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OMICRON VARIANTS OF THE SARS-COV-2: A POTENTIALLY SIGNIFICANT THREAT IN A NEW WAVE OF INFECTIONS

[Short title: Omicron variants of the SARS-CoV-2]

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From the beginning, the COVID-19 pandemic turned out to be a huge challenge and burden for medical services [1]. Currently, humanity is dealing with a new wave of the virus that has evolved and presents a new challenge, mainly due to its ability to avoid immune surveillance. Indeed, our main line of defense — vaccines — may be compromised. Omicron variants are characterized by an evolutionary force unprecedented so far. Among the several sublines that have already emerged, the BA.5 strain exhibit higher transmissibility and demonstrates a worrisome immune evasion. According to several laboratory investigations, vaccination-induced antibodies are less successful at preventing BA.4/5 strains infection as opposed to the infections following BA.1/BA.2 strains exposure [2–6]. The hyper contagious BA.5 variant is mainly responsible for the rise in hospital and intensive care unit utilization we are facing in the current times. Within a few months, BA.5 outperformed its forerunners and became the dominant strain in the United States (US). According to the most recent statistics provided by the Centers for Disease Control and Prevention (CDC), this subvariant was responsible for nearly 2 out of every 3 new COVID-19 infections in the US (3.07.2022–9.07.2022) [7].

The BA.4/5 variants are four times more resistant to sera from vaccinated individuals than other omicron strains [8]. The neutralizing antibody response induced by BA.1 infection, seems to be narrower than anticipated, leaving patients vulnerable to immune evading variants like BA.4/BA.5 [9]. As a result, repeated Omicron infections may affect previously (triple) vaccinated patients. Even patients who developed hybrid immunity via vaccination and prior infection (from Omicron BA.1 or other variants) fail to render BA.4/BA.5 ineffective. This has been linked to the spike mutations L452R and F486V. The new BA.2.75 variant, a sub lineage of the Omicron BA.2 that was first detected in India and has been discovered in other countries, including Japan, Germany, the United Kingdom, Canada, the U.S, Australia, and New Zealand [10]. This may pose a serious threat to humankind. Compared to its parent strain, eight more spike protein mutations are present in this strain. Because of the location of these mutations, it is likely that BA.2.75 may overcome immune defense against BA.2 [10]. The ability of BA.2.75 to evade immunity appears to be confirmed by the fact that it was able to expand in at least ten distinct areas of India, despite the previous experience of a BA.2

wave. Immune escape might be made worse by mutations of the novel BA.2.75 sub-variant than what we are now witnessing with BA.5 and BA.4, sub-variants known to escape immunity after both vaccination and prior infection.

The BA.5 variation essentially depicts how this virus evolved to be more infectious and to get beyond human immune defenses against infection, immunization, or both. People have relatively little defense against BA.5 for a mild to moderate illness, regardless of vaccination status, prior infection, or prior infection and vaccination. However, protection against the most severe forms seems to be maintained among healthy individuals as demonstrated by the relatively low incidence of hospitalization, ICU admissions, and death in the number of cases.

Protective measures might also be adapted when dealing with new variants. The Omicron variant (B.1.1.529) has a shorter incubation time and a greater transmission rate than earlier versions [11]. As a result, the CDC advised a shortening of the isolation period for infected individuals from 10 to 5 days following onset of symptoms (or positive test) followed by a 5-day mask wear. When analyzing the replicative capacity of SARS-CoV-2 obtained from swabs of infected patients researchers found that the median time from the initial positive PCR test to the absence of viral infectivity in culture was 4 days (3 to 5) for Delta strain and 5 days (3 to 9) for Omicron. The median time from symptom onset (or initial positive PCR testing) from sterile culture was 6 days (4 to 7) for Delta and 8 days (5 to 10) for Omicron. Considering those observations, it appears that compared to the Delta variant, the infectivity of Omicron lasts longer — on average by at least 2 days (5–10 days). Therefore, the 5-days isolation period seems too short to restrain virus spreading when infected with an Omicron strain. Therefore, the 5-days isolation period seems too short to restrain virus spreading when infected with an omicron strain. In this perspective, strict application of health precautions and physical distancing measures seems mandatory to restrain virus spreading [12].

It's important to keep in mind that vaccinations are based on the original Wuhan strain. Therefore, the vaccine's immunity may not confer enough protection to new variants. Due to the rapid ability of SARS-CoV-2 to evolve and evade, the pharma industry may not be able to develop and provide tailored vaccines fast enough. On this topic, salvation may come from pan-coronavirus vaccines, several of which are in development. Those pan-coronaviruses vaccines may ward off future variants and prevent upcoming waves in an optimistic scenario. However, the emergence of possible antigenic imprinting (or Hoskins effect), a failure of the

immune system to mount sufficient effective immune response when encountering a slightly different version of a pathogen, must be taken into consideration [13].

These symptoms will primarily be catarrhal and cold-related. This does not change the fact that owing to the virus's enhanced contagiousness, quite a lot of people may end up needing hospitalization. Due to their capacity to infect individuals who had developed resistance to earlier iterations of Omicron and other variants, BA.4/5 appears to have developed. The rise of BA.4/5, as well as their inevitable decline, will be largely influenced by population resilience because most of the rest of the world outside of Asia is doing little to control SARS-CoV-2. However, we are unable to predict what may happen along the way with potential new varieties. We are also unaware of any more changes that may be far deadlier, especially given the virus's quick mutations - on the bright side, there is less likelihood of a wholly new variety emerging because of infection the longer the Omicron and its branches continue to predominate.

Conflict of interests

The authors report there are no competing interests to declare.

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