

RED CELL INDICES IN PATIENTS WITH COVID-19 (AIR HUNGER RED OR NO RED)

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ABSTRACT

Objective: To see the effect of severe acute respiratory syndrome coronavirus 2 (SARS CoV- 2) on red cell indices in patients with COVID-19 disease.

Study Design: Cross sectional study.

Place and Duration of Study: The study was conducted in the department of Pathology, Pak Emirates Military Hospital, Rawalpindi, from Apr 2020 to Apr 2020.

Methodology: The study includes 100 confirmed cases of COVID-19 infection admitted in PEMH. Cases was confirmed by real time polymerase chain reaction (RT-PCR) performed on pharyngeal swabs. After obtaining the informed consent and approval from the ethics committee patient's complete blood counts (CBC) were performed. Haemoglobin and red cell indices values were collected and analyzed using SPSS version 22.

Results: Mean age of the study population was 43 years \pm 14.4 SD with minimum of 20 years and maximum of 75 years. Out of 100 samples 96 were males and 4 females. Mean haemoglobin was 14.4 g/dl \pm 1.93 g/dl. Red cell indices shows normochromic normocytic anemia. Among these 100 patients with moderate to severe disease admitted in the hospital 96 survived and 4 deceased.

Conclusion: COVID-19 patients show normocytic normochromic values. Therefore it is really important to evaluate the laboratory indices at baseline and during the evolution of disease which can help clinicians in making a structured treatment approach and urgently provide good intensive care to those who are in vital need.

Keywords: COVID-19, Haemoglobin, Mean corpuscular haemoglobin concentration, Mean corpuscular haemoglobin, Mean corpuscular volume, SARS CoV-2.

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INTRODUCTION

Corona Virus Disease -19 (COVID -19) was first reported by Wuhan China in December 2019. The disease is caused by a virus severe acute respiratory syndrome corona Virus-2 (SARS-CoV-2)¹. The mode of transmission of virus is through respiratory droplets². WHO reported 7,410,510 confirmed patients of COVID- 19 in 216 countries globally³. First case reported in Pakistan was in February 2020⁴. In Pakistan more than 125,521 confirmed cases have been reported with number of deaths are 2,463 uptill 12th june⁵.

The disease COVID -19 have different step by step phases starting from an upper respiratory tract infection associated with general flu like symptoms which can lead to viral pneumonia with hyperinflammatory reaction which can end

up to acute respiratory distress and multi organ failure⁶. Complete blood counts (CBC) performed on COVID-19 patients can predict the phases through which body is going through like from pneumonia to multi organ failure by showing many hematological findings like lymphocytopenia⁷, neutrophilia⁸, eosinopenia⁹, and thrombocytopenia¹⁰.

In COVID-19 patients we wanted to see that what is the effect of coronavirus 2 (SARS CoV- 2) on Haemoglobin, MCV, MCH and MCHC and if there values decrease below the reference range it can cause hypoxia or not as it is the leading cause of mortality. It is also observed that some COVID-19 patients also showed leucoerythroblastic blood picture with normocytic anemia.

METHODOLOGY

This cross-sectional study was conducted at the Pak Emirates Military Hospital (PEMH) Rawalpindi, which is an eleven hundred (1100)

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bedded facility now dedicated exclusively for COVID-19 patients. In this study we collected specimens from 100 hospitalized patients using the non probability consecutive sampling with moderate to severe disease, from April to April 2020. The sample size was calculated by WHO sample size calculator with confidence interval of 95% margin of error 5% and power of test 80%. A reference value of 16%⁶, was used to calculate the sample size. All the patients had confirmed COVID-19 with positive real time Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) for SARS CoV-2. Blood samples for complete blood counts were collected. Permission was obtained from the ethics review committee and informed consent was taken from all the patients. Data and patient identification (I.D) included in this study remains confidential.

We included COVID positive patients of both genders and all ages in the study. About 5.0ml of venous blood sample was drawn under sterile conditions from COVID positive patients transferred to EDTA anticoagulated tube and submitted to lab. Samples were run on sysmex X P100 for complete blood counts which included specifically haemoglobin and red cell indices (MCV, MCH, MCHC). The results were statistically analyzed using SPSS version 22. Variables were analyzed as frequencies, percentages; mean and standard deviations was calculated.

Reference Ranges

MCV reference value for adults is typically 80-100fL. MCH reference value for adults is typically 26-32pg. MCHC reference value for adults is typically 32-36 g/dL. Haemoglobin reference value for males 13.5-17.5 g/dl, females 12-15 g/dl.

RESULTS

Complete blood counts from 100 patients were processed. Data was collected from 1st April to 30th April 2020 (1 month). Out of 100 samples 96 (96%) were males and 4(4%) females as shown in fig-1 below. Five variables were analyzed (Age Haemoglobin, Mean corpuscular volume MCV, Mean corpuscular haemoglobin

MCH and Mean corpuscular haemoglobin concentration MCHC). The mean age of presentation was 43 yrs \pm 14.4 SD. In our study with minimum of 20 years and maximum of 75 years the range was about 55 years. We have analyzed patients from all the age groups from youngest to oldest to see the effect of virus on red cell chemistry.

Red blood cells having normal size or volume (normal MCV) are called normocytic. Red

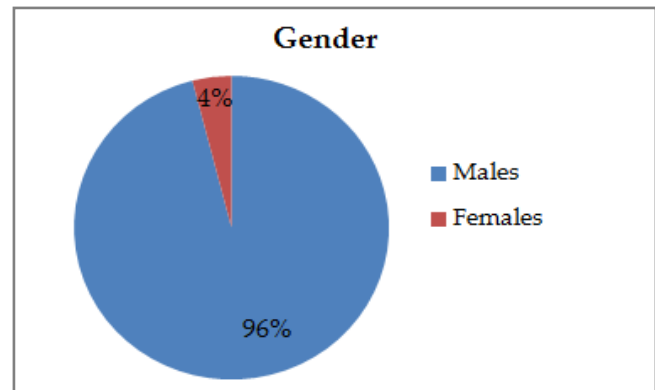


Figure-1: Showing the percentage of male and female contributing as part of the entire sample size.

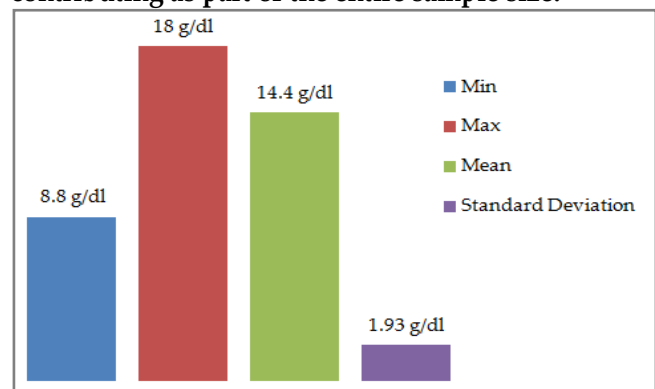


Figure-2. Showing the distribution of Hemoglobin (g/dl) amongst the target population.

blood cells with high MCV are called macrocytic. Red blood cells with low MCV are called microcytic. Red blood cells having normal amount of hemoglobin (normal MCHC) are called normochromic.

Among the five variables we analyzed mean Haemoglobin value in COVID-19 patients had 14.4 g/dl \pm 1.93 SD with minimum value of 8.8 g/dl and maximum value of 18 g/dl as shown in the fig-2. In red cell indices Mean corpuscular volume (MCV) showed mean value of 83fl \pm 8.4

SD with minimum value of 29fl and maximum of 97fl. Mean corpuscular haemoglobin showed mean value of $28.9\text{pg} \pm 2.66\text{SD}$ with minimum value of 18.3pg and maximum value of 35.4pg. The last Mean corpuscular haemoglobin concentration showed mean value of $34.4\text{ g/dl} \pm 1.44\text{ SD}$ with minimum value of 29.7 g/dl and maximum of 37.9 g/dl as shown in the table.

Table: Showing red cell indices amongst the target population.

	Min	Max	Mean	Standard Deviation
Mean corpuscular volume, MCV (fl)	29	97	83	8.4
Mean corpuscular haemoglobin, MCH (pg)	18.3	35.4	28.9	2.66
Mean corpuscular haemoglobin concentration, MCHC (g/dl)	29.7	37.9	34.4	1.44

DISCUSSION

COVID-19 can slowly causes shortness of breath as starving the body of oxygen. By the time some patient start having symptoms like trouble breathing or feel pressure in the chest they are already in dire straits¹¹. About 98.5% oxygen inside red blood cells which is transported by hemoglobin and carried to the tissues¹². Red cell indices include mean corpuscular volume (MCV)¹³, mean corpuscular haemoglobin (MCH)¹⁴, and mean corpuscular haemoglobin concentration (MCHC)¹⁵. Haemoglobin and red cell indices assist with the differentiation of anemias (decrease in haemoglobin)¹⁶. It is also noted that haemoglobin values may be decreased in patients with severe corona virus disease¹⁷. In our study four patients showed haemoglobin less than 10 gm/dl (8.8, 9.0, 9.4 and 9.7). Out of which only one patient with Hb 9.4 gm/dl was on ventilatory support. Decrease haemoglobin can be one of the factors causing hypoxia in COVID-19 patients this possibility cannot be ruled out because the disease has effect on multiorgan-systems.

In COVID-19 patients we wanted to see that if there is any association between decrease haemoglobin, MCV, MCH and MCHC with hypoxia as it is the leading cause of mortality. We also wanted to see if there was a rapid blood loss that causes a sudden decrease in haemoglobin and red cell indices like in viral diseases (Viral hae-

morrogic fever)¹⁸. In red cell indices MCV is raised in haemolytic anemias (macrocytosis) which we also wanted to see if there was any underlying haemolysis going on in these patients. Further studies should be done to see if transfusion support is helpful to prevent evolution into severe disease and death.

In our study we observe that COVID-19

patients of even moderate to severe disease have haemoglobin values within the normal range. Like wise red cell indices (MCV, MCH and MCHC) also show values in the normal range. Our results are same as compared to the study done in California by Mitra *et al*¹⁹. They also found out that COVID-19 patients have normochromic normocytic anemia with no sudden decrease or increase in the red cell indices. There research also showed that some COVID-19 patients also showed leucoerythroblastic blood picture. So Hypoxia in these patients is most probably due to inflammatory changes in the lungs²⁰.

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CONCLUSION

In conclusion, COVID-19 patients show normocytic normochromic values with also other prominent manifestations in the hematopoietic system. Therefore it is really important to evaluate the laboratory indices at baseline and during the evolution of disease which can help clinicians in making a structured treatment approach. To reduce the overall death rate and without significant comorbidities it is urgently needed to give

good effective intensive care to those who are in vital need.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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