



## Arjun Kalyanpur

*Dr Arjun Kalyanpur is the MD, Chief Radiologist and CEO of, Teleradiology Solutions, a global healthcare company headquartered in Bangalore, that reports radiology scans for over 150 hospitals in the US, Singapore, India, Europe and Africa. He pens down his thoughts on how as the corona scare pervades our world, it is natural to wonder why it and other deadly virus pandemics such as Ebola and Zika are on the upswing in the new millennium, even as the bacterial epidemics such as plague and cholera that ran rampant in past centuries are close to nonexistent today.*

At the time of writing this piece, the Corona virus has infected 45,000 people with over 1100 deaths and is being described as significantly more virulent than its previous cousin SARS (the current coronavirus has been named as SARS-CoV-2). While in the past our ancestors feared often-fatal bacterial diseases such as diphtheria, whooping cough and tetanus, today instead we are afflicted by epidemics of viral diseases such as dengue, chikunguniya and Japanese encephalitis. As the Corona scare pervades our world, it is natural to wonder why it and other deadly virus pandemics such as Ebola and Zika are on the upswing in the new millennium, even as the bacterial epidemics such as plague and cholera that ran rampant in past centuries are close to nonexistent today.

To further emphasize this phenomenon: in recent years, an epidemic of swine flu swept the states of Gujarat and Rajasthan with 33000 documented cases and over 2000 deaths. In previous years, the same virus (H1N1) had claimed the lives of 981 people in 2009 and 1,763 in 2010. Japanese Encephalitis, another viral infection causes an estimated 50,000 cases and 15,000 deaths annually (a mortality rate of 30%). In the early 2000s, the SARS and MERS virus infections claimed hundreds of lives in the South East of Asia as well as the Middle East respectively. These are not numbers to be taken lightly.

Here are some of the reasons for this recent proliferation of lethal viruses. As you will note, several of them have nothing to do with the virus and everything to do with us, the human race...

- Overpopulation – Viruses breed within humans, and require human cells in order to replicate. The world's population increases by 1% each year. This means that potential virus incubators are continuously increasing. Also, the world's population is also becoming increasingly urban, as a result of which people are living in closer proximity, which is particularly conducive to the spread of viruses, as human to human transmission is facilitated by living in overcrowded conditions.
- Closer contact between humans and animals/livestock. The current Corona virus epidemic is believed to have originated in a market in Wuhan where carcasses of wild animals such as bats, snakes and baby crocodiles are on display. The Ebola virus epidemic that decimated parts of Africa not too long ago was believed to be the result of contact between humans and a species of tree-living bats. As human population overgrowth continues on its unfortunate march, the increasing decimation of forest space brings humans into ever closer contact with species that were otherwise confined to wildernesses.
- International travel – a 2016 survey conducted by Visa indicated that world travel would increase by 35% over the subsequent decade. This dramatic rise predisposes to virus spread across international borders, something unheard of in the pre-jet airliner days of a century ago. This in turn is predisposed to by an increase in the number of airports, decline in airline fares and increasing affordability by consumers. Ironically the same survey predicted that China, the source of the current pandemic, would lead the way in this growth, with an estimated 85% increase in travel spend by 2025. Chinese travellers were projected to nearly double their spending to US\$255 billion during this period, representing nearly one-sixth of the global travel spend.
- Climate Change – As the world becomes increasingly warmer, the result of our constant and consistent depletion of the planet's natural resources and release of carbon dioxide into the environment, the patterns of virus spread change and increase. This is in turn related to proliferation in mosquitoes and ticks that transmit these viruses. An editorial in the journal *Clinical Microbiology and Infection* dryly states: "alterations in average temperature, humidity and vegetation quality, as well as large-scale movement of animals, will inevitably be accompanied by changing patterns of arthropod distribution and the virus diseases transmitted by these arthropods." A 2019 article in the journal *Clinical Medicine* identified three insect borne virus strains, namely dengue, West Nile virus and tick-borne encephalitis whose increased transmission can be directly related to climate change. The same article projects that the UK will begin to experience dengue by the year 2100 as a result of climate change.

- **Airborne infections:** All the Corona virus infections spread person to person through the air which makes them especially difficult to contain. Workplaces, aircraft, cruise ships and other closed environments in which afflicted persons may spread the disease to healthy individuals are particularly at risk. At the time of writing, a cruise ship with over 3000 people aboard is held off the Japanese coast in quarantine, with over 175 people having contracted the infection. The evocative term “floating petri dish” (a petri dish is a laboratory container for cultivating germs) has been coined to create a spectre of the risk that cruise ships provide in terms of incubating and spreading infection.
- **Asymptomatic infection period** – unlike its predecessor SARS whose symptoms manifest relatively early, the Corona virus has a longer period where the person though infected and infectious to others, is completely asymptomatic. As a result, unlike in other diseases where the person can be immediately quarantined, with Coronavirus infection the asymptomatic patient may unknowingly continue to infect other healthy persons for a relatively prolonged period, rendering it even more dangerous.
- **Viruses’ adaptation to human hosts:** The longer viruses circulate among people, the more time they have to evolve adaptations that are advantageous to them – and more dangerous to humans. As viruses adapt to human hosts they become increasingly resistant to the host’s immune system. Adaptation to people is one reason why controlling emerging virus epidemics like swine flu is so important, and so difficult. “The more humans that get infected, the greater the chances of a virus adapting itself to humans,” is an observation by Dr Anthony Fauci, eminent immunologist and AIDS expert.
- **Prevention of Spread of Infection:** While simple measures such as frequent handwashing, the use of facemasks and keeping a distance from others who may potentially be infected are all means of protecting oneself against viral borne infections, these are arguably not things that we might wish to have incorporated into our daily existence, which is probably why they are not routinely adopted and typically make an appearance only at the times when such epidemics have already made their presence felt. Other routine measures for boosting immunity such as intake of Vitamin C, honey and fruits and getting adequate sleep are always beneficial but again, these simple measures are not always given adequate attention by us on an ongoing basis which is ultimately what is needed in order to prevent infection.

- **Virus Mutations:** The current coronavirus has been named as SARS-CoV-2 as the International Committee on Taxonomy of Viruses have determined that it is the same species as SARS but a different strain of the species. In general, the fundamental difference between viruses and other organisms is that viruses multiply faster. Since the frequency of mutation is directly linked to the frequency of reproduction, the rate of mutation in viruses is higher than in other organisms. Because viruses are constantly mutating they are more challenging to detect, control and treat. Essentially the rate of mutation of viruses renders challenging the development of effective vaccines. However it should be noted that there is a spectrum of virus mutations and so no reason for panic. Some viruses such as the measles virus are stable and so the vaccine for measles is an effective one in the long term.
- **Vaccine development:** While the time to develop a vaccine in the laboratory has dropped to as low as a few weeks, the challenge lies in the time taken to conduct the clinical trials necessary to establish the safety and efficacy of the vaccine. Plus, the production capacities of the organizations making the vaccines are finite and limited, while the potential clientele is the population of the entire globe. Typically therefore the vaccines need to be reserved at least in the early stages of production, for the most vulnerable sub-populations namely children, the elderly, and healthcare workers who are exposed to the infection.

Today healthcare is at a crossroads where legacy infections such as Tuberculosis while somewhat controlled, are not yet completely eradicated, while at the same time new viruses and superbugs are emerging in force. And if that were not enough, we have lifestyle diseases such as cancer, stroke and heart disease that are on the rise in terms of prevalence. We need to keep things in perspective that ultimately the solutions that can deliver the human race from such killers do not require rocket science/scientists but lie in disease prevention by profoundly simple and basic preventive measures such as sanitation, population control, and nutrition. Sadly, however, while we may talk about disease prevention until the cows come home, as the current Corona virus epidemic has highlighted, our actual practical approach to it at a global, national or system level is often divided, contentious and protectionist/nationalistic, much as in the way it is to climate change. Until we get our act together and work as a global community to effect change, we will unfortunately continue to be the victims of killer virus diseases.