frequent because blood and blood vessels together contain various numbers of antigens than any other organ in the body<sup>3</sup>. The principal hematological abnormalities are anemia, leukopenia and thrombocytopenia<sup>4</sup>. The causes of these cytopenia in SLE may be due to presence of autoantibodies<sup>5</sup>, chronic inflammation<sup>6</sup>, immunosuppressive drugs and marrow suppression<sup>7</sup>.

Majority of the patients present with hematological abnormality as their initial manifestation. Duration of disease may have impact on their hematological parameters. Complete blood count (CBC) parameters are ideal biomarkers which are easily measured and sensitive to changes in disease activity. Previous studies reported an association among anemia, leucopenia and thrombocytopenia with duration of disease<sup>4,8</sup> but data was not adequate to establish association. Therefore, the present study has been designed to observe the relationship between CBC and ESR with duration of disease in patients with SLE.

### Methods

This cross sectional study was conducted in the Department of Physiology, Dhaka Medical College, Dhaka from July 2016 to June 2017. For this study, 30 SLE patients who fulfilled the American College of Rheumatology (ACR) criteria<sup>9</sup>, aged 18 to 55 years, duration of disease

>5 years were considered as the study group and 30 aged matched healthy subjects were considered as control group for comparison. Purposive sampling technique was used for sampling. The patients having history of liver disease, renal disease (other than SLE), rheumatoid arthritis, ankylosing spondylitis, inflammatory bowel disease, psoriasis and malignant disease, history of taking anticoagulant, chemotherapy and recent history of blood transfusion were excluded from the study. The study subjects were selected from Department of Medicine, Dhaka Medical College Hospital, Dhaka on the basis of inclusion and exclusion criteria.

After selection of the subjects, the nature, purpose and benefit of the study were explained to each subject in details. Informed written consent was taken from the participants. The research work was carried out after obtaining ethical clearance from Ethical Review Committee of Dhaka Medical College Dhaka. Before taking blood, detailed family and medical history were taken. Anthropometric measurement of the subjects was done and blood pressure was measured. All the information was recorded in a prefixed data schedule. With all aseptic precautions, 3.6 ml blood was collected from all subjects. CBC (total count of RBC, WBC & platelet) and ESR were estimated by Automated Hematology Analyzer (Sysmex XT-2000). Data were expressed as mean and standard error (mean  $\pm$  SE). Unpaired Student's 't' test, Chi Square test and Pearson's correlation co-efficient (r) test were performed as applicable. *p* value <0.05 was accepted as level of significance. Statistical analyses were performed by using a computer based statistical program SPSS (statistical package for social sciences) version 22.0.

### Results

In this study, age, sex, BMI and blood pressure of all the subjects in study and control groups were almost similar and statistically no significant differences were observed among them (Table I).

**Table I :** General characteristics of the subjects in both groups (N=60)

Parameters	Control (n=30)	SLE patients (n=30)
Age (years)	34.89±10.59	35.10±10.92
Sex (%)		
Male	4(13.3%)	2(6.7%)
Female	26(86.7%)	28(93.3%)
BMI (kg/m <sup>2</sup> )	21.91±1.45	20.34±1.27
Systolic BP(mmHg)	122.30±12.50	123.60±13.25
Diastolic BP(mmHg)	79.67±8.90	81.67±9.13
Duration of disease (months)	-	28.97±16.85

Data were shown as mean±SE. Statistical analysis was done by Unpaired Student's 't' test and Chi

Square test (frequency %). Control= Healthy subjects, SLE= Systemic lupus erythematosus, BMI= Body mass index, BP= blood pressure.

In present study, the mean ESR was significantly ( $p<0.001$ ) higher and RBC, WBC and platelet counts were significantly ( $p<0.001$ ) lower in SLE patients in comparison to that of control. (Table II).

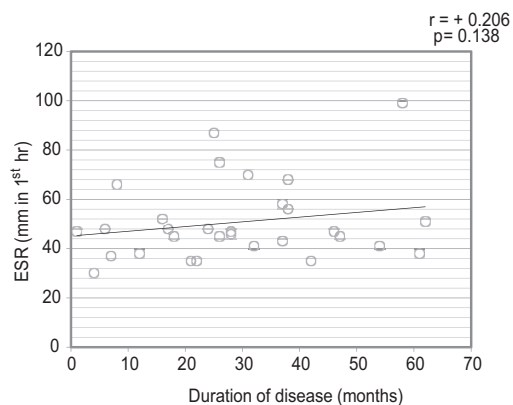
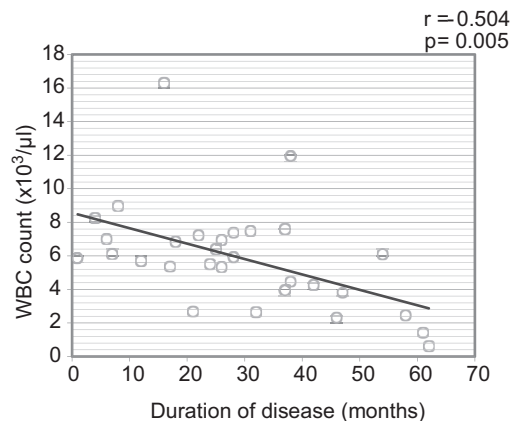
Correlation analysis showed, ESR was positively correlated, RBC, WBC and platelet counts were negatively correlated with duration of disease in patients with SLE and these were statistically significant except ESR and platelet count (Figure 1, 2, 3 & 4).

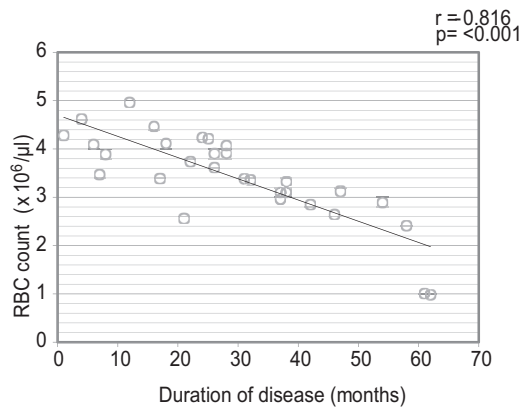
**Table II:** Hematological parameters of the subjects in both groups (N=60)

Parameters	Control (n=30)	SLE patients (n=30)
ESR (mm in 1 <sup>st</sup> hr)	9.47±3.31	47.60±14.14 <sup>***</sup>
RBC count ( $\times 10^6/\mu\text{l}$ )	4.22±0.51	3.40±0.94 <sup>***</sup>
WBC count ( $\times 10^3/\mu\text{l}$ )	8.35±1.85	5.90±3.11 <sup>***</sup>
Platelet count ( $\times 10^3/\mu\text{l}$ )	230.50±54.39	194.50±79.44 <sup>**</sup>

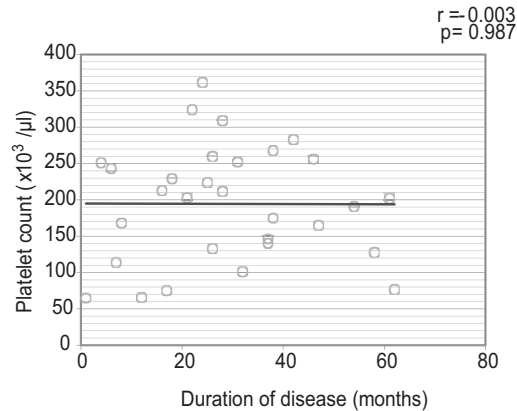
Data were shown as mean±SE. Statistical analysis was done by unpaired Student's 't' test.

Control= Healthy subjects, SLE= Systemic lupus erythematosus, ESR= Erythrocyte sedimentation rate, RBC= Red blood cell, WBC= White blood cell, <sup>\*\*\*</sup>= $p<0.001$ , <sup>\*\*</sup>=  $p<0.005$

**Figure 1:** Correlation of ESR with duration of disease in SLE patients presenting that there is positive correlation between ESR and duration of disease. ESR= Erythrocyte sedimentation rate.**Figure 2:** Correlation of WBC count with duration of disease in SLE patients presenting that there is negative correlation between WBC count and duration of disease. WBC= White blood cell.



**Figure 3:** Correlation of RBC count with duration of disease in SLE patients presenting that there is negative correlation between RBC count and duration of disease. RBC= Red blood cell.



**Figure 4:** Correlation of platelet count with duration of disease in SLE patients presenting that there is negative correlation between platelet count and duration of disease.

### Discussion

In present study, ESR was significantly higher and RBC, WBC and platelet counts were significantly lower in SLE patients in comparison to that of control. These findings are parallel to the observation of some groups of authors<sup>10-13</sup>. On the contrary, Kanfir et al. and Hassan found no significant changes in WBC and platelet counts in SLE patients<sup>14-15</sup>. This disagreement in findings might have occurred due to demographic variations and different methodology used in those studies.

In correlation analysis RBC and WBC showed significant negative correlation with duration of disease in patients with SLE. Some researchers found significant negative correlation between RBC count with duration of disease but no association was found with other hematological parameters<sup>5, 16</sup>.

Though the explanation of these changes in CBC and ESR of SLE patients is not known but literature review suggests that increased ESR may be due to chronic inflammatory response with polyclonal increase in immunoglobulins<sup>17,18</sup>. Some studies reported that genetic and environmental factors may contribute to the

development of SLE. Interactions between susceptible genes and environmental factors results in abnormal activation of immune cells, T and B lymphocytes and ineffective regulatory CD4+ and CD8+ T cells. Therefore, sustained autoantibodies are formed in SLE<sup>17</sup>. These excess productions of auto antibodies cause activation of natural killer (NK) cells. These cells bind with antibody coated target cells and causes lysis of the target cells. The hematopoietic system is very much vulnerable to these effects. Thus autoantibodies causes destruction of circulating bloods cells resulting cytopenia<sup>7,19,20</sup>.

Both innate and adaptive immune pathways become activated in SLE. So, immunosuppressive drugs (steroid, cyclophosphamide etc.) are used for long time to suppress antibody production<sup>5,21</sup>. They are bio-transformed in the liver. Their active metabolites inhibit purine synthesis and block the proliferation of activated T and B lymphocytes. These effects cause bone marrow suppression. It is accompanied with reduction of all three formed elements of blood leading to cytopenia<sup>22</sup>. This increased ESR and decreased CBC might be consequence of

increased inflammation process in SLE patients which is evident from its relation to disease duration.

### Conclusion

From results of the study, it can be concluded that CBC and ESR were altered in systemic lupus erythematosus (SLE) patients and were related to duration of disease.

**Conflict of interest:** None

**Acknowledgement** The authors acknowledge the Department of Medicine Dhaka Medical College, Dhaka for their kind co-operation during sample collections.

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