

# The Body Immune Response Against COVID-19 in Africa

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## INTRODUCTION

On 31 December 2019, pneumonia of unknown cause was detected in Wuhan, China. Later it was named “Severe Acute Respiratory Syndrome” [1]. On 30 January 2020, the outbreak was declared a Public Health Emergency of International Concern [1,2]. Later on, WHO named this pneumonia a coronavirus disease 2019 (COVID-19) and the virus was named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [3].

Infectious diseases like influenza have been claiming millions of lives. The first outbreak of influenza known as Spanish flu occurred in 1918 and by 1920, the pandemic had infected about one-third of the world’s population and resulted in an estimated 50 million deaths [4].

Africa is known to face a double burden of chronic and infectious diseases attributed to factors like under-funded healthcare facilities, poor hygiene, malnutrition, and overcrowded households [5], making it hard to contain outbreaks on Africa. However, Africa has not suffered a great deal of COVID-19 in terms of severity and prognosis compared to the rest of the continents [2,6,7].

In early April 2020, the African region had fewer than 6,700 confirmed cases of COVID-19, a significantly lower count than the 112,000 cases reported in the Western Pacific and the 655,000 cases reported in Europe [6]. The puzzle that remains to solve is finding the source of the claim that Africans were more resistant to the first wave of COVID-19 or that when infected, they were less likely to suffer severe complications than other races [7]. Nevertheless, the World Health Organization has warned Africa to prepare for the worst of COVID-19 in the near future [6].

Therefore, while the scientific community is focused on developing vaccines against the SARS-CoV-2, it is imperative to understand clearly the body immune response against this virus [8].

## HUMAN IMMUNE SYSTEM RESPONSE TO COVID-19

### Immune system Overview

The immune system is a defense system for the human body to clear up pathogens like viruses,

bacteria and others [8]. The innate response components include natural killer cells and physical barriers [1,7], but it is not specific to foreign materials invading the body [7]. On the other hand, the adaptive response is specific and produces memory cells to each pathogen. It is mainly composed of T-cells that coordinate

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and regulate the immune system and destroy the infected cells [9,12]. B-cells present the pathogens to the macrophages for elimination and secrete antibodies that stop the multiplication of pathogens hence limiting the infection [9]. Different factors play a role in determining the immune system's quality, including vitamin D, microbiota, psychosocial status, sleep, and previous exposure to diseases [8,12].

Vitamin D modulates the innate and adaptive immune responses by downregulation of pro-inflammatory cytokines [10]. Deficiency in vitamin D is associated with chronic diseases like autoimmune diseases, cardiovascular and neurological diseases that compromise the immune system and render a person a significant risk to infections. Vitamin D, stored in the form of 25-hydroxyvitamin D, is produced from exposure to the sun and it is determined by both ultraviolet exposure and dietary vitamin D intake [11].

### **Immune response to the COVID-19 in Africa**

The African continent straddles the equator and has northern and southern temperate zones that enjoy sunshine all year long [12]. Therefore, Africans are privileged to benefit from the sun to boost their vitamin D levels. This could be one factor that explains why Africa has not suffered a great deal of COVID-19 during the first wave.

Africa faces a double burden of infectious and chronic diseases [13]. Chronic infection can enhance the immune system's ability to control unrelated pathogens. It has been made clear that a pathogen's persistence, even at very low levels, can enforce the immune system's ability to react to a new unrelated infection [14]. It was observed that many B and T-cell epitopes were conserved between SARS-CoV-1 and SARS-CoV-2, and the human immune response to SARS-CoV-2 was thought to target these pillars of the adaptive immune response [8]. The acquired immunity against infectious diseases depends upon B and T-lymphocytes and can be nonspecific to the pathogens [14]. Since infectious diseases like Tuberculosis, Malaria, Ebola and others are common in Africa. Almost everyone has been significantly exposed to them and Africans may have developed immunity that clears most infections off the body, which is why infections

like COVID-19 may not severely threaten life as they do on the rest of the continents [7,11].

Moreover, COVID-19 has been found to affect people in old age more and the highest mortality rate has been documented in elderly people. Data of approximately 90% of mainland China's confirmed COVID-19 cases found a death rate of 13.4% among people of 80 years and 0.32% for people under 60 years [3]. One in five patients over the age of 80 were likely to require hospitalisation compared to around 1% of people under 30 [15]. Africa has the youngest population globally, whereby, for example, 65% of Africa's 1.25 billion people are under age 25 [16]. Thus Africa's youth bulge may be a buffer against the most devastating medical complications of COVID-19 on the continent [17].

In addition, rich intestinal microbiota provides the Africans with enhanced protection against their immune system's pathogens [11].

The African diet is low in fat and animal protein and rich in starch, fibre, and plant polysaccharides [17]. In a study done assessing intestinal microbiota produced by a modern western diet in the Italian children versus a traditional rural African diet in the Burkinabé children, the later was found to have more intestinal microbial diversity [18].

### **COVID-19 outcome among Africans**

Poor outcomes of COVID-19 have been reported in African American ethnicities. Factors like underlying medical comorbidities, social and structural determinants of health, crowded neighbourhood and household conditions, historical and ongoing discrimination, and chronic stress have exposed them more than their counterpart white ethnicities [19].

Case fatality rate for COVID-19 in Africa is lower than on other continents. The contributing factors were reported to be: relatively young populations, adherence to the preventive measures, quick action by African governments and their experience in dealing with other outbreaks like Ebola [20,21].

In conclusion, claims that Africans are immune to COVID-19 have been proved wrong. However, in Europe and the Americas, patients with African ethnicity have been reported among the most affected mainly due to socio-economic disadvantages. Less severity of COVID-19 in

Africa has been attributed to its population's youth, exposure to Vitamin D, diet, and its experience with other infectious diseases. African continent should be prepared for new peaks of COVID-19 infection due to new SARS-CoV-2 variants that

might be more virulent and thus compromise the immune system. Mitigation strategies should be strengthened as the new variants might differ significantly in their transmission mode or disease course.

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