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Review Article

Challenges and Opportunities in Accessing Veritable Vaccines and Curbing the Dissemination and Excesses of the SARS-CoV-2 or COVID-19 Variants

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Abstract

SARS-CoV-2, the etiologic agent of the COVID-19 pandemic, spatiotemporally evolves or mutates to its variant with potentialities for adverse opportunistic infections via replications and transmissions or disseminations. The dissemination and transmission of the Delta variant is accelerating more than expected partly due to unvaccinated persons not treating the pandemic as seriously as necessary. The test and tracing service must be effected because a vast proportion ofthe population is unprotected. It is crucial to restrict movements. Vaccinated persons must socialize indoors in well-ventilated ambients, and avoid non-essential foreign travels. The evolution of the COVID-19/SARS-CoV-2 pandemic portends a well-nigh impossible termination of events. It is, therefore, imperative to focus on the cost and not merely the opportunity cost to control the never-ending SARS-CoV-2/COVID-19 pandemic. There is the need to make public health system a priority with emphasis on cost sharing and cost saving for vaccines and other healthcare modalities to reach the poor and the vulnerable populations in developing countries and elsewhere for safety and protection of lives through enhanced substantial, restorative and sustainable financing,technical expertise and capacity building.

Keywords: Immunity, variants of concern, variants of interest, spike protein, mutation, transmissibility, social restrictions, antigens.

INTRODUCTION

As the scourge of the COVID-19 or SARS-CoV-2 [1] pandemic remains unabated, it becomes imperative to configure the public health systemas a priority with emphasis on cost saving and cost sharing for vaccine distribution and consumption to extend to the poor and vulnerable populations [2]. These are achievable by strengthening the health system for safety and enhanced potential of lives and livelihood through conscientious efforts,restorative and sustainable [3] financing and technical capacity.

It is pertinent that governments and other contributing agencies provide the general public with expansive information and communication needs for the treatment and control of the veritable symptoms regarding SARS-CoV-2 or COVID-19 [4, 5] in order that global citizens ameliorate or curb the never-ending prevalent sceptism. Procrastinations in minimizing restrictions have been associated with incremental vaccinations, dissemination, transmission and upsurge of the new Delta variant that is perspicuously overwhelming the health system and becoming a global scourge.

Perspectives in vaccines and coronavirus variants

Even with this dimension, vaccination intensity comparatively declined spatiotemporally, partially due to the exclusion of those below the fourth decade of life as beneficiaries/recipients of the AstraZeneca version and the preponderant reluctance to be vaccinated. It is, however, predicted that the Delta variant has disseminated with involvement of circa 50,000 new infections daily within a brief period in the instant year. The critical aspect may be effectively and efficiently circumvented by curbing the untoward impact of the variants via vaccine combination or multifactorial applications, mask adornment, social distancing and invariable lockdown as in the herd community strategy [6].

The presence in Nigeria of the Delta variant, lineage B.1.617.2 of the COVID-19 or SARS-CoV-2 virus was revealed [7]. It is suggested that the Delta variant is more adverse than the Alpha variant with double the latitude for infection, hyperinfection, retarded convalescence, elevated dissemination, debilitating outcome or resultant impact and concomitant hospatilization. It becomes imperative to inter alia adhere to appropriate guidelines in the

applications of nose, mouth and face masks in crowded ambients, handwashing with soaps and running water as well as hand sanitizer application. It has become advisable that travelers from outside Nigeria undergo the mandatory seven-day isolation period with concomitant testing prior to physical communication with the general public. Residents are advised to seek medicalcare/healthcare services, and avail themselves of free- testing opportunities where there are certainties of resultant morbidity and mortality,as measures to ameliorate or contain the dissemination and preponderance of SARS-CoV-2 or COVID-19 in the environs, The National Primary Health Care Development Agency, NPHCDA declared that Nigeria will be the beneficiary/recipient of 41,282,770 doses of Oxford/AstraZeneca, Pfizer-Bio-N-Tech and Johnson & Johnson COVID-19 or SARS- CoV-2 vaccines within July and September this year, 2021 but was delayed for a couple of months. Ignoring preventive strategies against the COVID-19 places the populace at risk for infection. Shortly, following the confirmation of the Delta variant in Nigeria, cases have consistently become elevated in the country infecting unprotected and vulnerable persons with accelerated pressure on the deficient provision of oxygen, therapeutics, healthcare systems and services, personnel protective equipment, exasperated healthworkers, low ncome, and other shortages paving the trajectory for deteriorating public health emergency with the resultant threat to human life, livelihood, healthy economy, restoration and sustainability [7].

Etiopathogenetic mechanisms

A study [8] depicts a key alteration that placed the Greater Horse-shoe coronavirus bat, Rhinolophus ferrumequinum on the trajectory for infection with a pathogenic impact on humans from animals. The mutation ostensibly aids the virus per the spike protein, and adhere to the human replica of a host protein, hACE2, thus creating the latitude for the virus to penetrate and infect cells. The mutated virus has a greater potential lock and adhere to human cells than other coronaviruses deficient in the alterations; and also has greater replicative capacity in experimental human lung cells than erstwhile versions of the coronavirus. It is, however, suggested that this does not necessarily connote that it is the sole mutation, and that the strategy employed in the research is not conventionally applicable in virology with the tendency not to have detected other pertinent or appreciable mutations. However, the COVID-19 or SARS-CoV-2 culprit is the substitution of the amino acid, threonine that is ubiquitous in animal viruses by its counterpart, alanine. The mutation, T372A may have been due to the deletion of certain sugars which coat the spike protein. These sugars probably impede pathogenicity, thus their eradication provides the latitude for hACE2 to permeate cells. An excess of 182,000 SARS-CoV-2 genomes screened for selective sweep signatures depicted an adaptive alteration with the spike protein receptor-binding domain. The alteration was predicted, and the laboratory-setting correlated to enhanced affinity to hACE2 with resultant viral replication in relation to conventional ancestral variant. The culminating mutation ostensibly contributes to the emergence of SARS- CoV-2 from animal reservoirs with potentiated transmission to humans [8].

Throughput for vaccinations

Thus, mRNA vaccines coated with soft fatty acids utilise genetic material in addition to diverse inactive excipients to construct an aspect of the coronavirus spike protein, and directs the immune system for the formation of specific antibodies [9]. The soft lipids permit the mRNA to gain entry into cells for cytoplasmic absorption and initiation of the spike protein synthesis. Predictably, vaccination activates T cells which potentiate the immune system response to future coronavirus exposure [9]. The mRNA induces SARS-CoV-2 or COVID-19 antigen synthesis that triggers the antibody response of the vaccinated individual via the formation of neutralizing antibodies.

Characterizations of Strains/variants of COVID-19 or SARS-CoV-2

Several strains of the coronavirus have been identified in recent outbreaks. The Delta variant depicts that vaccines are effective in the dilemma of the COVID-19 or SARS-CoV-2 pandemic. In ambients with depreciated COVID-19 or SARS-CoV-2 vaccine coverage, an upsurge of morbidity, mortality and expansively overwhelmed healthcare infrastructure including gross economic may prevail [2]. These correlate with the Delta variant (B.1.617.2) dominance [10] in numerous aspects. This strand presents greater transmissibility, resilience, and suppresses vaccine efficacy. The dissemination of variants, such as B.1.1.7 and B.1.351 has prompted extensive effort to prevent and control the SARS-CoV-2 or COVID-19 pandemic by vaccination employing disparate modalities for emerging variants [11]. A retarded vaccine rollout has resulted in adverse repercursions in certain countries. However, after vaccinating the risk groups, Israel altered her itinerary in this COVID-19 or SARS-CoV-2 pandemic era in its policy of "soft suppression" that entails living with the virus by ameliorating expansive restrictions and a fourth national lockdown which could perspicuously impede the economic potential of the country [12]. The opportunity cost may be the ravaging tendency of the incipient variants.

The Lambda variant of COVID-19 or SARS-CoV-2 was declared by WHO as a "Variant of Concern", VOC. The Lambda strand or variant C.37 was initially detected in Peru [13], and classified as a "Variant of Interest", VOI by WHO. A VOI is defined as a variant that is commonly established in diverse communities with mutations which give rise to certain alterations within the virus exhibiting atypical symptoms. A VOI exhibits mutations which are

predicted or realised to impact factors, such as confounding of diagnostic tests, transmissibility, disease severity, and propensity to elude immunity from erstwhile infections or vaccines. Variant of Concern merely specifically relates that the variant has the attribute of elevated rate of transmission. Although, the Lambda variant has been established in several countries, excepting those in Africa and Asia, it is not yet classifiable as a VOC because of paucityof evidence in its transmission potential. Ii is, however, designated as a "Variant Under Investigation" due to its "international expansion and several notable mutations".

In retrospect, the Lambda variant is a coronavirus strain that has recently been detected in about thirty countries. It is associated with extensive community transmission rates in numerous countries, with spatiotemporally increasing prevalence and increased incidence of COVID-19 or SARS-CoV-2. The unusual combination of mutations due to the Lambda variant may constitute its greater transmissibility. There is diminished availability of data or evidence to suggest that these combinatorial mutations depict the Lambda variant as being more adverse than the originating coronavirus. The Pfizer and Moderna vaccines are protective against the Lambda variant, and there is no evidence to indicate that it has greater pathogenic virulence than the Delta variant. Thus, it remains of interest and not of concern [13]. The Delta strain presents not merely a greater transmissibility but its infection rate deleteriously impacts on erstwhile COVID-19 or SARS-CoV-2 subjects. Currently, vaccination becomes imperative as every instant and extant COVID-19 or SARS- CoV-2 is a preventable mortality. A recent Kappa variant that is also more benign than its Delta counterpart has emerged in Rajasthan [14].

Parameters for infection, vaccines and treatment

A vast majority of viral mutations may not mpact on the attributes of the pathogenicity of the viruses in their dissemination, transmission and severity depending on the locale of alterations in their genetic materials. The extant COVID-19 or SARS-CoV-2 vaccines on implementation are predicted to provide certain or absolute protection against novel variants due to the potential of the vaccines to elicit expansive immune response in concert with varied cells and antibodies. In the modicum of events, that alterations or mutations attenuate or debilitate the effectivity of a vaccine, the components of the vaccine need to be fortified or modified for efficacy, effectivity and efficiency. Implementation of public health policies must not detract concerns of SARS-CoV-2 or COVID-19 variants as to diminish vaccine efficacy per VOCs culminating in excoriated vaccination rates of extant SARS-CoV-2 or COVID-19 [15], and as the spike protein portend constraints for monoclonal antibody treatment and pose bottlenecks to the efficacy of extant vaccines [16].

DISCUSSION

Besides other anomalies and untoward events herein brought to the fore, the COVID-19 or SARS-CoV-2 pandemic has culminated in adverse misinformation [17]. There are spatiotemporal variations and changes regarding viruses and other microorganisms [18] which are characteristic of COVID-19 or SARS-CoV-2. The concomitant changes may not translate into pathogenic mutants which adversely impact on the attributes of the viruses in certain instances dissemination, transmission, associated pathogenicity, reliability of vaccines, diagnostic and other social, environmental and public health strategies. It is mandatory to establish, improve and undergird extant social and public health programmes as well as infection prevention and control strategies for effective and efficient diminution of COVID-19 or SARS-CoV-2 virulence, prevalence, incidence, hospitalisation, morbidityand mortality. These are realisable by undergirding surveillance, sequencing capacities, and applications of systematic modalities to predict the magnitude of dissemination and transmission of SARS- CoV-2 or COVID-19 variants by thinking locally and acting globally in order to preclude the incident risk of the pandemic for restoration and sustainability [3].

There are tendencies for several countries to lift, ease, continue or augment restrictions as they battle the COVID-19 or SARS-CoV-2 pandemic despite the accelerated dissemination of the Delta variant. Globally, there are perspicuous economic prospects [2, 19] with availability of vaccines combined with easing or discontinuance of restrictions, especially in the education, tourism, hospitality, social, recreational, industrial, manufacturing and production sectors. These considerations must, therefore, not merely relate to the public health perspective despite the superimposed economic preponderance.

The successful achievement of the vaccination programme will negatively correlate the number of cases, hospitalisations and mortality, even with disproportionate number of individuals who elect to decline vaccination or further jabs. As there are those in the industrialized countries who are ostensibly presented with the choice of being vaccinated, this choice may not be available to most vulnerable populations in less developed countries. These susceptible individuals are at risk of being overwhelmed by novel variants and decreased restrictions. Blood was collected from COVID-19 convalescent discharged persons and studied for SARS-CoV-2-specific humoral and cellular immunity [20]. Findings suggested that NAb development is associated with T cells and NK cells activation with linkage in the genesis of a veritable vaccine for for SARS-CoV-2 [20] with the potential for immunity to SARS-CoV-2 and COVID-19 pathogenesis. Explicating the duration of antibody responses to SARS-CoV-2 is fundamental to

sustained prevention of reinfection, especially as the SARS-CoV-2 and SARS-CoV genes are most closely related among the human-infections coronaviruses [21]. These make provision for future investigations on the pathogenesis, and optimization of diagnostic and vaccination modalities for the coronaviruses.

CONCLUSION

Global produc tion, distrib ution and consu mption of vaccin es and booster doses to curb the scourge of the SARS- CoV-2 or COVID-19 pande mic with its perspicuous incessant and proliferative variants are grossly inequit able within certain countries and vulnera ble populat ions. It is conscionable to have access to increased volume of vaccines as they portend prolonged immunity against untoward and life-threatening COVID-19 or SARS-CoV-2 virulence rather than prioritizing mere restrictions and lockdowns in conjunction with other COVID-19 or SARS- CoV-2 protocols. The attendant consequences of the opportunity cost of not presenting an encompassing multifa ctorial strategy of curtailing the cascade of variants via decisions on access to vaccines, booster doses and social restrict ions must be obviated.

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