A look at the usage of Antibody tests to determine level of immunity against COVID-19 after vaccination: A recent trend in India

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Keywords: Covid-19, Pandemic, Primary Prevention, Health Education, Vaccination, Antibody

Declarations

• Funding: Not Applicable

• Conflicts of interest/Competing interests: No conflict of interest

• Ethics approval: Not applicable

• Consent to participate: Not applicable

• Consent for publication: Not applicable

• Availability of data and material: Not applicable

• Code availability: Not applicable

• Authors' contributions:
The authors confirm contribution to the paper as follows:

1. Dr. Saad Ahmed Jamal (M.B.B.S.) : Conception and design of the work, Drafting the article, Data Collection, Data analysis, Final approval of the article

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To The Editor:

India, the second worst hit country due to the COVID-19 pandemic, has registered a total of 30 million cases, and 392,000 deaths[1]. In order to combat the huge loss of life in the second wave of the pandemic due to the Delta variant of the coronavirus, the Government of India announced its third phase of vaccination. Eligibility was extended to all adults above the age of 18 from May 1 2021 onwards with three vaccines being provided: Covishield/Oxford AstraZeneca (Adenovirus viral vector), Covaxin (Inactivated SARS-CoV-2), and Sputnik-V(Adenovirus viral vector)[2].

As of 23 June 2021, 261 million doses of the Oxford AstraZeneca vaccine, 35.3 million doses of Covaxin, and 50,000 doses of Sputnik-V have been distributed[3]. As the number of vaccinated individuals has increased, there has also been an increase in concern amongst beneficiaries due to a proportion of vaccinated individuals continuing to contract the virus. Although the numbers of vaccinated individuals testing positive remains low - 0.03% of Individuals after the second dose of Covishield, and 0.04% after second dose of Covaxin[4], this hasn’t stopped the general public resorting to tests that detect antibodies against Covid spike proteins, which have been advertised by private laboratories to “detect levels of immunity” post vaccination.

The popularity of these tests have dramatically risen over the second wave, especially among recent beneficiaries of the vaccine, owing to the worry that they are not sufficiently protected even post vaccination, and also due to increased advertisement of these antibody tests by private laboratories. A private laboratory in the city of Pune, India reported a 25% increase in the sale of these tests in June 2021, when compared to April and May earlier this year[5]. Another news article observed that private laboratories have observed a three fold rise in patients opting for these antibody tests, when compared to February 2021[6].

Earlier this month, a resident of the city of Lucknow, India, registered a legal complaint, after a negative rapid antibody test, 28 days after taking the first dose of Covishield (Oxford-AstraZeneca) vaccine[7]. Such incidents are forcing individuals to go as far as revaccinating with a different type of vaccine after negative antibody test results.

The Covid-19 virus comprises nearly 30 proteins, out of which special attention has been paid to M (Membrane), E(Envelope), N(Nucleocapsid), S(Spike) proteins[8]. The M, E, and
N proteins are surface proteins. The M, E, and N proteins are critical for viral assembly while the S protein is responsible for entering and infecting host cells and fusion with the host cell membrane. There are two further subunits of the S protein - S1: the globular head and S2: the stalk embedded within the viral envelope. S1 binds to receptors on the host cell surface whereas S2 is responsible for conformational changes which lead to the fusion with the host cell membrane [8]. Since the S protein is responsible for viral propagation, vaccines tend to target this by producing antibodies against the S protein. The S protein is also responsible for induction of neutralizing antibodies (NAbs) [8], which makes it a good choice for vaccine producers to target. There are 4 types of tests available to check for antibodies against these spike proteins: Rapid diagnostic tests, which are growing in popularity, enzyme linked immunosorbent assay (ELISA), Neutralisation assays, and Chemiluminescent assays.

The FDA, USA, however has advised against the use of such antibody tests for quantitative/qualitative analysis of immunity achieved post vaccination, advising that such tests are only to be used to indicate a past infection of COVID-19. The FDA cites many reasons behind its position, one of them being false negatives due to incorrect proteins being tested. It is possible for a person who has been vaccinated to receive a negative result if the antibody test in question is only testing for antibodies against Nucleocapsid (N) protein, which are achieved via natural infection, and not via vaccination, whereas Antibodies against S protein are produced in response to vaccination. There is also the growing worry that a positive antibody test may result in individuals taking fewer precautions leaving them vulnerable to infection. [9] The CDC also warns against the use of antibody tests to assess immunity post vaccination, as these antibody tests can identify a humoral response. However these tests do not identify the role played by cell mediated immunity through B and T cells, which is increased by vaccination [10].

Dr. Carl Fichtenbaum, infectious disease specialist at the University of Cincinnati College of Medicine, argues against the use of these tests, by stating the prematurity of development of these tests. He argues that while such antibody tests are beneficial for diseases such as measles and mumps, they have been developed over decades. Dr. Peter Hotez, dean of the National School of Tropical Medicine at the Baylor College of Medicine, has a similar stance, saying that there is still not sufficient published evidence to confirm the threshold of antibodies against spike proteins, which deems a patient safe from subsequent infection. However Dr. Hotez states that there may be benefit in such tests especially in
immunocompromised individuals, who need increased surveillance, since they are at increased risk. [11]

In conclusion, it is important that these tests are used only in necessary circumstances, and not as measures of detection of immunity after vaccination, until sufficient studies are established to determine the threshold of antibodies at which a person is considered immune. As healthcare workers, it is imperative that we guide the general public to understand the way these tests work, so they are used in the correct circumstances, rather than as a test that may cause confusion amongst the masses.
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