



Peripheral Blood Smear Morphology- A Red Flag in COVID-19

Savitri Singh¹, Jyotsna Madan¹, Devajit Nath¹ and Neema Tiwari^{1*}

¹*Department of Pathology, Super Speciality Pediatric Hospital and Post graduate Teaching Institute,
Noida, India.*

Authors' contributions

This work was carried out in collaboration among all authors. Author SS contributed in conceptualization, formulation and data collection. Author JM contributed in conceptualization, formulation, editing and revision author DN contributed in formulation and editing. Author NT contributed in formulation and editing of the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2020/v41i830311

Editor(s):

(1) Dr. Shankar Srinivasan, Rutgers - School of Health Professions, USA.

Reviewers:

(1) Amar Ibrahim Omer Yahia, University of Bisha, Saudi Arabia, University of Kordofan, Sudan.

(2) Peyman Nowrouzi-Sohrabi, Shiraz University of Medical Sciences, Iran.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/58882>

Short Communication

Received 24 June 2020

Accepted 06 July 2020

Published 16 July 2020

ABSTRACT

Covid-19 pandemic has affected the whole world medically, economically and emotionally. It is being considered as the biggest pandemic after the Spanish flu, with very high degree of morbidity and mortality in those with complications. The diagnostic and treatment criteria of this novel virus are being updated frequently as nothing much is known about it. This highlights the importance of hematology lab parameters in Covid diagnosis and prediction of disease progression. Multiple studies on complete blood counts and its derived parameters have been conducted in patients of Covid-19 however limited literature is available which discusses the morphology of circulating blood cells in Covid-19 cases. This short communication is presented with the purpose of highlighting the peripheral blood findings of 50 lab confirmed Covid-19 cases admitted at Super Specialty Pediatric Hospital and Post Graduate Teaching Hospital, NOIDA.

Keywords: Covid-19; morbidity and mortality; SARS CoV2; real time RT-PCR.

*Corresponding author: Email: nehaneemat@yahoo.co.in;

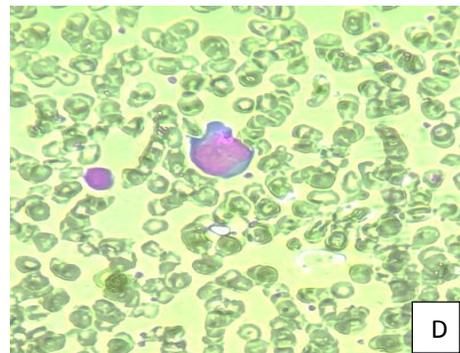
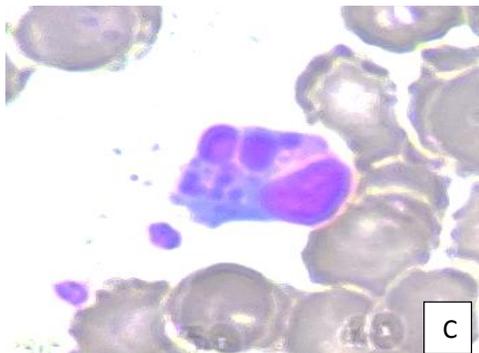
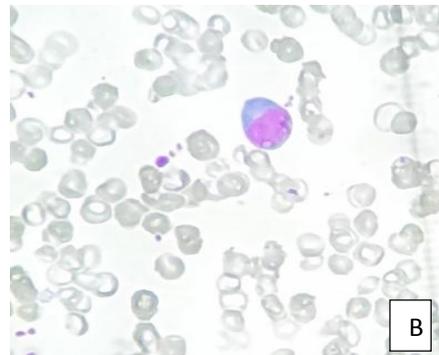
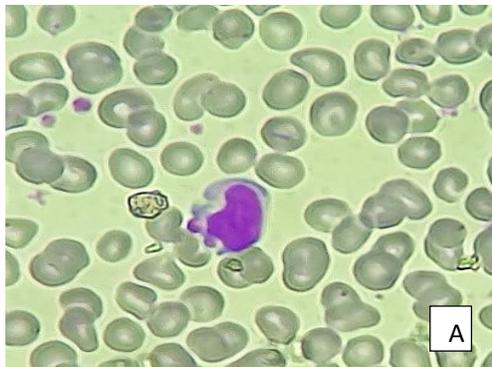
1. INTRODUCTION

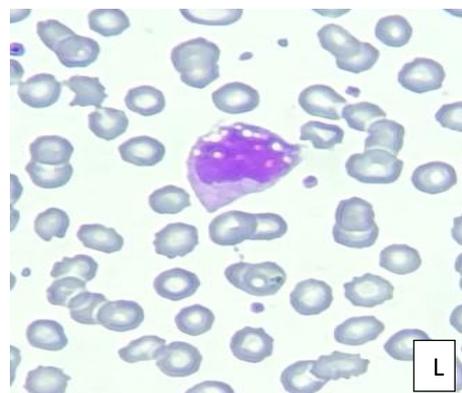
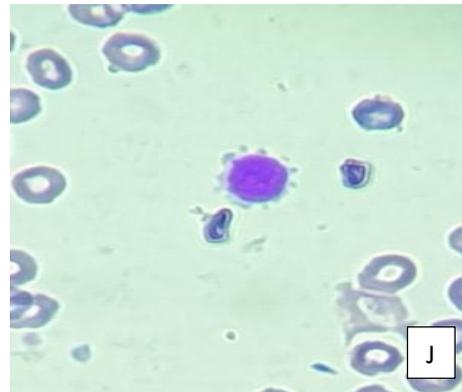
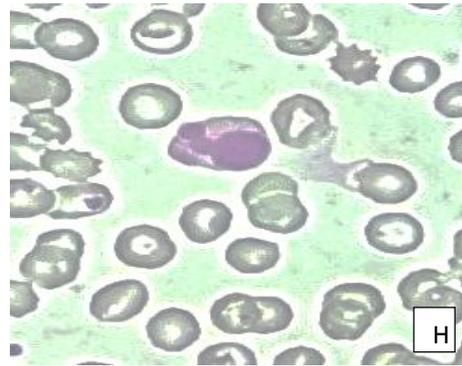
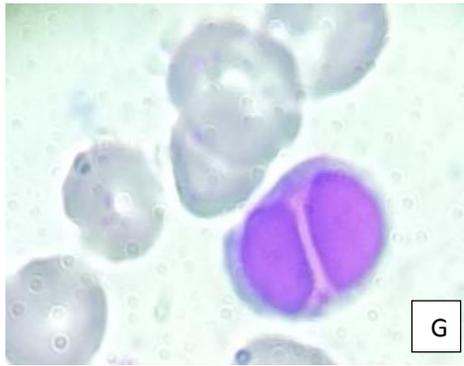
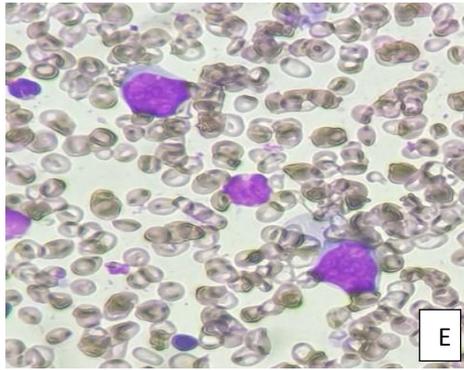
Covid-19 infection has spread around the world leading to worldwide morbidity and mortality in cases with complications. After the Spanish flu, no other illness has taken such heavy toll on human population like the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). As per the literature available the origin of first case of Covid-19 was from Wuhan, China [1] and this later spread around the globe. This disease has variable clinical presentations and outcomes in pediatric as well as in adult population. India has a total of 276583 cases with a mortality of 7745 as of 10th June, 2020 [2].

Real time RT-PCR (reverse transcriptase polymerase chain reaction) has been touted as the gold standard diagnostic test in diagnosis of Covid-19 infection, however there are still researches underway to ascertain the prognostic efficacy of different tests which diagnose Covid and which can be helpful in predicting the clinical outcome of the patient. The clinical severity of this disease has been correlated with several diagnostic modalities such as radiology, Pulmonary function test & SPO2 etc. As far as

lab medicine is concerned along with coagulation profile, D-dimer and fibrinogen levels there have been many studies discussing role of Complete blood count (CBC) in early diagnosis of Covid-19 infection, however very few studies have been done on the blood of Covid-19 patients to study the morphology of the circulating cells in the blood smears. There have been claims of virus infecting hemoglobin levels, peripheral blood lymphocyte and monocyte count [3].

We at our institute reported a case with Covid-19 associated with leukemia and hemophagocytosis in bone marrow examination, where we were confounded by the overpowering viral effect on blood cells which made a peripheral smear diagnosis of acute leukemia difficult for us [4]. Literature is full of quantitative hematological parameter's correlating with clinical outcome where studies prove CBC to be a pointer/indicator of Covid-19 disease progression. The common hematological finding seen on CBC are Lymphocytopenia, Neutrophilia, Eosinopenia, mild Thrombocytopenia [4-6]. Research is underway to look for virus in peripheral blood cells and to confirm if smear findings can be corroborated [7-9].





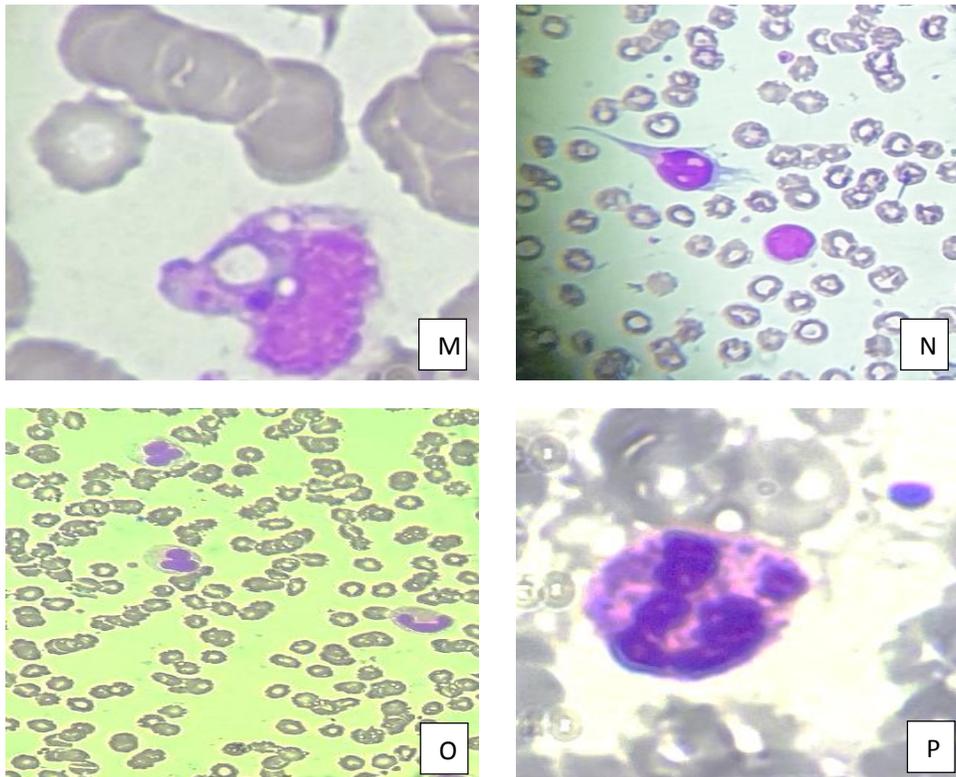


Fig. 1. (A-P) Peripheral blood smear morphology, Romanowsky stain

Fig. A- Activated lymphoid/monocytoid cells with cytoplasmic blebbing(400x);Fig. B- Plasmacytoid lymphoid cells(400x); Fig. C-Apoptotic cell in peripheral smear(1000x); Figs. D,E-Blastoid morphology of lymphoid lineage (400x); Fig. F-Monocytic cells with hemphagocytosed debris(1000x); Figs. G,H- Nuclear irregularities in lymphoid/monocytoid cells(1000x); Figs. I,J-Lymphoid cell with cytoplasmic blebbing with coarse toxic granule like granules in cytoplasm(1000x,400X); Fig. K- Virocytes and Blastoid cell in peripheral smear(400x); Fig. L- Monocyte with vacuoles in cytoplasm and over the nucleus(400x); Fig. M-Monocyte attempting to hemphagocytose debris and platelet(1000x); Fig. N-Virocytes with intranuclear inclusions and cytoplasmic process(400x); Fig. O- Hypolobation in polymorphs (400x); Fig. P-Polymorph with coarse granules (1000x)

We screened 50 Romanowsky stained peripheral smears of Covid-19 cases to analyze morphology of blood cells to highlight the importance of the peripheral smear examination in Covid-19 cases. Wide array of morphological changes was seen in all the cases analyzed and overall morphological changes of the cases analyzed are summarized below.

2. OBSERVATIONS

- RBCs-Changes observed in RBC morphology was mainly non-specific and could not be correlated to the viral etiology. Normocytic normochromic blood picture to microcytic hypochromic cell was seen Some smears showed occasional polychromatophils ,target cells and nRBCs
- Neutrophil-coarse granules(like toxic granules), hypolobation, hypo granulation,

and dyspoietic forms, cytoplasmic vacuolation, mild shift to left, Eosinopenia [6,7].

- Lymphocyte-Lymphocytopenia, Large granular lymphocyte, variant reactive monocytoid and plasmacytoid forms and blastoid forms, intranuclear inclusions [7,8].
- Monocyte-cytoplasmic vacuolation and prominent granulation, hemophagocytosis.
- Platelet-normal to mild thrombocytopenia, giant forms, agglutination [6,7,8].
- Other cells: Bizarre cell and Apoptotic body

Hence various morphological alterations in all the cell lines examined in the peripheral smear were noted and whether all these changes are due to the virus infecting them or are secondary to the pathogenesis of Covid disease, needs to be evaluated by larger studies.

3. CONCLUSION

Hence we conclude that a close examination of peripheral smear can give us ideas about the ongoing pathogenesis of the disease and whether presence of hemophagocytosis ,toxic granules like granules or vacuoles in WBCs can become indicators of adverse clinical outcome. Morphological findings coupled with CBC parameters can help a pathologist to alert the physician of an impending disease progression.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Ethical waiver applied for no patient identifiers present in the analysis.

ACKNOWLEDGEMENT

I thank the technical staff of the department of pathology for all technical help and support.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Lin Ling, Li Taisheng. Interpretation of the new health coronary virus infection pneumonia diagnosis and treatment program (Trial Version 5) [J]. Chinese Medical Journal. 2020;100(00):E001-E001. Available:www.icmr.gov.in
2. Available:www.icmr.gov.in
3. What the blood tests of a COVID-19 patient can tell us. UC Davis Health. Available:health.ucdavis.edu
4. Tiwari N, Radhakrishnan N, Singh S, Madan J, Nath D, Tripathi S, et al. COVID 19 and pancytopenia: A single case experience of a pediatrics Institute. Saudi J Pathol Microbiol. 2020;5(5):308-310.
5. Liji Thomas. Does COVID-19 infect peripheral blood cells? Available:https://www.news-medical.net/news/20200519/Does-COVID-19-infect-peripheral-blood-cells.aspx
6. Mitra A, Dwyre DM, Schivo M, et al. Leucoerythroblastic reaction in a patient with COVID-19 infection. Am J Hematol; 2020. Available:https://doi.org/10.1002/ajh.25793
7. Gina Zini1,2, Silvia Bellesi2 , Francesco Ramundo1, Giuseppe d'Onofrio1. Morphological anomalies of circulating blood cells in COVID-19. Am. J. Hematol. 2020;95: 870-872
8. Dan Zhang, Rui Guo, Lei Lei, Hongjuan Liu, Yawen Wang, Yili Wang et al. COVID-19 infection induces readily detectable morphological and inflammation-related phenotypic changes in peripheral blood monocytes, the severity of which correlate with patient outcome. medRxiv preprint; 2020 Available:https://doi.org/10.1101/2020.03.24.20042655
9. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019. (COVID-19) outbreak in China: Summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. JAMA; 2020. DOI: 10.1001/jama.2020.2648. [Epub ahead of print]. [CrossRef]

© 2020 Singh et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/58882>