(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 4, Issue 4, Page No: 1126-1129
July-August 2021

IJMSCR

Vulnerability of Sickle Cell Disease Patients to Covid-19 Infections in India

Debistuti Saha
Fourth year medical student, RIMS, Imphal

***Corresponding Author:**
Debistuti Saha
Fourth year medical student, RIMS, Imphal

Type of Publication: Review Article
Conflicts of Interest: Nil

Abstract

Sickle Cell Disease (SCD) patients often present with cases of acute exacerbations of pulmonary conditions such as pulmonary edema, acute chest syndrome and pneumonia. These cases need to be immediately managed which otherwise increases the risk of mortality of the patients significantly. Furthermore, the immunodeficient state due to splenectomised condition renders them vulnerable during the COVID-19 pandemic. Effective screening and treatment measures of sickle cell disease can improve the situation but in developing countries like India lack of hypervigilance put significant section of this patient population at greater risk.

Keywords: cytokine storm; demography shift; rouleaux; screening.

INTRODUCTION

With the rapidly progressing COVID-19 cases in India, and the added significant burden of the population affected by sickle cell anaemia, most of whom remain largely undetected till much later stages of infection, it is important to identify the gaps in the diagnosis and treatment of this vulnerable section of population and ways to improve their management. Studies conducted so far mostly looks into the progression of the COVID-19 infection amongst the SCD patients and the treatment approaches like Tocilizumab administration, assisted respiration, blood transfusion etc. that proved to be more efficient than others [1]. In this review, we look into the outcome of these studies and apply the obtained results to improve the SCD patient management typically limited to the health setting within India.

Sickle Cell Disease:

Pathogenesis: SCD is the most common genetic hemoglobinopathy that is associated with mutation at the sixth amino acid position (Glu6Val) in the beta globin chain. This leads to altered hemoglobin structure that undergoes polymerization and alters the usual biconcave shape of RBCs. This sickled shaped RBCs have reduced elasticity because of which undergoes rouleaux formation and plugs the narrowed capillaries thereby compromising the blood supply to essential organs (brain, lungs, spleen, bones, etc.).

Epidemiology: While the disease has significant prevalence globally, certain regions have higher concentrations of SCD cases as compared to rest of the world. Africa has the highest population of SCD cases with around 30% of heterozygous prevalence. Roughly, 2/3rd of the cases are found in the sub-Saharan countries [2]. Due to compatibility with life of this mutation and presence of relatively asymptomatic heterozygous carrier state this mutation has been found on the rise in the general population. It is predicted that the annual new-born cases to rise from 300,000 in 2010 to 400,000 in 2050. Further, same study showed India to be the 2nd worst affected country in terms of predicted rise in SCA cases [3]. Figure 1 shows the prevalence of SCD cases in India in 2018 [4].

COVID-19 infection:

COVID-19 pandemic is associated with upper respiratory tract infections caused by COVID-19

virus, outbreak of which was first reported in Wuhan, China. Transmission occurs mainly by the respiratory droplets. Infected patients can present with spectrum of symptoms ranging from asymptomatic cases to cases with severe presentations of shortness of breath due to pulmonary edema, Acute Chest Syndrome, along with severe systemic presentation of fever, myalgia, arthralgia, etc.

Epidemiology: While the country is still reeling over the impacts of the massive second wave of the COVID-19 pandemic, WHO has released concerns about a possible third wave. While the first wave began receding after reaching an all-time high during the months of September, 2020; the cases started to mount again in the months of February and March reaching its peak during April reporting a daily of around 2,000,000 cases as seen in figure 2 [5]. Furthermore, it was observed that there was a noticeable demographic transition of patients presenting with severe cases and increased mortality with the second wave with young adult population being particularly affected. Till date around, 271 million population has been infected, comprising of around $1/5^{th}$ of the total 1.4 billion of the country's population [6].

Overlap of clinical features & associated complications:

The demographic shift in second wave has been of important concern as majority of the population that presents with acute exacerbations of SCD belong to a similar population and thereby leading to missed or delayed diagnosis of COVID-19 infection [7]. This acute attacks of sickle cell anemia is usually associated with pulmonary edema, shortness of breath and acute chest syndrome (ACS) accompanied with severe myalgia and arthralgia. And these manifestations are similar to severe cases of COVID-19 cases [8]. While the patient presentation is similar, management is completely different in both these cases and thus proper and timely diagnosis is crucial. While management of SCD acute attacks require routine analgesics, symptomatic care and blood transfusion; in case of severe COVID-19 infection, treatment involves Tocilizumab with assisted mechanical ventilation, Remdesivir, Dexamethasone, empiric antibiotic therapy and anticoagulants. Immunodeficiency state of SCD patients due to hypo splenic condition renders them further at risk of developing severe COVID-19 infections with high risk of mortality and morbidity.

Case-studies showing impact of COVID-19 infection on SCD patients:

While it is hypothesized that patients diagnosed with sickle cell anemia have higher morbidity and mortality risk when infected with COVID-19, it was observed in studies conducted in UK and France that these patients showed improved prognosis than the general population [9]. One possible explanation for this could be that in SCD patients as a result of increased hemolysis and release of hemoglobin in the circulation, it activates the TLR-4 proteins which in turn activates the pro-inflammatory cytokines in the circulation (IL-1, IL-6, TNF-alpha) [10]. Thus, these patients are better tolerated to the impact of severe cytokine storm induced by COVID-19 infection. Another possibility is that since most of these studies are conducted in developed countries where early diagnosis of this genetic condition allows prompt medical attention in case of any deviation from normal physiologic state of these patients, it might have contributed to better prognostic results.

Conclusion:

For developing countries like India, it is particularly important to maintain a hypervigilant attention on this vulnerable section on the population. This can be done by a dual approach, that involves- prenatal and neonatal screening for this genetic condition for early diagnosis and proper prophylactic and therapeutic management including prophylactic pneumococcal vaccination, blood transfusion etc.; at the same time to continue mass vaccination of the entire population and ensure strict COVID-19 safety protocols to be followed even if the population is fully vaccinated.

Volume 4, Issue 4; July-August 2021; Page No 1126-1129

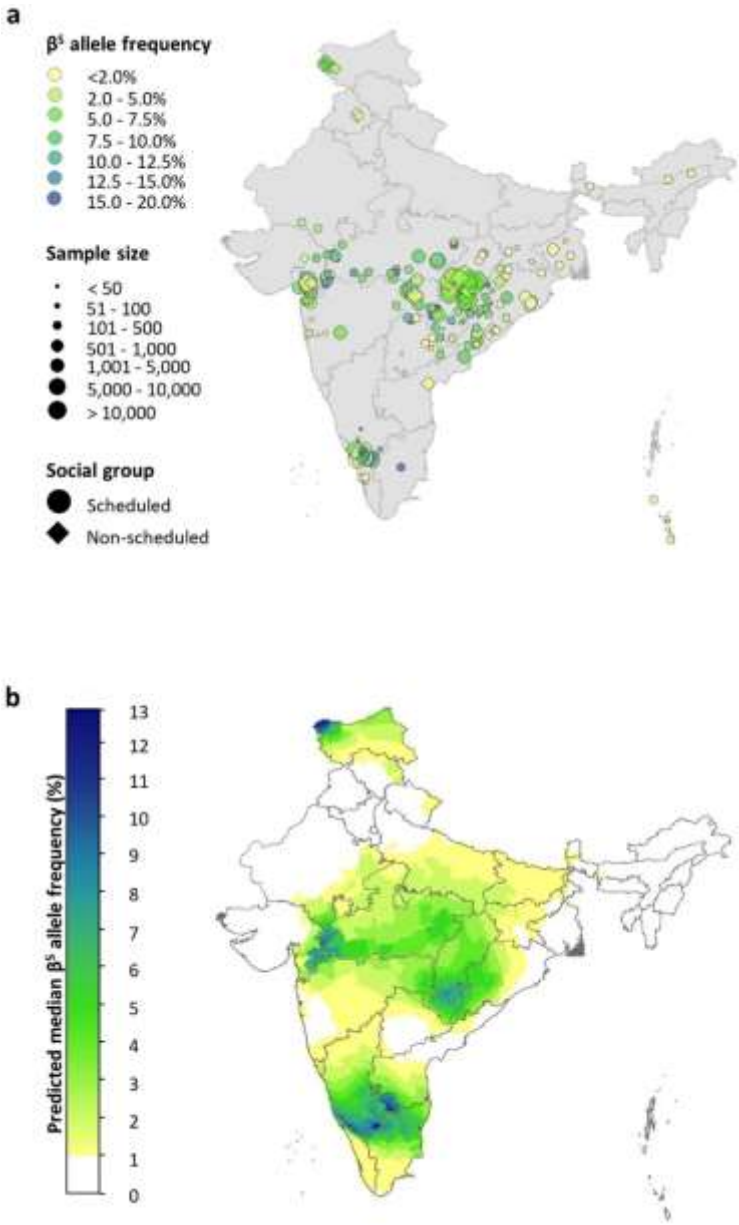

Figure 1: a) A map of the sickle-cell surveys included in the study database (n = 249). Data points are coloured according to the βS allele frequency reported in the study sample. The size of the data points relates to their sample size. A spatial jitter of up to 0.3° latitude and longitude decimal degrees coordinates was applied to improve visualisation of the data. (b) Map of median predicted βS allele frequency estimates at a resolution of 10 km × 10 km. State boundaries are displayed in dark grey. (Hockham C, et al. 2018) [3]

Volume 4, Issue 4; July-August 2021; Page No 1126-1129

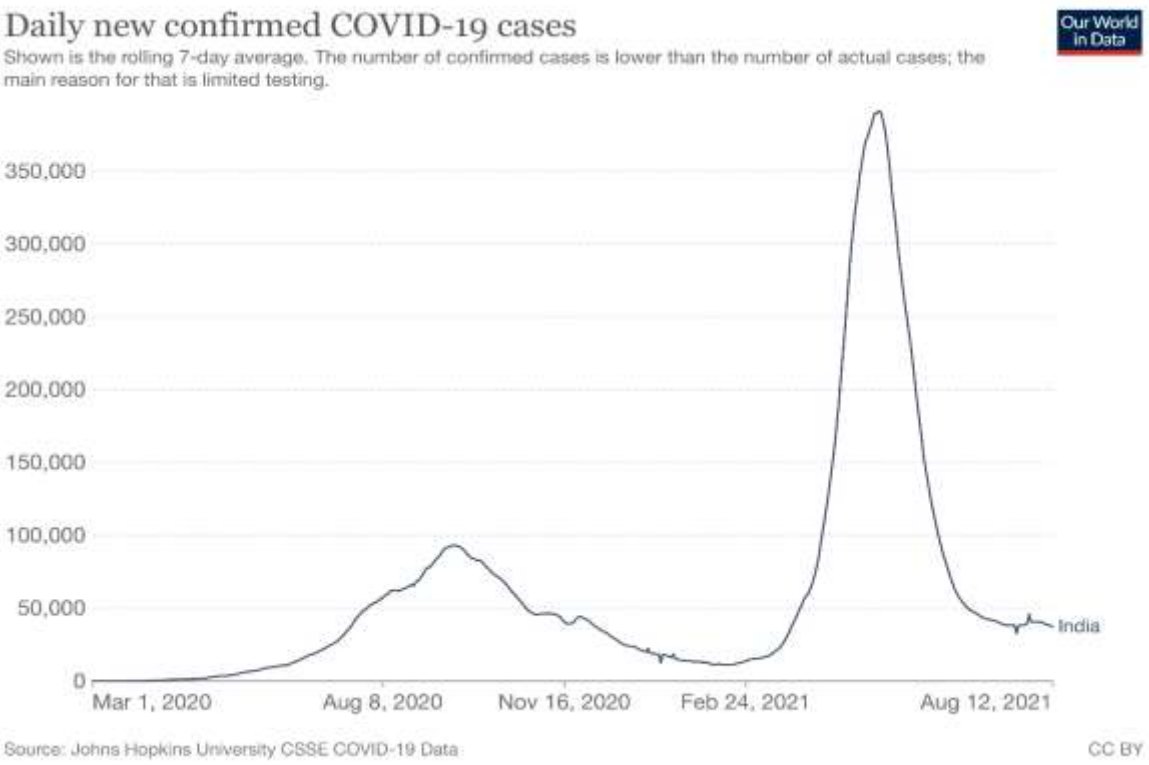

Figure 2: Daily confirmed COVID-19 cases in India (John Hopkins University 2021) [5]

References

1. Chowdhury S, Anwar S. Management of Hemoglobin Disorders During the COVID-19 Pandemic. Front.Med. 2020 Jun
2. John N, John J. Implications of covid-19 infections in sickle cell disease. Pan African Medical Journal. 2020 Jun; 36(81).
3. Hockham C, Bhatt S, Colah R, Mukherjee M, Penman B, Gupta S, Piel F. The spatial epidemiology of sickle-cell anaemia in India. Scientific Reports. 2018 Sep; 8(17685).
4. Scientific Reports, 2018, Hockham C, et al. The spatial epidemiology of sickle-cell anaemia in India, accessed 29 July 2021, < https://www.nature.com/articles/s41598-018-36077-w >
5. John Hopkins University, 2021, Daily new confirmed COVID-19 cases, accessed 29 July 2021, < https://ourworldindata.org/coronavirus/country/india >
6. Mallapaty S. India's massive COVID surge puzzles scientists. Nature. 2021 Apr;592(667-668).
7. Lalwani V. How is India's second wave of Covid-19 different from the first? Scroll.in. 2021 Apr. https://scroll.in/article/992165/are-younger-people-at-greater-risk-in-indias-second-wave-of-covid-19
8. Sivalingam T, Inusa B, Doyle P, Oteng-Ntim E. COVID-19 and the pulmonary complications of sickle cell disease. EJHaem. 2020 Oct; 1-2(545-547).
9. Chakravorty S, Padmore-Payne G, Ike F, Tshivangu V, Graham C, Rees D, Stuart-Smith S. COVID-19 in patients with sickle cell disease – A case series from a UK tertiary hospital. Haematologica. 2020 Nov; 105(11).
10. Tonen-Wolyec S, Djang'eing'a R, Kambale-Kombi P, Tshilumba C, Belec L,Batina-Agasa S.Vulnerability of sickle cell disease persons to the covid-19 in sub-Saharan Africa. Hematology. 2020 Jul; 25,(1),280-282.

Volume 4, Issue 4; July-August 2021; Page No 1126-1129