COVID-19 vaccines- A closer look

The Oxford vaccine (ChAdOx1 nCoV-19 vaccine) trial interim data were recently published in the Lancet. This randomized controlled trial was conducted in the UK, Brazil and South Africa. Both safety and efficacy were tested. The control was the meningococcal vaccine. The primary outcome were rates of symptomatic COVID 19 infection. This is a replication-deficient chimpanzee adenovirus vector containing the SARS CoV2 spike protein gene.

The 11,636 participants received 2 doses roughly 1-2 months apart. A small subsection (around 3000) inadvertently received a lower dose of the first vaccine. The majority of participants were between 18-55 years and only 12% were above 55 years of age. The efficacy was around 62% in the vaccinated group and 90% in the group which received the lower dose initial vaccine. The reason for this is still unclear. There was one case of transverse myelitis in the vaccine group and one case of hemolytic anemia in the control group. Two more cases of transverse myelitis in the vaccine group were considered to be unrelated to the vaccine. One because of an underlying multiple sclerosis and one because it occurred 68 days after the vaccine.

A subset of participants were also monitored using weekly nasal swabs for asymptomatic infections. It appears the low dose subgroup is 60% effective in preventing asymptomatic infections. This data was not evaluated in the Moderna and Pfizer vaccine. Prevention of asymptomatic infections is an important consideration for policy makers.

The vaccine will be marketed by Astra Zeneca at a relatively low cost of $2-4/ dose. In contrast the Moderna vaccine will cost $37, the Pfizer vaccine $20 and the Sputnik vaccine $10 per dose. The Oxford vaccine has an added advantage. It requires only routine cold chain refrigeration unlike the ultra low freezers (<70º C) which the mRNA vaccines (Moderna and Pfizer) require.

In summary, though the Moderna and Pfizer vaccine have a superior efficacy of over 90% in preventing symptomatic COVID19 infections, the practicalities like cost and ease of storage may bias governments towards the Oxford vaccine.In India, the Serum Institute is manufacturing the Oxford vaccine as Covishield and another vaccine Novavax which has SARS CoV2 spike proteins packaged as nanoparticles. Bharat Biotech and ICMR are producing an indigenous inactivated virus vaccine "Covaxin". Dr Reddy's is partnering the Russian vaccine Sputnik V with an efficacy of 92%.
(*Lancet December 2020*)

COVID-19 risk in planes and other mass transport

It appears that therisk of SARS-CoV-2 transmission during air travel are not as high as imagined. In commercial jets, inflow of air occurs from the roof downwards to the floor on the aisle side, from where it is then swept out below the seats. Air changes occur about 20-30 times per hour. Half of the air inflow is from outside and 50% is recirculated through HEPA filters which are highly effective in clearing out viruses. There is very little flow between rows. A US Department of Defence modelling using mannequins found that a person would need 54 hours of exposure to contract an infectious dose of the virus in a plane. Suggestions for passengers include wearing a mask at all times, adjusting the sir nozzle full blast towards ones face, sanitising hands regularly and avoiding touching ones face.

Suggestions for bus travel include taking a window seat and keeping the window open, using a mask and limiting travel to short bus rides. In taxis, keeping the windows open, limiting rides to under 15 minutes, avoiding conversation as far as possible beside masking are the best strategies.
(*Scientific American 19 November 2020*)

The mRNA vaccine

Scientists have long been tinkering with the idea of an mRNA vaccine. This is because they can be rapidly and cheaply manufactured compared to traditional inactivated viral vaccines. The Pfizer and Moderna COVID 19 vaccines are the first to reach such an advanced state of approval. In the Pfizer vaccine, the mRNA coding for the spike protein is enclosed in a lipid nano particle formulation. After entry into cells the mRNA is used by cellular machinery to code for the spike protein. It is expressed on the cell membrane and sparks the immune response.

Safety and efficacy results of the Phase III trial studying the Pfizer vaccine have also been recently published in the NEJM. This RCT was conducted on 43,448 participants above 16 years of age. It's efficacy in protecting against symptomatic COVID 19 infection was 95%. Fatigue and headache occurred in about half of the participants and fever in around 15%. Axillary lymphadenopathy was reported in 0.3%. Younger participants had more adverse effects than older participants. Britain has approved the Pfizer vaccine for emergency use in the UK, but added a caveat after 2 NHS workers developed anaphylactoid reactions after the vaccine. People with prior history of allergic reactions are to avoid its use.
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