Introduction:
A novel coronavirus was emerged from Wuhan, the city of China in December 2019 and then it was spread throughout the globe within a few weeks (1). By 19 July, 14.5 million people have infected with the virus with a death toll of over 0.6 million (https://www.worldometers.info/coronavirus/). It is a very dangerous, fast-spreading, and clever virus with a high mutation rate (2). Many international researchers/scientists are working on the development of vaccines against 2019-nCoV but no vaccine is available yet (3).

The Indian Council of Medical Research (ICMR) recommended the use of hydroxychloroquine and Chloroquine as the first-hand treatment for asymptomatic healthcare professionals and laboratory-confirmed cases of COVID-19 (4). ICMR’s recommendation followed by WHO consent and FDA approval to use chloroquine phosphate hydroxychloroquine sulfate against COVID-19 (5). Both previously mentioned drugs are antimalarial (6, 7).

The use of antimalarial medicines and their effectiveness against COVID-19 seeded the idea that there might be some kind of liaison between malaria and novel COVID-19. To find out the existence of this relationship, online available research is studied. During the study, we found that the total number of the infected population in malarial countries is very low as compared to non-malarial or malarial free countries (8) (See Figure 1). This study was conducted by comparing percentages of death due to COVID-19 between malarial and non-malarial countries along with percentages of the affected population (9).
viralyme II receptors located on the human cell membranes of lungs and brain and then translocated inside the cell (11-13). The single-stranded RNA molecule of the virus is a large genome, consisting of six open reading frames. A large peptide is fragmented with viral encoded protease and two other proteases into sixteen non-structural proteins and four structural membrane proteins. The viral proteins are translated and packed in the cellular endoplasmic reticulum and Golgi bodies (14). On the other hand, the host cell takes the virus as a foreign particle and activates the immune system to rip viral RNA molecules apart. A battle starts between host cell defense and the virus for conquering host cells. Initially infected cell signals to nearby cells by displaying Major Histocompatibility complex (MHC) proteins on the cell surface with pieces of viral proteins. The message is read by circulating T-cells which release cytoplastic factors to kill infected cells (15). If virus succeeds and gets control on host cell’s defense, it inhibits the movement of MHC proteins on the membranes, and produces structural and non-structural viral proteins and multiply exponentially, killing the cell and ready to infect other cells (Laing K. https://www.immunology.org/public-information/bitesized-immunology/pathogens-and-disease/immune-responses-viruses). Host cell produces other immune cells, called natural killer (NK) cells; these attack on the cells having a smaller number of HMC protein than usual – to control viral infection. Once inside infected cells, NK cells produce cytotoxic factors and cytokines (interferons and tumor necrosis factors (16) are released from infected cells to the speed-up killing process of nearby cells,

The immunity works by memorizing ways of defense to control viral infection in the future by producing particular antibodies. It gives strength to fight off the virus, but if the host’s immunity is not strong enough to control viral replication, the person will be infected due to uncontrolled viral replication followed by virus-induced cell death by host cells.

We have calculated percent mortality as a percentage of deaths as compared to total infected persons. The percentage of COVID-19 positive cases among the total population (C19+ cases) was calculated by the percentage of confirmed cases as compared to the total number of tests performed.

To find out the relationship between COVID-19 infections and resistance due to malaria, death percentages of COVID-19 infected people and C19+ were plotted against malarial (MC) and non-malarial countries (NMC). The countries with greater than 10,000 cases selected for comparison and divided into two categories: i) having less than or equal to 0.1 million infected cases (Fig. 2a) and ii) having more than 0.1 million infected cases (Fig. 2b).

A total of 20 countries fall under the range of less than or equal to 0.1 million infected cases. It includes six malarial and fourteen non-malarial countries. Percent mortality observed in MC countries viz South Korea, Nepal, Nigeria, Philippine, Ecuador, and Singapore was 2, 0, 2, 3, 0, 8 respectively. The average value of death in these countries was found to be 2.5%. Whereas the percent mortality in non-malarial countries was found between 4-16% which is significantly higher than in malarial countries except for Qatar (0%).

Moreover, eleven countries fall under the category which have 0.1-0.4 million on the infected population. In malaria-affected countries, percentage mortality has been found very low as compared to mortality in malaria-free countries (Fig. 2b). For example, percentage mortality due to COVID-19 in Pakistan, Iran, and India was found to be 2, 5, and 3% respectively. In contrast, the percentage of mortality was 18% in France, 14% in Italy and UK, 10% in Spain, and 8% in Canada. However, it was also found that two malarial countries, Ecuador and Mexico exhibited deviations in percent mortality patterns, which were 8% and 12% respectively. This deviation is justified when we observed that approximately 40% population of both countries is expected to be COVID+.

The noteworthy...
difference of deaths between malarial and non-malarial countries can be related with the concept that malarial countries might have developed immunity because of malarial infection (https://www.drroyspencer.com/2020/03/some-covid-19-vs-malaria-numbers-countries-with-malaria-have-virtually-no-coronavirus-cases-reported/). The idea builds-up strength when infection increases from 0.1 million to 0.4 million of people in both malarial and non-malarial countries (Fig. 2b). A high rate of mortality means less immunity against COVID-19.

**Conclusion:**
The comparison strengthens the idea that malaria has brought some kind of resistance against COVID-19 infection. However, experimental studies are required to understand why malarial countries exhibit significant resistance against COVID-19? What are the different factors contributed to this resistance? If we get answers to these questions then we might be able to develop effective therapies against COVID-19.

**References:**
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