



ORIGINAL RESEARCH PAPER

Medical Science

HEMATOLOGICAL PARAMETERS AND CLINICAL OUTCOME IN INTENSIVE CARE UNIT OF A DEDICATED COVID HOSPITAL: A SPECIAL CONSIDERATION TO HEMOGLOBIN CONCENTRATION.

KEY WORDS: Hematological, COVID19, hemoglobin, outcome.

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ABSTRACT

Introduction: The world is currently facing the threat of the COVID-19 pandemic. It is well established that hemoglobin deficient state is associated with severe form of Covid19 disease. the present study was done assess the changes in hematological parameters with special reference to hemoglobin and clinical outcome in intensive care unit of a Dedicated COVID Hospital, Government Medical College, Jalgaon. **Materials and Methods:** The present study was of retrospective, analytical type conducted at Government Medical College, Jalgaon which was a Dedicated COVID hospital. We collected the data of demographics, co-morbidities, laboratory investigations, drug prescription and clinical outcome from the record section of medicine department after taking required permission. **Results:** Out of 111 patients with confirmed Covid19 infection, majority belonged to age group of 51-60 years (24.3%). Mean hemoglobin was not statistically different in survivor versus non-survivor analysis. **Conclusion:** Although the hematological parameters and inflammatory markers were significantly deranged in deceased patients as compared to cured patients, mean hemoglobin was not significantly different. Thus, as per the findings of present study mean hemoglobin cannot be considered as marker of prognosis in patients with moderate to severe Covid19 disease.

INTRODUCTION:

The world is currently facing the threat of the COVID-19 pandemic. SARS-CoV-2, the virus responsible for the COVID-19 infection, is considered highly contagious by a number of experts. As of January 2021, COVID-19 infection has claimed more than 2.1 million lives.¹

Coronavirus is a positive-sense single-stranded RNA virus. They consist of four main structural protein which includes the spike (S), membrane (M), envelope (E), and nucleocapsid (N), with all being encoded in the 3' end of viral genome.² The replicating virus primarily targets the respiratory system (nasal cavity, trachea, bronchi, and lung lobe). As the disease progresses, lesion develops in the pulmonary tissue involving alveoli and bronchioles which leads to alveolar edema. Exchange of gases across alveolar membrane is affected resulting in hypoxemia.²

On 11 March 2020, WHO declared Novel Coronavirus Disease (COVID-19) outbreak as a pandemic and reiterated the call for countries to take immediate actions and scale up response to treat, detect and reduce transmission to save people's lives. The COVID-19 pandemic in India is part of the worldwide pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The first case of COVID-19 in India, which originated from China, was reported on 30 January 2020. India currently has the largest number of confirmed cases in Asia, and has the second-highest number of confirmed cases in the world after the United States, with the number of total confirmed cases breaching the 100,000 mark on 19 May, and 1,000,000 confirmed cases on 17 July 2020. On 29 August 2020, India recorded the global highest single-day spike in COVID-19 cases with 78,761 cases, surpassing the previous record of 77,368 cases recorded in the US on 17 July 2020. India currently holds the single day record for largest increase in cases, set on September 17, with an additional 97,894.³

It is well established that hemoglobin deficient state is associated with severe form of Covid19 disease.^{4,5} Multiple

studies have been published regarding the changes in hematological parameters and inflammatory markers. But, the data related to these changes and clinical outcome especially in this part of the country is very scarce. Therefore, the present study was done assess the changes in hematological parameters with special reference to hemoglobin and clinical outcome in intensive care unit of a Dedicated COVID Hospital, Government Medical College, Jalgaon.

MATERIALS AND METHODS:

The present study was of retrospective, analytical type conducted at Government Medical College, Jalgaon which was a Dedicated COVID hospital. Medical records of 111 patients of Covid19 who received treatment in Intensive Care Unit (ICU) of Government Medical College, Jalgaon from August 2020 to December 2020 were included in the present study. We collected the data of demographics, co-morbidities, laboratory investigations, drug prescription and clinical outcome from the record section of medicine department after taking required permission. After going through all the records data was entered in the Microsoft Excel sheet. Data was analyzed with the help of Microsoft Excel. For demographic characteristics and clinical outcome descriptive statistics were used. For comparing the laboratory investigations chi square test was used. P value of less than 0.05 was considered significant. Strict confidentiality of data was maintained throughout study duration. Approval of the Institutional Ethics Committee was taken before start of study.

RESULTS:

Out of 111 patients with confirmed Covid19 infection, majority belonged to age group of 51-60 years (24.3%), followed by 41-50 years (22.5%) and 61-70 years (20.7%). On gender wise analysis, it was found that males (60.4%) outnumbered females (39.6%), male: female ratio being 1.52. Most of these patients resided in urban area (42.3%) as compared to rural (57.7%) [table 1, figure 1].

Table 1: Socio-demographic details of the patients in the present study.

Sr. No.	Category	Subcategory	n	Percentage
1	Age	10-20 years	2	1.8
		21-30	5	4.5
		31-40	18	16.2
		41-50	25	22.5
		51-60	27	24.3
		61-70	23	20.7
		71-80	9	8.1
2	Gender	>80 years	2	1.8
Male		67	60.4	
3	Residence	Female	44	39.6
		Rural	47	42.3
		Urban	64	57.7

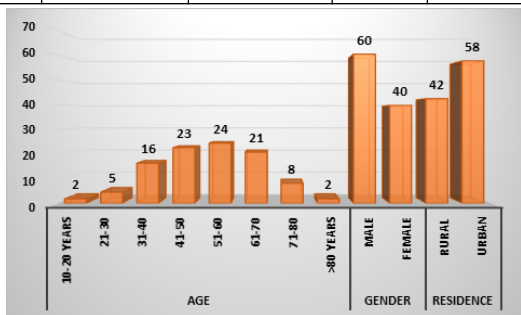


Figure 1: Graphical representation of socio-demographic details of patients (%) in present study.

On co-morbidity analysis, it was found that hypertension (30%) was most common co-morbidity followed by diabetes (22%), chronic kidney disease (5%) (figure 2).

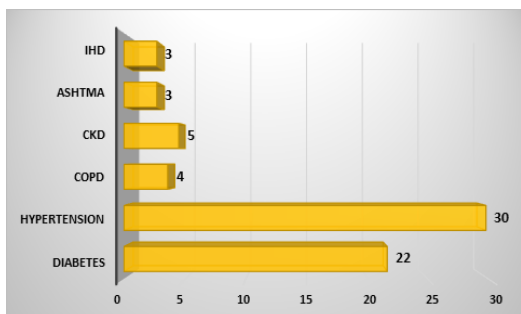


Figure 2: Comorbidities in patients (%) of present study.

Where: IHD-ischemic heart disease, CKD-chronic kidney disease, COPD-chronic obstructive pulmonary disease.

In terms of clinical outcomes, 60% of the patients (n=66) were cured, 35% patients (n=39) had died, while 5% of the patients (n=6) were transferred to higher centers (figure 3).

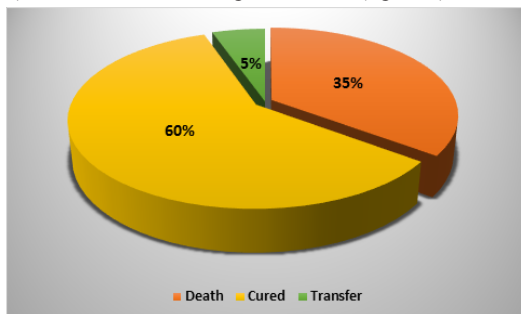


Figure 3: Clinical outcomes in patients of present study.

On analyzing the mean hemoglobin (Hb) at the time of admission it was found that deceased patients had Hb of 11.4

± 2.5 as compared to 12.7 ± 2.21 in discharged/cured patients (p=0.01) [figure 4].

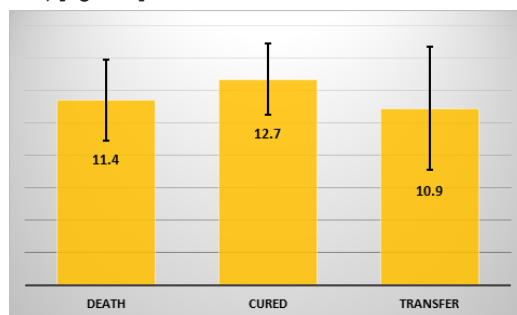


Figure 4: Mean Hemoglobin at the time of admission in association with clinical outcomes in patients of present study.

On analyzing the hematological parameters and inflammatory markers, expressed in terms of mean and standard deviation, it was found that total leucocyte count, C-reactive protein, lactate dehydrogenase, creatine kinase MB, and D-dimer were significantly higher in non-survivor as compared to survivor patients. The difference was statistically significant. Mean hemoglobin was not statistically different in survivor versus non-survivor analysis. Red blood cell count, platelet count was significantly lower in deceased patients as compared to cured patients (table 2).

Table 2: hematological parameters and inflammatory markers in patients of present study.

Haematological parameter	Clinical Outcome			p-value
	Death	Discharged	Transfer	
Haemoglobin (mg/dl)	11.4 ± 2.5	12.7 ± 2.21	10.9 ± 3.8	0.312
Blood sugar level (mg/dl)	206.3 ± 69.4	139 ± 58.7	188.4 ± 92.4	0.02
Red blood cell count (per microliter)	3.86 ± 0.85	4.65 ± 0.73	4.07 ± 1.23	0.04
Total Leukocyte count (TLC) (per microliter)	17.45 ± 10.56	13.6 × 10 ³ ± 3.25	11.4 × 10 ³ ± 4.12	0.05
Platelet count (per microliter)	151.4 ± 155.4	216.6 ± 119.1	202.1 ± 94.7	0.01
C-reactive protein (CRP) (mg/Litre)	72.69 ± 33.9	42.5 ± 21.8	38.6 ± 18.5	0.01
Lactate dehydrogenase (LDH) (units/litre)	898.5 ± 158.7	360.2 ± 112.6	564.2 ± 269.20	0.001
Creatine kinase-MB (CK-MB) (IU/Litre)	45.7 ± 23.6	30.79 ± 19.4	28.47 ± 12.92	0.02
D-dimer (ng/ml)	5073.6 ± 3408.2	2900 ± 2100.3	3191.03 ± 2023.14	

DISCUSSION:

The pandemic coronavirus disease 2019 (COVID-19) continues to be a significant problem worldwide. Moreover, the significant differences in clinical pattern coupled with coinciding chronological sequence poses a giant task for clinicians to choose appropriate treatment for optimal outcomes. Prevention of hypoxia by providing oxygen supplementation in moderate to severe infection is important aim of therapy.⁶ It is recommended to start antiviral drugs when the viral titers are high and there is no evidence of irreversible damage.⁷

In the present study majority belonged to age group of 51-60

years (24.3%), followed by 41-50 years (22.5%) and 61-70 years (20.7%). On gender wise analysis, it was found that males (60.4%) outnumbered females (39.6%). The most common age group affected in the present study was adult age group, which is in accordance with study done by Molla et al.⁸ Most common patients in the present study were males, which was in corroboration with other such study.⁹ In the present study majority of the patients were residents of urban area as compared to rural area. This was in corroboration with findings of a study done by Huang et al. Densely populated residences in urban area are known to accentuate the transmission of Covid19 infection.¹⁰

In the present study hypertension (30%) was most common co-morbidity followed by diabetes (22%), chronic kidney disease (5%). In a study done by Sunyaolu et al. it was found that hypertension was the commonest co-morbidity followed by cardiovascular disease and diabetes.¹¹ In a meta-analysis on co-morbidities in Covid19 patients by Biswas et al it was found that mortality rate was higher in Covid19 patients with one or more of these co-morbidities as compared to patients without any co-morbidities.¹² In the present study 60% of the patients (n=66) were cured, 35% patients (n=39) had died, while 5% of the patients (n=6) were transferred to higher centers. This was in corroboration with a retrospective cohort study done by Pouw et al, wherein 74% patients showed clinical improvement, while 25% of the patients succumbed to Covid19 or its complications.⁵

In the present study mean hemoglobin (Hb) at the time of admission was found to be 11.4 ± 2.5 in deceased patients as compared to 12.7 ± 2.21 in discharged/cured patients ($p=0.312$). Similar results were reported in a study done by Zhang et al wherein there was no significant difference in hemoglobin levels when compared in survivor and non-survivor patients of Covid19 infection.¹³ However it is noteworthy to mention about findings of a meta-analysis by Hariyanto et al. It was quoted in this meta-analysis that anemia is associated with increased risk of severe Covid19 disease [14]. The reason cited for such finding was hypoxia due to hemoglobin reduction which ultimately leads to organ dysfunction, especially respiratory system.¹⁴

There are various postulations regarding the association of severe infection and anemia. SARS-CoV2 is known to attach on various receptors present on hemoglobin surface which leads to destruction of beta chain thus leading to hemolysis. SARS-CoV2 can also lead to structural damage of hemoglobin which ultimately results in anemia. There is another assumption regarding anemia and COVID19 that the virus may act like hepcidin leading to iron deficient state and hence the resulting anemia. It is also postulated that this state may increase serum ferritin levels to such extent that there may induction of oxidative state which can act as a contributory factor for development of cytokine storm.¹⁵

On analyzing the hematological parameters and inflammatory markers, expressed in terms of mean and standard deviation, it was found that total leucocyte count, C-reactive protein, lactate dehydrogenase, creatine kinase MB, and D-dimer were significantly higher in non-survivor as compared to survivor patients. Similar results were reported by Pouw et al.⁵

The blood sugar level in the present study was more in deceased patients as compared to surviving patients. This was corroborated by the findings of the present study by Wu et al.¹⁶ It has been cited in published literature that hyperglycemia in Covid19 infected patients might be relative. Inflammation induced insulin resistance has been assumed to be the main culprit for this finding. SARS-CoV2 induced viral pancreatitis, stress are some of the other postulations.¹⁷

The present study was not without limitations. Major limitation was non-availability of readings of hematological parameters and inflammatory markers after admission. Lastly, this was single center study so the results of present study cannot be generalized.

CONCLUSION:

Although the hematological parameters and inflammatory markers were significantly deranged in deceased patients as compared to cured patients, mean hemoglobin was not significantly different. Thus, as per the findings of present study mean hemoglobin cannot be considered as marker of prognosis in patients with moderate to severe Covid19 disease.

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Conflicts of interest: None.

Ethical consideration: Permission taken prior to the start of the study.

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