

Covid Pandemic: Where we Stand Today

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REVIEW ARTICLE

Covid Pandemic has drastic implications in our lives, physical, social, mental, emotional. Here we review the situation as we stand today. Covid has influenced all walks of life; here we explore a few arenas that are shaping our present and future.

Technology and Covid

No touch techniques, walk away automation in laboratories, mobile apps and software based applications, distance learning and industries robotic surgeries [1] online services [2], digital marketing [3] tele health and robotics [4]. These make the involvement of less manpower, faster results, quick delivery of greater volumes of service, less manual errors.

Covid Pandemic has sped up science and technology by leap and bounds. Artificial Intelligence, [5] big data, machine learning are the new and interesting fields changing every sphere of life, creating jobs. How our eyes move on Google website during search, voice, recognizing face has replaced signatures and fingerprints [6]. New methods of diagnosis with minute volumes of sample, non-invasive diagnosis with data and lab results is the new mode of medical practice. Online learning has taken over classroom teaching and practical. Covid infection diagnosis can be done with the rapid antigen test quickly and at home. Reverse transcriptase Polymerase Chain Reaction (RT-PCR) is still the confirmatory test which takes 2 days to report. Digital Technology is being used to manage patients, monitor cases and spread awareness and knowledge [7].

New technology check blood glucose levels by touch technique with no need for fingerprick [8]. Similarly point of care testing that are quick, cheap, noninvasive and reliable as well as accurate can improve the diagnostics of lab medicine.

Evolution predictors of Covid

Latest in line with the earlier variants is the new Deltacron virus which is likely going to be vaccine resistant. More sinister and resistant to treatment and vaccines are emerging every day.

Immunity and Covid

Immunity after vaccine is definitely improved as proven with the last variant of covid virus. Immunity is especially useful with those with co-morbidities like diabetes, heart disease and in the elderly. New vaccines have been approved for emergency use in

15-18 years and are effective and safe. Immunity is conferred by lymphocytes known as cluster of differentiation CD4+ T cells and T helper cells. Immunity can be increased with overall health, diet and fitness regimes.

PCR negative people have memory T cells which aid in long term immunity⁸. Patients with comorbidities and elderly have greater mortality rates as compared to patients without [9,10]. Cytotoxic killer T lymphocytes CD 8+ T cells which attack foreign microbes are rendered less effective in Covid infection. Both Cellular (B and T lymphocytes) and humoral (Plasma cells and antibodies) immune response in covid infection help to recover from disease. Covid infection causes depletion of both CD4+ and CD8+ T cells [11].

Strength of Natural Immunity and Covid –

Elderly individuals are at risk because of their deficient immune capacity and lower ability for regenerative epithelial cell repair. Preexisting diseases like coronary artery disease, diabetes, cancer, pose high risk.

Timing of RT-PCR and Covid

Oropharyngeal and nasopharyngeal swabs are collected in dipped in preservative for transport and processing of the sample by RT-PCR. It identifies the virus if present and quantifies it by the viral load. It is done in symptomatic patients.

Vaccines and covid

Herd immunity occurs when majority become immune to a

disease, making the spread of disease from person to person unlikely. It can occur through natural infection or vaccine [12].

CoVac-1 is an adjuvanted vaccine candidate that includes 6 SARS-CoV-2 peptides recognized by recovering patients' T cells [13].

Durability of immunity among evolutionarily close coronavirus relatives of SARS-CoV-2 to estimate times to reinfection by a comparative evolutionary analysis of related viruses SARS-CoV, MERS-CoV, human coronavirus (HCoV)-229E, HCoV-OC43, and HCoV-NL63 revealed protection could last from 3 months to 10 years. Reinfection will be increasingly common [14, 15]

MRNA vaccines, such as Pfizer-BioNTech and Moderna, confer immunity but do not affect DNA.

Covaxin by Bharat biotech and Covishield are the vaccines in use in India. Covaxin is a killed vaccine while covishield is live attenuated vaccine. Some other vaccines in use are Corbevax – protein subunit vaccine, Novavax – contains part of coronavirus spike protein, Sputnik V- adenoviral based two part protein, a cocktail vaccine, Sputnik Light – single dose, recombinant adenoviral 26 vector against s protein increases IgG and gives immunity, Johnson and Johnson, Zydus Cadila.

DNA Vaccine and covid

The first DNA vaccine for covid is prepared and marketed by India under brand name 'Nassal'. DNA vaccine in India is manufactured by Zydus Cadila and called Zycov D. Other countries soon brought out their DNA vaccine. Sputnik V is a DNA vaccine from Russia made with recombinant adenoviral vector, r Ad36 with covid spike protein gene ligated together, forms an episome in the nucleus of human cells and has proven to give definite protection and increased immunity against covid.

Diet and covid

Fish and nuts are good for recovery and health. Avoid red and fatty meats, butter and full-fat dairy products, palm oil, coconut oil, solid shortening, salt, sugar, Trans fats and oils. Cook meat, poultry and eggs thoroughly. Consume high protein rich foods, lentils, cottage cheese, and yogurt, soluble fibre in terms of fruits and vegetables, oats. Limit sugar, salt, fat, fried food intake. Keep hands, kitchen and utensils clean Prepare home-cooked meals. Stay hydrated with plenty of fluids. Keep up fruit and vegetable intake. Include dates, sesame seeds, milk with almond, turmeric, cinnamon, cardamom, pepper, jaggery, Bajra soup, carrots, green peas, cumin, garlic, hummus, pumpkin, ragi, jowar. Guava, apple, banana, strawberry, cantaloupe melon, grapefruit, pineapple, papaya, orange, green bell peppers, garlic, ginger, kale, lime, coriander, broccoli, green chili pepper, maize, oats, wheat, millet, brown rice, roots such as yam, potato, taro or cassava, nuts like almonds, coconut, and pistachio, fish, eggs, and milk meat and beans. Carrots, turnips, potatoes, beets, onions, squash, cabbage, apples, melons, oranges, grapefruit, lemons, and limes, Zinc, iron, and vitamins A, B 12, B6, C, and E are essential for the maintenance of immune function.

Lifestyle and covid

Yoga, meditation, stress relief, exercise, relaxation, breathing

exercise are keys to long lasting and good health. Mediterranean diet pattern, consist mainly of fruits, vegetables, cereals and less of red meat is considered a healthy style of eating. Lifestyle changes like staying mostly indoors, reduced physical activity, social distancing, avoiding gathering, sneezing coughing in handkerchief and clean properly, avoid crowded places, wearing masks, Workplaces to use video conferencing, virtual meetings and lockdown during outbreaks.

After MERScov, covid 19, SARScov2, delta, omicron BA2, neocov, deltacron variants are some of the latest varieties of covid.

Pathophysiology of covid

Covid 19, SARS Cov 2, Omicron variants affect by the Renin Angiotensin mechanism blocking angiotensin converting enzyme which leads to buildup of fluid in the lungs because epithelial cells lining of lungs cannot clear the water drainage machinery leading to acute respiratory distress syndrome or ARDS and lung collapse. ACE 2 receptors are mainly responsible for attachment and entry into pulmonary epithelial cells and viral spike protein S2 for entering pulmonary epithelial cells and taking over host cell machinery.

Diagnostics and covid

Reverse transcriptase Polymerase Chain Reaction or RT PCR is the confirmatory test for covid. Covid virus is an RNA virus and reverse transcriptase enzyme is used to form a single stranded DNA from the RNA of virus which is then converted to double stranded DNA. First at temperature of 95 °C the double stranded DNA undergo denaturation or melting or separation into individual strands. Then at 55-58°C the Primers undergo annealing to the target DNA template. They prime the single stranded DNA so that DNA polymerase can add deoxyribonucleotides and complete gene transcription. RTPCR can be one step or two step process. Primers may be made from complementary DNA. Thereafter the DNA polymerase, Taq Polymerase or Pfu Pyrococcus furosus undergoes polymerization at temperature of 72° C. 30 cycles are repeated to form a billion copies of the virus and which are analysed for the target genes and their copy number. Both open and closed system RT PCR²³ techniques are used for diagnosis of covid. Microbiological tests like antigen tests and reverse transcriptase Polymerase chain reaction RTPCR, True NAAT, and CBNAAT.

Biochemical diagnosis in covid

Biochemical tests include Ferritin; Procalcitonin Liver Function tests Interleukin 6, hsCRP, Lactate dehydrogenase. Alanine aminotransferase or ALT, is increased in severe covid. Urea, creatinine are increased in severe covid. White blood cells, WBC counts are increased. Blood neutrophil and lymphocyte counts are increased in severe covid. Troponin levels are high in covid. CRP levels are high in covid. Procalcitonin or PCT predicts the severity of infection and serial PCT measurement predicts prognostic implications. Chemiluminescence is used to estimate procalcitonin levels. It is 116 amino acid secreted by parafollicular C cells of thyroid gland which is cleaved to form hormone calcitonin. In Covid infection it is secreted by many extra follicular tissues mediated by inflammatory tumor necrosis factor alpha,

TNF α and interleukin 6, IL6. LDH blood test is done as a marker of tissue damage. In covid it predicts the severity of disease and mortality Ferritin an inflammatory marker is increased in covid disease and cytokine storm. Interleukin 6 is the main effector chemokine that causes inflammation of respiratory system and acute respiratory distress syndrome among the myriad of chemokines released known as cytokine storm. Pathological tests D-dimer, Prothrombin Time is increased in severe covid.

Mortality and covid

3.4% of infected cases have died due to Covid infection worldwide

Treatment and covid

Besides antibiotics, anti-inflammatory medicine, vitamin C, D, Zinc is useful.

Ayurvedic alternatives like chyawanprash, gooseberries, giloy, kadhas, and coconut water are useful.

Hot water, soups, plenty of fluids and rest are helpful.

Antiviral medicines are being used for treatment of covid.

Monoclonal antibodies containing IgG being increasingly used in

treatment of covid disease.

New advancement and covid

Recovery from Covid will require intense innate and acquired immunity and epithelial regeneration.

Stem cells therapy may help in regeneration of new effective cells with strong immunity against Covid.

Mitochondrial increase in cells may be helpful as it will enhance respiration and generation of ATP.

Ways of containment and covid

Staying indoors

Avoiding rains and taking all precautions in rainy season

Avoid overcrowding

Automation in technology, industry, education

Greenery promotion

While science and technology have pros they have cons too. The viral vectors that are used in advanced genomics and research tools may also have to contribute in the ongoing pandemic.

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