

Retrospective Study on Haemoglobin Levels of COVID-19 Patients

Kumar Sharp¹, Bharat Ghodke²

¹MBBS Undergraduate Student, Government Medical College and Civil Hospital, Jalgaon

²Associate Professor, Department of Pathology, Government Medical College and Civil Hospital, Jalgaon

Corresponding Author: Bharat Ghodke

ABSTRACT

Since June 2020, there has been discussions and observations by the scientific community about effect of SARS-CoV 2 on haemoglobin levels. Haemoglobin which is the oxygen transporter for the body needs to be maintained in order to compensate for the decreased oxygenation in the lungs. With this hypothesis, anaemic patients might be exposed to increased risk of disease progression which can be easily prevented. The final data set consisted of haemoglobin values of 506 patients. Out of them, 54.34% were non-anaemic. 26.28% of the patients were mildly anaemic. 12.64% of the patients were moderately anaemic and 6.72% were severely anaemic. Low haemoglobin concentration can easily be tackled by dietary requirements which can be supplemented with the current management protocol. Larger data-based studies like this where detailed clinical and pathological findings are incorporated must be conducted.

Keywords: haemoglobin; anaemia; SARS-CoV 2; coronavirus

INTRODUCTION

While efforts to bring the pandemic in control are underway, new symptoms keep on emerging about COVID-19. Pathological diagnosis is imperial to reduce severity and progression of disease. Risk factors are being identified to protect the vulnerable population. With recent studies highlighting abnormal coagulation parameters in active disease, there has also been increase in studies regarding haematological changes observed. Since June 2020, there has been discussions and

observations by the scientific community about effect of SARS-CoV 2 on haemoglobin levels. ^[1] COVID-19 disease produces respiratory distress, ^[2] and thereby decreasing oxygen supply to the body tissues. Haemoglobin which is the oxygen transporter for the body ^[3] needs to be maintained in order to compensate for the decreased oxygenation in the lungs. With this hypothesis, anaemic patients might be exposed to increased risk of disease progression which can be easily prevented. With theories being drawn up about the association of coronavirus and haemoglobin, the aim of this study is to provide a pioneer stone on actual data-based observations of haemoglobin levels of COVID-19 patients.

METHODOLOGY

Haemoglobin levels of active COVID-19 patients admitted at tertiary care rural hospital were used for this study. They were measured using automated Erba H-360 haematology analyser. Name, age and gender of patient was not recorded to maintain anonymity. Relevant permission for use of data was obtained. Samples which were reported as “clotted” were not included in this study. Repetitions of sample were omitted. The lowest values from these repetitions were recorded. The final data set was compiled and categories were drawn up for analysis. Haemoglobin was recorded in gram per decilitre (gm/dl) units. Since there is no clear-cut reference range for categorizing haemoglobin concentrations,

values from various study were averaged to from a final basis for the study. [4-6] These categories are as follows:

1. Non-anaemic equal to and above 12.5 gm/dl.
2. Mildly anaemic between 10.5 and 12.5 gm/dl.
3. Moderately anaemic between 8 and 10.5 gm/dl.
4. Severely anaemic below 8 gm/dl.

MS-Excel 2016 and IBM SPSS version 25 [7] was used for statistical and numerical evaluation of the data set. Statistical parameters were calculated, outliers were identified and histogram was drawn for the data distribution. Skewness of the distribution was calculated and plotted on the histogram.

RESULTS

The final data set consisted of haemoglobin values of 506 patients. Out of them, 54.34% were non-anaemic. 26.28% of the patients were mildly anaemic. 12.64% of the patients were moderately anaemic and 6.72% were severely anaemic (Figure 1).

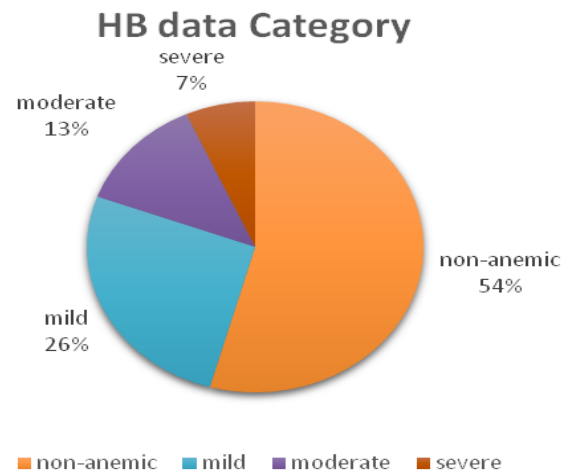


Figure 1: Haemoglobin category-wise distribution pie chart.

Descriptive statistics calculated using IBM-SPSS version 25 is as follows:

Mean of haemoglobin levels was 12.45 gm/dl with standard error of 0.1214. Confidence interval for mean is 95%. Median of the data set is 12.7 gm/dl. Variance is 7.453. Standard deviation is 2.7301. Minimum value is 2.3 gm/dl and maximum value is 22.3 gm/dl. Range is hence calculated as 20. It is negatively skewed with value of -0.587 and standard error 0.109. Outliers in the higher range were 22.3, 20.5, 20.3, 18.9 and 18.5 gm/dl. Outliers in the lower range were 2.3, 2.4, 3.0, 3.5 and 4.0 gm/dl.

Histogram plotted on basis of frequency is shown in figure 2 below:

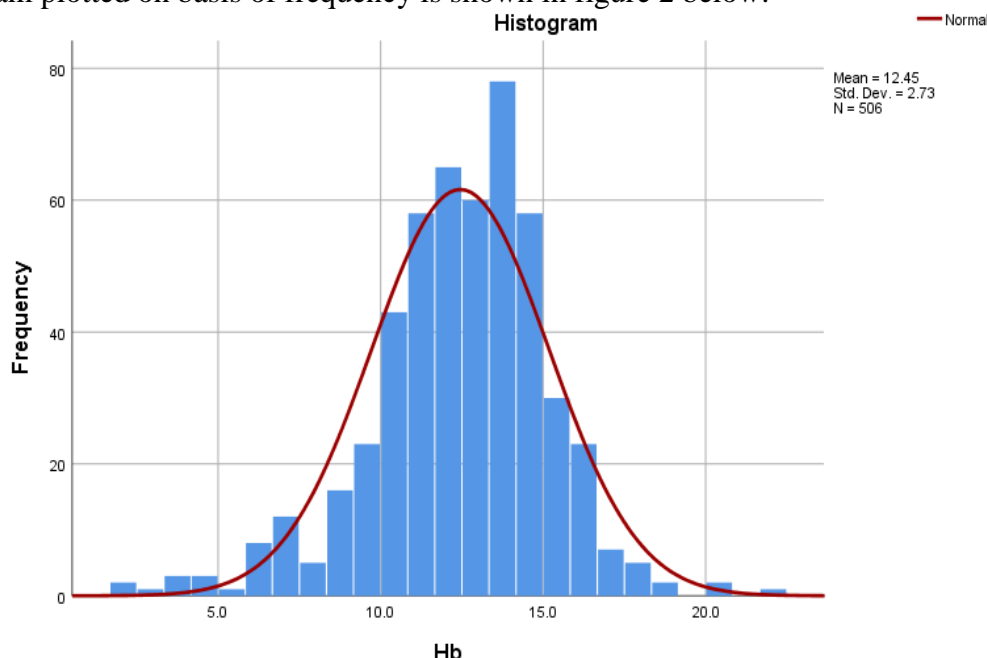


Figure 2: Histogram plot for the data distribution with distribution curve in red.

DISCUSSION

Around 46% of active COVID-19 patients in our study are anaemic making it consistent with theories and studies. One of the studies claimed that COVID-19 caused interference in heme synthesis thereby decreasing haemoglobin concentration. [8] Low haemoglobin concentration can easily be tackled by dietary requirements which can be supplemented with the current management protocol. Development of auto-immune haemolytic anaemia has been also been claimed recently. [9] Coronavirus interacts with haemoglobin in erythrocytes via ACE2, CD147 and CD26 receptors. [10] Lactate dehydrogenase levels is a marker of haemolysis and increases with decrease in haemoglobin levels in COVID-19 patients, thereby differentiating severe and mild cases. [11][12] Myelodysplastic features represented by red cell distribution width (RDW) because of decreased haemoglobin levels have been reported. [13] The above theories and observations supplemented by our study make this topic worthy of future and detailed investigation. In this study, we have not considered age and gender for the data set development. They need to be incorporated because of different pathological parameters in male and female. Other investigations like LDH level and RDW along with clinical status of the patient can be incorporated for future studies. General population must be advised to maintain their haemoglobin level through dietary changes to prevent oxygen stress in cases of contraction of the disease.

CONCLUSION

From our study we conclude that COVID-19 disease can possibly decrease haemoglobin concentration. Larger data-based studies like this where detailed clinical and pathological findings are incorporated must be conducted. This can help in effective patient management.

Source of funding: Nil.

Ethical Approval: Not required.

Conflict of interest: None.

REFERENCES

1. Lippi G, Mattiuzzi C. Haemoglobin value may be decreased in patients with severe coronavirus disease 2019. *Hematology, Transfusion and Cell Therapy*. 2020 Apr 2.
2. Gattinoni L, Coppola S, Cressoni M, Busana M, Rossi S, Chiumello D. Covid-19 does not lead to a “typical” acute respiratory distress syndrome. *American journal of respiratory and critical care medicine*. 2020 May 15;201(10):1299-300.
3. Hsia CC. Respiratory function of haemoglobin. *New England Journal of Medicine*. 1998 Jan 22;338(4):239-48.
4. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. World Health Organization; 2011.
5. Didzun O, De Neve JW, Awasthi A, Dubey M, Theilmann M, Bärnighausen T, Vollmer S, Geldsetzer P. Anaemia among men in India: a nationally representative cross-sectional study. *The Lancet Global Health*. 2019 Dec 1;7(12): e1685-94.
6. Onyeneho NG, Ozumba BC, Subramanian SV. Determinants of childhood anaemia in India. *Scientific reports*. 2019 Nov 12;9(1):1-7.
7. IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.
8. Wenzhong L, Hualan L. COVID-19: Attacks the 1-beta chain of haemoglobin and captures the porphyrin to inhibit human heme metabolism. *ChemRxiv* 2020. Preprint. <https://doi.org/10.26434/chemrxiv.11938173.v8>.
9. Lazarian G, Quinquenel A, Bellal M, Siavellis J, Jacquy C, Re D, Merabet F, Mekinian A, Braun T, Damaj G, Delmer A. Autoimmune haemolytic anaemia associated with Covid-19 infection. *British Journal of Haematology*. 2020 May 6.
10. Wenzhong L, Hualan L. COVID-19 Disease: ORF8 and surface glycoprotein inhibit heme metabolism by binding to porphyrin. *ChemRxiv* 2020; Preprint. <https://doi.org/10.26434/chemrxiv.11938173.v3>.

11. Han Y, Zhang H, Mu S, et al. Lactate dehydrogenase, a risk factor of severe COVID-19 patients. medRxiv 2020.03.24.20040162; doi: <https://doi.org/10.1101/2020.03.24.20040162>
12. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet 2020; 395:1054-106.
13. Foy BH, Carlson JT, Reinertsen E, et al. Elevated RDW is Associated with Increased Mortality Risk in COVID-19. medRxiv 2020.05.05.20091702; doi: <https://doi.org/10.1101/2020.05.05.20091702>

How to cite this article: Sharp K, Ghodke B. Retrospective study on haemoglobin levels of COVID-19 patients. International Journal of Research and Review. 2020; 7(8): 118-121.
