CORONAVIRUS SPECIAL

DIGITAL ISSUE

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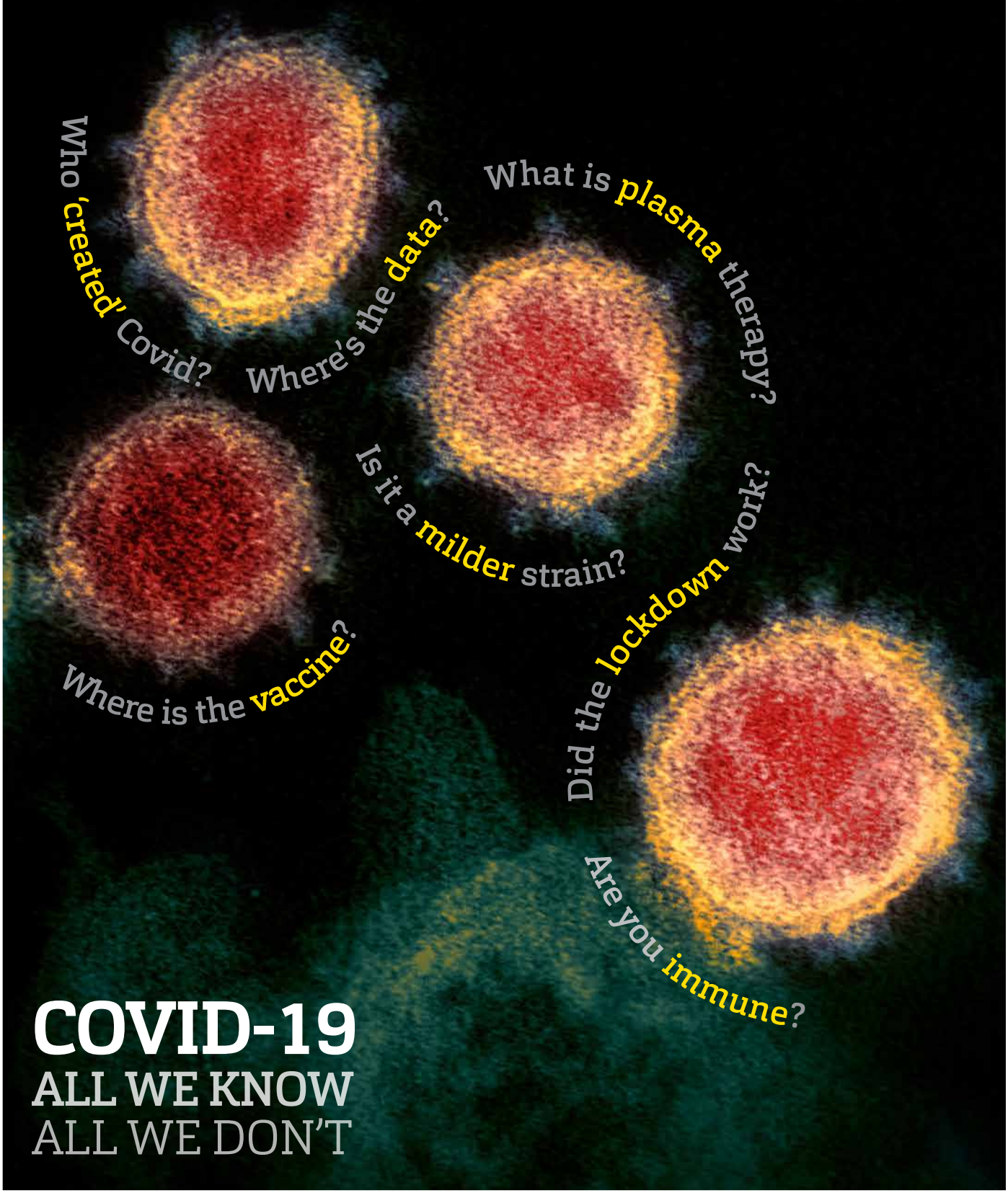

COVID-19
ALL WE KNOW
ALL WE DON'T

Outlook

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COVID-19 SPECIAL

Issue Editor: Sunil Menon

Cover Design: Deepak Sharma

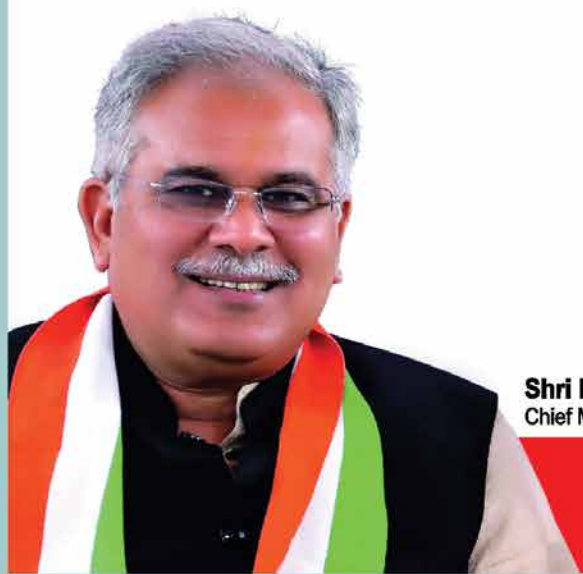
NYAY
Initiated from Chhattisgarh

Rajiv Gandhi Kisan NYAY Yojana

- Direct Benefit Transfer of Rs. 5700 crore into accounts of 19 lakh paddy, maize and sugarcane farmers in 4 installments
- Disbursed Rs.1500 crore of first installment on May 21, 2020, former Prime Minister Bharat Ratna Rajiv Gandhi's martyrdom day

Landless Agro-Labourers NYAY Yojana

- A High Level committee constituted to prepare an action plan to provide fixed income to Landless Agricultural Labourers

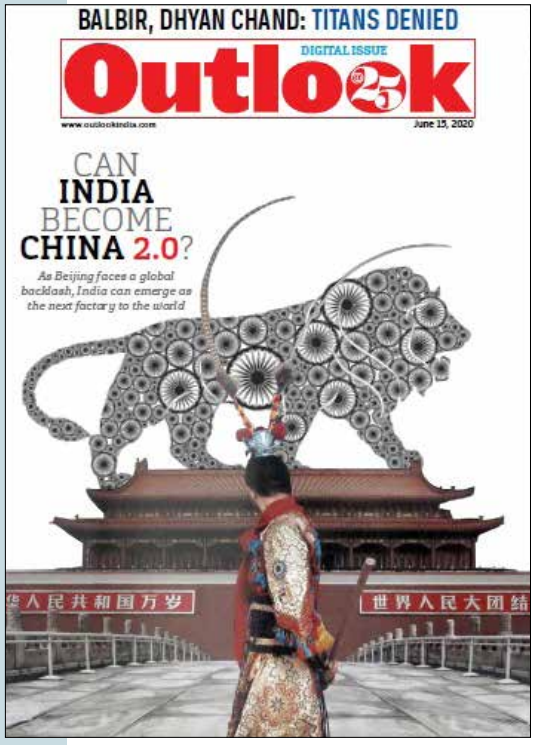


Shri Bhupesh Baghel
Chief Minister, Chhattisgarh

Determined to Deliver

Chhattisgarh Samvad R.O.S. No 11225

15/6/2020



The Tiger **Blows Fire**

NAINITAL

Vipul Pande: This refers to the cover story *Can India Become China 2.0?* (June 15). The pandemic has disrupted the supply chains of many goods originating from China. This has made countries realise that overdependence on China isn't prudent. Moreover, there is Beijing's opaque, stubborn and aggressive attitude to contend with. With countries, especially those that do not toe its line, wary of China's increasing clout, opportunities have opened up for India. Its positive image and vast market can draw big companies to its shores. However, this entails a lot of spadework to create an investor-friendly atmosphere. Cocooning Indian manufacturers in the name of self-dependence isn't the right way forward. Let them compete on a level playing field.

BANGALORE

H.N. Ramakrishna: India and China share one of the world's longest land borders and there have been several conflicts. In 1962, China attacked India while ostensibly professing the motto 'Hindi Chini Bhai Bhai'. The present flare-up cannot be viewed in isolation—it is part of China's quest for hegemony. Similar incidents are occurring in the South China Sea, Senkaku Islands and the Taiwan Strait. China does not hesitate to weaponise trade. It plays by its own set of rules, whether in the domain of trade practices or territorial disputes. Its message to neighbouring nations: do not support USA in the US-China standoff. Many might consider its economic strength a positive, but the country's rise as a global power is not making it popular with its neighbours. China should not overlook the fact that in the event of a cold or trade war with USA, it will need support from its Asian neighbours, including its major trading partner India. More altercations are likely, but fortunately, communication channels between the two countries have been and, hopefully, will remain open and strong.

NAVI MUMBAI

C.K. Subramaniam: It is evident that China is not comfortable with India's strengthened infrastructure along the border. As a sovereign nation, India is within its rights to take aggressive steps. Unfortunately, the government has not thought it fit to take the nation into confidence or share the ground reality. This may lead to spiralling misinformation. While the government is not expected to disclose all its plans for security considerations, as an elected democratic government, it is obliged to tell the nation about the extent of incursions by the Chinese army. It is time to take citizens and the Opposition into confidence.

CHENNAI

K.R. Narasimhan: India and China should fight COVID-19 rather than indulge in brinkmanship across the LAC. At a time when India is facing a significant increase in cases and there are fears that a second wave could engulf China, border clashes are uncalled for. But the timing of the border incidents comes on the heels of India's decision to clamp down on Chinese FDI investments and encourage Western and Japanese companies to shift their production bases away from China. India also supports Taiwan's participation in the WHO as an observer. Despite the PLA's incursions, India's infrastructure upgradation close to the LAC will continue. This has irked China to no end. Softening its stand, Chinese ambassador Sun Weidong said that China and India pose no threat to each other. While India has shown a willingness to confront China to safeguard its territorial interests, it should also try to diffuse the standoff through talks.

Hunger Games

DEHRADUN

Rakesh Agrawal: This refers to *What After Home?* (June 8). Terming the workers forced to return to their homes as migrants is rubbing salt on their bleeding wounds. Is any doctor, engineer, software professional, poet, writer, actor or politician branded a migrant? If so, the entire Bollywood fraternity and almost every politician and bureaucrat in Delhi and state capitals would be a migrant. We, the people of India, the city-based, urbane middle-class professionals and elites, have failed the workers who built our dream worlds. We have remained as we are—self-centred, inward-looking

and insensitive—while millions of poor people have been left at the mercy of a government that utterly lacks empathy and foresightedness, like most of us.

MUMBAI

M.R. Jayanthi: The overnight declaration of lockdown to combat the spread of COVID-19 has harmed people and the economy. The country has not healed from the wounds of demonetisation, yet the government has pummelled it further. The Centre should have been considerate and strategic; it should have scheduled consultations with experts and stakeholders. The proverb 'haste makes waste' has come true with the sudden declaration of the lockdown. Brainstorming is vital for any decision to be effective and successful.

MARUTHANCODE

G. David Milton: The Supreme Court's belated order to provide free food, water and transport to migrant workers appears to have been passed to atone for its initial refusal to intervene to secure their welfare. The apex court could have crowned itself with greater glory by taking the desperate plight of migrant workers far more seriously at the beginning of the crisis itself. The country's top court took an unforgivably long time to take note of their misery and ask the government to provide succour. Even now, there seems to be no end to the suffering of migrant workers. Tragic deaths due to hunger, heat, dehydration and exhaustion continue to occur due to the government's ill-disguised apathy bordering on callousness. Of particular poignancy was the image of a child trying to wake up his dead mother at a railway station. Running of Shramik Specials looks like tokenism when it falls far short of the requirement to ferry lakhs of migrant workers. It is not that the Indian state is incapable of ensuring the safe return of workers to their native places, but it has been unwilling to recognise the value of their lives.

MUMBAI

Ramani C.K. Jayanthi: This refers to *Thank You, Nurse* (May 4). Nurses from Kerala, who form the backbone of almost every hospital in Mumbai, have left in droves, crippling operations at several major hospitals. The contribution of Kerala in the medical field is commendable. In Mumbai as well as other parts of the world, nurses from Kerala are a common sight. Nurses are the most important pillars of the medical fraternity—abroad, they are one rung below doctors, but in India, they are not accorded much respect. Nurses are vital for healthcare and should be compensated with high salaries and more time-off.

MUMBAI

Bholey Bhardwaj: This refers to *The Abusage Of Rhetoric* (June 8). It's not a coincidence that Nepal woke up to redraw its map and claim Indian territories—it's a well-thought plan to upstage India at China's behest. Nepal is culturally and geographically aligned with India. It could never have mustered the courage to make an issue out of border roads without China's clandestine support. India will do well to placate Nepal and increase it's presence there, for ignoring it may push the Himalayan nation into China's fold.

FROM THE Daak Room

Dear Ruth, I have some more very bad news to write. I guess if things keep on like this, by the end of the year, there will be nobody left in town. Harold Ashley died yesterday at Camp Wilton(?) and his body is to be brought to Middleboro as soon as the government can get things straightened out.

As things are, I can give you no further information about the funeral, only that in Massachusetts, no public funerals or any other gathering can be held. Schools, churches, lodges, clubs, book rooms etc are closed down tight. All Red Cross workstations are suspended and they have cut out some of the electric car trips as so many men are sick.

Just as soon as I hear any more about Harold's funeral, I will let you know. I will also look out for the flowers. I was intending to write on Saturday, but Captain Doten told me that Harold was improving, so I thought I would be able to give you some good news... but about 8 pm today Harold Doten came up to the house on his motorcycle and told me the sad news. He also said that Mel Shurtleff died at Camp Devens yesterday at almost the same time as Harold.

Yesterday I worked around the yard all day, getting things cleaned up so that I could... then rest this morning, I filled one barrel with Baldwins so that we might have a few in case we had a high wind. On Friday we had seven funerals and Saturday about as many so you see what we are up against. In Brockton, three days last week, there was one every hour. I am glad that you are having so good a time and that you can be on vacation even if I can't get one as things are very rushing at present.

Last Friday I went to work at 8 am and quit at 8:30 pm with just one half hour out for supper. For dinner, I had two sandwiches so you can imagine what we are up against.

I am sending you the OLD COLONY and the Middleboro paper and also a card which came from Abington. If I find it is all right for you to go to the funeral, I will telephone you, but do not go unless I do for at this time it doesn't pay to take any chances.

I hope you have written to Harry's mother explaining the circumstances, for I should feel rather cheap if I should happen to meet any of them and not have them understand just how things were. Captain Doten was just in and told me to tell you not to think of coming as Harold will be buried just as soon as his body arrives and there will be no funeral. Dr. Jackson's wife is very ill.

Hoping you will not catch anything and that you are still getting better with the...

With Love, Chick....Plymouth, Massachusetts, September 30, 1918

Bad News A letter written by a man in Plymouth, USA, during the Spanish flu

Oil India Ltd firefighters—Durlav Gogoi, a former state football team goalkeeper, and Tikheswar Gohain—were killed trying to contain a massive fire that broke out at an oil well blowout site, barely 1.5 km from Dibru Saikhowa National Park in Assam's Tinsukia district on Tuesday. Many houses were damaged. Villages were emptied out after the blowout a fortnight ago.

Indian and Chinese troops have "disengaged" and returned to their previous positions along the Line of Actual Control (LAC) in Ladakh following military-level talks by both sides to defuse a faceoff since May 5 when soldiers clashed in Pangong Tso.

Reading the *Communist Manifesto*, Lenin's works, Mao's life, calling friends 'Comrade' and greeting them with 'Lal Salaam' are among the reasons cited by the NIA for charging farmer leader and social activist Akhil Gogoi of Assam under sedition and anti-terrorism laws. Gogoi and three other Krishak Mukti Sangram Samiti (KMSS) leaders were arrested for protests against the Citizenship (Amendment) Act last December.

Heartland Heartburn

Runaway Covid, sulking loyals...MP BJP also has Scindia playing hardball

PTI

Return hug—Jyotiraditya Scindia and Shivraj Singh Chouhan

Puneet Nicholas Yadav

MADHYA Pradesh health minister Narottam Mishra is a busy man these days. His schedule, however, isn't packed with matters linked to the steadily rising coronavirus infections in MP. Instead, it is the health of the BJP government that has taken primacy for Mishra. While the state has been adding nearly 200 new COVID-19 cases daily, the health minister has been trying to pacify BJP veterans still sulking over the induction of Jyotiraditya Scindia's loyalists into the party in March.

Mishra was among the five ministers inducted by Chouhan into his mini-cabinet on April 21, nearly a month after the BJP returned to power in the state following a 15-month hiatus. Mishra's efforts comes at a time when chief minister Shivraj Singh Chouhan has been struggling to finalise his cabinet expansion plan while also preparing for 24 assembly bypolls. The bypolls—16 of them within the Gwalior-Chambal region—have been necessitated because of the defection of former Congress MLAs loyal to Scindia who switched to the BJP, making way for Chouhan's return as CM by toppling the Congress-led Kamal Nath government.

Sources say Chouhan had finalised a blueprint for cabinet expansion recently after discussions with state BJP president V.D. Sharma, party leaders Vinay Sahasrabuddhe, Suhas Bhagat and some ministerial hopefuls. The plan was "put on hold by the central leadership because several senior MLAs were unhappy after being informed that they may not find a place in the cabinet because Scindia's men have to be accommodated," a BJP leader says.

Senior BJP MLAs feel that Scindia's men would be favoured above them for cabinet berths and that party veterans who lost the December 2018 assembly polls against these newcomers may be permanently elbowed out of electoral politics. BJP veteran and Chouhan's former cabinet colleague, Gauri Shanker Shejwar says, "The BJP used to value its *karyakarta* but now those who have fickle loyalties get rewarded."

Chouhan's five-member cabinet has two ministers who are Scindia loyalists. Sources say Scindia wants at least four more cabinet berths for his men in the upcoming cabinet expansion. A section of BJP leaders, however, wants the induction of these former MLAs made incumbent on their ability to win the bypolls.

Amid this confusion, rumours that Chouhan may go for another mini-cabinet expansion instead of an extensive one have begun to gain currency in Bhopal. This, say BJP insiders, would give Chouhan more time to broker peace between old warhorses and Scindia. Mishra, who played a key role in the defection of Scindia and his loyalists, has been tasked with playing peacemaker between party veterans from the Gwalior region and Scindia.

India's Largest Rice Brand Steps Forward to Serve Millions

KRBL Ltd. - World's largest rice millers & owners of Brand **India Gate**, along with Michelin star **Chef Vikas Khanna** recently organized world's largest food drive "Barkat" with more than 2 million meals being distributed to help vulnerable marginalized communities.

KRBL has been supporting Vikas's noble effort of feeding millions of migrant workers, daily wagers, poor and under privileged people throughout the Covid-19 lockdown period across the country.

In order to lift the spirits of people and help them during these tough times, **Chef Vikas Khanna** started this movement to #FeedIndia. **Barkat**, an event under this initiative, hosted by **Chef Vikas Khanna** along with India Gate saw huge success as more than 10,000 bags containing dry rations were distributed across different parts of Delhi-NCR serving 2 Million meals to those in need.

Speaking regarding the campaign, CMD **KRBL-India Gate** Basmati Rice- Mr Anil Mittal Said "At **India Gate,** we deeply associate ourselves with the old Indian values of sharing, helping the needy and underprivileged within our society. During this pandemic, we joined hands with **Chef Vikas Khanna** to provide meals to lakhs of migrant workers, poor families, slum dwellers and daily wagers who were struggling for basic necessities every day. Vikas's **#feedindia campaign** is a big step towards bringing happiness into thousands of marginalized communities and families who were left out from any help till now. We wish Vikas best of luck for his astounding endeavours and pledge our support for many more such initiatives in the future as well"

Chef Vikas Khanna, said, "Some partnerships are beyond commerce, it becomes a part of your being … this for me is one such collaboration. I am extremely proud of the work we have been able to do and ensure food for millions of people together. **India Gate** truly epitomised giving back to the community and we surely see this as a long term commitment to ensure food on every plate. I take immense pride in thanking **India Gate** for their constant support during the pandemic. This initiative would not have been possible without their support. We hope to work together on more such initiatives and serve meals to those in need."

KRBL Ltd. has been extending support to feed lakhs of people since the start of lockdown and has provided more than 20 lakh meals under their campaign #UmeedhainHum. It is an initiative to get food to old- age homes, orphanages & leprosy centres and millions of other families in India who are not only fighting against Corona, but also against hunger.

Know more at - www.indiagatefoods.com/umeed

PTI

Vendors are back— Chikmagalur, after lockdown restrictions were eased

SNAPSHOT

PTI

Efforts under way to retrieve the body of the pregnant elephant which died in Kerala's Palakkad

The Trunk Call is an SOS

Salik Ahmad

WILDLIFE

Its imposing bulk, with its pendulous proboscis, is imposing; its capacity to wreak havoc in ancient warfare or if it's disturbed is terrifying too. But the elephant is an acutely sensitive and gentle animal that follows rigidly atavistic social norms. The whole herd celebrates a newborn calf; when a male reaches reproductive age, it is pushed away from the herd by matriarchs to avoid inbreeding—elephant society is one of the most evolved in nature. Along with its majesticity, it is celebrated as such too—in traditional tales in the Panchatantra and the Jatakas it's held up as a creature imbued with wisdom; as a rare animal which sheds tears, like us, from emotional distress (elephants experience post-traumatic stress disorder like humans from trauma), it's perhaps a natural choice for ancient, and modern-day, anthropomorphism. Thus, the outpouring of national grief over the death of a pregnant elephant in Kerala's Palakkad is natural. Yet, in the same week, two more elephants would have died a death as painful somewhere else in India. According to government data, an average of 102 elephants died unnatural deaths every year between 2014 and 2019.

Consider this: a train mowed down five elephants in Assam's Hojai in February 2018. That year, seven elephants were electrocuted by a high-tension wire in Odisha's Dhenkanal. The Wildlife Society of Odisha says about 100 elephants were killed in accidents during 2018-19 in Odisha alone!

The Wildlife Protection Act 1972, which protects elephants too, is poorly enforced. Oversight has led to trafficking of sorts.

"Elephants travel hundreds of kilometers through fixed corridors for food. As railway lines, roads, canals, high-tension wires, and quarries disrupt these, what will the stressed animals do?" says WSO's Biswajit Mohanty. They have little choice but to venture into villages and raid farms, leading to man-animal conflicts. Elephants have killed over 2,300 humans between 2014 and 2019.

The destruction of elephant corridors is a chief reason leading to deaths. But who is to be blamed? The government, largely. The ministry of environment last year gave clearance for mining in 1,70,000 hectares of pristine Hasdeo Arand forests in Chhattisgarh. They include elephant corridors. The National Board of Wildlife recently allowed Coal India Limited to conduct open cast mining in an additional 41 hectares of the Dehing Patkai Elephant Reserve in Assam.

While wild elephants (about 27,000) face disruptions, the lot of those in captivity is worse. Captive elephants in India number between 2,600 and 3,000—used for temples, tourist rides, even for wedding processions. To subdue and train young elephants, mahouts subject them to great pain. The situation of tuskers is no better in temples.

How does this happen when the Wildlife Protection Act, 1972, gives elephants the highest protection? Ownership certificates, initially permitted by the Act for those already in possession of elephants, have continued, owing to poor enforcement of the law. Oversight has led to a trafficking of sorts.

"At times, young elephants are caught in the Northeast and sent to temples in Karnataka, Kerala, Tamil Nadu and Gujarat. The owners claim they are unable to take care of them and are giving them away. Something does not seem right here," says Suparna Ganguly, co-founder of Wildlife Research and Rehabilitation Centre.

India, certainly, is no country for elephants.

ODISHA

Firing The Blank Mask

Sandeep Sahu in Bhubaneswar

PTI

'Scam' taints Naveen Patnaik's stellar job in fighting the pandemic

THE 'blank cheque' is proving really costly for the Naveen Patnaik government. Speaking at the daily government briefing on the coronavirus pandemic on April 28, Hemant Sharma, principal secretary of the industries department and head of the "emergency procurement committee for COVID-19", said chief minister Patnaik had given a 'blank cheque' to buy and stock on everything needed to fight the contagion. After two cases in the Orissa High Court, an FIR by RTI activists and removal of Sharma from the committee, the 'blank cheque' is haunting the government. Tell-tale signs of corruption in the purchase of PPE kits, masks and test kits keep tumbling out.

The crux of the allegations so far is this: the state government ordered 30 lakh triple-layered masks priced at Rs 16 apiece from a Tamil Nadu-based firm on April 17 in what was a clear violation of the Centre's guidelines, which pegged the maximum price at Rs 10 apiece. Curiously, the state placed orders for the same kind of masks to a Faridabad based company at Rs 9.90 apiece barely 48 hours ago on April 15. As if that was not enough, there were wide variances in the procurement price of test kits, which were procured from three different firms at prices varying from Rs 980 to Rs 1,125 within a short time—between April 21 and May 10. RT-PCR machines, which cost Rs 4 lakh to Rs 5 lakh were bought at Rs 12.84 lakh.

With the Opposition turning on the heat and activists constantly breathing down its neck every day, the state government on June 5 removed Hemant Sharma as head of the "COVID-19 purchase committee".

Odisha ordered masks priced at Rs 16 apiece from Tamil Nadu firm, clearly above Centre's ceiling of Rs 10.

In another firefighting measure later in the day, the government also divested nine senior IAS officials of their additional pandemic responsibilities.

But the government's hurried action has failed to douse the fires as the accusations have only turned shrill in the days since then. The Nationalist Lawyers' Forum filed a writ petition in the Orissa High Court seeking a CBI inquiry into the scam. State Congress unit chief Niranjan Patnaik said the opposition party would move both the central vigilance commission (CVC) and the Lokayukta seeking high-level investigation into the "scam".

The financial scandal appears to have taken the sheen out of the state government's otherwise stellar record in fighting and containing the coronavirus.

brevis

Javed Akhtar became the first Indian to receive the Richard Dawkins Award—presented to people who uphold rationalism and scientific truth.

Ved Marwah, the former governor of Mizoram, Manipur and Jharkhand has died in Goa. He was 87. He was Delhi police chief just after the 1984 riots.

Bollywood producer **Anil Suri** has died of COVID-19. He was 77. He produced films like *Karmayogi* (1978) and the 1984 multistarrer *Raaj Tilak*.

Former Santosh Trophy player, **E Hamsakoya**, has died of COVID-19 in Mumbai. The 61-year-old former footballer was from Malappuram, Kerala.

Kannada film actor **Chiranjeevi Sarja**, who began his career in 2009 with *Vayupatra* and acted in 22 movies, died after a cardiac arrest. He was 39.

MixedShots

AIRPORT TO HOTEL IN 74 DAYS

IT could have been like the Tom Hanks movie *The Terminal*. Or worse, Mehran Nassiri, the Iranian-origin refugee who lived in a Paris airport from 1988 to 2006. But Ghanaian footballer Randy Juan Muller's residence at the Mumbai airport ended after a relatively short stint—74 days—thanks to the timely intervention of the Sena youth wing. Rudy was scheduled to fly home on a Kenya Airways flight, but international flights were suddenly suspended due to the pandemic. He bided time in the airport's fancy artificial garden and bought food from the stalls there. Airport staff helped him by recharging his phone and giving him WiFi access. A post on Twitter bought the man's plight to the attention of Aaditya Thackeray, who shifted him to a local hotel, mercifully avoiding a repeat of Mehran's fate.

FIRE THE FIRER

THE Maharashtra State Reserve Police Force should be worried. One of its jawans is so off the mark that during target practice, a bullet he fired crossed a "mountain range" (sic) and wounded a woman in Sitepaar village, Gondia district. The force has now instituted a probe team to find out how the bullet travelled "accidentally" for 3 km!

BEEP BEEP? PEE PEE

AFTER 25 years as a surgeon, Walliul Islam thought he had seen it all—until he saw a charging cord in a 30-year-old man's bladder at a private hospital in Guwahati. The man came to him complaining of stomach ache after eating a headphone cable "by mistake". A surgery found nothing in his gastrointestinal tract, but an X-ray found a charging cord in his bladder. For those who were wondering how the cable entered his urinary tract, the doctor unequivocally spelled out the anatomical nitty-gritty in a Facebook post with a heartening conclusion: "Everything is possible on earth." He also questioned the man's mental health, though it seems more a case of misdirected pleasure-seeking.

WORSHIP GOES VIRAL

SHITALA Mata, that divine healer of fevers, sores and diseases, might lately see a drop in devotees thronging her temples for a cure. For there's a new goddess in town—Corona Devi. To end the pandemic, women in several districts of Bihar are making offerings to the Devi at waterbodies—rituals generally associated with the Chhatth festival and sun god. Quite apt, we think, considering the sun has a corona too. A woman at Sarveshwarnath Temple in Brahmapura, Muzaffarpur, says she realised that the disease could only be eradicated with offerings of laddoos, sesame seeds and flowers after "watching a video". Another learnt of it in a dream. It's too early to say what the Devi thinks of her followers' oblations presented with adequate social distancing, but COVID-19 cases have been rising steadily in Bihar.

THE PRACTICAL MATHS TEACHER

IF there is one thing India doesn't lack, it's talent. What that talent might be used for is another matter altogether. Take Anamika of Mainpuri, Uttar Pradesh. The enterprising pedagogue allegedly "worked" simultaneously in 25 schools in Baghpat, Aligarh, and Saharanpur among others, earning a neat sum of over Rs 1 crore in 13 months. This despite a digital database and "real-time attendance monitoring" in UP schools. All the more easier, we guess, with a name like Anamika, which means unnameable. Too bad. We won't be able to call her for a webinar to find out the details behind her stupendous heist because she who must not be named has gone incommunicado.

ILLUSTRATIONS: SAAHIL; TEXT BY SYED SAAD AHMED, ALKA GUPTA

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Founder and Managing Consultant, Goldratt India

In conversation with

V KESHAVDEV
Executive Editor,
Outlook Business

JUNE 18, THURSDAY, 7:00, PM

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GIFTS THAT SPEAK TO YOUR HEART

Balloting a Pandemic

Social distancing at booths, virtual or e-voting, postal votes—polls in Bihar may herald era of post-COVID electioneering. But is it possible?

Boats on the Ganga during the lockdown in Patna

Bhavna Vij-Aurora

HOME minister Amit Shah spoke about Bihar's journey from the "lantern to LED" as he addressed the people of the state at a virtual rally on June 7. The BJP tried to make it look as real as possible by creating a rally-like atmosphere at the party headquarters in Delhi, giving a peek into what post-COVID-19 electioneering is going to be like. And Bihar is going to be the first big election following the outbreak of the pandemic in India. Top government sources say postponement of the Bihar elections is the last thing they would want. The assembly elections, which must be concluded by November 29, are likely to take place as per schedule in October-November and will be the trendsetter for a new kind of electoral democracy.

Though various options of virtual and e-voting are being discussed, they are all in the nascent stage yet. According to sources, the elections will by and large see voting in the traditional manner, though people will have to maintain social distancing norms while queuing up at polling booths. Virtual voting may be tried in a few assembly seats as a test case. Declining to give details of the "baby steps" taken towards digitisation of voting, chief election commissioner Sunil Arora says, "We are working on blockchain solutions to enable remote voting. The Technical Experts Committee (TEC) of the Election Commission of India (ECI) is working to develop a blockchain system that would allow voters to exercise their votes when they are physically away from their constituency." The TEC comprises experts from IITs across the country.

The ECI is holding an exhaustive meeting on June 15 to discuss the way forward. "CEC Arora has always reiterated that elections will be held on time," says a senior government official, who has attended previous ECI meetings—all held on video platforms. "The general view is that elections can be delayed only in a force majeure situation, if pushed completely into the corner by the prevalent situation of the pandemic."

A hybrid model of e-election and regular voting could be tried out in the Bihar elections.

Elections to Lok Sabha or state assemblies can be postponed for six months by the EC. However, in case of an Emergency, the elections can be deferred for one year, plus six months after the Emergency is lifted. Former CEC S.Y. Quraishi says the state of emergency can be declared only if there is a threat to the security and sovereignty of the nation, not if there is an epidemic or a pandemic. "Imposing President's rule in the state is another option, but its limits have been repeatedly defined by the Supreme Court," he says.

According to Quraishi, holding elections in Bihar may be a daunting task, but not impossible. "After all, South Korea held its parliamentary polls amid the coronavirus pandemic and

witnessed the highest ever turnout. The ECI is studying the South Korean model and I am sure India will do better than that," he adds. Bihar's population of 9.9 crore is, however, much bigger than South Korea's 5.16 crore.

The sheer logistics involved in holding elections in Bihar at such a time are intimidating, says an official. In the 2019 Lok Sabha elections, the total number of polling booths in Bihar was 72,227. Each booth ideally caters to 1,200 to 1,500 voters, which can turn out to be a nightmare for social distancing. The ECI is in the process of figuring out the ideal number of voters per polling booth. "If we allow only 500 voters per booth, we need 70,000 more officials to man the increased number of booths," says the official. "And if we decide to have 800 voters per booth, we need 51,000 additional officials. We are working on all these issues." Each booth needs at least six officials to man it—first polling officer, second polling officer, third polling officer, presiding officer, micro observer and digital camera person. The role of each is well-defined and cannot be curtailed.

There are no easy solutions. IIT-Bhilai director Prof Rajat Moona, who is part of the ECI's TEC, says they have been working on the possibility of remote voting for some time. Referring to a 2015 conference where this issue was discussed, he says the electronically transmitted postal ballot system was initiated as an outcome—for people using postal ballot, like those in the armed forces and other services. In this, the ballot paper is transmitted to the voters through an electronic mechanism. The PDF file is then downloaded by them, a print taken and the vote cast. It is then mailed back through the normal postal system. There is no system in place yet to send the ballot back electronically.

Centre for Digital Economy Policy Research president Dr Jaijit Bhattacharya says holding e-elections with the current infrastructure is extremely challenging. "People need to have their e-signs and it is far-fetched as of now. Penetration of smart devices is still not deep in India. Enormous amount of training and system build-up is needed before we move towards e-elections," he says. There is also the need to devise a way to maintain the secrecy of the ballot as e-signs or digital signatures could give away the identity of the voter.

Rallies will be replaced by virtual ones. Focus will be on digital canvassing, says BJP's Bhupendra Yadav.

PHOTOGRAPHS: PTI

Bhattacharya believes a hybrid model of e-election and regular voting could be tried out in the forthcoming elections in Bihar as the ECI is contemplating. Quraishi agrees it can be tried out in a few assemblies, but adds that these should selected by the draw of lots. He adds that it is important to demonstrate that the technology used is hack-proof.

Bhattacharya says technology, when deployed on a large scale, needs to be tested out for both its technical robustness and its social acceptance, especially for sensitive applications like elections. "We should start moving towards e-elections as it would also reduce the cost of conducting polls," he adds. The 2019 Lok Sabha elections had cost the ECI Rs 6,500 crore—Rs 72 per voter.

While holding digital elections may reduce the cost manifold, political parties are hoping there will be a major reduction in their campaigning costs in the Bihar polls, and then in the elections in West Bengal, Assam, Tamil Nadu and Kerala, due in the first half of 2021. They anticipate that social distancing norms are here to stay for some elections to come. Political leaders say their campaign strategies will also see a big shift. "Crowded rallies will be a thing of past, replaced by virtual ones. There will be an increased focus on digital canvassing and more personalised micro ground-level contact with the voters. There will also be a return of handbills and pamphlets," says BJP general secretary Bhupendra Yadav.

The parties are also taking a relook at the issues they generally raise before every election—those of caste and religious identity. They may not work anymore as delivery of welfare measures and livelihood issues are likely to take centre stage in the post-COVID-19 scenario. "The fear of disease has united the people in broader terms. There is also anger among the migrants regarding their struggle to reach their homes, and at the mismanagement by the authorities. There will be a political fallout," says political analyst Manisha Priyam. Whether LED has replaced the lantern or not, more important in the coming elections would be whether the political parties keep their promises.

THE AUTHOR IS SECRETARY, AGRICULTURE MINISTRY

Seeds of a Revolution

The government's intervention in the agriculture sector is expected to help farmers take control of their destinies

THE promulgation of three ordinances, undertaken to push through holistic agriculture reforms, will provide freedom of choice to both farmers and buyers to sell and buy across the country and that too without licensing barriers for better price realisation for the farmers. The Agricultural Produce Market Committees (APMCs) Act has geographical restrictions as the farmers can sell their scheduled market surplus only at fixed market places, which can be either the markets operated by market committees or private markets or warehousing, cold storages, silos declared as deemed markets or the notified places of direct marketing licensee. In these places also the purchase is by licensed trader. The licensed buyer on the other hand is free to sell to anyone anywhere. These constraints hindering the development of "one nation one market" for agricultural produce shall be removed.

The new reforms will not only create competition but will also make the APMCs more efficient. The holistic approach to reforms will also encourage investment in developing value chain infrastructure by new investors in the states due to a liberalised atmosphere. This will eventually lead to value addition, reduction in post-harvest losses, improvement in agriculture share in GDP leading to more rural employment, thus ultimately motivating states to come on board to support the consolidated measures.

Thus, the ordinances will potentially enhance production and productivity by facilitating competitive pricing for farmers' produce due to more choice of buyers. The greater freedom and choice to both farmers and buyers will open up multiple channels of buying-selling like physical trade and e-trade under this ordinance, in addition to options to sell in the market yards notified under the APMC Act. Thus, in days to come, there will be a farmer-friendly marketing ecosystem.

The Farmers' Produce Trade & Commerce (Promotion and Facilitation) Ordinance provided for the creation of an ecosystem to promote efficient, transparent and barrier-free inter-state and intra-state trade and commerce of farmers' produce outside the physical premises. It also provides a facilitative framework for electronic trading and transactions platform for trade. Trade and commerce ordinance does not require state authority as state governments will continue to have control over APMC Acts and their efficacy has been protected except when it pertains to trade area.

The Farmers' (Empowerment and Protection) Agreement on Price Assurance & Farm Services Ordinance provide for framework for farmers to engage with agri-business firms, processors, wholesalers, exporters or large retailers for farm services and sale of farmers produce. Opening of agriculture markets will lead to greater choice and price competition, allowing farmers to seek the best price for their produce. This will ensure higher income to farmers, a part of which is expected to result in improved investment in better agricultural practices resulting in higher productivity. Marketing avenues will open up and result in higher private sector investment in supply chains.

The reforms are expected to protect farmers as informal agreements will shift to formal agreements.

Another aspect of the new initiatives is that they will help in unfolding funding facility, announced as part of Atmanirbhar Bharat Abhiyan package, to the tune of Rs 1 lakh crore for creating post-harvest management infrastructure, including e-marketing points with the active partnership of states. As farmers get better prices and opportunities of employment grow in rural areas due to investment in agriculture related infrastructure, the role of states will gain prominence. The present system of MSP for various agri produce shall continue. It is a support price mechanism, announced before the cropping season. The farmers shall now have additional options apart from mandis and MSP centres.

Substantial increase of area under farming agreements is expected. The reforms are expected to protect farmers as informal agreements will shift to formal agreements. The farming agreements for sale of future farm produce at predictable and remunerative price can be adopted at a large scale only if there is a conducive and uniform policy framework in the country.

Under the ordinance, the farmer is safeguarded against price volatility, as the purchase price of the farm produce is to be determined and mentioned in the farming agreement. In case price is subject to variation, the farming agreement will explicitly provide for guaranteed price to be paid and additional amount as premium and bonus over and above the guaranteed price based on the pre-determined price reference.

Farmers entering into farming agreements will be safeguarded as the ordinance prohibits acquiring of land ownership by the sponsor and also not allowing the sponsor to construct any permanent structure on farmers' land. Accessible, quick and cost-effective dispute mechanism have also been provided to safeguard the interest of the farmers. *(Views are personal)*

UK-INDIA JOIN HANDS TO COPE WITH CLIMATE CHANGE DISTRESS

At Kabirdham district, home to the Baiga tribe, women plough the land as men believe the land to be their mother (Chhattisgarh)

ABOUT two-thirds of India's 1.3 billion population is engaged in agriculture. Out of those, more than 85% come under the category of small and marginalized farmers, or simply put, those with less than two hectares of land. This huge section of the village population finds itself in a very volatile economy. The reasons are their limited resources, dependence on erratic monsoons, and agriculture being vulnerable to adverse effects of climate change.

In such a situation, protection of these small farmers is a pressing challenge. That's where an intervention called the Infrastructure for Climate Resilient Growth (ICRG) comes in. It emerged in 2016 from collaboration between the UK Government and the Ministry of Rural Development in India. One of the central objectives of ICRG is to embed climate resilient strategies in the implementation of Mahatma Gandhi National Rural Employment Guarantee Act (MGNERGA) – the world's largest social protection scheme.

Any person in a village can seek work under MGNREGA and has a guarantee of 100 days of work in a year. The work involves light manual labour and the daily wages are roughly around Rs 200. It's not seen as a source of primary income but certainly as an important source of supplementary income, especially for women who can't go out of the villages for work owing to a number of social reasons. With migrant labourers working in cities returning to their villages due to covid-19 lockdown, the reliance on MGNREGA for succour has risen steeply in villages. As per the latest figures, there are 120 million active workers under the scheme.

The ICRG has always been committed to making interventions at the very grassroots. In the same spirit, it tries to make the works under MGNREGA more in line with climate-resilient practices. The works in the employment scheme are usually related to irrigation, plantations, ground water recharge, and soil conservation. A driving idea behind ICRG is to take climate science to district, block and village levels. So far, it has been implemented in 103 blocks across 22 districts of Bihar, Chhattisgarh and Odisha. The initiative has benefited approximately 1.8 million people in these three states.

GRASSROOTS-LEVEL INTERVENTIONS OF ICRG HAS HELPED IT GIVE A CLIMATE-RESILIENT APPROACH TO WORKS UNDER MGNREGA

Furthermore, ICRG helps farmers make informed decisions about crop choices in view of climate change. So it's providing knowhow on climate-resilient practices to not just MGNREGA works but also farming. Awareness about rights is another focus area of ICRG. That, teamed up with climate knowledge, empowers the village representatives to negotiate with district administration on fund disbursal, and channel it towards a more climate-conscious form of development.

This joint UK-India initiative has not only helped rural development but also made it more sustainable and enduring vis-à-vis climate change. The initiative has provided a way for vulnerable communities to secure their livelihoods, along with learning to guard themselves from the onslaught of climate change. World Environment Day is the perfect timing to acknowledge the importance of global cooperation and the power of countries joining hands to act as a force for good.

WORLD TOUR

NORTH KOREA The nation threatened to cut off all communication lines with South Korea, including the hot line between the two nations' leaders. The North said this was the first in a series of actions against the "enemy". The two nations are officially at war. But the current move is seen as North's attempt to get more concessions from the South.

LIBYA Turkey-US relations may enter a "new era" after an agreement on Libya was reached between Recep Tayyip Erdogan and Donald Trump. The two spoke on the phone recently. Turkish support for the UN-backed regime in Tripoli managed to marginalise renegade general Khalifa Haftar's force, backed by Russia. Moscow says it will work for peace in Libya with Erdogan.

SPAIN A probe has been launched against former Spanish King Juan Carlos by the Supreme Court for alleged kickbacks for a high-speed rail project in Saudi Arabia. Carlos abdicated in 2014... and lost immunity from the probe. Spanish firms had won a contract worth 6.7 billion euros for the rail link between Mecca to Medina. The probe also involved Swiss banks.

FOREIGN **HAND**

IRAN and Venezuela, two adversaries of the US, both subject to American sanctions, came together in an act of defiance to violate the terms being set by the Donald Trump administration. The Islamic Republic leadership in Tehran undertook a risky mission when it decided to send five tankers carrying oil through some of the world's most crucial maritime gateways to cash-strapped Venezuela, which suffers from acute shortage of refined oil, despite having the world's largest oil reserves.

Through its action Iran wanted to send a message to the US that Tehran was determined to challenge American policies aggressively. The mission was accomplished last weekend when the last of the five tankers reached their destination. Despite its large military presence in the Caribbean waters, the US did not intervene; the revolutionary socialist government of Nicolas Maduro got its much-needed cargo. As motorists lined up to fill their tanks, Maduro declared that he would soon visit Tehran to sign more agreements and thank the people of Iran. US sanctions on Iran's oil sales have throttled its crude exports. Anyone buying Iranian goods risks punitive measures from Washington. Venezuela is also under US sanctions.

"Our policy towards the US has changed from a defensive to an offensive approach," an Iranian regime insider told *Financial Times*. "The US sent us messages through two regional states that 'we will hit your tankers if you proceed'. Our answer was clear: If you hit us, we'll hit back." In the last stage of their journey, Venezuela, which had warned that any US efforts to stop the convoy would be an act of war, sent jets and the navy to escort the tankers.

For Iranian leaders, given the risks and transport costs, the transaction made little economic sense. In total, they earned at most $50m, probably paid in gold to bypass sanctions. The five tankers carried 1.5m barrels. But, for the regime, the show of strength justified the risks. Iran has stood firm in its encounters with the US and Britain. When British marines seized an Iranian tanker in Gibraltar, Iran impounded a British-flagged ship in the Strait of Hormuz. The Iranian tanker was later released. It also shot down a US drone last year. After the US killed Iran's revered military commander, Qassem Soleimani, in Iraq in January, Iran launched missiles against a US base in Iraq.

A western diplomat observed that despite a huge rise in inflation and unemployment, the republic was showing no desire to change course. "The US knows its sanctions will not pay off," said the diplomat.

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WHAT ARE VIRUSES?

A glimpse into virosphere—that mysterious cusp between life and non-life—will tell us they are part of us, within us, and wrote us into being

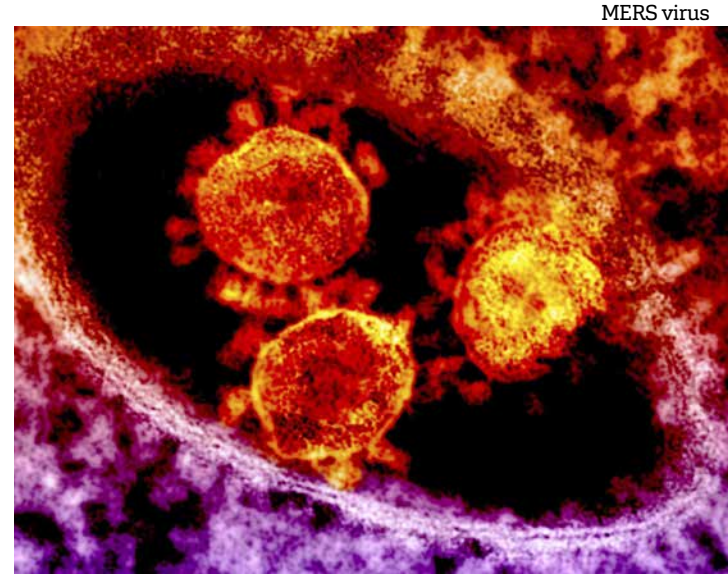
ANIRBAN MITRA

ALBERT Szent-Gyorgyi was a giant of twentieth century science. His discoveries on Vitamin C, the Krebs cycle and how our muscles function are part of textbooks of biochemistry. He once wrote how, in his search for a picture of life, the torch-light slipped over the very edge of being: "I started with anatomy, then shifted to function, to physiology, and studied rabbits. But then I found rabbits too complicated and shifted to bacteriology...later I found bacteria too complicated and shifted to molecules and began to study chemistry.... I ended with electrons which have no life at all—molecules have no life—so life ran out between my fingers actually while I was studying it, trying to find it..."

Szent-Gyorgyi was not alone in this. The boundary that separates the non-living from the living—that mysterious cusp—is a real one, but trying to put that knife-edge under a microscope can actually impede understanding life on this blue planet. Take the most abundant biological entities of nature—viruses. The sheer number and diversity of viruses easily dwarfs humans, our crops and domesticated cattle, the billions of insects teeming in the tropical forests, even the microscopic organisms abundant in any river. A litre of seawater may contain a hundred billion viruses of few thousand different kinds! They occur in millions in the lungs and intestines of healthy people. They are present deep below the Antarctic surface, in the subterranean caves of Mexico, on the scorched sand dunes of African deserts, and in almost every living species scientists have studied. They control the growth of bacterial populations, play vital roles in the mega geochemical cycles that make up our environment and can, of course, evolve—jumping from one host species to another, as we now are only too keenly aware. It's no wonder that Carl Zimmer referred to the Earth as *"a planet of viruses"*. The present global crisis brought on by Covid-19—directly linked to rampant deforestation and illegal animal trade—is a result of our unbridled and greedy misadventures into virosphere.

Yet, viruses are not exactly 'alive' in the sense cellular organisms are. The latter are made up of one or many cells. Indeed, many of them, like ourselves, form large, organised cellular associations—a body. The bodies move, eat, fight, take in resources to build their cells and, in time, mate with other bodies to make more cellular entities like themselves—the next generation. The instructions for doing all this is encoded in a long chain-like polymer(s), called DNA, present within the cells. The DNA is a manual, a blueprint; different links in the chain—genes—carry the information for making different proteins. Following those commands embedded in the DNA, the rest of the cell makes proteins. In turn, the proteins (like insulin, antibodies, enzymes and collagen) join hands to do all the physiological work, finally leading to reproduction and thus ensuring that there are more copies of that body and the DNA within. It's teamwork between the cell's DNA and protein-making apparatus.

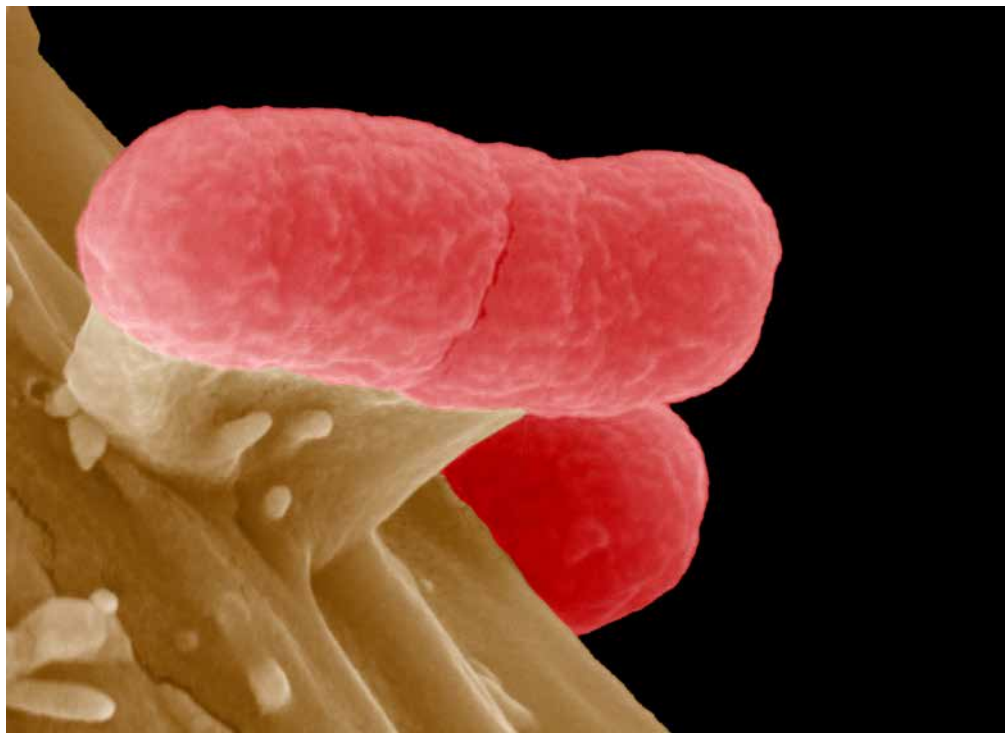
MERS virus



Viruses do the same but they have found a shortcut. They do carry DNA (or RNA, a related molecule), but, being so tiny, there's no space for the protein-making apparatus. There's no need either: when a virus infects a cell, it hijacks the latter's protein-producing factories, captures the depots of nutrients and commands the cell to make only multiple copies of viral proteins and viral DNA! Thus, although they carry only a part of the ingredients essential for life, viruses are intracellular parasites that evolve and flourish in the foggy zone that demarcates the living from the inanimate.

How viruses evolved this 'hijack strategy' is an enduring mystery. The fact that prehistoric viruses have not left fossils has not helped either. But today, there's a wealth of knowledge that take us to the very origins of life. Notably, even within present-day cells, some RNA molecules can store genetic information (like DNA does) as well as catalyse biochemical reactions (like proteins do). This is an indicator that at the very dawn of life, in the hot, anoxic oceans of the primordial world, simple chemicals formed bonds resulting in complex molecules and some of them, in turn, gained the chemical

"Stunning as it may seem, the DNA in our chromosomes is peppered with sequences that once belonged to active viruses."



Ecoli bacteria

ability to make copies of themselves. It was certainly not an efficient process, more like a stenographer who makes mistakes while typing several copies of a document, so soon there were variants of the parent molecule that were competing with each other for better duplication. In time, small RNAs (or the more stable DNAs) might have joined to form larger chains of genes, and then a membrane of fats probably enclosed them to form a mobile, self-replicating unit. Alternatively, some proto-cells might have gained both DNA and protein-making machines, but then lost the latter and learnt to enslave neighbours who had both. Probably both mechanisms gave rise to the vast repertoire that makes up virosphere today. Evolution by natural selection had found its way.

WHAT is certain is that it's this ancient lineage that has made viruses so ubiquitous. Animals, plants and bacteria—all are hosts to viruses in this timeless struggle for existence. The most abundant of viruses are the *bacteriophages*, literally the 'bacteria-eaters'. But, phages do not only devour bacteria. They constantly shuttle fragments of bacterial DNA from one cell to another, creating fresh combinations of genes and thus providing fodder for evolution. Science has put these phage-couriers to good use. During WWI, Felix d'Herelle discovered that bacteriophages could be used to cure soldiers of dysentery. Popular in the 1930s, phage therapy lost to 'non-living' antibiotics. However today, when antibiotic-resistant bacteria have significantly blunted our ability to stop infections, phage therapy is being studied with renewed enthusiasm. In addition, oncolytic viruses are being harnessed to selectively target and kill cancer cells.

Thus, no more only parasites, viruses now answer to that proverb—"an enemy's enemy is a friend"! The utility of viruses does not stop there. Rather, their perennial arms-race with bacterial cells is the source of what are called *restriction enzymes* and *CRISPR-Cas*, sets of bacterial proteins without which many of the applications of modern biotechnology would be impossible.

There are others who are less friendly, of course—for example, the malignancy-inducing Papillomavirus and Hepatitis B viruses. But, humankind's association with viruses goes way beyond diseases and modern technology. Stunning as it may seem, the DNA in our chromosomes is peppered with sequences that once belonged to active viruses. Called *Endogeneous Retroviruses*, these relics of past encounters make up more than 8 per cent of our genomic space—a colossal number when you consider that our protein-encoding sequences take up hardly 1.5 per cent! None of them make active viruses any more, but some have been recruited into our cellular circuits. One noteworthy retrogene is *Arc*, which is essential for long-term memory storage in the human brain. Another is *Syncytin*. Originally from an endogeneous retrovirus, it has got harnessed to build up the placenta—a unique mammalian organ without which none of us would have been born! These new findings, however, should not confound us. After all, the present is a fleeting snapshot on the evolutionary timescale and, like viruses, we are little more than carriers and mixers of genetic information. The rest—culture, history, societies, politics—are facets of human collective imagination.

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OUR LIVE-IN VIRUS

Corona has settled over this landmass like a moving cryptic crossword. How do we read its clues?

Ajay Sukumaran

Let's take a step back from a Covid-induced humidity, if such a thing is possible. And rewind to the mid-1980s when another scourge, a real 'unknown unknown' that had unnerved the West, was beginning to surface in India—HIV, or the human immunodeficiency virus. Veteran physician T. Jacob John has a vivid memory of a panic-stricken October evening in 1986 when Vellore's Christian Medical College—where he headed the virology

department—admitted one of its first HIV patients. An American, the patient was taken in by evening and at night his room was locked from the outside. The door was opened slightly, tremulously, for dinner—it was pushed towards him by a wardboy who scampered back to safety soon after.

The HIV danger, by then, was real, clear and present—in 1986, the first cases of AIDS in India had been discovered among sex-workers in remand homes in Tamil Nadu. How the infections first started was never tracked down, though it was clear it had come in via foreign visitors and then spread. India's HIV transmission was largely heterosexual—a later discovery—but the air then was thick with irrational fear, stigma, misinformation. "In the morning," recalls John, "I had the blood sample and it was positive...full-blown AIDS." He accompanied the duty doctor on his rounds, went and sat on the patient's bed next to him, put an arm around his shoulder and spoke to him. "That's the best lesson doctors got that day," he says. The story of how India finally wrestled AIDS down began that day—'social vaccine', as the term goes. "Public education became one of the cardinal rules for its containment," says John, who designed the sentinel surveillance for HIV/AIDS that continues even today. Think of all those condom campaigns and the Red Ribbon Clubs in schools and colleges. The world is now gasping for clarity and a new chance against a new enemy—a highly contagious respiratory virus—but that social vaccine jab is what will work for COVID-19 too, he says, long before an actual vaccine comes along.

After all, the coronavirus is, we're told, something we have to live with. India's headline numbers of March and April bucked the worst predictions, but now, after four months of living with the virus, we are faced with that experience common to trekkers: the moment you scale a high promontory, a bigger peak swims into view...and then another. Judging by the altitudes of May and early June, the real Everests may belong to July. "Now the inevitable is happening. Our goal is now to reduce mortality. Let the virus play its game, but we should now protect all the vulnerable people," says John. That's why he's stressing on precaution—the elementary symbols of which are the mask and those physical distancing circles chalked out on the ground. The past few days, India has been reporting a razor's thin edge short of 10,000 cases daily—the country's Covid curve saw no peaks or troughs as elsewhere, no jagged edges; instead it has been arching upwards smoothly, like a yogic asana, to break into the world top 10. With the US, Brazil and Russia taking the medals, India has been in the playoffs with Spain and the UK for positions 4-6 with a caseload upwards of 2.5 lakh, inching towards 3 lakh. The original European hotspot, Italy, has stanched its haemorrhaging wounds *(for a comparative Covid growth rate graph of all four, with India in the clear lead, see Lockdown story)*.

The good news is that half of those patients have also recovered—so the count of active cases has just crossed 1.3 lakh, less than half of the total 2,67,614 as on June 9. But could this be the actual figure of infected people? Not likely, say most experts. "We will have some idea of that number once we have some serological data available from the first ICMR (Indian Council of Medical Research) survey that is being rolled out," says Prof Gautam Menon of Ashoka University, who's

VOX POP

Vikram Patel

Pershing Square Professor of Global Health and Wellcome Trust Principal Research Fellow, Department of Global Health and Social Medicine, Harvard Medical School

Will this pandemic radically alter our approach to public health?

It's hard to predict the long-term consequences of our approach to public health due to COVID-19; remember we had a similar major scare in the 1990s in relation to HIV/AIDS and while the public health response to that particular disease was outstanding, most of the rest of the healthcare system has remained under-funded, under-performing, poorly governed and largely unaccountable. On this occasion, the threat is right at the doorstep of the rich and I hope there will be much greater impact in mobilising support across society for a much stronger public healthcare system.

Those actually infected could be 20-30 times the number of confirmed cases. So Infection Fatality Ratio is always much lower than Case Fatality Ratio.

Extrapolated over Germany, actual infections were pegged at 1.8 million—a straight 10 times more than its official figure of 1.8 lakh.

working on mathematical modelling initiatives, including one by the Indian Scientists' Response to Covid (ISRC). Think of serological studies as a dipstick survey—testing localised groups of people for antibodies in the blood to know the average ratio of the population that had a Covid infection. But until that data is available, a probable yardstick to go by would be 20-30 undetected infections for every detected case, Menon reckons. That range, he explains, is based on the number of deaths—just short of 7,500 so far in India, which can be reasonably assumed to be closer to the real picture (barring a few undiagnosed deaths). How is this done? There's something called the Infection Fatality Ratio (IFR)—the number of people who die out of all those who actually get infected. This is always much smaller than the ratio of deaths among only the confirmed cases. For COVID-19, the IFR was calculated at 0.37 per cent for a small German town. Extrapolated over Germany by the University of Bonn, even that yielded 1.8 million actual infections—a straight 10 times more than its official figure of 1.8 lakh. Elsewhere, Covid IFRs range up to 0.7 per cent. At this point, therefore, we can only guess at the actual footprint a tiny virus is leaving over this vast landmass.

Zoom in on that map. So far, here's what we know: about 30 districts account for 70 per cent of the total Covid cases in India—the western states of Maharashtra, Gujarat and Rajasthan coupled with Tamil Nadu and Delhi figure prominently there. But, officials warn that the eastern states—Bihar, West Bengal and Assam, to which the flood of migrant workers flowed—could potentially emerge as the next hotspots. The numbers are beginning to rear their hoods there. Add to this inclement weather—two cyclones in a span of one month and a monsoon season just setting in, bringing with it those familiar seasonal illnesses. The situation's fluid, literally.

Take Kerala, which had famously kept its infection count leashed down, but is now battling Round 2 with inter-state movement opening up *(see Jeevan's Sitrep story)*. Or take Delhi, where daily cases were around 400 in mid-May—now it clocks 1,400. "The cities with more infections may be peaking sooner. The other places, Tier 2 and Tier 3, will progress slowly," says Dr S.K. Sarin, who heads the Delhi government's Covid response panel. He foresees a plateau by end-July or mid-August for the capital. "We are in a relatively early stage, and the peak is still several weeks ahead of us. That could be one guess," says Gautam Menon. "You would really know you have crossed the peak when the number of daily cases begins to decrease."

Case counts alone don't offer much granular insight—the states differ on many counts. For example, contact tracing. A recent ICMR study showed wide variations in 'contacts tested per case' during the early phase across states—broadly, those with good public health systems did meticulous contact tracing, explains epidemiologist Giridhara R. Babu, a co-author of that study. That's still easy to grasp, as a function of administrative efficiency. But in many other ways, the epidemic settled over the land like a giant cryptic crossword. What explains the fact that, for instance, while both Tamil Nadu and Delhi carried out a high number of Covid tests over a span, Delhi saw 7.8 per cent testing positive, while it was only 2 per cent in TN?

The 'test positivity ratio', as it is called, could point to two things. The simpler explanation: Delhi could have genuinely had a wider prevalence during that period. "Different states are indeed in different stages," says Babu. "Or again, testing itself could have been made more targeted and efficient, say by zeroing in on as many severe

respiratory cases as possible—a syndromic approach." Sharp, constant surveillance is key. Not the easiest thing to manage during 'Unlockdown'. Railway stations are opening up, public places coming alive—eventually, places of worship will draw out the devout from their confines, trying to dispel the gloom. What can be done?

Mask-wearing, says John, needs to be enforced like a sacred commandment. "Viral behaviour is as predictable as water going down a slope. So if you have a virus that spreads by droplets, it will infect people by social contact," he says. "Ultimately, people have to take precautions for themselves and their families. Nobody has understood that. Even now people shift from the ludicrous to the sublime."

Across the world, lockdowns are tapering off. But the coronavirus still places us in a peculiar spot: there's a wealth of information about the virus itself, but some fundamental questions haven't been settled yet. For instance, are asymptomatic patients infectious? Is reinfection possible? We haven't heard the last word on these yet. That's another facet of the corona chronicle—a very conspicuous absence of scientific consensus on many fronts. Scientists are indeed working at an unprecedented pace, crossing milestones in days and months instead of years. But the deluge of research reports globally seethes like a stormy, troubled sea. Last week's retraction of a controversial study on Hydroxychloroquine in leading journals *The Lancet* and *The New England Journal of Medicine* came by as a shocker amidst this turbulence. There was a controversial India connection there too (*see Data story*).

Since the pandemic broke out, scores of pre-print papers—not yet vetted by peers—are being put out every week and some of these hypotheses are hotly debated. "A significant fraction of that would never make it to peer-reviewed publications," says virologist Shahid Jameel, who heads the DBT/Wellcome Trust India Alliance. "Nevertheless, it's important for the rapid evolution of knowledge. So whatever one reads in that space must be read with that understanding." Jay Bhattacharya of Stanford University agrees: "We will need good ideas from everywhere to solve this epidemic." Some frictions are inevitable, he says. "People working in different disciplines learn for the first time the different ways in which other scientists approach similar problems. This is typical of the scientific process and will undoubtedly be sorted out over time."

The coronavirus isn't likely to go away anytime soon. But why did it come? "This pandemic was not a black swan event," says Sridhar Venkatapuram, associate professor of global health and philosophy at King's College London. "Any good epidemiologist will tell you that pandemics were expected. And more will come in the future." But it has created an important need to rethink how societies are connected, he says. Countries may have been flinching back from hyperglobalisation of late, going back into their protectionist shells...but here has come along a microbe, like a voice of the planet, to remind humanity that we are indeed one.

VOX POP

Gautam Menon

Professor
Physics and Biology,
Ashoka University

What does data tell us about the pandemic—its past and future trajectory?

It tells us that the lockdowns have worked in reducing the exponential growth of the epidemic. The doubling times have increased from around 3-5 days at the onset of the lockdown to somewhere between 15 and 20 days at present. However, the effective reproductive ratio remains above 1, indicating that the epidemic is still in its growth phase and the number of new cases each day shows no sustained decline. Thus, relaxing our guard now will inevitably lead to a faster spread of the disease. Our models suggest that allowing people to return to work in a periodic but staggered manner—say with three days on and six days off, with a third of the population at work each time while being effectively locked down otherwise—can reduce the rate at which disease spreads. Our models also point to the crucial importance of rapid, ramped up testing and quarantining of positive cases as the only way to halt the progress of the epidemic.

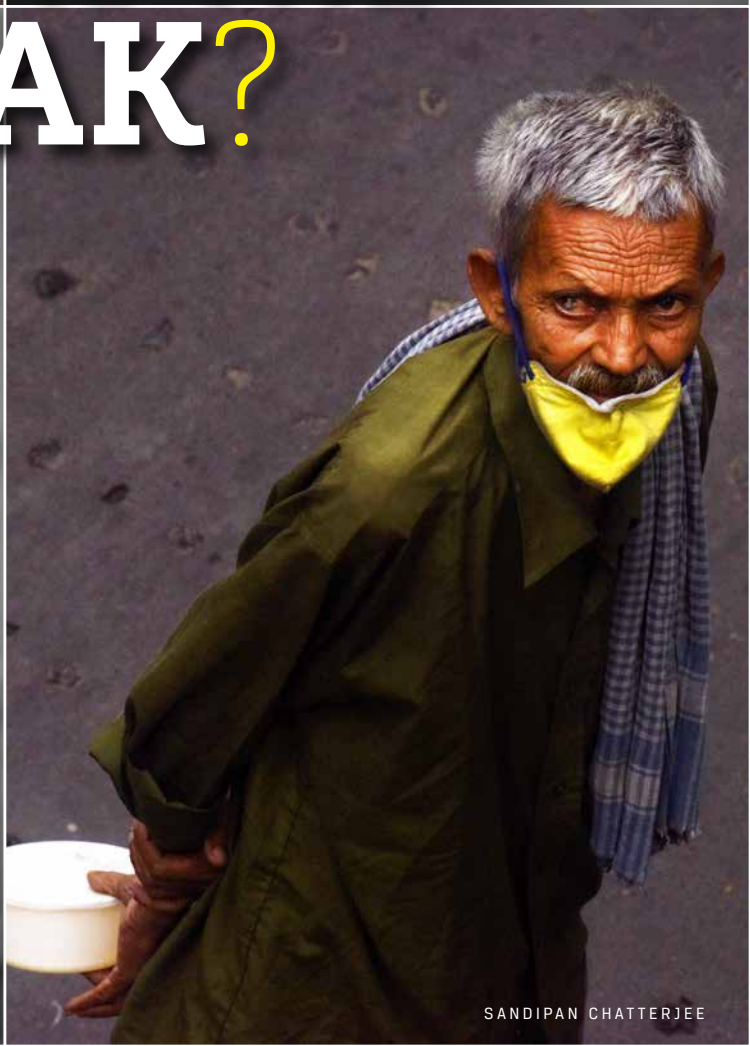
COVID-19 SPECIAL

WHAT IS THE PEAK?

TRIBHUVAN TIWARI

APOORVA SALKADE

APOORVA SALKADE



SANDIPAN CHATTERJEE

Jeevan Prakash Sharma

When the air is vacuum-cleaned of real information, what fills it is the elements of empty anticipation. Rumour, speculation, fear...all these form a suspended particulate matter that we then breathe in. The latest talk doing the rounds was that India would duck back into hibernation—into a strict lockdown—by the middle of June or so. Since Indians are familiar with the phenomenon of a late-evening broadcast fundamentally altering their realities, appending a 'could be' or 'maybe' on that rumour is pointless. But the reason why the situation spawns such speculation is clear.

India's Covid graph has been curving up in an unbroken geometric progression—regardless of lockdown. Then, in phases since May 3, India has been also opening up: 'Unlockdowning'. For eyes long shut, the light outside was blinding. After our first coronavirus case on January 30, India had taken 45 days to reach 100. Nine days later, as the lockdown started on March 24, we were around 500. But six weeks later, on May 6, just after we exited strict lockdown, we had zoomed to 50,000! The localised surges consequent to opening up bent that curve further upward, like surf on the sea. In another four days, we reached a lakh. As we go to print, we're just 20,000 short of 3 lakh, with 1.3 lakh active cases. It has been messy and cheerless.

As we adjust our retinas, what do we see? COVID-19 as a radiating pain, a shifting, pulsating, intensifying migraine. Some parts of the body in extreme distress; the big cities beginning to choke, with their available ICU bed-to-patient ratio looking alarming; new areas of the hinterland in trauma; even hitherto healed regions plunged anew into a spreading gloom. Karnataka had had its first Covid +ve case on March 8, but expended good energy on dragging it out—it took 65 days, till May 12, to reach the 1,000-case mark. But that, alas, was when 'Unlockdown 1.0' was already in motion. The next 1,000 cases took a mere 10 days; then eight days; then three days; then four again. As of June 10—another four days—it was on track to hit 6,000 cases with over 3,000 active cases. Manipur had registered the Northeast's first case on March 24, but touched only 29 in the next two months. Over the next fortnight, by June 10, it was aiming for 300, with only 61 cured. Kerala, famously, took nearly two full months to reach 100 after inaugurating India's first case on January 30, then sloped up gently to 800-plus over the next two months. That doggedness went waste when, in one day after domestic flights resumed on May 25, it took a standing leap to 1,326—now it gloomily contemplates 2,000, out of which over 1,200 are still active patients.

But economic exigencies mean Unlockdown is inevitable. The question is: How to open up? What can be the mechanics of doing it in modulated, calibrated ways—where you can loosen the tourniquets on our starving economy, while at the same time lassoing down the rampaging

In big cities, ICU bed-to-patient ratio is alarming, and hitherto healed regions have plunged anew into the Covid morass.

Experts predict different months, from July to November, for the peak to arrive. But should we look out for varying peaks for individual states?

virus. A bit like an ICU doctor handling a critical patient with multiple points of contraindications. The layperson wants to know, even more anxiously, if COVID-19 will get him or her sooner or later—the chances of that happening now are infinitely higher, especially if actual infections out there are close to a million, as some estimates go. Epidemiologists and data experts, on the other hand, are groping in the dark about the shape the epidemic graph will take. In what way, on which parts of the map, will it spread further? And what does the much-talked-about 'peak' look like? Most crucially, can we alter it?

Simply, the 'peak' stands for that point on the graph after which the number of infected people starts declining. There's, of course, no sign yet of that Mount Meru, the tip of the pagoda. At present, as the government ramps up testing, India's caseload is only showing a daily upward trend. At the peak, the 'R0' value tips over to less than 1 (see Lockdown story)—this means an infected person infects less than one person, so you start descending to the valleys. Now, if 50 per cent of the population is infected, the R0 automatically dips below 1 (see Muliyil interview). But many experts say India should not wait for that—a crucial part of epidemiology policy relates to this. Depending on how policy affects the trajectory, experts have also predicted different months, from July to November, for when the peak will arrive. But no one knows what it looks like: how many Indians being Covid+ve at one time. The concept of a peak throws open a whole lot of questions. Should we not look for one peak—and see different states as having different peaks? What about rural and urban regions within a state? It's important to capture the dynamics of a disease—that helps us ensure we are as medically prepared as possible. It's not a question of choosing one mathematical model to calculate the infection rate—there are many—as the most convincing and final. The real complexity is due to the varying rates in each state. Some, like Maharashtra and Delhi, witnessed a quick surge; others are catching up now.

To understand the peak in the context of India, the Department of Science & Technology (DST), under the guidance of the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) and IISc, Bangalore, is trying to create a new model that integrates "the best features" of hundreds of existing models sourced from government and private bodies (they're calling it, well, the 'supermodel'). "The consultative committee was formed last week, formal proceedings have just begun," says A.N. Jayachandra, secretary, JNCASR. The idea is to arrive at a predictive tool with the same prescience as meteorological tools that do weather forecasting. To get there, it's mapping the pandemic across the globe, trying to understanding the factors that led to specific events, and weaving that into their grid. The model should be ready in a few weeks.

"Using the Susceptible-Infected-Exposed-Recovered-Dead (SEIRD) model, the infection rate in India at the end of May (averaged from May 18-31) was at around 8.5 per cent, which is definitely better than what we started with, around 24 per cent, but also far from the peak. This is a highly simplified model; we are working on more hyperlocal models to derive the 'supermodel' now," says Ashwin Srivastava, co-founder and CEO, Sapio Analytics. Sapio is part of the ongoing exercise.

Why is predicting the 'peak' a challenge?

Data scientists say it's the quality of data—any presumptive model can only be as good as the data that feeds it. Correct reporting of data—and enough tests to cover an acceptable sample—is not exactly forthcoming from every part of India. Scientific assumptions have to fill in the blanks. A section of experts says the peak should be seen as happening state-wise, and should be calculated differently for rural and urban regions within a state. "At this moment, it's practically impossible to suggest a peak for India. Any model that does so is (deficient of) required parameters," says Srivastava. Positing a peak anywhere from August to November, they also say this range can change significantly based on policy decisions. Manoj V. Murhekar, director, National Institute of Epidemiology (NIE), also prefers caution. "I have no idea what the peak will be like and how many in-

fections will make the peak. Experts have given various deadlines, none has come true," he says.

Modelling the peak on the basis of, say, Italy or US, poses its own issues. "Many European countries contained the infection within a geographical limit; in India, we have allowed it to travel the length and width of the country," says Bhupesh Daheria, CEO, Aegis School of Data Science. State health officials admit the lockdown relaxation and resumption of air-services, along with the earlier displacement of migrant workers, took COVID to Tier II-III cities and beyond. Many districts in Bihar, Jharkhand, UP, Odisha have witnessed a sudden rise in cases of late. The Northeast, barring Assam, Meghalaya, Manipur and Tripura was completely COVID-free and in the green zone till May 25. Dadra Nagar Haveli didn't have a single case. Not so anymore—these places have turned into red zones with cases being reported from even remote districts. Mizoram initially had only one case, with a recovery, says the state's Integrated Disease Surveillance Programme (IDSP) officer, P. Lalmalsawma—"now we have 88".

Health experts point to the irony of opening up after the lockdown itself forced migrant abour back to their native places—bad economics, bad pandemic control. "We created a huge shortage of workforce in our factories while allowing the infection to travel all across India," admits a senior epidemiologist. A lot of villages in, say, Bihar and UP converted government schools, banquet halls and community centres into quarantine centres to contain the infection. But many smaller cities and state capitals failed to track the incoming population due to the sheer numbers. Patna, for one, is at serious risk. Containment is the initial strategy; if the infection explodes, one has to resort to mitigation.

How to stop health system from getting overwhelmed

One of the biggest advantages of the lockdown, claimed the government, is that it provided time to upgrade the health infrastructure to meet the demand (see box). Contrary to that claim, cities like Delhi, Mumbai, Ahmedabad and Indore have started facing an acute shortage of beds in hospitals; patients saying they have to run from one hospital to another is a common scare-story—in many cases, even dying in transit for want of treatment. That suggests

TESTING TIMES

ICMR ramps up capacity but controversies abound

THE ICMR website shows that, as on June 9, the total number of samples that India has tested was 1,45,216. On May 20, it also claimed that, in just 60 days, it made a 1,000 per cent progress in the country's testing capacities. On January 30, when the first Covid-19 patient was found in Kerala, there was only one lab under ICMR: the National Institute of Virology, Pune. Even till mid-February, samples of COVID-19 patients were being air-lifted from various locations and brought to Pune for testing. Today, ICMR has approved 590 government labs and 233 private labs across India country for the three kinds of tests currently being done to test for the Covid: rRT PCR, TrueNat and CBNAAT.

Initially, rRT PCR—or Real-Time Reverse Polymerase Chain Reaction—was the only confirmatory test for COVID-19. Out of the three tests it was seen as the most reliable, but it entails complex steps: a specially manufactured swab to collect throat or nasal secretion, a special fluid called viral transport medium (VTM) to transfer the swab to the lab, a viral extraction kit to tease out the virus from the swab, and then finally an rRT-PCR kit to test for viral presence. Even with all four elements present, if personal protective equipments (PPEs) were not available for those engaged in the process, testing could not be initiated. Everything needed to be there, at once.

Naturally, that limited the scope of its applicability. Considering the urgency of the situation and the need to ramp up testing, ICMR then approved TrueNat (a test for drug-resistant tuberculosis) and CBNAAT (cartridge-based nucleic acid amplification test) as part of the testing arsenal. "While rRT-PCR is limited to well-equipped hospitals, TrueNat can be deployed at district hospitals across India, addressing the last mile barrier," says Dr Rajni Kant, PRO, ICMR. Till date, 240 labs for TrueNat and 63 for CBNAAT has been given approval. The Council now says it has "developed and validated the completely indigenous IgG ELISA test for antibody detection for SARS-CoV-2." It has transferred this technology—which it calls 'Covid Kavach'—to seven companies that are expected to get manufacturing licences from the Central Drugs Standard Control Organisation (CDSCO) in a month.

In April, the Council also faced flak for buying a China-manufactured rapid-test kit that was supplied to all states. The kits had to be withdrawn after some states reported erroneous results. Though ICMR claims it incurred no financial loss as no money was paid to the company, the lack of due diligence that led to the goof-up and the ambiguity in financial dealings raised questions. Not to mention the waste of precious time and manpower in the middle of a pandemic.

SURESH K. PANDEY

Crematorium, Lodi Road, Delhi—Stacks of ash urns of the dead during the lockdown

Available COVID-related health infrastructure as of June 5, 2020

- 957 dedicated COVID hospitals with 1,66,460 isolation beds, 21,473 ICU beds and 72,497 oxygen-supported beds.
- 2,362 dedicated COVID Health Centres with 1,32,593 isolation beds, 10,903 ICU beds and 45,562 oxygen-supported beds.
- 11,210 quarantine centres and 7,529 COVID Care Centres with 7,03,786 beds.
- 128.48 lakh N95 masks and 104.74 lakh PPEs provided to states/ UTs/central institutions

the health system is already overwhelmed: not a good omen, with the peak still far from sight. State governments like Delhi dismiss news reports and public claims about a shortage of beds, but all the signs are that resources are drying up. For one, the various restrictions on treatment and testing; for another, the strange decision in which the Delhi government prohibited people from the National Capital Region from availing any hospital facility in Delhi. (The order has been overruled by the LG.)

The Delhi government claims it has a total of 8,575 dedicated COVID beds right now—4,413 occupied, 4,162 vacant—including government and private. It has also developed a mobile application in which anyone can check this availability. But patients say the app shows something, and the hospitals something else when they reach there. Black-marketing of beds is also being spoken of. One scary indication of the shortage—present and/or imminent—came from the deputy CM, where he said Delhi would need 80,000 beds by July end, when the state's caseload is expected to touch 5.5 lakh. The Union health ministry said there were a total of 1,33,632 Covid +ve patients in India as on June 10—an exact break-up of admitted patients is a matter of loose reckoning, because mild/asymptomatic patients are advised home quarantine.

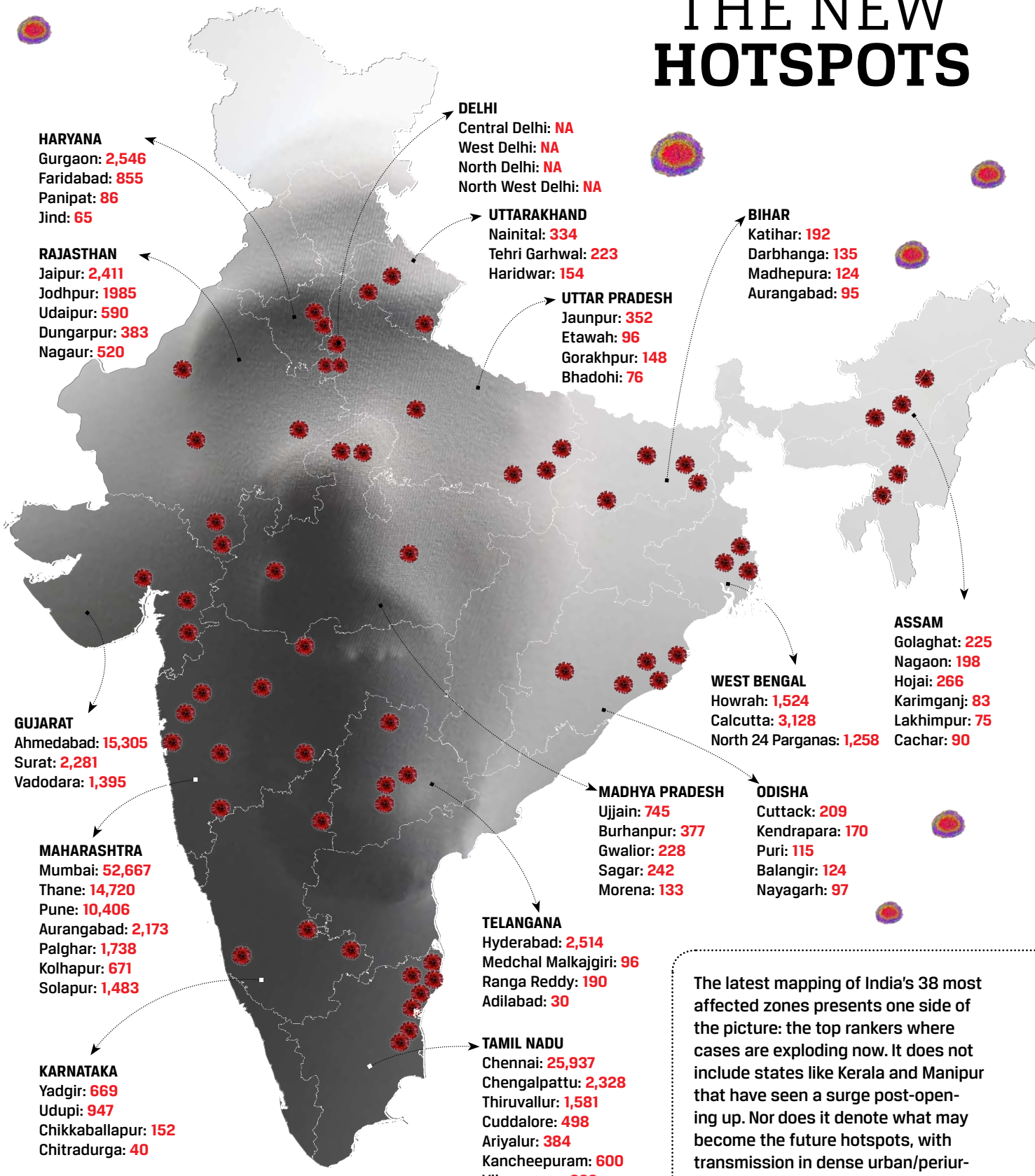
Many states had initially kept private hospitals out of the ambit of COVID-19 but are now rethinking their strategy. Uttar Pradesh didn't allow a single private hospital to treat COVID-19 patients—not even those willing to bear the costs. Karnataka too. "At present, all COVID hospitals here are government hospitals," says Nandakumar Jairam, CEO, Columbia Asia Hospitals. The government "may involve private healthcare" if the numbers increase. Delhi initially had only three private hospitals roped in for COVID. "But of late, the state has asked all private hospitals to either completely get converted to COVID-19 hospitals or reserve 20 per cent beds for it," says Mahipal Singh Bhanot, zonal director, Fortis Hospital. Mumbai has followed a different strategy. It has demarcated some hospitals as quarantine centres for patients who are asymptomatic, mildly symptomatic and severely symptomatic/ high risk respectively. The state government has asked all private hospitals to ramp up capacity. It has also notified that 80 per cent of total operational beds (both COVID and non-COVID) will be regulated as per rates specified by the government.

But hospitals have their worries: severe shortage of staff, especially non-medical staff like nurses, housekeeping, ward boys etc. Many non-medical staff have got infected, absenteeism is high, many are leaving due to fear of catching the infection—Maharashtra, the current hotspot, is grappling with an exodus of sorts. "We need to understand that our frontline healthcare workers are putting themselves at risk, sacrificing their personal lives and working round the clock. They need to be counselled, kept motivated," says Gautam Khanna, CEO of Hinduja Hospital, Mumbai.

The treatment cost also becomes a bone of contention as soon as private healthcare comes in: many patients complain of overcharging. Experientially, most Indians will say that's true, but it's not always easy to judge. "When an allegation of overcharging is made, we need to have a standard or mean to judge it by. In its absence, any rate can well be called arbitrary," says Nishant Srivastava, managing partner, Actus Legal Associates. The FICCI health services committee recently proposed that treatment costs be fixed between Rs 17,000 to Rs 45,000 depending on the facilities. The government hasn't taken any call on it yet. "Various state governments have announced separate policies for reimbursement of care given to COVID-19 cases," says Dr Harish Pillai, member of the FICCI committee. This is one end of the drama unfolding across India—private healthcare in the midst of a very urban nightmare. Other, less visible nightmares stalk the countryside.

COVID-19 SPECIAL

THE NEW HOTSPOTS



HARYANA
Gurgaon: 2,546
Faridabad: 855
Panipat: 86
Jind: 65

RAJASTHAN
Jaipur: 2,411
Jodhpur: 1985
Udaipur: 590
Dungarpur: 383
Nagaur: 520

DELHI
Central Delhi: NA
West Delhi: NA
North Delhi: NA
North West Delhi: NA

UTTARAKHAND
Nainital: 334
Tehri Garhwal: 223
Haridwar: 154

UTTAR PRADESH
Jaunpur: 352
Etawah: 96
Gorakhpur: 148
Bhadohi: 76

BIHAR
Katihar: 192
Darbhanga: 135
Madhepura: 124
Aurangabad: 95

ASSAM
Golaghat: 225
Nagaon: 198
Hojai: 266
Karimganj: 83
Lakhimpur: 75
Cachar: 90

WEST BENGAL
Howrah: 1,524
Calcutta: 3,128
North 24 Parganas: 1,258

GUJARAT
Ahmedabad: 15,305
Surat: 2,281
Vadodara: 1,395

MADHYA PRADESH
Ujjain: 745
Burhanpur: 377
Gwalior: 228
Sagar: 242
Morena: 133

ODISHA
Cuttack: 209
Kendrapara: 170
Puri: 115
Balangir: 124
Nayagarh: 97

MAHARASHTRA
Mumbai: 52,667
Thane: 14,720
Pune: 10,406
Aurangabad: 2,173
Palghar: 1,738
Kolhapur: 671
Solapur: 1,483

TELANGANA
Hyderabad: 2,514
Medchal Malkajgiri: 96
Ranga Reddy: 190
Adilabad: 30

KARNATAKA
Yadgir: 669
Udupi: 947
Chikkaballapur: 152
Chitradurga: 40

TAMIL NADU
Chennai: 25,937
Chengalpattu: 2,328
Thiruvallur: 1,581
Cuddalore: 498
Ariyalur: 384
Kancheepuram: 600
Viluppuram: 392

The latest mapping of India's 38 most affected zones presents one side of the picture: the top rankers where cases are exploding now. It does not include states like Kerala and Manipur that have seen a surge post-opening up. Nor does it denote what may become the future hotspots, with transmission in dense urban/periurban zones in, say, Bihar and Bengal.

Map not scaled; Figures are in total COVID-19 cases (active+recovered) on June 9
Source: Union health ministry data

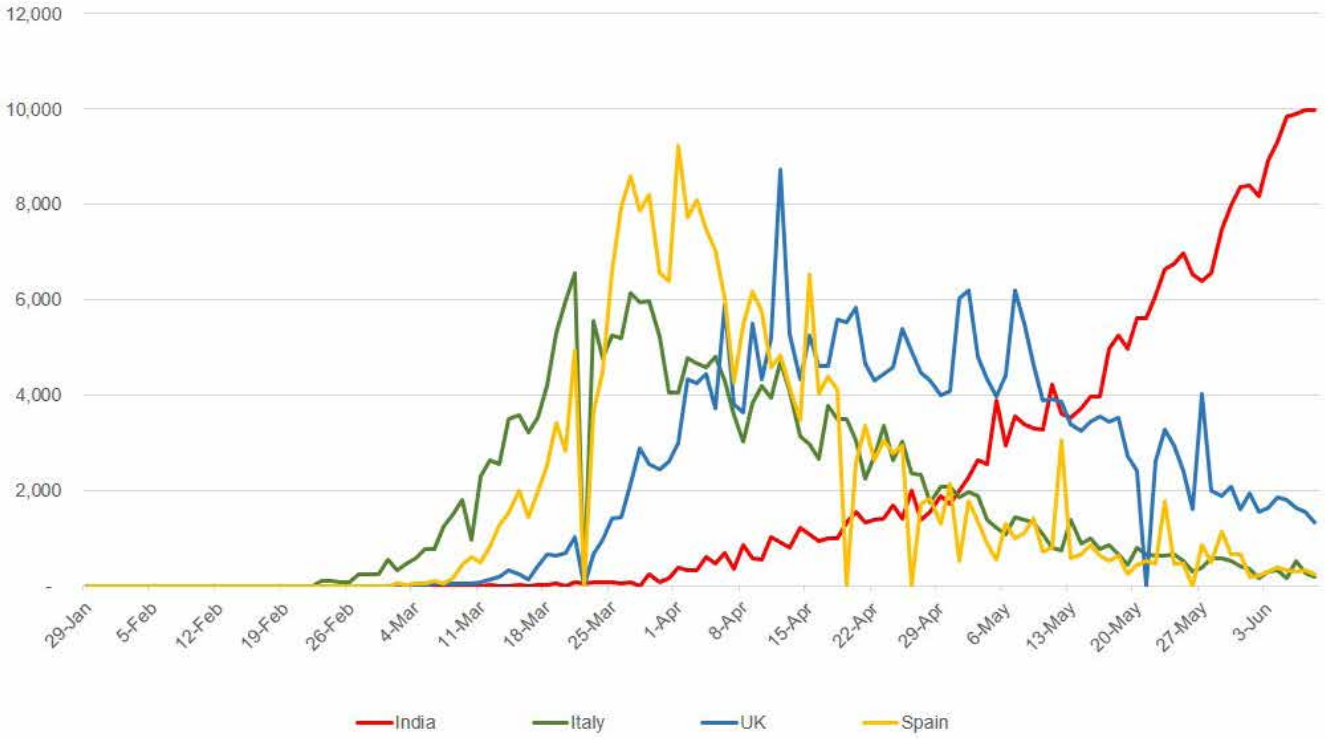
GRAPHICS BY SAJI C.S.

COVID-19 SPECIAL

DID THE LOCKDOWN WORK?

Ajay Sukumaran

This one executive decision was deemed at first to be a no-brainer. Perhaps a faint dread preceded it, blended with a resigned sense of inevitability—as if for an elemental event beyond our control, the way we may anticipate news of a solar eclipse sweeping the land that would offer no clear promise of when the sun would shine again. Still, for a country



Source: World Health Organization
June 9, 2020

blessed with frighteningly fractious opinions on everything, there had been near-unanimity on this. No political party, no social segment, no corporate lobby, nor even any healthcare expert had offered a serious objection. Stunningly simple at one level, it was also profound in the way it straitened our primary conditions of living. Poets, historians and sociologists will have their say another day. But the immediate, practical question is: did it work? As Week 9, 10 and 11 of the lockdown saw public transport and air travel thaw out messily from a freeze—as India daily counts a new crest in numbers, and balks at counting the social and economic costs of internal migration on a never-before scale—one prediction can be safely made. This question will be hotly debated even months from now, in ever-new forms. Questions proper to governance in the socio-economic realm cannot really be delinked from the growth path of an epidemic—they are connected inextricably. But they are also subject to opinions beyond the scope of medicine proper. The original question still stands: was the lockdown effective in controlling the India story of COVID-19?

Contrary to scepticism, that the lockdown slowed the Covid rate of growth isn't in much doubt. Consider a model evolved by Prof Sitabhra Sinha of Chennai's Institute of Mathematical Sciences, whose projections have closely resembled official statistics. Sinha works on publicly available daily statistics that the government puts out and his analysis shows the curve indeed shifted, with a smaller rate of growth. Had the epidemic continued at its initial rate of growth, active cases would have crossed 2.5 million by May 17, the end of Lockdown Phase 3. And the number, as we know, was around 55,878 that day. 'Active cases' is different from the total tally: it's the total number of positive cases minus recoveries and deaths.

Yes, it's still exponential: with the chart galloping at 10,000 cases a day, India will be skimming 3 lakh by the time these words reach you. If this pattern continues through June-July, the figures will begin to look very scary. But there's reason for some grim comfort: cases will go up as long as the Reproduction number of the infection (also called R0, pronounced 'R nought') is greater than one—essentially, that means one affected person can infect more than one person on average. "It's not a big surprise that every day will bring a new record. The thing we need to really worry about is whether the rate of growth has increased or not," says Sinha.

India's R0 trajectory could offer some clues—Sinha's analysis of national data attributed a basic R of 1.83 at the start of the contagion in March and a significantly lower 1.29 for the period April 13-May 14. It reduced further to about 1.22 between May 29-June 4. Essentially, that means 10 COVID patients can probably infect 12 others. So while the overall numbers climb, that may suggest a cooling of the pandemic's inner fire

A collective of 600 scientists estimates that 8,000 to 32,000 fatalities had been averted till May 15, compared to a 'do-nothing' scenario.

Should the lockdown's efficacy be measured against a 'do nothing' situation? Or against very plausible, better alternatives?

as it scythes through the forest of people in India. What explains this decline, especially when lockdown relaxation saw freer movement and higher caseloads? The most plausible answer, Sinha suggests, is that the national R0 was so far skewed by the early exponential growth in Maharashtra. In recent weeks, Maharashtra's R0 value has actually decreased to even below the national average, he says.

"Now you are seeing a crossover. Because Maharashtra is tending to flatten out, other states that are growing at a much faster rate are going to start influencing the India-wise number," says Sinha. But those states punch at a lower weight in number terms. Seen another way, Maharashtra's R0 is now lower than some states far down the ranking list. "From a policy point of view, it's very important to keep an eye on states with a very high R0 because that's presumably where the hotspots might move if you don't take immediate corrective action," he adds. Overall, there's a mixed picture—in some states like Rajasthan, Gujarat and Madhya Pradesh, the curve of daily active cases is somewhat flatlining. In others—like Karnataka and Bihar—it's climbing. So too in Haryana, Assam and Uttarakhand, where the R0 (as of June 4) too shows a sudden increase.

Did the lockdown save lives? The Indian Scientists' Response to COVID-19 (ISRC), an independent collective of around 600 scientists, has estimated that 8,000 to 32,000 fatalities had been averted till May 15, compared to a "do-nothing" scenario. Their analysis had come as a response to the Niti Aayog's range of 37,000 to 2,10,000 fatalities averted during lockdown—as the ISRC pointed out, various models had been cited but there was little explanation as to how those numbers were obtained. There are also lateral lines of questioning that can find no quantifiable answers. Should the lockdown's effectiveness be really measured against a "do-nothing" scenario? Or against what could have been very decent, very plausible, perhaps better alternatives? Say, having had our antennae and radars up earlier—a month and half earlier—putting in place elements of an early response, tracking and contact-tracing only the 15 lakh or so international arrivals in that period, creating containment zones only around their hubs, and testing there aggressively? Instead, India was in vishram stance all through—even Parliament functioned till March 23...and the very next day it was savdhaan. The whole country had to down shutters with a couple of hours' notice. A discomfiting new reality that actually created the movement of lakhs of people from urban hubs. As we said, in epidemiological terms, difficult to quantify.

So what lies beyond a lockdown? The frank answer is that an accurate picture is elusive. From one end of the spectrum of scenarios, epidemiologist Jayaprakash Muliyil offers the unsettling figure of 2 million deaths and that, "in three months, we develop herd immunity". Muliyil argues that herd immunity is the only way out (see '*We have to count...it will stop*'). What that means is, when a substantial percent-

age of the population has been infected and develops immunity, a virus finds it difficult to find a new host, or get from person to person. But, for that salutary stage to be reached, a reasonable guess is that 50 per cent of people will have to get infected, sometimes more. And even countries that initially thought aloud about the idea, like the UK, have balked at it. Even the US, with the world's highest infection count, isn't anywhere near herd immunity, according to some experts.

EXPERTS concur that lockdowns helped to buy time but the trade-offs started to get skewed the longer they were in force—the human costs in India, given the fact that most of our workforce is in the informal sector with virtually no social security, were far worse than those seen in wealthy countries, says Vikram Patel, professor at the department of Global Health and Social Medicine at Harvard Medical School. "The lockdown definitely slowed down the epidemic. But beyond a point, it is not helpful," says Ramanan Laxminarayan, director of the US-based Center for Disease Dynamics, Economics & Policy. "You have to remember its purpose was not that the disease will die out. A lockdown was always to buy time to prepare."

The other crucial question vis-a-vis lockdowns was, of course, how to end them? For, it could be relatively easier to enter a lockdown than exit it—the medical analogy to exiting a lockdown, as virologist Shahid Jameel puts it effectively, is that of a patient on ventilator. "You decide in a few seconds whether to put somebody on a ventilator. But then you need to wean them off slowly." The world over, these are the dilemmatic waters being navigated currently. With the exception of Sweden—an outlier of sorts, it didn't opt for a lockdown, instead relying on social distancing. But Sweden's Covid death toll at 4,656 (as of June 7) is much higher than those of its Scandinavian neighbours and recently its state epidemiologist Anders Tegnell admitted that, with hindsight, things could have been done better.

Surveillance indeed is the way ahead, reckons epidemiologist Giridhara R. Babu. But, as a subset of public health in India, the amount of resources or attention given to surveillance has been abysmal, he says. "If we do not have surveillance systems strengthened and then open up, we are just pretending that nothing is going to happen." Both polio and HIV, he points out, were tackled on that very premise and the results speak for themselves. "We showed we were the world leaders for polio when people said we couldn't eradicate it. They also said that for HIV but they were wrong." So, it all boils down to how well we can track and trace: what they call man-to-man coverage in football. "The only thing we have to monitor is the (virus) circulations going on and how we can prevent deaths. If we wait for hospitals to report, it will be too late. The earlier we pick up, the better it is." While testing has to follow a systematic strategy, it's still possible to isolate people assuming every case of pneumonia to be Covid unless otherwise proved, says Babu.

For India, the implications of the COVID-19 lockdown need to be seen also within the

VOX POP

Jay Bhattacharya

Professor of Medicine, Stanford University

Lockdowns have helped buy time. But what next?

Lockdowns delay, but do not prevent, the onset of Covid-19 cases. They are not a tool for disease eradication. The costs of the lockdown—including the collapse of the global economy and increased deaths and disease among the poor throughout the world—are already enormous and will have to be paid for years to come.

Some alternate policy proposals, such as testing, contact tracing, and quarantining the infected population, cannot work given how widespread the epidemic already is and the likelihood of spread by the asymptomatic population. We are going to have to learn to live with the virus, just as we have learned to live with a host of other deadly infectious diseases.

VOX POP

Reetika Khera

Development economist, IIM Ahmedabad

"One important rationale for a lockdown is so the administration could focus on the public health crisis. A stringent, sudden lockdown in India was a bad idea because it created an additional, humanitarian crisis. Rather than reducing administrative burden so that pressing concerns like increasing laboratory/hospital bed capacities and creating a protocol for testing could be addressed, the unplanned lockdown multiplied challenges. The new crisis stretched limited state capacities, which has not been directed at dealing with it. One reason could be because the government was plugged into conversations in the developed world, with very different economic structure. Only about 17 per cent of the workforce has salaried jobs here. One-third of the employed work as casual labour, many as daily wagers. Nearly 50 per cent are self-employed, mostly small operators. The lockdown dried up their earnings overnight. It seems our policymakers did not realise how fragile their lives are, how numerous they are. A rerun of *Ramayan* was announced for the people; the rest don't seem to matter or is visible to the ruling political class, at least not until news reports/viral videos about their condition flooded our media sources. Much of rural India rely on the remittances from migrant workers who are now additional mouths to feed at home. For the rural poor, the lockdown is a double whammy."

frame of other diseases that too require urgent attention. "You have to be worried about other collateral damages," says Muliyil, pointing to appendicitis or cancer patients who have not been able to get to the hospital. "For India and other lower/middle income countries, there are epidemics occurring among the poorest continually," agrees Prof Sridhar Venkatapuram of King's College London. Based on other epidemics like HIV and malaria, most observers expect the COVID-19 pandemic to 'settle' into LMICs while high-income countries will control it, he says. "Some people have been arguing that we should just let it spread and let people get sick and become immune, and protect those more vulnerable. What they don't say is that potentially hundreds of thousands or millions could also die over the two-three years of waves it would take to create immunity in the population."

So do we have a picture of the new way of living, the tentative openness, we are heading into? Vikram Patel of Harvard Medical School sums it up: "Let's be clear about one thing: as lockdowns are lifted, it is inevitable that new infections will occur." Engaging public health assets, such as ASHA workers, with appropriate training and personal protection, to identify cases, trace contacts, and help people self-isolate, may well be the more effective weapon, he says. "But, at the same time, I hope we must remember that social interaction is an essential component of our humanity and without it we cease to have lives that are worth living." The initial question, then, devolves into a web of interrelated questions that will remain with us for the foreseeable future—and the answer can only consist of precise detailing, care and empathetic micro-management.

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Planet Outlook
LECTURE SERIES

LIVING WITH Leopards

Lecture by
DR. VIDYA ATHREYA
Director–Conservation Science, WCS – India

In conversation with
Ananda Banerjee, *Editor, Special Projects, Outlook*

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June 17th, Wed, 7:00 p.m.

‘We have to count up to 60 crore, that’s when it will stop’

Jayaprakash Muliyil *is the chief contrarian in India’s epidemic story—who famously prophesies two million deaths post-lockdown. Leading epidemiologist, former principal of Vellore Christian Medical College, chairman of the scientific advisory committee of the National Institute of Epidemiology...he explains his theoretical preference for ‘herd immunity’ to* **Preetha Nair**.

We are in Unlock 1.0 and already seeing almost 10,000 daily cases....

Those are people who are positive. It possibly doesn’t mean they are sick. Everybody gets viral infection, all of them are not sick. Over 80 per cent are sub-clinical cases. We call them ‘case’. We keep counting them, we have to count up to 60 crore, that’s when it will stop. I think fear is what troubling us. Fear causes stigma, stigma makes you unjust and unfair. But all this is the natural trajectory of an epidemic. We are mostly rural, so it will slow there, then it will come down. Next year, this time, everybody would have forgotten Covid. We live with lots of viruses anyway. Do we remember any of them any time?

But Covid is different...

It may seem so at the moment. When HIV and HINI happened, people were frightened. HIV was there for several years, torturing

Mayan doomsday portrait—A mural from the Mexican state of Chiapas. Smallpox, measles, influenza, typhus, yellow fever... epidemics introduced by the European colonisers in the New World decimated 90 per cent of Maya and Aztec who had never encountered these germs and lacked immunity against them.

us. Now nobody is worried. Only thing is, Covid is a prolonged one.

How do you come to the calculation that India will see two million deaths with a substantial opening up?

Based on the mortality experiences from UK and France, their latest publications. I applied the age-specific corona death rate through our population. India's population is 1.36 billion: one should see the two million in that context. It comes to about two per thousand, much less than Europe. In India, even small percentages give us large numbers. One per cent of Indians is 13.6 million people. So the number of deaths would be high but the rate of death will be low. Some 1.358 billion will still be alive.

And 7.5 lakh deaths in the age group of above 60?

That's the most dramatic thing. The death rate is very disproportionate when you take age. Above 80 is over nine per cent of our population. They will have over 80 per cent share of the deaths. We have 36 crore below age 15. My calculations say they will have very few deaths. For a 25-year-old, the risk of dying is still only 30 out of 1,00,000, a very small rate. The equation changes as you go up the age graph. For those in the seventh decade (in their 60s), the rate is 2 per cent. In the eighth decade, it's 4 per cent. Ninth decade, 8 per cent. In those groups, mortality is anyway high: whether corona is killing them or another disease, it's not clear.

Did the lockdown serve its purpose? They could have given one week's time, instead of taking people for granted. New Zealand informed the public several days in advance about the coming lockdown. We just announced it and people got caught on the road. Basically, by doing this, we supported the virus.

But we have to open up?

You have to worry about the collateral damages of a lockdown too. Now people are going around sealing hospitals...tragic and ridiculous. People with other diseases will be in danger. There's a number of Covid deaths we expect. We can't help it. The focus has to be on providing services.

We have reached community transmission, nobody admits it...it's a dirty word for everyone. At one point, one can test, identify and isolate, like Kerala did. This is a different phase. A majority will get infected, most will be fine. Only the ones who get breathless are sick. Adequate oxygen supply will save lives. There's no point testing asymptomatic people. Just treat every pneumonia case as a Covid patient, without testing.

How does herd immunity work?

Let the young go out and work. In the bargain, they

will get infected...and be immune forever. They will not die: infection is nothing, they just walk away from it. When many people develop immunity, the virus finds it difficult to get from person to person. I'm an optimist. For one death, there will be 400 people recovering and developing immunity. That becomes an immunity-building population. We expect cities to achieve herd immunity at 60 per cent, villages around 40 per cent. Mumbai will come to that phase very rapidly because they have many cases. Delhi too. The virus doesn't disappear...it goes into a phenomenal value of R1, a quiet endemic phase where it can remain for months or years. We hope that break will be enough for a vaccine to come.

But protecting the elders may be difficult in India...

You can't just protect them by issuing a government order. You have to tell them how to protect themselves. Physical distance, hand hygiene, ironing newspapers etc. Make sure even in the house, you wear a mask most of the time. The numbers will come down from 7.5 lakh.

Do we see evidence of herd immunity anywhere in the world?

Herd immunity levels will be different in different areas... you need above 50 per cent level to reach herd. In a thickly populated place like Dharavi, you need a higher level, above 60 per cent, maybe even 80 per cent. With Influenza A, H1NI, we measured it at exactly 40 per cent. Then it died down. I saw it in 2009, then the next year. (New births occur, people move, so there's always a new population, with a certain percentage who are immunologically susceptible.) It happens by itself. I say it with confidence because I have seen it with measles, Ebola, chicken pox, rubella etc.

Are you hopeful of a vaccine?

I'm very confident a vaccine will come, a good one. All studies on the virus show nice immunogenicity...the ability to stimulate our immune system. So chances are the vaccine is also easy to make. Whether it's vaccine or virus, it's our body that produces antibodies. And this virus is not that highly mutant.

Will there be a second wave?

That's for people who are not immune, never for this virus. My reading is, once you are finished with corona, you are out of it.

What about the reports of reinfection from China et al...

Humbug, not a single report. What happened is, they found the virus in the throat of those who had 'recovered' even after 21 days. CDC Atlanta did a careful study... they took the lingering virus and tried to culture it. They couldn't! So NOT infectious. After the ninth day, nobody had any of the infectious virus in their throat. Then what was that PCR test picking up? Fragments of the virus, not the whole thing. So first we thought it was a peculiar disease that doesn't go away even after immunity. Now we know. This is the truth currently. But with new evidences, it can change. That's science.

Is corona here to stay?

The virus has found a balance between itself and us. R0 is the starting rate: everybody is susceptible. Herd immunity means R1: one case leads to one case, no epidemic, just a lingering on in the community. That's what WHO is referring to. Future outbreaks will happen when the susceptible population increases... after a year or two, when a large number of children are born, Covid can again move around. Young people will block it, but it can kill the uninfected elderly. By the time, we will have a vaccine hopefully.

Experts predict a peak in July.

Luckily, I'm not an expert! Usually it takes three months, not over four months. A lockdown is a break, a temporary delay, so we are slightly better off vis-à-vis the peak. But this epidemic will take away a few elderly. In the process, we have to make sure we don't destroy our country.

Why are some states so badly affected?

We are taking a snapshot in between.... Everywhere the curve is starting. Wait for it to be over.

VOX POP

Giridhara R. Babu

Epidemiologist, Indian Institute of Public Health, PHFI, Bangalore

Is herd immunity the solution?

One of the largest surveys was done in Spain recently and the results show just 5 per cent of the population was infected in terms of immunoglobulins. Therefore, looking at 5 per cent and so many deaths, imagine the number of deaths if 60 per cent get infected. So, I'm not a believer that herd immunity through infection is going to be the solution. Herd immunity has to come from a vaccine.

Would all of us get infected sooner or later?

Yes, sooner or later. We don't know yet, because 80 per cent is asymptomatic. We can get unduly afraid.... Even at 71, I have 95 per cent chances of living.

Outlook

the Outlier

WILLIAM DALRYMPLE
Historian and author

On

NARRATIVE HISTORY,
LITERATURE FESTIVALS,
& PARTYING POST-COVID

In conversation with

Satish Padmanabhan
Executive Editor, Outlook

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on

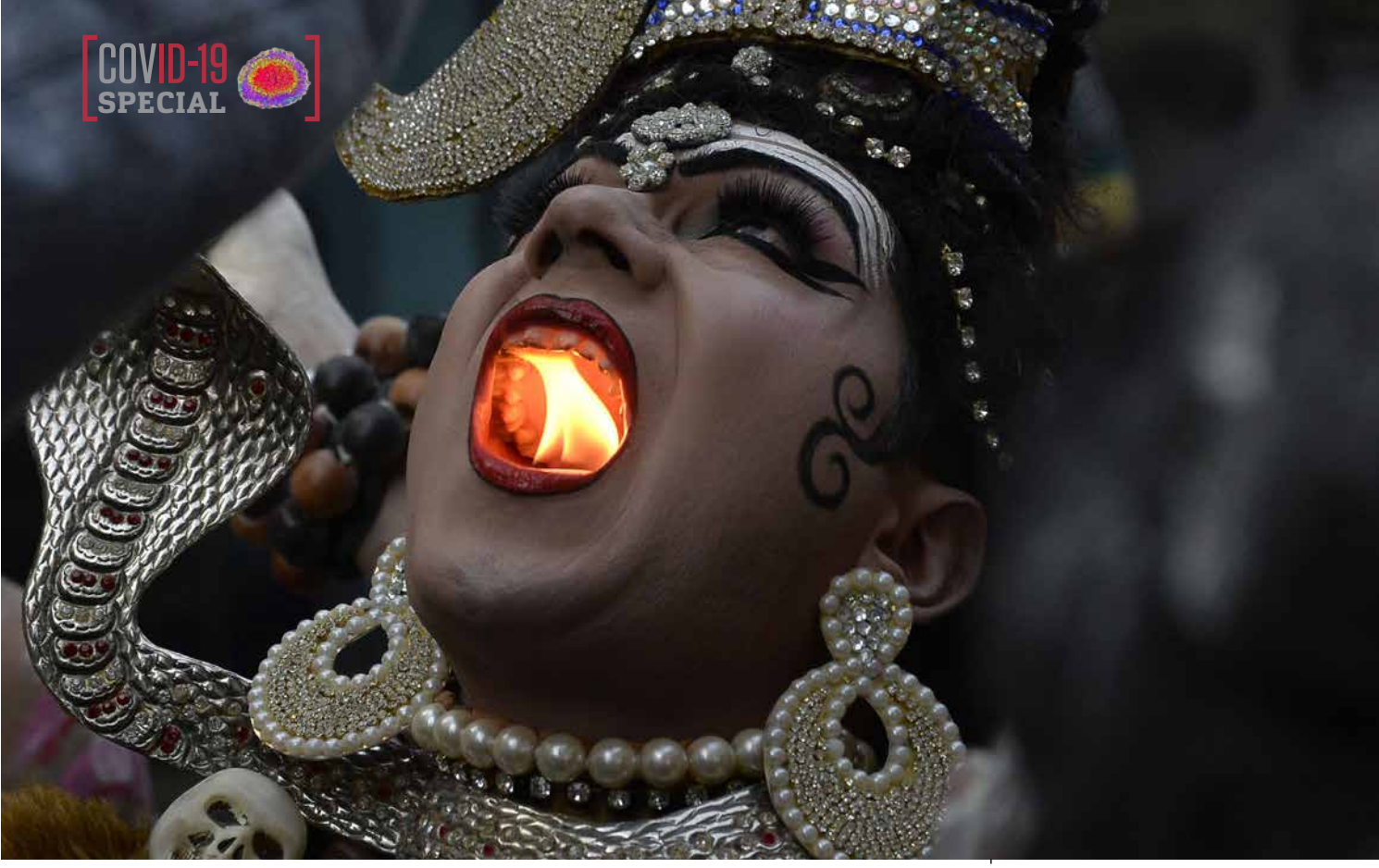
June 14, Sunday, 11:00 a.m.

DOES INDIA (NOT) HAVE A MILDER EPIDEMIC?

Ajay Sukumaran

This is a question that has mutated right in front of our eyes, almost as if to mock us. It was in the air, minus the 'not', all of spring and early summer, tremulously asked, and perhaps frequently (and prematurely) presumed to have an answer in the affirmative. A sense that the virus was somehow less virulent here; that if there was a specific India story to Covid, purely epidemiologically speaking, it was that we were speaking of a more modest dystopia. Merely a stronger version of a passing flu. The data curve was such that it could help foster that impression.

It was around three months ago, in March, that the COVID-19 season properly began in India. Soon, the dizzying spiral in Italy had gripped the world's attention. Then, within days, that graph was replicating itself in the US. Naturally, the spectre of Covid effortlessly conquering new territories evoked fears.



But even by April, India's statistics were nowhere near the worst-case scenario. The question naturally arose: was there something at work besides a stringent lockdown?

Nearly every possibility was speculated upon—perhaps the virus was behaving differently here, maybe it was a milder 'strain'. Maybe there were different 'strains' in India itself....one thing in Gujarat, another in Gurgaon. The questions were not surprising: we knew little of the novel coronavirus, except that it was beset by signs of seemingly inexplicable randomness. So how do we begin to put the pieces of the puzzle together? We put the question to various experts.

For a start, the actual spread of the disease across the world is itself an unravelling story. Russia, where they were making music videos celebrating the near-absence of COVID-19 in the initial days, is now a scare story (see *Is Socialism the Vaccine?*). And this is a strange, moving earthquake, one that has serially found new epicentres: from Italy in spring, to Brazil now. The data dashboard maps out the curve so far—over 66 lakh confirmed cases globally by the first week of June, out of which about 3.9 lakh people have died. And India has crossed 2.87 lakh cases, still with relatively fewer deaths—8115—than in many other countries. But the arc had begun to look ominous by May, in such a way as to almost completely negate the original question.

So no, it's no longer milder in the ordinary sense—we'll have to wait for the final count and look at percentages to make a weaker claim at 'mildness', if at all. And no, the heat certainly didn't kill the virus.

One way to navigate this warren of alleys is to try and mark out the actual presence of the virus, as opposed to official numbers. "Based on the results of seroprevalence studies conducted around the world, we now understand that the epidemic has spread far more widely throughout the (human) population than can be gleaned from case reports alone," says Jay Bhattacharya, professor of medicine at Stanford University. By seroprevalence, he's referring to the blood tests that look for antibodies—the body's natural method of fighting an infection. It's a useful tool for epidemiologists to estimate what fraction of a population has already been exposed to the coronavirus. Last month, a Spanish antibody study indicated that 5 per cent of Spain's population has been affected—a figure that held up in a subsequent second round of survey. Sounds modest? Well, that's nearly 24 lakh people, over a third of the official world total. That may be the actual wingspan of the virus flying under the radar.

And here? Well, the Indian Council for Medical Research (ICMR) too is currently

What explains India's low uptake initially? India's population structure probably... other countries have a larger representation of the elderly than we have.

In the initial phase, India saw the infection mostly in young people. When it spreads to the elderly and more vulnerable, the picture will be the same as anywhere in the world.

carrying out a household-level antibody survey to estimate the prevalence of the infection in the country—an ELISA test has been developed by the National Institute of Virology to look for Immunoglobulin G (IgG), a type of antibody. The survey across 69 districts in 21 states could potentially give us a richer, more finely-grained view of COVID-19's passage through India. ICMR favours repeated cross-sectional investigation to establish the actual trends in an evolving pandemic—a kind of live cartography that maps the progress (or regress) of infection in specific districts which, when aggregated, offers us a country picture.

THE spurt seen in the official count in recent weeks—6,000+ cases being docked each day in the last week of May, almost touching 8,000+ as we closed off the month, then scaling 10,000 with a kind of sherpa-like tenacity a week later—gives us a peek into the spread. But even that may be a fraction. Bhattacharya says various global studies indicate—depending on the locality—that, for every identified case, "somewhere between 10 and 500 people have been infected without being identified by healthcare systems as having the virus". By itself, the view that swab tests alone may not yield a true picture isn't new, because these tests, being time-consuming and expensive, have not cast their net wide enough, especially in India. But, on the other side, antibody survey findings too have been widely disputed—even a paper Bhattacharya co-authored last month was criticised for its methodology (one of the early antibody surveys, it had looked at Santa Clara, California, as a case study).

Then, the virus itself. Some pointers of how it spread around the world come from the genomic sequences various labs have decoded. About 40,000 sequences are currently available on the GSAID database, including some 400 from India, enabling researchers to piece together an evolutionary history, or the phylogenetic tree. All viruses mutate over time—think of them as the typos they make as they replicate their RNA inside the host body's cells, which then get to be a new accepted spelling. The coronavirus is no exception. Researchers broadly group these variations into genetic lineages or clades. Globally, at least 10 clades have been identified, the A2a clade being the most common—in India as well. But there's no evidence to say if any clade is less or more virulent than the other—it's precisely such a claim that had come up last month from Gujarat.

All talk about some mutations being deadlier—such as the allegedly more lethal D614G mutation—or references to variable infectivity between the so-called 'S strain' and 'L strain' have now been given a quiet burial. Columbia virologist Vincent Racaniello summarised it with a headline to his blog post, *'There is one, and only one strain of SARS-CoV-2'*. The more recent claim from Italy that COVID-19 was "weakening" too has largely met the same fate. No serious study anywhere has yet found a significant mutation—either heralding more virulence, or a weakening.

Epidemiologist Giridhara R. Babu of the Public Health Foundation of India sums it up thus: "What we definitely know is the genetic make-up of the virus is nearly the same all over the world." Another scientist working on vaccines says virus mutations don't present a significant issue to researchers like him—"the most important protein on the virus is the Spike protein and there is a mutation at a single position, but the rest of the Spike is pretty well-conserved in all the isolates that have been seen to date."

That doesn't mean science stops looking. "We can't say yet if a strain is more virulent or not," says Rakesh Mishra, director, Centre for Cellular and Molecular Biology (CCMB), Hyderabad, offering a cautious margin note. "There are some mutations that look unique to our isolates, which is

understandable." Last week, Mishra's centre—along with its sister labs, the Institute of Genomics and Integrative Biology in Delhi and the Chandigarh-based Institute of Microbial Technology—identified five clades that were circulating in India at the beginning of the outbreak. Among them was a new clade, which, the study claimed, hadn't been classified as such before. This new clade—they named it A3i—was mostly from the Telangana and Tamil Nadu region, and seen in some other South Asian countries, says Mishra.

THEIR next step will be to see if there's a link between the clades and patients' clinical manifestations. "We want to see if there is a medical correlation," says Mishra. Meanwhile, genomic studies too are being planned to try and tease out a better understanding of the virus and disease progression. There are several questions here—why are such a large number of patients asymptomatic, for instance. But alas, good science needs to be allowed to mature. "This patient-based gene study will take six months to a year...data generation takes time," says Mishra.

"We certainly know more about the disease than we did at the beginning," says Gautam Menon of Ashoka University, which is currently building a long-term simulation model for the COVID-19 spread in India. "Our earlier estimates of the infection fatality rate were probably excessive, and we did not understand the importance of asymptomatic cases in driving transmission early enough." Even now, the question of how infectious asymptomatic people can be is open-ended *(see Asymptomatic box)*. An ICMR study of testing data up to April 30 had found 28 per cent of 40,184 positive cases to be asymptomatic—but these were only those who had direct contact with lab-confirmed cases.

Throughout the world, the Covid virus is asymptomatic or mildly symptomatic in about 80 per cent of infected people. So what explains India's low uptake initially? "India's population structure probably offers clues," says virologist T. Jacob John. "Other countries have a larger representation of senior citizens than we have. We have a different population pyramid." But even though the 65+ age group made up only 6.18 per cent of India's population in 2018 (as against over 18 per cent in the UK and Italy), the sheer numbers are still large—roughly over 83 million people. In the initial phase of the epidemic, says Babu, we were seeing the infection mostly in young people. "The moment it spreads to the elderly and more vulnerable, the picture will be the same as anywhere in the world," he had predicted in mid-May. Three weeks later, as India takes the fifth spot in the world, we're already there in a gross sense—without the benefit of an age-wise mapping. The real challenge may be to stop this from becoming truly, chillingly Malthusian.

VOX POP

Sridhar Venkatapuram

Associate Professor, Global Health & Philosophy, King's College London

Are we in an era of constant and regular viral attacks, since SARS? Is a bigger one lurking?

This is an opportunity for India to really understand that there have been outbreaks and epidemics in India every year for decades. SARS, MERS, Ebola, COVID-19 are epidemics you are aware of because they worried people in rich countries. Globally, HIV caught people by surprise because most public health people in the 1970s believed infectious diseases were all under control in rich countries, and they were only a problem of poor countries. What we now know is that there are outbreaks around the world every year, and that some of them can become pandemics. This COVID-19 pandemic was expected, and unfortunately, it is not considered to be the worst pandemic that is possible. There are other, even more dangerous pandemics that are possible. Old infectious diseases can come back, and there are new ones coming more frequently. In fact, the WHO has a category called Disease X which stands for a new disease that we have no ideas about regarding its origin or make-up, and they have been preparing for what to do with that.

ASYMPTOMATICS: Can They Infect?

Ajay Sukumaran

THE 'silent spreader'—a patient without symptoms—is the big mystery about Covid. That puzzle actually starts with the symptoms because there's such a wide range of them, and many of them so mild that you may not even notice. On the US Centers for Disease Control and Prevention (CDC) website, there's a list of 11 symptoms—nearly half of these, like 'new loss of taste or smell', were added in April, weeks after the global outbreak had begun. These symptoms could appear 2-14 days after exposure to the virus.

By now, there's fair consensus that a large portion of Covid patients could be 'paucisymptomatic' or experiencing mild symptoms—again, falling into different categories. But how many of them truly don't give out any clues at all of having an infection while they have it? There's no precise statistical answer at the moment—estimates range wildly, from 6 per cent 41 per cent, globally. But the actual riddle researchers are trying to crack is: Can they infect others? Yes, warned a group of Chinese scientists back in February. They described the results of a comparative study they had conducted to the *New England Journal of Medicine* thus: "The viral load detected in (an) asymptomatic patient was similar to that in symptomatic patients, which suggests transmission potential." An *NEJM* editorial reinforced this view two months later, calling asymptomatic transmission "the Achilles' heel of current strategies". It cited a US study that also confirmed high viral loads in the upper respiratory tracts of asymptomatics: "Quantitative SARS-CoV-2 viral loads were similarly high in the four symptom groups" (those with typical symptoms, atypical ones, the presymptomatics, and asymptomatics).

Using this as a benchmark would alter testing strategies around the world. Currently, since there's no doubt that people with symptoms are indeed infectious, testing has largely been centred on them and their contacts. But this follows a line of epidemic control that perhaps stems from the SARS virus which, while genetically highly similar to Covid-19, behaved differently in terms of onset of symptoms, a quickly peaking/subsiding transmissibility, and a lower viral load in the nose and upper respiratory tracts. That's why, "despite the deployment of similar control interventions, the trajectories of the two epidemics have veered in dramatically different directions. Within eight months, SARS was controlled after SARS-CoV-1 had infected approximately 8,100 persons in limited geographic areas. Within five months, SARS-CoV-2 has infected more than 2.6 million people and continues to spread rapidly around the world," said the *NEJM* edit in April.

Virologist Shahid Jameel elaborates on that. In the case of the SARS epidemic in 2003, he says, people were shedding the virus only when they were symptomatic. "But this virus starts shedding before symptoms appear. And that is one of the reasons why this outbreak has expanded so rapidly," he says. Pre-symptomatic patients being infectious isn't new: measles and chicken pox too behave that way. HIV too is a classic example of that, says Jameel. "With HIV, you don't show symptoms of disease up to 8-10 years after infection but you are transmitting. So there are various examples."

And yet, doubts about that are also occasionally lobbed into the air—even if not always convincingly. WHO epidemiologist Maria Van Kerkhove this week had to clarify her claim about it seeming rare for an asymptomatic person to transmit the disease on to a second individual. There's no answer yet to the complex question of asymptomatics spreading infection, she said a day later, explaining that she had referred to a subset of studies. "Comprehensive studies on transmission from asymptomatic individuals are difficult to conduct, but available evidence from contact tracing reported by member states suggests asymptomatically-infected individuals are much less likely to transmit the virus than those who develop symptoms," says a WHO document. Even if this dovetails with the anxiety of governments to open up, there's science behind it—and the science on both sides is incomplete. The question, clearly, is far from settled. Do asymptomatics then hold out possible clues—to immunity and even cure? Some think so. A silver lining, perhaps.

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COVID-19 SPECIAL

WHERE IS THE DATA?

SANDIPAN CHATTERGEE

COVID-19 SPECIAL

Jeevan Prakash Sharma, Siddharth Premkumar

So we have a bio-earthquake with shifting epicentres in Covid-19, still rumbling unpredictably over our demographic plates. How do you measure it on a real-time basis, count the damages, predict the next building to fall, the next neighbourhood to be hit, and evacuate everyone safely? Not easy at all, as it turns out. Our need to quantify has loosed on us a vast trove of unruly statistics—data itself gone viral, a tsunami in the wake of a quake. Its sheer scale and speed posed challenges. But there's an additional qualification. The virus, for all the conspiracy theories around it, is an apolitical being—class-neutral and ideology-agnostic.

Data, on the contrary, is deeply political—and not merely at the level of nations or governments. As a unit of knowledge, it is in its very DNA to segue into power—and to bend to its whims. It is owned, it is withheld, it is manipulated. Knowledge, when shared, grows—or so goes an old Indian dictum. But deriving power by knowledge secretly is tradition too. Democracy enjoins upon its keepers an oath to transparency on anything that affects the public; opacity means you don't even know what questions to ask—a handy thing during one of human history's most momentous events.

Data is also an infinitely plastic element—clay in the hands of the potter. And that's not a uniquely Indian affliction. Witness the Surgisphere scandal in the US. Or wait...it's an Indian-founded analytics company at the heart of the story. It had a data registry said to include some 96,032 Covid patient records from nearly 671 hospitals on six continents. That lured a star Indian-origin cardiac surgeon, with all the requisite gravitas, to push through major observational studies into venerable journals, *The Lancet* and *The New England Journal of Medicine*. The Lancet study claimed anti-malarial drug Hydroxychloroquine (HCQ), touted by President Trump as a 'wonder drug', posed an increased death risk to Covid patients; the NEJM paper said certain blood pressure medications did not. Both were retracted within an hour of each other after suspicions mounted about the data sets—which were never made available for peer review. In their apology statement, the authors said they no longer had "confidence in the origination and veracity of the data, nor the findings they have led to". But by then, based on that research, the WHO had halted the HCQ arm of its global Solidarity trial. They have since resumed.

APOORVA SALKADE

There is no basic data that all states generate, so that conclusions can be deduced from them, policy framed and common people forewarned.

HCQ, meanwhile, still receives bullish endorsements from Indian advocates. But India is yet to extricate itself fully from the heart of darkness when it comes to data. How many people tested? How many men, how many women? What age-groups? Do we know their blood groups? Co-morbidities? Are there patterns of any sort? Why did we not test enough earlier? The best way to hide data is, of course, to not even generate it. What value was there in saying India had only around 500 Covid +ve cases on March 24 when we had tested only a grand total of 12,872 people by then—not even a handful of apartment blocks? We were logging 1,300-odd tests a day when we could have tested 12,000 a day. The tsunami was born as a trickle. Questions were posed before the Union health ministry and ICMR about their reluctance to release both raw data and its sourcing: the answer was mostly omerta. Not very conducive to analytics.

Over two months on, the ministry website still provides only basic data: the total number of active cases, recoveries, and fatalities, and their state-wise break-up. Asymptomatic? Mildly symptomatic? The number of beds they occupy? No. For more geographical more granular details—for instance, snapshots of district and taluka—state government websites are the only recourse (though Delhi does not confer us with that honour either). Most cripplingly, there's no uniformity in the approach to data collection—hence no comparability. Some states occasionally release age/gender data, some are hazy on that detail. The taps shut completely when it comes to more nuanced information, such as the number of PPE kits available, or of patients on ventilators or oxygen support in hospitals in the country. There's no such thing as a set of, say, 10 basic data-points that all states religiously generate, so that medical professionals and researchers can rifle through them and arrive at reasonable conclusions, so that they can feed bureaucrats and policymakers, so that the layperson can both be illuminated and forewarned. That would speak of a data culture that we just don't seem to have; India as a collective largely behaves as if it's still a family—disease is a stigma that we love to hide from our neighbours. Sorry to disappoint you, we aren't sick.

The ministry's daily briefings dovetail perfectly with that information-shyness. When they do happen—one hadn't been held for 10 days as this goes to print—they divulge genuinely valuable details and analyses less readily than they dispense homilies on the merits of physical distancing and pronouncements of 'faraway peaks'. And yet, government press releases are the only official sources of information on such pressing questions as the doubling rate of positive cases, status of PPE kits or updated guidelines for testing protocols. Other crucial elements remain elusive: till date, we have been handed zero details on testing kit production, capacity and import status. Nor any break-up of the number of tests conducted by private labs and government labs and the percentage of positive cases in each. When it does update the total number of RT-PCR tests conducted,

it uses the ambiguously-worded 'specimen'—an imprecise measure of the number of individuals tested, since all Covid +ve cases involve multiple tests with as many specimens.

"So we don't know how many individuals have been tested across India so far. If this basic information is not provided to common people, what else one can expect?" says a senior government official, on condition of anonymity. A common request made during Outlook's information-gathering efforts, it mostly met with a wall of reluctance. Those who do speak from within officialdom say that besides the lack of data transparency, the situation is further aggravated by a dearth of the requisite levels of data savvy at both the crisis response management and leadership levels.

What's the SoP?

There's none, and that's a major impediment to data analysis, researchers say. The lack of uniformity across states in the way their data is compiled, analysed, reported and presented makes it difficult for those outside the system to access... let alone understand. Put that down to ICMR's lack of interest in devising any standard operating procedure. "What we are working with is highly imperfect because different states, even different districts, have adopted different reporting and testing strategies. It's not an apples-to-apples comparison. When we put them all on the same graph, it's almost like committing a statistical sin," says Prof Bhramar Mukherjee, a biostatistician at the University of Michigan who heads the CovInd-19 Study Group—a collection of US academics tracking the pandemic in India. She spoke those words at an online symposium organised on June 6 by the Indian Scientists Response to Covid-19 (ISRC) collective, an initiative comprising about 600 scientists attempting to provide independent, data-driven, evidence-based information about the pandemic to the public.

Statistical and data reporting infrastructure itself is an issue, says Prof Mukherjee, speaking to *Outlook*. Owing to "gaps and misalignments in daily reporting from ICMR...we use covid19india.org. I have been looking for daily admissions and death data related to Influenza-like illness (ILI) and Severe Acute Respiratory Illness (SARI) across India, both historically and now, but have not been able to locate it. This is very important to track in the future as a departure from the historical curve could indicate an outbreak." Covid19india.org is a crowd-sourced volunteer initiative that aggregates data from state press bulletins, official social media handles and media reports—the gap they fill is obviously left by a retreating officialdom.

Another speaker at the symposium, Dr T. Sundararaman, former executive director of the National Health Systems Resource Centre, had similar thoughts. "The ICMR protocol is very clear that ILI cases which are symptomatic, outside hotspots and containment zones will not be tested. There's a phenomenal reluctance to test symptomatic patients. But a hotspot cannot be declared as such unless you test. So there's this whole chicken or egg situation," he said. And why had the Integrated Disease Surveillance Programme (IDSP) stopped its monthly reporting of ILI and SARI from February 24, since Covid-19 is "clinically

VOX POP

Prof Bhramar Mukherjee

John D. Kalbfleisch Collegiate Professor of Biostatistics, School of Public Health, University of Michigan

"Investment in public health, biostatistics and epidemiology is minimal in India and I am sure after this pandemic is over, the need for growing capacity in these domains will be forgotten until the next public health crisis emerges. It is a medicine/treatment-focused culture rather than one that invests in prevention/public health. Maintaining a strong public health infrastructure is a general broader need as there will be many other public health crises aside from a pandemic in the future. I hope this public health challenge gives us an opportunity to advocate for public health, data and data scientists. Data transparency and modelling is key not just in this pandemic, but for information-driven policymaking in general. We need a well-funded CDC in India, staffed with qualified data scientists and public health professionals."

Experts blame a top-down lack of expertise for data for poor quality of ground-level collection. The poverty of data colection transmits downward.

indistinguishable from the flu"? The only plausible answer is, so that we don't know. "There's a mountain of data being churned out from various sources, including IDSP and health management information systems, among others. But there's almost no inter-operability; these data don't talk to each other despite a high degree of overlaps," Dr Sundararaman noted.

Some data anomalies happen even within one system: on May 14, the Delhi government put out two sets of figures—one mandated by the high court, another in its daily health bulletin. In response to a court order, it said 1,807 cases were reported that day from various government labs, of which 472—that is, 26 per cent—were positive. Meanwhile, the daily bulletin stated that the total testing done till May 14 was 1,19,736—that was 6,391 more than on May 13, hence 4,504 more than the number given to the court. Numbers from private labs, which report only to ICMR, could have accounted for the difference, except for the curious fact that the number of positive cases (472) was the same in both reports. So private labs tested 4,504 people—earning eighteen million rupees—and found zero? "How is this possible? That too when 1,807 public lab tests gave 472 positive cases? The state government is either unable to explain it properly or manipulating the data," says a Delhi government official. "If this is happening in the national capital, can you imagine the situation in other states?"

Human errors?

Several data experts blame a top-down lack of expertise and appreciation for data for a host of ills, including the poor quality of ground-level data collection. Some, however, call it a "legacy problem" involving previous governments—yet, the manner of, and motivation for, data collection does change with each change of the guard. And the poverty of the data culture transmits downward. A government data expert says the problem is more individual than institutional. "If a person is not data-savvy, it leads to a lot of data collection in non-standard formats, leading to confusion. There have been multiple changes in the way data was recorded over the last two months even in the country's most significant city...so public data cannot be considered accurate," he says. Dr Raman Sharma, an expert on infectious diseases at Jaipur's Sawai Man Singh Hospital, too says the Union health ministry is not entirely at fault because a lot of data contamination occurs from the ground up. "Sometimes the patient's age is missing, often the gender is not marked. If data transmission from the field is not correct, its analysis is bound to give errors. The Centre is dependent on state governments and hospitals for all such data," he says.

Dr Sundararaman, though, isn't inclined to blame doctors or auxiliary nurse midwives (ANMs) for falsifying whole sets of data. "There's no stake for them to do so. If the numbers upstairs are unreliable, there are complex processes responsible for this... the whole way in which this data management is done, with senior IAS officers at the top making pronouncements with raw numbers without any sense of the denominators, is problematic," he said at the symposium. Concerns about the denominator have been raised in a number of indicators and metrics—including cases/deaths/tests per million, as also test positivity and case fatality rates (TPR and CFR). "In India, TPRs have been staying at 4-5 per cent. It's been argued that this shows there's no community transmission, but it's undeniable that there's wide variation in TPR across states. It's important to monitor such trends at the granular level," Prof Mukherjee notes. Her Cov-Ind-19 group published a preprint on medRxiv last month that illustrated the wider problem of national data masking state-level variations by using metrics that don't reflect their heterogeneity, thereby hampering nuanced analyses and informed policy interventions.

As for the case fatality ratio, Ashwin Srivastava, CEO, Sapio Analytics, a data analytics firm working with various government agencies, told *Outlook*, "The

government has adopted a wrong method to calculate CFR. It counts all cases together and then finds the death rate. That shows a low mortality rate because the denominator consists of cases that should not be included in the pool." That is, also the closed cases—the dead and recovered—along with the active cases. A patient admitted today may die in 10-15 days—that's the relevant time-period. In the symposium, Dr Sundararaman too flagged the issue of time-lags being neglected. "If we use the right denominator accounting for the 10-15 days, the CFR would be 4.5-6 per cent. This is internationally comparable. It shouldn't be surprising to learn that the virus behaves in India exactly as it does elsewhere in the world," he noted.

Others like Dr Sanjay Mehendale, director (research) at Pune's Hinduja hospital, maintain that data has to be validated before being released. "In my 30 years of working with ICMR, I can assure you data will become available in public domains only once it is clearly validated and its quality ensured. It's easy to criticise that the correct data is not available, but you have to agree that if non-validated data is put in the public domain, it will lead to much higher criticism."

The teaching hospital

Many experts feel government bodies are so stuck in fire-fighting mode that they forget to plan for the medium- and long-term. "It's one of the main reasons why our situation is so critical right now. Instilling a culture of data appreciation is much needed," says Srivastava. Generating lateral data, going beyond the immediate focus of testing someone positive or negative, could be of immense value. Studies published in Europe and China, for instance, have also looked at possible statistical links between Covid and genetic variations—such as in the gene that determines blood types. The research papers, while preliminary, suggest that people with blood type A might be more vulnerable to coronavirus infection while people with blood type O—which a 2014 study found to be the most common in India—might be resistant to more severe symptoms. How do we know if there's a potential correlation unless someone has taken the trouble—over the lakhs of samples tested—to also do a simple blood group test? Researchers now hope that at least ICMR's nation-wide serological survey (see D-G's Interview) analyses samples for genotyping. "It will help prioritise risk stratification, help public health planning. If an association is found between certain genetic variants and severe outcomes...future patients carrying that mutation can be screened in a targeted way. Identifying pathways, predicting treatment response and drug targets...it will aid all of that," says Prof Mukherjee. Data, like time, is folded into three—there's the past that needs to be understood, there's the present emergency that needs to be solved, and most of all, there's the orientation to the future that the other two must feed. This pandemic, and the next one. India as a civilisation cannot just be a hospital, it needs to be a research hospital that sows and reaps its knowledge for tomorrow.

INTERVIEW

Forming public policy with missing data is like flying blind

Steve H. Hanke, a Professor of Applied Economics at the Johns Hopkins University in Baltimore (USA) and a member of the Charter Council of the Society of Economic Measurement, spoke to Outlook on why India doesn't have a good data.

What could be the reason for poor data generation and management in India?

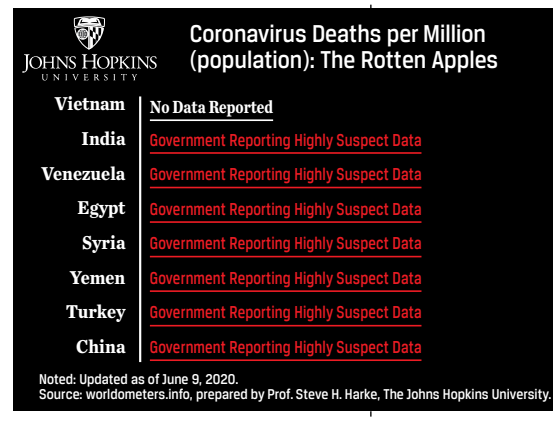
India has a poor track record of maintaining a reliable labour market and other economic statistics. One important reason for this is that almost half of India's economy is considered to be in the "shadow economy."

Do you think it is due to poor data culture or a deliberate attempt to hide the real picture?

The problem is a mix of poor data culture and a bloated, corrupt bureaucracy. This is confirmed in a report by the Carnegie Endowment for International Peace (CEIP). According to CEIP, the Indian Administrative Service "is hamstrung by political interference and outdated personnel procedures."

Is it due to bad data that India is not able to predict the pressure on its health infrastructure? And will it cause an acute crisis in the near future?

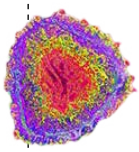
Missing or low-quality data are always a major problem when attempting to form public policy in the health--or any other--field. It's equivalent to the pilot of an aircraft flying blind.



WHO DECIDES COVID POLICY?

Preetha Nair

The pandemic has not been kind to Delhi. The state government, no stranger to pugilist moves in politics, is locked in a grim battle. Even since the lockdown was eased, horror stories have been escaping out of city hospitals like ghouls out to torment the populace. The city's Covid graph is soaring; overloaded hospitals are turning away patients, letting them die without proper medical care. But what's a crisis if not an opportunity for some extra lashings of mayhem?



Tale of two windows Bengal CM Mamata Banerjee does an aerial survey of the damage from Cyclone Amphan with PM Narendra Modi

We were not disappointed: two contentious decisions came along from chief minister Arvind Kejriwal to set off a right royal row. One was on barring admission to patients from outside Delhi to state-run hospitals. The order was sent back to the pavilion by the lieutenant-governor, Anil Baijal, before you could pronounce N95. The other was a revised testing strategy—that asymptomatic people will be restricted from testing. Again, the L-G scalped it, directing the state to adhere to guidelines set by ICMR. The soundness of the decisions—or the lack of it—in terms of ethics or effective epidemic policy is one thing. But the episode framed a central conflict at the heart of India's Covid-19 battle—central being an accidental word there. The key question is: who owns an epidemic?

Kejriwal's U-turn—from being a votary of aggressive testing to a subdued line—baffled all, and gave enough ammunition to the Centre to train its guns on the state. Not only because this was flip-flop—a pandemic is a dynamic flux, and policy needs to be alive rather than rigid. The real issue was whether a state could adopt its own strategy, in tune with its needs, but at variance with the broad national template. There are competing formal frameworks at play here. Health is a state subject under the Constitution. At the same time, a pandemic is a national event—indeed, global. Rich migrants courier in infection from abroad, poor migrants connect it to the last mile. It calls for national collaboration to solve it, a measure of uniformity in policy. But how much uniformity? And who examines the content of that policy for its soundness? Whose perspectives would feed it? Does it reflect India's multiple experiential realities? Is it consultative enough? A restriction on autonomy at state level, essentially, creates the spectre of a monopoly in policy-making. In short, it seems to have fallen upon a tiny virus you cannot see to invoke another thing you cannot see much in India these days: a federal spirit.

In a glance, India's COVID-19 policy is overwhelmingly within the remit of a central body, ICMR. (How did it get that job? See ICMR story.) States have to kowtow to its decisions, even if those often seem short on logic or transparency. There's another entity in play—the COVID-19 National Task Force. It has representatives from all states—an ideal candidate, then, to help set a well-rounded, multi-voiced policy. But last heard, its own voice was not being heard. Not that too many policymakers across the spectrum knew what to do with a pandemic. In terms of the quality of actors who filled out the roles, all sides come up short—Centre and states, with stray exceptions. That's why health economist and epidemiologist Dr V. Raman Kutty can ask, "How much can they test? States have limited resources." That's not a constraint unique to states—"our health expenditure is very low nation-

The real issue about Kejriwal's U-turn—from aggressive testing to a subdued line—is if a state could adopt its own strategy that varies with a national template.

While states were kept in the dark, the Centre drew on its legal powers to monopolise decision-making on key aspects: testing strategy, drug protocol, travel, kits, emergency supplies....

ally also," he rues.

Despite being at the forefront of pandemic control, taking decisions that could save lakhs of lives, most states, at least in the initial months, were in the dark about key decisions: testing strategies, lockdown, suspension of travel, zone classification, almost everything. The nationwide lockdown on March 24, with a four-hour advance notice, caught many states by surprise. The resultant migrant exodus also hit them the hardest—states were left bereft, and states had to cope with the deluge—that too with nary a talk of central aid. On top of all that, an older virus was infecting the air too—curiously, in selected states. West Bengal, for instance, where elections are due next year. Trinamool Congress spokesperson and Lok Sabha MP Mahua Moitra says states weren't consulted on anything—lockdown or the schedule of Shramik trains. "We requested the Centre to shut airports and not to run Parliament in end February-early March. They didn't listen. Now that the situation is out of control, they want us to handle the situation," she says.

The contestation between the Centre and states over federal rights is nothing new. Every regime in New Delhi has tried to curtail the rights of states through dubious constitutional means: indeed, the Congress has authored some of those means. However, the last six years have seen increasing centralisation of power. The continuous tussles one sees over West Bengal, Kerala, now Maharashtra...that has tragically cast a shadow over pandemic policy too. "The Centre is completely at odds with the federal spirit," says Moitra. "Everyone works together in a pandemic. That's not the case here." Mithilesh Kumar Thakur, a minister in opposition-ruled Jharkhand, echoes the sentiments. Asking Ranchi before deciding on a lockdown? No such luck, he confirms. "We were never consulted, but it is we who get the huge influx of migrants. Our CM conveyed his reservations about opening up also, that too wasn't taken into consideration. Now all states are opening up, we too will have to play along," says Thakur. One of India's poorer states, Jharkhand's demand for financial assistance, especially pending GST dues, have often fallen on deaf ears. Nothing better to exacerbate a tragedy.

Legally Bound

What's the ideal scenario? Of course, the Centre acting as a facilitator, say most experts. Supporting states with financial support, guiding the laggards with a policy grid detailing best practices, becoming a network of shared knowledge, enabling research collaboration, distributing its fruits, becoming a nodal point for learning and teaching at once. But what one saw was the Centre draw on its legal powers to monopolise decision-making on key aspects: testing strategy, drug protocols, suspension of international travel, procurement of emergency supplies, local production of diagnostic kits—things that affected everyone, without anyone being on board. India has invoked the Disaster Management Act (NDMA) 2005 and Epidemic Diseases Act 1897 to do all this, and questions are being asked about the adequacy and validity of the two laws, especially their conflicting provisions. Under Section 2 of the Epidemic Diseases Act—which came into being after the Bombay plague—state governments can adopt exceptional measures to contain a disease. However, under the NDMA Act, the Union health secretary is entrusted with those powers. Says M.R. Madhavan, president, PRS Legislative Research, "NDMA allows centralisation of power, which may not be a good thing during an epidemic. That battle has to be as local as possible."

Legal expert Prashant Reddy concurs, saying the century-old Epidemic Diseases Act badly needs an update. "The government shut down the entire country using some flimsy provisions of the NDMA," he says. Constitutional expert Subhash

Kashyap defends the resort to NDMA. "Nobody anticipated such a situation. Legal science tells us existing laws have to be read in context, and interpreted so that the present situation is covered till the law is amended," says Kashyap. Whatever the legal opinion may be, Maharashtra, the current hotspot, feels aggrieved. "Under NDMA, the Centre possesses the power to decide on international travel. It delayed the suspension despite our demand. That's the reason for the exponential surge in Mumbai," says NCP leader and state cabinet minister Nawab Malik. The lack of autonomy further hamstrung them. States are in a better position to devise strategies to suit their requirements, he says. "Private labs here were not allowed to get into production of drugs or testing kits, while the Centre erred in buying faulty kits from China," he says.

A handful of states managed amidst this straitened space—Kerala, Rajasthan and Karnataka, for instance. A non- centralised approach benefited Kerala internally too, points out Dr Kutty. "This happened 25 years back. Panchayats have been trained in disaster management. So when emergency measures were announced, they were ready. It's one of the good things that came out of the legislation process," he says. Legislating, as it were, to delegate. But up the chain, it's still a picture of conflict. Kerala was keen on conducting rapid antibody tests to check community transmission in March, but never got a nod from ICMR. And antibody kits developed by Kerala's Rajiv Gandhi Centre for Biotechnology (RGCB), sent for approval in April, are yet to be green-signalled. Says Dr M. Radhakrishna Pillai, director, RGCB, "ICMR told us our product didn't have a high sensitivity, although it had a perfect specificity. They haven't said what is required. If we are supposed to re-engineer the kits, we need to know. There's lack of clarity," says Pillai.

Lack of transparency is especially problematic, says Dr B. Ekbal, head of the expert panel advising Kerala on tackling COVID-19, because ICMR is neither a statutory body nor a regulatory one. "ICMR works in a bureaucratic set-up. It should act as a dynamic body in this hour. Some standards should be set. Then research institutes should be free enough to market their products based on that. Beyond that, ICMR should not act as a roadblock," says Dr Ekbal. "States have different sets of problems, so should be free to develop their own strategies. If Kerala is spending money and testing people, why should ICMR object to it? It's a desire to control," says Dr Kutty. Karnataka and Delhi too had been keen in April to conduct random antibody tests, but a kind of denialism about community transmission seems to have guided policy. ICMR's ongoing serosurveys are expected to throw some light on the topic now. Dr M.C. Mishra, ex-AIIMS chief, says it's too late to deny community spread now—"all of us felt it was there, but on a minimal scale. I'd say there was a delay in conducting antibody tests."

Not all are critical of ICMR. Despite being a non-BJP state, the Centre "always cooperated" with Rajasthan, says Rohit Kumar Singh, the state's additional chief secretary (health). "We have the flexibility to decide our strategy, and never faced any shortage of kits," says Singh. That's a model of the dynamic, flexible equilibrium federalism should mean.

VOX POP

M R Madhavan

President, PRS Legislative Research

"The Centre has invoked the Disaster Management Act, 2005, which was not designed to handle epidemics. It repurposed this Act to impose the lockdown across the country as it had no other legislation which gives the power to do so. Parliament was in session till March 23 and they could have brought a new Act to tackle the pandemic. The PM announced the lockdown on March 24. From early March, the government has been imposing restrictions and they had enough time to plan it. We also had some flights cancelled and the PM and other ministers had cancelled Holi celebrations in March. They could have passed a broadly-worded emergency Act to manage the crisis. That would have been a better way to do it."

'Kerala is not easier to manage than New York'

With low mortality and high recovery rates, there has been a 'Kerala model' in pandemic control too. But post-opening up, the coronavirus again stalks the coastal state. State health minister **K.K. Shailaja***—aka 'Shailaja Teacher'—explains how they're refocusing their strategy. Excepts from an interview with* **Preetha Nair**

Kerala's curve is rising again....
We were expecting it after the (post-lockdown) influx—till now, 1,87,619 people have reached from outside. The majority of new cases are among them. We are not worried...the situation is not out of control. We have surveillance at airports, ports and state borders. But with lakhs coming in, institutional quarantine is difficult. People who come by road or air can go for 14-day home quarantine if they don't have any symptoms. Only symptomatic patients are shifted to hospitals.

What about contact tracing?
It's an arduous task now, but we are still following it. We have strict panchayat-level monitoring. People are following the principles of home quarantine. But with lockdown relaxations, they sometimes behave as if they got freedom!

Still only 17 deaths.... How?
Most of them had come from outside, already in a bad condition...like a leukaemia patient back from the Gulf. Our fatality rate is low mainly because we took special care of the elderly, adopting reverse quarantine. We had a strong screening system at the airport since January; positive cases were immediately transferred to hospitals; ambulances were sent if anyone developed symptoms. Every patient was given extra care, that's how we could save even a 93-year-old patient with a heart condition and his 88-year-old wife. Such care was possible because we stopped the spread from the beginning...we may not have managed if 10,000 patients turned up at once.

Is there a threat of community transmission?
I can say community transmission hasn't happened so far. Out of the total cases so far, only 10-11 per cent got it via contacts. The rest is all imported cases.

Is Kerala testing enough?
We have adopted strategic testing. Instead of calculating testing rates per million population (TPM), we should view it against cases per million (CPM)...relative to the size of the outbreak. That way, we are much ahead of many other states. We are testing 67 times more than our caseload, Maharashtra only 25 times. Our daily testing has gone up to around 3,200 samples. We conduct sentinel surveillance (random tests). We have conducted 20,000 rapid antibody tests and detected only 25 positive cases; all had a history of contacts.

Are you prepared for a surge, the predicted 'peak' in July-August?
We are facing difficulties—people have been entering from hotspots, so the curve we flattened in April is rising again—but we are confident we will manage. The positive cases may go up to 25,000... we are trying our level best not to reach that. We are getting prepared with more hospital beds and Covid care centres. It will be difficult to handle if we face a situation like Maharashtra. Right now, we are in a good space.

What are the lessons you learnt in disease management?
Preparedness and pre-planning is the key. We devised protocols and SoPs...for instance, hospitals are not to fill their beds to capacity. If a hospital has 500 beds, and gets 500 patients, they should transfer half the patients to the next Covid hospital. Half the beds are always set aside for critical cases. In case of a huge surge, we plan to convert private hospitals, institutions and hotels into COVID-19 hospitals.

What can India do better to contain the contagion?
Every state is doing its best. I would say India should invest more on health. Kerala's strength lies in the strong foundation of the public health system, laid in 1957. This helped a lot during the corona crisis...even in district hospitals, we could afford to set aside 200-350 beds for a corona ward.

Is Kerala easier to manage, being a small state?
It's not scientific to say Kerala has a low mortality rate because of its size. With a population of 34 million and density of 860/sq km, the proneness to a spread is in fact way more, so it's more challenging. Kerala reported its first case on January 30. New York, with an 8 million population, reported its first case in March. Now New York's toll has crossed 20,000.

Are you on course to address monsoon-related diseases?
We are extra vigilant and have already taken steps to tackle dengue, malaria, viral fever etc...in the past two years, we have brought down infection-related fatalities..

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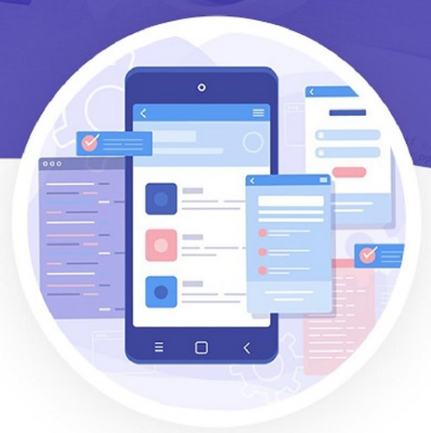



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ICMR, WHO?

Ajay Sukumaran

Not many would know that India's top health sciences body, the Indian Council of Medical Research (ICMR), actually predates the UK's Medical Research Council by a couple of years. That story goes back to the early 1900s, an era of big discoveries in tropical diseases—it was at the cusp of the 20th century that India-born British scientist Ronald Ross identified the Anopheles mosquito as a carrier of malaria in Secunderabad.

In the years that followed, many medical institutes for communicable diseases came up—like the Plague Research Laboratory at Bombay, and King Institute at Madras. Then in 1911, an Indian Research Fund Association was founded: that was to become ICMR after Independence.

It led research into every pestilence the country saw in the early years—plague, kala-azar, cholera, small pox. And, post-Independence, its family of institutes began to grow. Among the first were the National Institute of Nutrition in Hyderabad and Pune's Virus Research Centre—what's now the National Institute of Virology. Again, as veteran scientists recall, an era of stalwart science leaders.

COVID-19 now again puts ICMR in the driver's seat, getting both bouquets and brickbats as it guides India's epidemic response. In early March, when our case count was less than 100, researchers at ICMR had successfully isolated the novel coronavirus, thereby placing India among the handful of countries to have done so. That first step was critical to developing home-grown diagnostic kits and a vaccine. The res-

earch body last month also came up with its own ELISA test for antibodies, given the unreliability of imported kits. More recently, it stood its ground with the World Health Organisation (WHO) when the latter suspended ongoing Hydroxychloroquine trials based on a controversial paper—ICMR cited its experience to say there was no reason to suspend trials (globally, trials have resumed after the paper was retracted). No surprise then that a former ICMR scientist tells *Outlook* the council's response to Covid has so far has been 'impressive'.

But India's top medical research body has also battled charges of being tight-fisted—especially when it came to data about tests or while picking laboratories with expertise to join the battle sooner. It also took flak for India's low rate of testing in the early part of the outbreak. Noted immunologist Prof Indira Nath, however, says she would not single out ICMR or India when it came to specifics like data. "I would say many countries are not giving clear data on numbers of positive cases." A more widespread affliction, then, a misplaced nationalism that countries display which does not flow from the province of science.

And yet, any institution begins to breathe a kind of power when invested with it, perhaps to an excess. That's why Prof Nath, for instance, feels ICMR initially displayed a governmental attitude by only turning to its own institutes when it came to testing. "The RT-PCR test is done by many accredited labs and researchers, it's a very easy technique. So what you needed was clear-cut SoP and included a lot more institutions from the beginning. I think initially there was a worry that only ICMR-based, or government institutes, could do it best."

That possibly reflects a larger malaise affecting many scientific institutions in India—a bureaucratic attitude seeping in over the years. "ICMR has a lot of bureaucracy, so does CSIR (Council of Scientific and Industrial Research). What happens, it seems to me over the years as I'm watching all these organisations, is the scientists themselves become bureaucratic," says Prof Nath, who was on a committee reviewing ICMR's programmes back in 2013. There's no mistaking the scientific expertise, she points out. But she reckons that scientists, as they work with bureaucrats at the top, also tend to emulate them.

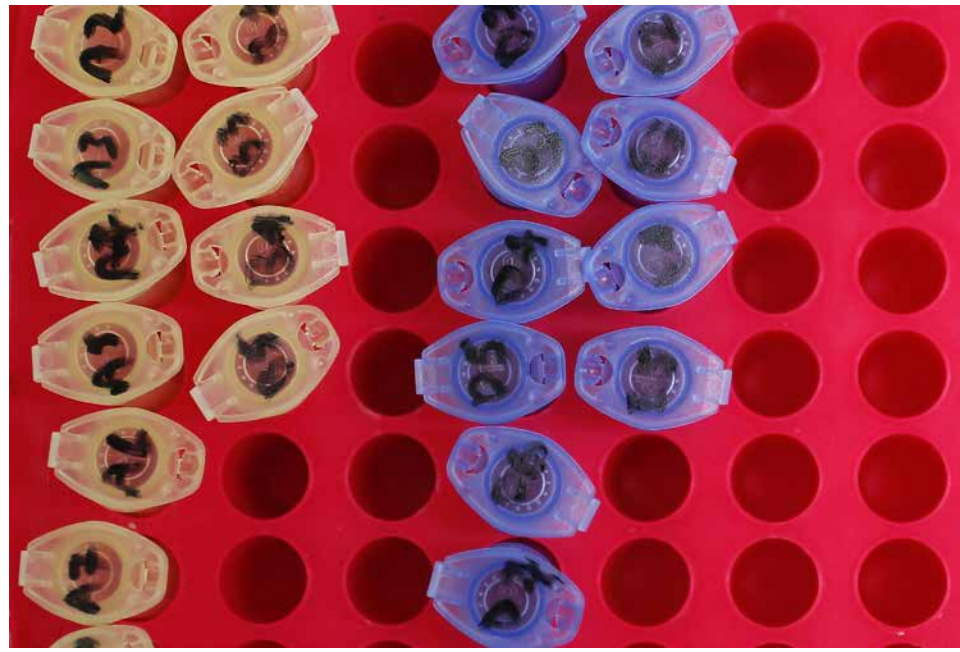
Of course, India's Covid response involves several agencies. Here's how the tasks are divided: testing, diagnostics and vaccine research are ICMR's forte; disease surveillance, which includes generating and compiling data on the spread, is the job of the National Centre for Disease Control (NCDC). The ICMR is an autonomous body whose director general is also secretary, department of health research. Meanwhile, the NCDC comes under the department of health services.

The NCDC too has a long history. Its origin was the Central Malaria Bureau set up in Kasauli in 1909, which became the Malaria Survey of India in 1927 and later shifted to Delhi as the Malaria Institute of India. In 1963, it was renamed the National Institute of Communicable Diseases. The Surat plague of 1994 proved to be a wake-up call. Seeing the need for better surveillance and preparedness, the government invested money and training to transform the institute into the NCDC.

For a rough comparison, think of ICMR as the Indian counterpart of the US National Institutes of Health, and the NCDC on the lines of the US Centers for Disease Control and Prevention. The NCDC uses a countrywide network called the Integrated Disease Surveillance Programme—a key outcome of the Surat plague—to keep track of outbreaks. "I can say IDSP is a robust surveillance system, better than in many countries," Udaiveer Singh Rana, a retired joint director of NCDC, tells *Outlook*. But then, as an agency, NCDC hasn't been as visible as its research counterpart ICMR, plausibly because the health ministry, which it reports to, conducts the daily Covid briefings. Also, as UMich biostatistician Prof Bhramar Mukherjee says, the usual IDSP data flow on severe respiratory cases in India curiously dried up during the pandemic (see *Where is the Data?*). Beyond Covid, ICMR's sphere of research activity spans a vast territory. There have been hits and misses—some experts point to how the setting up of regional institutes of expertise grew into an unwieldy set-up over the years, putting the social relevance of many programmes into question. Last year, answering a Lok Sabha question, the government said the number of institutes under ICMR have been brought down from 32 to 26 in a bid to streamline things.

Tackling diseases by creating an array of programmes as separate verticals—tuberculosis or malaria, for instance—too has been counter-productive in the long-run, say some experts. "The one-disease approach is a chronic disease of India," is how noted virologist T. Jacob John puts it. This tendency, he explains, is aimed more at international obligations and less at public health. "Without universal primary healthcare, TB cannot be controlled," says John. The Covid experience, says Prof Nath, may give us insights into the structural changes required in terms of funding—India spends less than 1 per cent of its GDP on research and development—and the working of institutions.

‘No underreporting, all the missing links will be answered’



The Indian Council of Medical Research (ICMR) has been at the centre of pandemic control in India. Under the aegis of the COVID-19 National Task Force, it has set the overarching policy on testing and treatment strategies, yet its role has faced flak for lack of data transparency, among other issues. Here, ICMR director general ***Prof Balram Bhargava*** *dismisses the allegation of under-reporting and says all the missing links would be soon explained. Excerpts from an e-mail interview with* **Jeevan Prakash Sharma**.

Do you still deny that community transmission has started in cities like Delhi, Mumbai, Ahmedabad etc?

A majority of cases are being reported from a limited number of cities. And within the cities, there are specific pockets. Hence, it would be better to use the phrase high containment zones. Many of the states and cities do not have that much infection: hence, it cannot be generalised. Prevention in containment zones and in clusters will be decisive in stopping future spread. Local governments and individual citizens need to play a responsible role here. ICMR has conducted a nation-wide sero-survey in 69 districts, covering a population of 24,000 people. This has recently been completed and its results will indicate the exposure due to COVID-19 in the community.

Health experts feel the monsoon will aggravate the situation—there’s speculation on reaching the peak around July-August.... When can we see a flattening of the curve?

The reproduction number of the virus determines its transmission, hence the spike. There is no concrete evidence that the virus multiplies higher in the monsoon season...how the rainy season will affect the transmission needs to be seen. Since this is a novel virus, it is difficult to predict its future course of spread.

Are there different strains of the virus in India?

To understand the progression of the virus in India, we require a phylogeographic analysis with samples from each state. Current sequencing data gives us over 220 (isolates) from India; the majority belong to the A2a genotype. The GISAID’s huge database has not revealed much beyond the mutation recorded in different countries; their role still needs research.

Is COVID-19 behaving differently in India?

The virus’s behaviour is dependent on its host and can have a varied effect based on the host immune status. Experiments need to be performed in order to assess whether the strain circulating in India is milder or virulent. The SARS-CoV-2 virus being an RNA virus has a comparatively higher mutation rate.

Any tests on India-specific strains? On their infectivity, lethality, ability to survive on various surfaces?

As the different strains for the SARS-CoV-2 are conserved (they have a similarity of ~99.7%), the same tests are being used to identify the virus. Experiments need to be performed in order to assess infectivity, lethality. Some studies are there on its ability to survive on different surfaces*.

Is India under-reporting?

We have crossed one lakh tests per day. If we compare to any other country, we are doing better from the beginning, ratio wise. Rather than doubting, we must appreciate

the holistic efforts made by every sector of the country to enhance diagnostic capacity and pool testing, especially ICMR and VRDLs.

Do we know why some districts are badly affected, others aren't? What explains, for instance, why Dharavi in Mumbai, where social distancing is not possible, initially witnessed low transmission...

Some districts are badly affected—Mumbai, Navi Mumbai, Thane, Pune, Ahmedabad etc—because of high movement, being cities. And it's not true that Dharavi showed lower transmission. It has seen a surge; strict containment has reduced the incidence.

Some experts still hold that Indians are more immune compared to the West...

There is no study or research which has proven that Indians are more immune compared to Western countries. There is also no conclusive data—either epidemiological, age-specific, gender-specific, vis-à-vis socio-environmental conditions, or serological evidence—to prove this hypothesis.

Is there any correlation between BCG vaccination and immunity?

BCG's positive correlation in protecting against COVID-19 is still not proven by any clinical trials.

What explains the better recovery rates in Kerala? Nutrition? Immunity? Better treatment?

It's not correct to say Kerala has shown a faster recovery rate than states like Maharashtra and Gujarat. There could be possibly many confounding reasons. The Nipah outbreak awakened the populace, so social acceptance of emergency moves being implemented helped.

There's sharp criticism about data being withheld or not even being generated? Won't a more holistic and open approach to comparable data help everyone?

Initially, the priority during any outbreak is containment. So, more focus was but naturally given to that, to increasing the robustness of diagnosis, and increasing testing capacity. Secondly, it was important to become self-sufficient by developing indigenous testing and diagnostic kits for different kinds of research related to COVID-19. In comparison to other countries, children have been less infected; all credit goes to the lockdown and continuous monitoring and testing. Now, as a task force, we are undertaking many projects and following lines of research...all the missing links will be soon answered. And data regarding different variables and its correlation with COVID-19 will be explained.

Most of our decisions seem based on western research. What have been ICMR's major research achievements?

Major research studies carried out by ICMR recently include the isolation of the virus, with India becoming the fifth country to do so. We also did the whole genome sequencing, which helped in the development of ELISA for antibody tests—and became the first step towards an indigenous vaccine, being developed in partnership with Bharat Biotech. ICMR is also participating in the WHO Solidarity Trial which will look at the beneficial effects of Hydroxychloroquine, the Lopinavir-Ritonavir combination therapy, Interferon beta-1a and Remdesivir. The study also seeks to understand the benefits of HCQ as prophylaxis in healthcare workers. ICMR has also initiated plasma therapy trials and published a special Covid supplement to its scientific journal—the *Indian Journal of Medical Research* (IJMR)—which includes 24 editorials, perspectives, policy pieces, protocols, short commentaries, review articles and original research papers from ICMR and non-ICMR researchers.

How close are we to an indigenous vaccine?

ICMR has transferred the virus strain to its partner, Bharat Biotech International Ltd (BBIL), for developing the indigenous vaccine. It has also initiated work with the Serum Institute of India (SII) and Oxford University to fast-track phase I/II clinical trials of the live attenuated recombinant vaccine for COVID-19 developed by the Oxford Group. We have also partnered with DBT/ICGEB for development of monoclonal antibodies for the treatment of COVID-19 patients. We have evaluated over 30 drug candidates/repurposed drugs for identifying promising treatment options.

Opening up has led to a surge. What's your strategy?

The first and foremost priority should be to contain the infection through social distancing, following adequate advisories like using a mask, washing hands properly and avoiding crowded places. Besides, the elderly and the comorbid population must be taken care of, as they are at higher risk.

**(Reference- Ren SY, Wang WB, Hao YG, et al. Stability and infectivity of coronaviruses in inanimate environments. World J Clin Cases. 2020;8(8):1391- 1399. doi:10.12998/wjcc.v8.i8.139).*

Rajiv Ranjan Mishra
Director General, NMCG,

NAMAMI GANGE

THERE IS A MARKED IMPROVEMENT IN GANGA'S WATER QUALITY

A clean Ganga river is the dream of every Indian. The National Mission for Clean Ganga (NMCG), aims to achieve this through Namami Gange. Though efforts were made since the late 80s to keep the river in its original state, the desired result remained off the mark till May 2014 when the Modi government came to power. A year later, the new government made an integrated and comprehensive approach to restore its piousness and glory by making several vital additions to the previous schemes.

Rajiv Ranjan Mishra, Director General, NMCG, *who has been entrusted with the gigantic task of achieving the dream of the nation, says that the new initiatives have already started showing the perceptible change in the quality of water.*

An IAS officer of 1987 batch from the Telangana cadre, Mishra has achieved many targets ahead of deadlines with his dynamic and inspiring approach. In an interview with Outlook, he reveals how soon a clean Ganga will be a reality.

Excerpts -:

Q How is Namami Gange different from its previous version and how well it is progressing to achieve its goal?

It is a unique initiative in many ways. We have been talking about Ganga cleaning for a very long time and several schemes and actions plans were made earlier. However, what really differentiates Namami Gange when it was announced in 2014 and formally launched in 2015 is its integrated and comprehensive approach based upon long scientific research by a group of a consortium of seven IITs.

Earlier the focus was on cleaning only. Now it is on the rejuvenation of the river which is much beyond cleaning, a comprehensive approach to tackle and find solutions to the challenges posed to Ganga in several sectors such as wastewater and solid waste management, industrial pollution abatement, river front development, Biodiversity conservation, Afforestation, River management Planning, wetland conservation etc. Under this mission, the approach has been changed from only pollution abatement to integrated mission for conservation of Ganga and its tributaries. It is like restoring the wholesomeness of river to the extent possible. We have embarked upon a process of scientific river rejuvenation for the first time in India. The two basic requirements to rejuvenate the river are, first the Nirmal Dhara which means unpolluted river and second Aviral Dhara which means maintaining a continuous flow. Besides that, we have also looked at the complete ecology such as aquatic life, flora and fauna, sediments etc so as to rejuvenate it in all aspects.

So far as achieving the goal is concerned, out of 313 projects taken at a cost of Rs 28,966 cr, 122 projects have been completed and the remaining are at various stages of execution. These projects are related to pollution abetment (sewerage infrastructure, solid waste management, Industrial pollution abetment, rural sanitation and water quality monitoring); development of riverfront, ghats and crematoria; afforestation, biodiversity conservation, research just to name a few.

Several major drains falling into Ganga have been intercepted and diverted to STPs –new and old. Almost 80 major drains in five states have been tapped and stooped waste water directly falling into the river. The Sisamau Nala in Kanpur, infamous Kasawan Nala in Haridwar and Chandreshwarnagar nala at Rishikesh are other notable examples of such tapping. Along with short term goals, we have tried to achieve long term sustainability through Hybrid Annuity Mode (HAM) projects and "One city One operator" approach.

Q Now when 37% project is already complete, can we perceive these changes on the ground?

Of course, we can see the water quality improvement along the entire stretch of river starting from Gangotri till the West Bengal. One of the indicators is the amount of dissolved oxygen which should be 5 mg per litre. In the entire stretch of Ganga, it has gone beyond that. Another indicator is BOD (biochemical oxygen demand) which should be less than 3 mg/litre. 351 polluted stretches of rivers in the country identified in 2018 by CPCB were prioritized on basis of BOD from category I to V, with category I being most polluted or critical. At present, not even one stretch of Ganga is in priority I to IV. There are only two stretches left now, that too in priority V.

For the first time, notification for ecological flow was issued for River Ganga in October 2018, formally establishing the right of river over its own water which has far reaching implications for ensuring river health in long term.

Because of the improvement in water quality the sighting of aquatic life of the river especially Ganges Dolphin has also increased.

So there has been a marked improvement in water quality in the last few years and I think compared to many other rivers in the country, Ganga is in much better condition.

Q How has been the response of the various state governments towards the river rejuvenation schemes?

Every state has naturally shown interest and enthusiasm as the cause of restoring health of mother Ganga is unifying and with universal appeal. The difference in approach often comes due to capacity constraints, lack of scientific data and planning. We do a lot of capacity building exercise among urban local bodies of all the states. They need a lot of hand-holding for preparing detailed project report or decisions during tender process.

All projects in Haridwar, Rishikesh, Muni ki Reti –the main cities in Uttarakhand on Ganga, have been commissioned and most other STPs in state on Ganga towns are also complete. It is a big achievement as the river meets the large population and hence pollution load from Haridwar and Rishikesh.

Almost entire Prayagraj now has sewerage network and STPs. Varanasi saw completion of 140 MLD STP at Dinapur and 120 MLD at Goitha. One city one operator approach HAM projects have been started for Kanpur, Prayagraj, Mathura etc. Mathura project has pioneered reuse of 20 MLD treated waste water in Mathura refinery with IOC sharing cost. In Bihar, Namami Gange projects are increasing treatment capacity by 10 times from existing functional capacity of about 60 MLD to 650 MLD. In Jharkhand, Sahibganj STP is already functioning and the only other STP on Ganga at Rajmahal will be completed in few months. Several projects in West Bengal too are making progress.

Q Give us a brief detail of the cities identified along the river for pollution control and how do you plan to implement various schemes?

As I said earlier, we are looking at the river in continuity, so right from the beginning till the end, we have got mapping of 97 towns done on the bank of the river. There are over 4600 villages in these 97 towns. Then we also identified villages and towns on the tributaries of Ganga because Ganga cannot be cleaned unless tributaries are pollution-free. Out of 313 projects, 152 are sewerage projects costing roughly over Rs 23000 cr. 39 out of those 152 are on tributaries. These tributaries help maintain a good flow.

So after identifying cities, we conducted intensive work to find out the condition of existing STPs and their capacities. Out of 50 STPs, some were defunct and some under-utilized. So besides rectifying the defunct ones, we improved the capacity and constructed new one keeping in mind the demand in 2035. For smooth operation and better governance, we introduced a concept of "one city one operator" which means one agency has been given the responsibility to construct new STPs, rehabilitate old STPs as required and maintain and operate all STPs-new and old for 15 years.

Further, to improve performance, we introduced Hybrid Annuity Mode (HAM). Here, we pay to the concessionaire only 40% of its cost initially. The remaining 60% will be disbursed in 15 years with interest.

Q In the past, crores of rupees were spent on cleaning up the river with no noticeable impact. How well is the money spent being monitored and how different are the outcomes this time around?

The prior programmes for clean Ganga had a total allocation of less than Rs 4000 from 1985 to 2014. Under this government, it has been significantly scaled up through a dedicated outlay of Rs 20,000 cr for the period 2015-2020 with 100% central funding. A total of 152 sewerage infrastructure projects has been sanctioned to create 4856 MLD treatment capacity in the Ganga basin. In 2014, only 28 projects existed for only 462.85 MLD. Projects have been taken up as per a comprehensive plan for all the 97 cities/towns along Ganga. Subsequently, projects for tributaries have also been started. Prior to Namami Gange, there was no effective mechanism for linking the payment of operation and maintenance with the STP performance.

Q How soon a clean Ganga become a reality?

Cleaning of a river is like cleaning your house. It is a continuous process and cannot be said that once done will not be repeated. The cleanliness needs to be maintained. We have to keep river clean and flowing. Ownership has to be taken by people. It cannot be the aim that any government-local or federal can clean up the river or rejuvenate the river. River cannot be cleaned in one day, it has to be kept clean & rejuvenated and that is why our mission also very strongly works for improving people- river-connect and several things are being done to improve the condition of banks.

Q How has lockdown improved the quality of water and what is the lessons learnt and plan of action for future

The nationwide lockdown imposed in the wake of COVID – 19, has resulted in overall ecological improvement due to curb on several human activities. There has also been improvement in quality of air and water. The improvement has come but we cannot have these kind of situations normally and we cannot depend upon such crisis to improve our river. Keeping river healthy must be our responsibility and we have to have long term perspective. There are many factors which combinedly resulted in the improvement of the Ganga river water quality during this period like increased flow in the river due to intermittent rains and lack of requirement of water for agriculture during this period, improved sewerage infrastructure in cities along the Ganga, reduction in industrial effluent discharge in the river, negligible human interaction with the river in terms of religious/ bathing activities, mining activities, motorboats activities, tourists.

Out of several sources of pollution, municipal sewage remained almost at same level as before lockdown, while other sources were reduced to minimal level during lockdown. If we talk about the improved sewerage infrastructure and curbing pollution along ganga towns, several landmark projects have been completed intercepting several major drains falling into Ganga and diverting them to STPs – new and old.

One of the important steps towards sustaining the river quality is creating awareness among people. Sustainability can be achieved by focusing on involving people living on the banks of the river. Everyone should be actively involving themselves in Swachhata & water conservation activities. Behavioural change is not only needed for keeping the river clean and achieve Nirmalta, it is also required for demand side management of water and improve water use efficiency to reduce abstraction which is very important for improving flow in the river to achieve the objectives of Aviralta.

It has been again clearly demonstrated during lockdown that rivers do not pollute themselves, but those who live on its banks and run industries, business etc are to take responsibility.

People's connect with river and their awareness is very important to rejuvenate the river. We have to learn the lesson from ecological resurgence during lock down that, even if we go to the river which we revere so much, we love so much, we have to change our behaviour, we have to control ourselves, we have to regulate ourselves. ■

ARE YOU IMMUNE?

Jeevan Prakash Sharma

Short stories can afford to come with a twist in the end. But epics are fated to contain twists at every turn, at every level of the labyrinth of nested stories. COVID-19 is proving to be one such gigantic and perplexing hall of mirrors: the logic unfolding in a sub-plot at Level 5 can alter the main narrative frame...

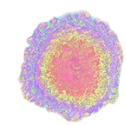
and then twist again. Immunity is a word that's been lurking around like a minor character with a walk-on part in the story from the beginning. There was at first that partly naïve optimism in the idea that Indians, on account of exposure to a rich bouquet of pathogens, have a kind of all-purpose 'native immunity'—a Teflon coating against Covid. As the new coronavirus plugged into India as a collective host, that was soon quietly replaced with a more modest, and perhaps illusorily durable, hypothesis. That if the virus strains were the same as were lacerating Italy, the UK and US, Indians looked at least *more* immune than the West. Could it have something to do with blood groups and variable vulnerability thereof? Was it the wall-to-wall coverage of BCG vaccination?

The questions seemed valid enough. After all, through Season 1, the India graph had moved at a gentle canter, with a low (official) fatality rate to boot. But as those ominous hoofbeats picked up in May, even that was discarded for a more fragmented picture. Some *regions* within India looked less (or more) at risk. Over 30 districts witnessed a wide spread, others experienced slower transmission. And seemingly inexplicable variations *within* that defied a universalising story. It still looks deadliest in Maharashtra, as the state exacts the highest toll. In Delhi, it looks more infectious but not as fatal as in Maharashtra and Gujarat. Kerala has a tremendous recovery rate; no other state has that.

But soon it became clear that one key playfield of variations existed at a still more micro level: not country, not region or ethnicity, but individual. Young Keralites in their 30s were dying in the Gulf, but back home in hilly Ranni, 93-year-old Thomas and his 88-year-old wife Mariyamma tested positive, even got critical and stayed so for days, then happily recovered—defying everything in the COVID 101 handbook about the elderly being at higher risk. By now, this randomness is a leitmotif of the COVID story: you as a patient may have merely experienced an unpleasant fortnight (with your "pizza tasting like cardboard," as writer Karan Mahajan told *The Atlantic*), but your neighbour goes to the ICU, perhaps thence to the mortuary. Why? Two axioms stay with us: the new coronavirus has shown an extremely varying propensity and potential to infect, and an equally puzzling unpredictability about who recovers and who does not. And perhaps neither has to do with the virus per se. Some variation in recovery rates could owe to differing healthcare practices and treatment protocols (at state/hospital/country level). But the lens surely needed to be adjusted to another level of magnification—because one key act in this grim drama unfolds *inside* the individual. This is where immunity comes in.

All other things being equal—age, health, exposure to virus—why does Person A get infected and Person B go unaffected? That's simply hard-wired *innate immunity*: a healthy body's first line of defence against pathogens, an in-built fortification. This invisible armoury of the body is by nature

The coronavirus has shown an extremely varying potential to infect and a puzzling unpredictability about who recovers and who does not.



Safety in numbers The possibility of herd immunity is a vexed question in India

The breakdown of immunity through a cytokine storm triggers a dysregulation of the host's immune system, similar to autoimmune disorders.

capable of warding off *new* enemies—so the fact of this being a novel virus wouldn't matter. The innate system has non-specific barriers that work regardless of *who* the enemy is—the body-castle's moat, drawbridge and mortar-fire repel Viking and Mongol alike. By contrast, *adaptive (or acquired) immunity* is like an active database of prior infections: it invests the body with a pathogen-specific immunological memory. An 85-year-old person's body thus carries the memory of a childhood measles infection, but is too slow to produce antibodies against a new enemy—hence, more at risk. "This is why children are more protected: their immune systems are simply stronger. That wanes as you age," says Calcutta paediatrician Dr Aniruddha Maitra. A point of mystery: COVID-19 initially seemed to spare children altogether. Thus the famous 'double peak' seen in other infections—older people and children being most vulnerable, healthy adults of median age being the hardiest—was markedly absent here. But as the pandemic spread, even children are seen to be not entirely out of its sway. But regardless of age variation, think of a first layer of armour.

Now, say the enemy penetrates that armour, via a Trojan horse, and you do get infected. Why only a mild flu for X, and ICU for Y? Well, post-infection, innate immunity continues to work, now in collaboration with its brother-in-arms, adaptive immunity: it smells out the foreign invasion, and enlists its ally to produce the ammunition...the antibodies. Inflammation happens, like sirens going off, signalling for reinforcements to rush to the infected site. Usually, this is when you get fever with any flu, before the body recovers. This is where the critical twist in the plot comes. It's a cataclysmic breakdown of these normal immunity processes—this complex wartime communication machinery—that's now looming forth frighteningly as a final act. A sudden, little understood crumbling of the fortress. A gasping, shuddering death. The key episode, called a *cytokine storm*, is now linked to many a Covid fatality. "It's a centerpiece of COVID-19 pathology," writes Tufts University immunologist Alexander Poltorak. "The killer is not the virus but the immune response." Essentially, an excessive reaction or dysregulation of the host's immune system, akin to what happens with autoimmune disorders. The system goes into hyperactive mode, then goes berserk and launches a stunning mutiny against the body itself—till the whole zeppelin comes flaming down. This happens when immunological agents fail in one key function—recognising self-substances, and exempting them from attack, while it goes for those nasty "non-self" macromolecules (the foreign pathogens).

The realisation that there's a consistent pattern of Covid fatalities being linked to this inner suicidal drama has led to a reorientation of efforts across the world. That's why proposed/ongoing studies posted on the US National Library of Health's ClinicalTrials.gov bear titles that refer to therapeutic strategies targeted at critically ill patients who've suffered or are close to an immunological burnout—by modulating or suppressing their immunity processes. A *Lancet* study called immunosuppression "a double-edged sword" because the body may be still vulnerable to any infection, and leaving it

bereft of its armour is risky too. As a focus area, though, it has dawned. But first the macro-level, before we descend the steps.

Are Indians immune?

'Native immunity' is actually just a synonym for innate immunity, but let's twist it to fit us 'natives'. Have Indians been conferred with an ability to take on all comers of the microscopic variety? Have we acquired a greater immunity by way of familiarity with viruses in general? Would that suffice to thwart a novel and tenacious one like Covid? The idea that prior exposure to other infections can create an all-purpose shield isn't entirely erroneous. There is such a thing as 'cross-resistance', which can work by altering the way receptor sites behave. But India's climbing numbers do not seem to offer any blanket comfort there. Why?

One reason could be that low nutrition levels enfeeble the delicate web acquired weaves in conjunction with innate. It's the latter's signalling apparatus—a complex, multi-function communication grid involving constantly patrolling sentinel called neutrophils, our most abundant White Blood Cells, and proteins called cytokines—that recruit the good guys with the Bofors gun, the B-cells and T-cells. (Roughly, the first produces antibodies that lock onto antigens on the surface of pathogens, and calls upon phagocytes that eat them up; the latter kills infected cells). Micronutrient deficiency leaves this double-barrelled defence fortification starving at all levels. The internet is awash with preprints of studies linking, for instance, Covid morbidity with low Vitamin D levels (severe among the old in Italy, Spain et al). Elina Hypponen, an Australian nutritional and genetic epidemiology professor, offers preliminary support "in theory" for the link, writing: "Nearly all immune cells have Vitamin D receptors (showing the interaction). The active Vitamin D hormone, calcitrol, helps regulate both innate and adaptive immunity. And deficiency is associated with immunity dysregulation." So, on that front, India fundamentally represents a vulnerable mass of humanity—and it goes beyond vitamin deficiency. (see https://bit.ly/379uA2z).

What about BCG? Can vaccination against bacterial infections even conceivably work against a virus? Well, there's a new line of theory on 'trained immunity'—the idea that, say, a vaccine can modify our innate system's pattern recognition receptors in such a way that they pick up similar antigens on even new enemies (antigens are surface structures on microbial bodies). But it begs further study.... "As of now, there is only correlation," admits Dr Maitra. And as *Lancet* warned in another context, "correlation does not equal causation".

Despite India's recent surge in cases, some researchers are willing to give a chance to BCG, a mandatory booster for children in India to protect them against meningitis and disseminated TB. "While COVID-19 caused a lot of deaths in Spain, its neighbour, Portugal, witnessed a very low fatality. And Portugal is the only European country where BCG vaccination is still prevalent," says Dr Sudhir Bhandari, senior professor of medicine at Sawai Man Singh Medical College, Jaipur. "The BCG association, like that of hydroxychloroquine, arose because the early spread of Covid was a reverse image of these two, but there are multiple possible explanations for it without ascribing a causal link," says Ranchi-based radiologist Dr Manish Kumar.

Many medical professionals anyway dis-

VOX POP

Dr Ramanan Laxminarayan

Director, Center for Disease Dynamics, Economics and Policy, Washington

Are we more immune? Does BCG, heat...any of that matter? Does having a younger population?

Younger population, yes. Not the others, of course. There is no difference in immunity, I think the only difference is that we got the epidemic later—India, Pakistan, Bangladesh all got it later. Remember, at one point in the global curve of number of cases, we were at number 39. Today, we've caught up.... So there's no question of us being more immune, it is just how countries managed their lockdown. There is no escaping the virus.

Amidst India's Covid surge, some are willing to give a chance to BCG, which protects children against TB and meningitis. But this begs further study.

miss the notion of India (or any other country) collectively having a higher immunity, citing the interplay of several factors that influence transmission and fatality. Dr Yadu Singh, Sydney-based cardiologist, for instance, attributes Australia's "spectacular" flattening of the curve (a mere 7,227 cases as of June 4, some 6,640 recovered, 102 deaths) to simply "good policies...and civic sense", adding it has nothing to do with high immunity among Australians. But even if country-wise variations are possible, we're still in the grip of a story that evokes fear and awe: the perennially unravelling mysteries of Covid, and how your body can itself unravel, a deadly denouement where immunity is the tragic protagonist.

An evolving death

The Covid infection was initially thought to be a merely respiratory phenomenon, affecting only the alveoli in the lungs—and bringing on pneumonia. That's still the primary effect: the lung's ACE2 receptors are the most abundant, most strategically placed, most amenable to hosting the virus. But it's becoming clear that it often causes a "multi-system disorder", says Dr Maitra—an all-pervasive attack on several fronts. Heart, guts, liver, kidney, brain...all cells can get infected because most organs have ACE2 receptors. A captured heart can go into myocarditis, an inflamed liver produces an enzyme glut. Most benignly, the gut lining; an altered gut flora equilibrium leads to the loss of appetite and/or diarrhoea common to many diseases. The UK officially added the loss of taste and smell as part of Covid symptoms on May 18—either as a presenting symptom, signalling an early onset stage, or independently, without other symptoms. Indeed, isolated anosmia and ageusia are now seen as a tool to screen potential spreaders, for these are often associated with a milder form of the virus—patients "10 times less likely" to go on to be critical. The reasons for anosmia/ageusia are not understood yet. One view is that ACE2 is also present in cortical neurons, making them potential targets. Another is that it's likely to be a secondary effect—the nervous system, for instance, is dependent on blood oxygen to function properly—rather than a direct infection of the nerves, as in, say, forms of meningitis or encephalitis.

This brings us to another potentially crucial site: blood. It was controversially proposed in a ChemRxiv preprint by two Chinese scholars and then reiterated by Italian pharmacologist Annalisa Chiusolo that the Covid virus manages to plug on to red blood cells, crack open the haemoglobin and release the enclosed iron. This was then linked to all the observed chain of catastrophic effects: anaemia, excess iron choking the kidney; silent hypoxia (from a hindered exchange of oxygen and carbon dioxide) starving all organs, including the brain; thrombosis, with all its usual effects (heart attack, stroke) et al. Blood was also a putative candidate to explain Covid's rainbow effect: the all-pervasive nature of its attack on the body. The theory is hotly disputed, even if Ebola too famously wrought havoc on blood systems in unexplained ways. The idea that the virus cracks open haemoglobin molecules (*haemolysis*) may or may not endure. Then where do we take all that stunning variety of symptoms? Well, recent understanding inserts a vital first step: immunity-gone-awry. Once that happens, your body-castle turns into a house of cards and caves in. That's cause; haemolysis, thrombosis et al are effect (https://bit.ly/3cGOKli).

So the real twist in the plot is when your body starts eating itself. An uncontrolled immunological self-immolation. And it's cytokines that do the arson. "Small proteins important in immunological processes" and produced by white blood cells are called macrophages, their job is to "trigger inflammation" and "recruit" other immunological elements to fight infection. Why they dysfunction is because Covid manages to "silence" this inflammatory response, and grows in the body in what an *Atlantic* article called "stealth mode". When the body realises belatedly that it has been totally besieged, the immune system goes into overdrive: *cytokine storm*. A mass attack ensues on infected cells. The lungs fill with a sea of dead cells, a kind of biological sludge that leads to organ failure. The blood clots all over, blood vessels leak, BP plummets because of vasodilation, anaemia occurs. Somewhere along this disastrous slope, they start turning on even healthy body cells. Just like any other autoimmune disorder, it's an aberrant overreaction that some people have. Including, it's now known, a subset of the children who get infected. Why only they have it is one of the mysteries of science. Thus, from a struggling country down to a self-immolating cell, the view is different at each step down the baoli. And the last step promises a pool of water with no clear reflections.

WHAT IS THE TREATMENT?

*There is no cure or vaccine for coronavirus. So far, there is no consensus on a treatment protocol either. Once infected, the treatment is largely supportive, based on managing symptoms. Many proposals are in the air or the lab—in the exploratory stage, trial stage or real-time in-vivo experiments on patients. Some proposed medicines, such as **hydroxychloroquine**, have been highly controversial. Here are the treatments being tried out across the globe—many are not backed by scientific evidence while others are downright harmful. The list, therefore is descriptive rather than prescriptive.*

For the uninfected

Vaccines are in the trial stage. There is speculation that existing vaccines like BCG and flu shots could protect against coronavirus.
Vitamin and zinc supplements. While a balanced diet helps you stay healthy, there is no evidence that supplements boost immunity. **Biomodulina T**, a thymic peptide obtained from bovine sources, is being used in Cuba to stimulate the immune system
Immunity boosters from alternative systems of medicine—ayurvedic products such as **Shadang paniya** powder, **Agastya harityaki** and **camphor**; and homeopathy products such as a mix of **Arsenic album 6/ Eupatorium perf 30/ Lycopodium 30)**. Doctors have termed these medicines quackery and cautioned against their use.
The most effective preventive measures are wearing a mask, washing hands, maintaining hygiene and practising social distancing

For mild cases

Symptomatic treatment with over-the-counter medicines such as **paracetamol** to relieve symptoms. Hydration and rest

For mild to severe cases

Anti-viral drugs like **fabiravir, ribavirin, lopinavir/ritonavir** etc.
Russia has approved anti-viral drug **Avifavi**r to treat COVID-19.
A combination of anti-malarial drug **hydroxychloroquine** with the antibiotic **azithromycin** has been proposed, though there are indications that it might have adverse effects in certain patient
Cuban product **Interferon alfa-2b**. Interferons are proteins that the body's cells produce in response to infections to signal nearby cells to heighten anti-viral defences. Interferon drugs, lab-made versions of the proteins, have shown promise in the treatment of hospitalised patients in Wuhan, China.
Ulinastatin, which is used to treat acute pancreatitis and septic shock
Acalabrutinib, a medicine used to treat mantle cell lymphoma (a kind of blood cancer)
Antibiotic treatments are being used for bacterial co-infections in patients with pneumonia

For critical cases

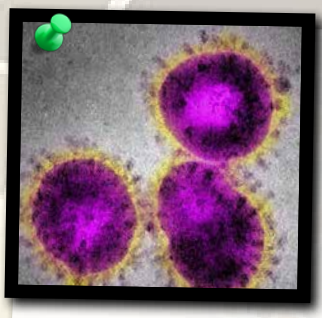
Respiratory supportive strategies: Oxygen therapy, high-flow nasal cannula and non-invasive ventilation might prevent the requirement for **endotracheal intubation**. Extracorporeal membrane oxygenation (a machine that pumps blood outside the body to an artificial lung for oxygenation) is an important life-support strategy.
Plasma derived from the blood of patients after recovery contains antibodies against COVID-19. Convalescent **plasma therapy** is an old technique that appears to be clinically effective and reduce mortality in initial studies.
Circulatory support and fluid management through measures such as fluid administration
Monitoring and management of the functioning of **vital organs** such as heart, kidney, liver etc to prevent organ failure.
Nutritional strategies such as gastric feeding to ensure that critically ill patients are not malnourished

In cases of cytokine storm

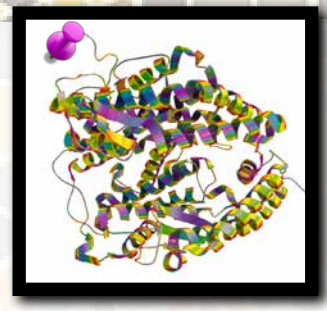
A hyperactive immune system response where the body attacks its own cells while fighting the virus. As lung tissues die due to the **cytokine storm**, the air sacs fill with fluid, causing shortness of breath. In such cases, **immunomodulation** (modifying the immune system's response) is done through
—**corticosteroids** (improves clinical outcomes and reduces mortality in cases of severe sepsis)
—**cyclosporine A** (immunosuppressant used in autoimmune disorders)
—**tocilizumab** (used in the treatment of rheumatoid arthritis)

COVID-19 SPECIAL

The C-Company



Don C: The Coronavirus Family's new don—a cousin of SARS of 2003. Codenamed **SARS-CoV-2**, he began small in Wuhan in December 2019 and quickly became the world leader (like most Chinese products). With a diameter of 75 to 160 nanometers (a good face mask can hold him off) and a continuous linear single-stranded RNA (genetic material of viruses), he is lightweight—around 0.85 attograms, or about one millionth of a trillion gram (70 billion of him makes a person sick, which is about 0.0000005 gram). But he packs a killer punch. Like all things underworld, he is a parasite; needs a host to survive and procreate (the abundant human species plays perfect surrogate mother and wet nurse). Known weakness is soapwater/disinfectant that breaks down his biological suit: the fatty shell protecting his protein/RNA (imagine a hen's egg). His primary murder weapon is COVID-19. Relies on stealth; a cough, sneeze or touch makes the fleet-footed killer change location instantly, constantly—"*Don ko pakadna mushkil hi nahi, namumkin hai!*"



Protein Shake: Like any wily criminal enlisting a hardworking but unacknowledged insider for clandestine access into a protected setup, Don C uses a cell protein called angiotensin-converting enzyme II, or **ACE-2**, which sits next to human cells and whose task is to regulate blood pressure of various organs, head to toe. He latches onto this protein and uses it as a gateway into the cell, where he rapidly makes a bunch of little progeny, and the host cell dies. Other proteins play a role too. Like the transmembrane serine protease 2 (TMPRSS2), a receptor-class gene that encodes a protein and whose biological function is yet unknown. The job becomes easier for Don C if both receptors are present in the same cell.

Go *For* A Nosedive: Don C enters the oral airway through the nose—behind your beautiful face sits the mucous membranes, nasal passages, sinuses. Say, if you touched a contaminated surface and ran your hands over your nose, or if an infected, 'unmasked' person talks to you up-close. Oral fluids contain about seven million SARS-CoV-2 copies per ml, and one minute of loud speaking generates more than 1,000 virus-containing droplets that remain airborne for eight minutes or longer, especially in enclosed environments. Well, Don C rides those projectiles and finds a welcome home in the inner lining of the nose (mucus-producing goblet cells and ciliated cells) that contains ACE-2 and TMPRSS2. He reproduces rapidly. The hijacked cells release interferons, a signaling protein that activates anti-viral defence of nearby cells, which in turn sets off the immune system alarm. Stormtroopers, the body's soldiers, are scrambled and if they don't beat back the gangster here, he slides down the trachea to the lungs and the oesophagus to the gut. Invisibly, of course!

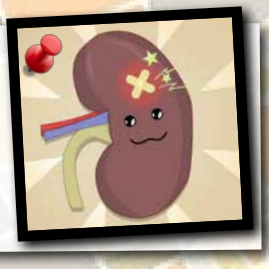
How COVID-19 kills? Frankly, we know little. The cunning, stubborn virus acts like no pathogen modern science has ever seen. Although the lungs are ground zero, doctors and scientists are realising that it is attacking its human host with devastating ferocity—from the brain to the toes, and the heart and blood vessels, kidneys, gut in between. Here's a snapshot of what we know so far, based on publicly available data and studies/ reports, some published at warp speed and not yet peer reviewed at the time of publication. Wait for research to sharpen the picture.

DESIGN BY LEELA
TEXT CURATED BY RITUPARNA KAKOTY

Liquid+Oxygen=Lungs: Don C does to the lungs what Ajit became famous for—"*Isko liquid oxygen me daal do. Liquid ise jeene nahi dega aur oxygen ise marne nahi dega.*" The lungs have microscopic air pockets, called alveoli, like holes in sponges, for the gas exchange: inhale oxygen, exhale CO2. They have two types of cells, or pneumocytes. Type I helps in the gas swap. Type II produces a layer of goo—surfactant—that keeps the alveoli from sticking when it collapses/expands, like a bellow. Don C targets Type II that has the ACE-2 receptor, and triggers an inflammatory response and the body sends out Stormtroopers. But the troops go berserk. The body suffers an auto-immune disorder: a "cytokine storm". Cytokines are chemical signaling molecules that guide an immune response. In a storm, cytokine levels soar beyond what's needed, and immune cells start to attack healthy tissues. Blood vessels leak, blood pressure drops, clots form, and catastrophic organ failure can ensue. Your alveoli starts filling up with fluid—pus and debris from the fighting. Fluid accumulates in the interstitial space too, the gap between your cells. Your lungs are drowning to death. You are intubated to a ventilator for oxygen support. That's pneumonia, acute respiratory distress syndrome et al.

Kill Dill: Your heart has abundant ACE-2 and the don loves it. Low oxygen can collapse your heart from a cardiac arrest and clots from arteries block it, especially the left ventricle—powerhouse chamber of our blood pump. Or a cytokine storm could ravage the heart as it does other organs.

Kidney Binned: Devoid of fresh oxygenated blood, the kidneys will fail. They will need dialysis because the body's filters, abundantly endowed with ACE-2 receptors, present another Don C target. Ventilators boost the risk of kidney damage, as do antiviral medicines. Cytokine storms can dramatically reduce blood flow to the kidney, causing renal failure. And pre-existing diseases like diabetes can increase the chances of kidney injury.



Stomach This: Don C slides down the foodpipe to the stomach, also a rich source of ACE-2. The classic COVID-19 symptoms—diarrhoea, vomiting, abdominal pain—are believed to be the don's misdoings in the gastrointestinal tract. Similarly, ACE-2's presence in the liver and bile ducts makes these organs vulnerable too. Plus, lack of oxygen will inflame the liver. Other events in a failing body, like drugs or an immune system in overdrive, can damage the liver.

The Plumbing Leaks: The don goes into Dharmendra mode—"*Main tera khoon pee jaunga*". In the lungs, oxygen transfers from the alveoli to the capillaries (tiny blood vessels that lie beside the air sacs). But a cytokine storm triggers blood clots, which break apart and land in the lungs, blocking vital arteries. Don C may directly attack the lining of blood vessels, which are rich in ACE-2 receptors. Lack of oxygen, from the chaos in the lungs, can damage blood vessels/alter oxygen uptake. Some COVID-19 patients record extremely low blood-oxygen levels and yet not gasp for breath. The blood vessels become inflamed throughout the body, causing vasculitis—a form of which, seen in kids, is the Kawasaki disease. Patients with pre-existing damage to those vessels (from diabetes and high blood pressure) face higher risk of serious disease.

Bheja Fry: Don C can infiltrate the brain's neurons/the central nervous system, much like his cousin SARS from 2003 could. He may cause meningitis and encephalitis, while blood clots can trigger strokes. A cytokine storm can provoke brain swelling. It's not clear how Don C enters the brain. ACE-2 plays handyman, perhaps. Our top floor is endowed with this enzyme. Some believe he travels up the nose through the olfactory bulb—which explains a loss of smell that Don C's victims experience.

Eyes, Toes In The Ballroom: Don C may cause conjunctivitis—red, watery eyes—though it's not clear if he directly invades the eye. Besides, blood vessel constriction can cause ischemia in the fingers and toes—a reduction in blood flow that can lead to swollen, painful digits and tissue death. Reports also suggest a man's testes are loaded with ACE-2 receptors, which raises the possibility of the don giving a kick in the groin. Does he really like to hang out down there? Picture *abhi baki hain*!

VACCINE RACE—THE CANDIDATES

Siddharth Premkumar in Thiruvananthapuram

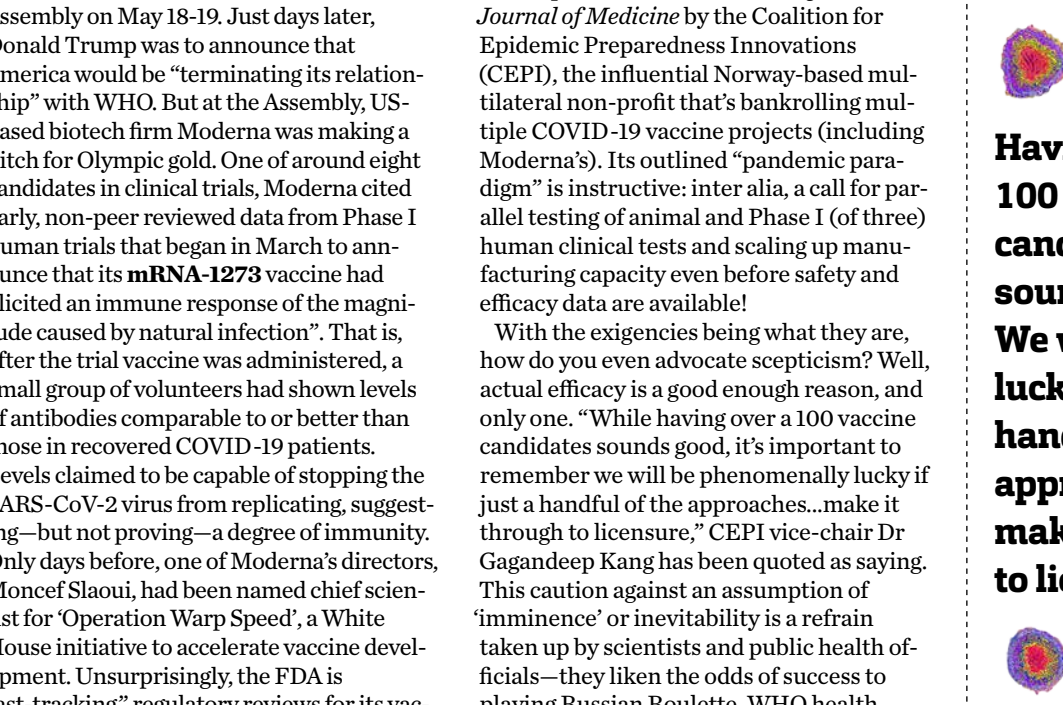
The starting gun was sounded as far back as the weekend of January 11-12, when Chinese authorities released the full sequence of the COVID-19 genome. The 'vaccine race' has now grown to field some 118 potential candidates and seen unprecedentedly short projected completion windows—most experts endorse a 12-18 month 'best-case scenario'. Traditionally, a vaccine's clinic-to-market cycle can take upwards of a decade. Though the global health emergency brought on by COVID-19 has looked like catalysing that marathon into a sprint, the race has regulatory, scientific and market hurdles to overcome: the transitionfrom proof-of-principle to commercial development will be plagued by bottlenecks. And attrition too will play its part:

industry benchmarks peg the failure rate at greater than 90 per cent. No wonder the European Medicines Agency dismisses claims of a 'cure by Christmas'.

All this unfolds against a backdrop of geopolitical tensions and 'vaccine nationalism'—faultlines that grew wider still at the WHO's 73rd (but first 'virtual') World Health Assembly on May 18-19. Just days later, Donald Trump was to announce that America would be "terminating its relationship" with WHO. But at the Assembly, US-based biotech firm Moderna was making a pitch for Olympic gold. One of around eight candidates in clinical trials, Moderna cited early, non-peer reviewed data from Phase I human trials that began in March to announce that its **mRNA-1273** vaccine had "elicited an immune response of the magnitude caused by natural infection". That is, after the trial vaccine was administered, a small group of volunteers had shown levels of antibodies comparable to or better than those in recovered COVID-19 patients. Levels claimed to be capable of stopping the SARS-CoV-2 virus from replicating, suggesting—but not proving—a degree of immunity. Only days before, one of Moderna's directors, Moncef Slaoui, had been named chief scientist for 'Operation Warp Speed', a White House initiative to accelerate vaccine development. Unsurprisingly, the FDA is "fast-tracking" regulatory reviews for its vaccine. All said, Moderna looks on pace to deliver on its "early 2021" timeline.

On a macro scale, this is a case study of the pandemic-induced new normal in vaccine development: novel (read unproven) technologies and approaches, fast-track tags, political interests—and record levels of international collaboration...and competition. The accelerated development pathways were mapped out in a March 30 article published in *The New England Journal of Medicine* by the Coalition for Epidemic Preparedness Innovations (CEPI), the influential Norway-based multilateral non-profit that's bankrolling multiple COVID-19 vaccine projects (including Moderna's). Its outlined "pandemic paradigm" is instructive: inter alia, a call for parallel testing of animal and Phase I (of three) human clinical tests and scaling up manufacturing capacity even before safety and efficacy data are available!

With the exigencies being what they are, how do you even advocate scepticism? Well, actual efficacy is a good enough reason, and only one. "While having over a 100 vaccine candidates sounds good, it's important to remember we will be phenomenally lucky if just a handful of the approaches...make it through to licensure," CEPI vice-chair Dr Gagandeep Kang has been quoted as saying. This caution against an assumption of 'imminence' or inevitability is a refrain taken up by scientists and public health officials—they liken the odds of success to playing Russian Roulette. WHO health emergencies programme executive director Dr Michael Ryan labels the prospect of finding a vaccine a "massive moonshot".



Having over a 100 vaccine candidates sounds good. We will be lucky if just a handful of the approaches... make it through to licensure.

But the key scientific determinant will be: what kind of vaccine is it? What does it do, how does it propose to stop this infinitely plastic enemy?

President Trump has been bullish about a vaccine to 'keep America great' in an election year, but the (since sidelined) head of his Coronavirus Task Force, Dr Anthony Fauci, says there is "no guarantee" a potential vaccine is going to be effective. What's worse, he cautions, in trading safety and efficacy for speed, a vaccine might actually "backfire" and *strengthen* the virus.

What about India? There's frenetic action in the worlds of science and pharma here—the promised speed with which the silver bullet may arrive depending on who's speaking, whether it's a repurposed version of an old vaccine or a novel technology, and whether it's emanating from pure research or is prodded along by industry linkages (including global collaborations). We also have official word. Union health minister Dr Harsh Vardhan says four of 14 vaccine candidates might begin clinical trials within five months. Dr Vardhan, appointed the other day to the WHO executive board rotational chairman's post, is of the (relatively) conservative opinion that a vaccine is at least a year away. It's a call-to-arms to the Indian scientific community from the government, so financial support/regulatory clearance should be a cinch. The story is running along several tracks, both independent of and tied to events elsewhere. So a quick scan of the world story must precede the India one. But the key scientific determinant here, as in China or the West, will be: what kind of vaccine is it? What does it do, how does it propose to stop this infinitely plastic enemy?

Dr Shahid Jameel, noted virologist and CEO of Wellcome Trust-DBT India Alliance (a leading research funding charity), speaking to *Outlook*, offers a preliminary description: "None of the vaccines claim to produce a sterilising response (protection against infection). In fact, most vaccines protect against the disease in that they don't allow the infection to *escalate*. This is a fine point that must be understood. Infections do happen, but the vaccine stops the virus from spreading from the primary site of replication (throat and nasopharyngeal space) to secondary sites (lungs). It's the secondary infections that cause most of the mortalities and morbidities." Dr Jameel is not one inclined to stand with all the naysaying on COVID-19 vaccine development.

But outright credulity may be inadvisable too. "There's no vaccine for either the SARS or the MERS coronavirus in humans, a clue to how difficult developing a vaccine for SARS-CoV-2 is," said Dr David Salisbury, ex-director of immunisation at the UK health department, during a webinar at London think-tank Chatham House. "Like any horse race, you pick your horse without the benefit of knowing whether it would win." The reference to the SARS virus is apt since the genome sequencing of SARS-CoV-2 is said to exhibit over 79 per cent of genetic material identical to the virus behind the 2002 epidemic (and 50 per cent of the MERS virus). Both viruses are comprised of RNA strips surrounded by a fatty sheath through which its spike (S-) proteins latch onto the same receptors on the host—the ACE-2 enzyme attached to the human lung's surface cells, for instance—and go on to extend and infect the cells.

What Kind of Vaccine?

Past failures have not deterred big (and small) pharma from attempting to unlock the virus's secrets. Moderna and some 20 other candidates (per the WHO) are taking advantage of a revolution in sequencing and genomics to create messenger RNA (mRNA) vaccines that instruct human cells to create a protein specific to SARS-CoV-2 in order to trigger a defensive immune response. There's also a plethora of alternative approaches. Nipping at Moderna's heels is China-based CanSino Biologics whose **Ad5-nCoV** vaccine has emerged as a dark horse after becoming the first candidate to both move into Phase II clinical trials and release peer-reviewed data. It's a recombinant adenovirus-based vaccine—that is, its base is one of the common cold viruses, manipulated and weakened in the lab. A 'proven platform', in industry parlance. A study in *The Lancet* found it to be both "tolerable and immunogenic" (stimulating an immune response) 28 days after vaccination.

Another front-runner was US firm Inovio, whose CEPI-funded DNA vaccine **INO-4800** has had to weather accusations of 'charlatanism'. Their approach supposedly involves having a hand-held smart device use an electrical pulse to open small pores in cells through which optimised DNA plasmids can enter—overcoming an issue with DNA and mRNA vaccines—and generate antigens that trigger an immune response. In addition to triggering neutralising antibodies in animal trials, Inovio claims INO-4800 generated "high levels" of T-cells—deemed a critical indi-

cator of the immune system's chances of defeating the virus—specific to the spike protein. One of the fastest horses out the gate was the Jenner Institute at Oxford University whose adenovirus-based **ChAdOx1 nCoV-19** vaccine—now being co-developed by drugmaker AstraZeneca—appears to have rebounded after taking a hit over a reported inability to both prevent, and stop the spread of, infection in animal trials. This vaccine also targets the virus's S-protein.

The India Vaccine?

Factors beyond science are at play because of the stakes involved—national pride, big money. Dr Jameel cites the fact that China may suffer from a "capacity and trust deficit" that puts off foreign investment. And trade publications attribute a lot of the negative buzz to Wall Street short-sellers with vested interests. Adar Poonawalla, CEO of Pune-based Serum Institute—among the Oxford vaccine's suitors—has said as much. A 'gentleman's agreement' between Poonawalla and Jenner Institute head Dr Adrian Hill has been reported. On its basis, Serum is repurposing its factory to produce sufficient quantities of the vaccine for low- and middle-income countries starting September, when Poonawalla has said the vaccine will be ready. A claim only matched in ambition by the scale of investment, given Dr Hill's recent estimations of the likelihood of a vaccine at "50 per cent". Serum has also reportedly hedged its bets through tie-ups with US biotech firms Codagenix and Novavax, as also Austria's Themis Bioscience GmbH, to potentially manufacture three other vaccine candidates.

On the other end of the scale is a start-up, the Pune-based Seagull BioSolutions. The first to be funded by the Union ministry of science and technology in April, its expected timeline for entering Phase-1 trials is 18-20 months. Incubated under the Technology Development Board's 'Seed Support System' scheme, Seagull will use its proprietary Active Virosome Technology (AVT) to create novel active virosomes (highly customised, replication-deficient artificial delivery mechanisms) through an attenuated measles virus vector platform. Founder-director Dr Vishwas Joshi says his tech has the advantage of not needing the virus to be "cultured, isolated and replicated" as in other approaches. "All we need is the sequence. With that, we can create AV agents after evaluating the best suited antigen cocktail to stimulate the body's immune response without getting compromised," says Dr Joshi, noting the AV agents will target both SARS-CoV-2's S-protein and basic structural proteins. Scale is a challenge for "cash-strapped" Seagull, so it has entered into an "in principle" agreement with Bangalore-based Biocon. Kiran Mazumdar-Shaw, Biocon's executive chairperson, tweeted about the project in April and is reportedly keen on its ease-of-commercialisation potential. As is Dr Joshi, though he says "decision-making processes in big companies take a long time".

Some Rs 56 crore has been earmarked for start-ups working on COVID-19 solutions, says Department of Science and Technology (DST) secretary Ashutosh Sharma. There's also Rs 100 crore for vaccine development under PM CARES. Helming this push are the Department of Biotechnology (DBT), the coordinating agency here, and the Biotechnology Industry Research Assistance Council (BIRAC). In April, DBT-BIRAC selected three projects—from Zydus Cadila, Bharat Biotech and Serum—for financing and regulatory help. The selections, DBT says, cover both efforts to repurpose existing vaccines and facilitation of novel ones, and fast-tracking will be enabled via a research consortium funded by the National

One of the fastest off the block was ChAdOx1 nCoV-19...it appears to have rebounded after an 'inability' to stop the spread of infection in animal trials.

"The world will not have enough vaccines for everyone if India is not part of the process," says WHO's chief scientist Soumya Swaminathan.

Biopharma Mission, an industry-academia collaboration. The Indian Institute of Science (IISc) too is attempting to design and test derivatives of the spike glycoprotein for potential vaccine candidates through Mynvax, an IISc-incubated start-up. "If the world is to get an affordable vaccine, Indian companies will absolutely play a leading role. No country can match our manufacturing capacity and production rates. But much of what we do relies on conventional technologies. Through collaboration or self-innovation, our facilities will need to be refitted with new technologies," Dr Jameel says. Speaking on National Technology Day (May 11), WHO chief scientist Soumya Swaminathan too said, "The world will not have enough vaccines for everyone if India is not part of the process."

It was nearly mid-May when India officially tossed its hat into the ring, with ICMR tying up with Hyderabad-based Bharat Biotech (BBIL) to develop "a fully indigenous vaccine". Dr Rajni Kant, director of the ICMR-Regional Medical Research Centre (RMRC) at Gorakhpur, estimates six months to a year for clinical trials to be completed. "Of the 17 isolates of the virus obtained at the National Institute of Virology in Pune," he says, "one strain that showed potential was purified, characterised and transferred to BBIL to develop and manufacture a truly made-in-India vaccine." ICMR has promised "continuous support" to fast-track the work. BBIL has also received DBT funding to try re-engineer its inactivated rabies vector platform for COVID-19. It's also working on **CoroFlu**, a one-drop nasal vaccine that uses a flu vaccine "backbone" being developed in a global collaboration.

Via Hyderabad

Since April, Hyderabad has become a hub of vaccine development with Indian Immunologicals (IIL) scientists collaborating with Australia's Griffith University to develop a single-dose, 'live attenuated vaccine' using 'codon de-optimisation technology' while the University of Hyderabad has designed a candidate using 'T-cell epitopes' that's being analysed for viability. All of which prompted Telangana CM K. Chandrasekhar Rao to suggest the possibility of a vaccine produced from his state capital between July-August. In Ahmedabad, Zydus Cadila is working on two options, including a DBT-funded DNA approach, while an arm of the state's DST has inked MoUs with three Gujarat-based private firms: Hester Biosciences, Vekaria Healthcare and start-up Neuberg Supratech Reference Laboratory. Caveat? As Dr Jameel says, "It depends on what one means by 'getting a vaccine'. When one says a vaccine will be out by September, they are referring to proof-of-concepts that show which approaches work or do not work. Beyond that, we are still, optimistically, about a year from licensure."

Mutatis Mutandis

This is a parallel danger: virus mutations rendering a vaccine inefficacious. Dr Salisbury says this mechanism isn't properly understood, suggesting there could be "genetic drift", like with the seasonal flu, which necessitates adapting the vaccine to keep pace. "If the bit of the virus critical to vaccine development mutates, we'll have problems," he has warned. But Dr Rajni Kant says changes so far have been within an acceptable range—"not so significant that vaccine efficacy will be affected". An IISc scientist concurs: "From a vaccine point of view, mutations are not yet a significant issue. In the crucial S-protein, there's a widely-found mutation at only one position, not in others."

For all the competition and 'vaccine one-upmanship', what will prove decisive is *cumulative*—and collective—science; the sharing of knowledge, resources and technologies. For all the bickering over who gets the first dibs, there has also been an unprecedented pooling of ideas—pharma majors Sanofi and GlaxoSmithKline, for instance, are co-developing an adjuvant vaccine (a substance combined with a vaccine antigen to stimulate a more robust, targeted immune response). Moderna CEO Stephane Bancel even hopes "regulators will approve several vaccines from multiple companies, because no manufacturer can make enough for the planet". Nowhere is it written, Dr Jameel says, that the "first vaccine to cross the finish line would be the best or be produced in enough capacity to save the entire world by itself". The WHO Assembly adopted a unanimous resolution overriding corporate patent rights in the interest of public access to vaccines. A good start, but as Oxfam International noted, even that left "too many barriers standing in the way of a vaccine for all".

#indianeducationconclave

Outlook

INDIAN EDUCATION Outlook

Igniting Minds

In conversation with

RAMANANDA SENGUPTA,
Consultant Editor,
Outlook

Knowledge Partner

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REIMAGINING LEARNING WITH TECHNOLOGY- BEING PREPARED FOR THE FUTURE

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AKSHAY MUNJAL,
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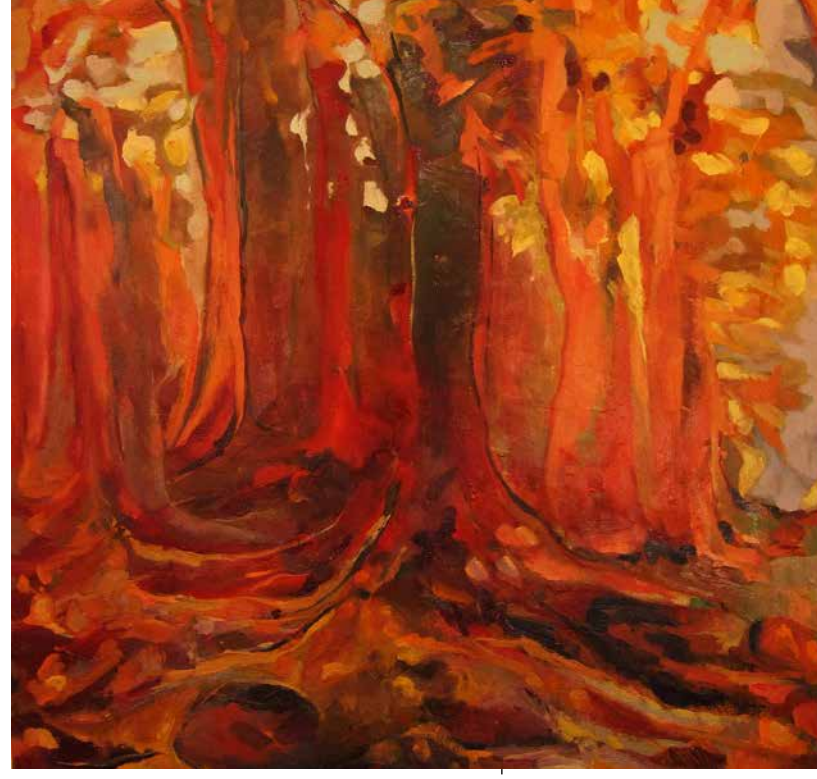
June 14th, Sunday, 6:00 p.m.

PLASMA THERAPY

SILVER BULLET OR NOT?

Preetha Nair

Leave, for a moment, those telescopic shots—those world maps filled with red dots, the Covid Tracker popups spinning and dancing on your screen. Come to a close-up. A place where death is intimate, proximate...and the walls are white with fear. Where the littlest medical decision can mark a before-and-after in your life...can change whether the one who gave birth to you lives or not. Krishna, the daughter of 67-year-old Tushar Mehta*, was there a handful of weeks ago. Imagine the scene. Mehta is losing his battle to the deadly pandemic in a private hospital in Delhi. His daughter is making frantic calls to her acquaintances to make arrangements to shift him to a government hospital. Krishna is holding on to a hope,



an idea. The government hospital offers one last avenue to life: it's authorised to conduct Convalescent Plasma Therapy. Infusing antibodies harvested from a survivor's blood... that could give her father a fighting chance.

In the bargain between life and death, Convalescent Plasma Therapy has emerged as a new buzzword in the absence of a preventive vaccine or effective treatment against COVID-19. It's not a new idea, though, and has been around since the late 19th century. That was when physiologist Emil von Behring and bacteriologist Kitasato Shibasaburou arrived at the idea of using antibodies present in serum—another blood component—to fight diptheria. "In fact, the first Nobel Prize was given to Behring (in 1901) for the use of serum to treat diphtheria," Dr Arturo Casadevall, a top US immunologist at Johns Hopkins, told *Medical News Today*. Case reports from the Spanish flu epidemic of 1918 indicate use of blood products from recovered patients may have cut fatalities in the severely ill by half. Dr Casadevall is now a steering figure in the National COVID-19 Convalescent Plasma Project, in which 57 institutions are collaborating. Early results from clinical trials on 12,000 patients had, by late May, offered a modicum of certainty on one crucial aspect: safety of use. A handful of other countries too are at the clinical trial stage, but the jury is still out on whether it will be a game-changer in fighting the deadly virus.

The treatment involves transfusing the blood plasma of a recovered patient into another patient. Plasma is the liquid part of your blood, 55 per cent of its total volume—yellowish in colour when separated, it holds the blood cells in suspension, and carries cells, proteins, minerals, blood-clotting factors and antibodies. That last element offers the rationale behind turning it into an instrument of therapy: the blood plasma of recovered patients contains significant levels of neutralising antibodies that, if transfused into the blood of a severely affected patient, can potentially strafe the virus out of existence. The century-old treatment—which has shown some results in treating measles, chickenpox and rabies over the decades—thus deigns to become part of the COVID-19 narrative.

A fortnight before India crested 2 lakh cases, with the first signs of a post-opening up spurt staring us in the face, the health ministry gave the green light for clinical trials to assess the safety and efficacy of plasma therapy. And the IICMR launched a multi-centre clinical trial in 21 hospitals across India—to be done on 452 patients—to find out whether plasma therapy can be recommended as a standard cure for COVID-19.

Does the established world of medicine look askance at it? Not very much on theory—it's the turning of it into praxis that's still a question. Experts point out that it's too early to dub plasma therapy as a 'silver bullet' as it's yet to be put through the litmus test of randomised controlled trials to prove its efficacy to treat any infectious disease. Dr S.K. Sarin, head of the Delhi government's COVID-19 panel, expresses this qualified 'opti-scepticism' when he says at this juncture the therapy can only be seen as a short-term emergency aid until definitive treatments are found. "I would say it's an experimental therapy. We are still in the process of finding out whether it's good or bad. But the scientific basis of plasma therapy is very robust," says Dr Sarin, who also heads the Institute of Liver and Biliary Sciences (ILBS).

Dr Anoop Kumar, a key member of the task force for plasma therapy set up by the Kerala government, too says more trials are needed. "It was used earlier with many diseases: including MERS, SARS and Ebola. But no randomised controlled studies have been done. It's not a magical bullet for sure. There's clinical evidence but it has to be properly grounded in trials," says Dr Kumar, who was the first one to submit the protocol for plasma therapy to ICMR.

States like Delhi, Rajasthan and Maharashtra are keen to go ahead with the therapy and have some positive results to

Plasma is the liquid part of blood, 55 per cent of its total volume—yellowish in colour when separated, it holds the blood cells in suspension.

VOX POP

Dr. Larry Brilliant

aka Subrahmanyum. American epidemiologist, instrumental in eradicating small pox in the 70s.

"I would just like my beloved friends in India to remember that it was Indian doctors and Indian epidemiologists that eradicated smallpox and also who eradicated polio from India and amazing Indian ophthalmologists at Aravind (the eye hospital in Madurai) and Hyderabad that have given back sight to millions. Surely, great Indian doctors and epidemiologists will rise to the occasion and help defeat the scourge of Covid as well!"

Experts say it's too early to dub plasma therapy as a 'silver bullet' as it's yet to be put through the litmus test of controlled trials to prove its efficacy.

show too. However, the Union health ministry has said the treatment should be done only on trial basis and warned against indiscriminate use. Delhi's LNJP, one of the first government hospitals to get the nod from ICMR, has already undertaken 20 clinical trials. "The results have been encouraging so far," says J.C. Passey, former medical director, LNJP. The largest Covid hospital in the capital, LNJP has already treated over 2,500 patients.

In Sawai Man Singh (SMS) Medical College, Jaipur, too, the trials have shown promise, as they proceed under a protocol set by ICMR and with the permission of the Drug Controller General of India (DGCI), the sanctioning authority for blood/blood products. "So far, we have conducted three successful plasma therapies and all of them are showing improvement in their clinical state, oxygen saturation and d-dimer levels," says Dr Sudhir Bhandari, principal and controller, SMS. The d-dimer is a protein in the blood; a four-fold spike is strong predictor of mortality.

But the risks are being discussed too. Reports of a doctor's death in UP and another from Maharashtra after infusion of plasma have cast a shadow on the prospects of the therapy. Experts, however, say more conclusive studies are needed to correlate the deaths and the treatment to rule out the post hoc fallacy. "It may be a coincidence and may have happened even without plasma therapy. We do not have strong correlative evidence. Plasma is given only to fit candidates," says Passey. Patients with extensive co-morbidities such as heart problems, uncontrolled diabetes or cancer patients are not selected for the trial.

That brings up the question of the eligibility criteria of donor and receiver. Experts say the donors need to have tested positive for COVID-19 and then completed two to four weeks without any symptoms. In terms of the receiver, there's a debate about when a patient must receive plasma. Dr Sarin recommends that it be administered before the patient goes onto the ventilator. He explains that the virus attacks in three stages—in stage one, it multiplies; in stage two, the infection spreads to the lungs; the last stage sees organ failure. "Plasma therapy should not wait till the third stage. It's good to give in the early stages so you can protect other organs and avoid injury. The basic idea of plasma therapy is to reduce the viral load and stop organ failure," he says. Dr Anoop Kumar also stresses on timing: "You have to infuse the plasma in proper time. So availability must be ensured." That last has not yet been a bottleneck, says Dr Passey. "There's no scarcity of donors; most survivors are willing to donate plasma as their moral responsibility. We have a reserve of plasma from 700 donors," he adds. Doctors also cite the fact that plasma therapy is relatively economical: a donor weighing 70 kg can donate 800 ml of plasma.

However, Dr Kumar says the therapy needs to score more on the efficacy part. "None of the trials has shown any potential risks, but it hasn't shown any promising efficacy either. Not having a risk is not an argument to use a drug. We should be able to establish its effectiveness as well, either in terms of mortality benefit or in terms of thwarting complications," he says. Timing, he reiterates, is crucial to fine-tune our understanding. "In a majority of cases, the therapy is being used after the patient lands on a ventilator in bad shape. It may not work in those cases." Tushar Mehta, tragically, was among those—he was too far gone by the time plasma was administered. A grim vignette from a global crisis that should only goad medicine across new frontiers.

(*Name changed)

MYTHYA

Avoid shipped packages/shopping carts/ATMs, or you'll die.

No. Coronaviruses' surface survival is one thing; that surface causing an infection is another. Wash your hands; live your life.

I can catch COVID-19 from ordering takeaway and Chinese food.

Wrong. COVID-19 is a droplet related infection (like flu) not a food-borne infection. There is no documented Covid risk with takeaway food.

If I lose my sense of smell, I have Covid.

False. It's common to temporarily lose one's sense of smell with many viral infections/allergies. It's a non-specific symptom that may/may not happen with Covid.

I receive messages that using garlic/lemon with hot water/onion in the room will prevent or cure COVID-19. Is it true?

No. It's just made-up stuff. None of these substances have been scientifically tested against Covid. Don't share such posts; they create confusion.

Taking hydroxychloroquine and azithromycin preemptively is a good idea to prevent Covid.

Don't. These drugs should be used in selected Covid patients. They can sometimes cause fatal heart rhythm problems plus other side-effects.

Always change my clothes/shower after coming home. Or I will bring coronavirus to my family.

Wrong. Cleanliness is a virtue; paranoia isn't. Our biggest return on investment is in handwashing, staying six feet away, avoiding large crowds etc.

Are smokers at high risk?

Yes. Smokers have higher level of a molecule—ACE-2— that is the entry point for the coronavirus in your lungs. The virus causes sudden strokes in heavy smokers, diabetes and those suffering from hypertension.

Pollution increases the spread of Covid.

Very likely YES. There is enough data that shows this virus can get attached to particulate matter floating in the air.

The messages I receive are from doctors in China/Italy. Why shouldn't I believe them?

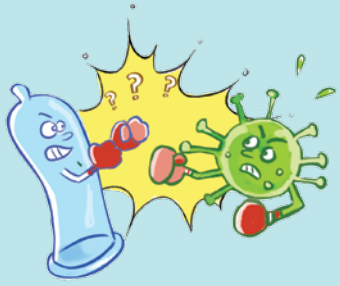
False. Real doctors publish their research in scientific journals, not on social media. Lots of good research is already published.

The coronavirus droplets travel further than social distancing norms.

They can. An unobstructed cough can travel over two metres (six feet) in less than three seconds, and keep going.

Can COVID-19 be sexually transmitted?

Unlikely to spread through semen. Like ebola, zika and other viral pathogens.



Should I wear a face mask when I go for a run in the park?

Depends. You won't need a mask while jogging or riding a bike if you're exercising with no one around. But it's good to carry one just in case. If it's difficult to breathe through a mask when running or doing other strenuous physical activity, find uncrowded trails or times to exercise when you won't encounter others.

When will Covid go away?

Impossible to predict. WHO says it's possible the new coronavirus may be here to stay. This may become just another endemic virus in our communities. Previously novel diseases such as HIV have never disappeared.

WHO 'CREATED' COVID?

Was the Moon landing fake? Do reptiles rule us? Is Elvis alive? When conspiracy theories start proliferating like mutant viruses...

KAJAL BASU

"When does a conspiracy theory become a conspiracy reality? Covid-19 looks like a perfectly designed Disease X."
—William Ebiefung

LIKE a single COVID-19 virus playing Chinese whispers—and making a million bad xerox copies of itself—the conspiracy theories took no time at all taking off after China announced its animal-to-human vector in mid-January. In a week, stories about the involvement of Bill Gates began circulating until he turned into what a Syracuse University professor called "a sort of abstract bogeyman" for conspiracists. Multi-billionaire investor George Soros, a thorn in both US president Donald Trump and Chinese premier Xi Jinping's side, was targeted swiftly after Gates (but never—because he does not fund antiviral research—with an equal ferocity). It isn't entirely transparent as yet how anyone would stand to gain from a deadly pandemic that's pretty much an equal-opportunity offender for all countries, if not in the number of people culled, then in the devastation of economies. But the idea lives.

The galaxy of conspiracy theories spinning around the neocoronavirus was birthed by a complex network of right-wing doomsayers in internet watering holes for paradigm questioners such as 4chan, QAnon, QClearance, 8chan, 2 Staqe 2, Zero Hedge and InfoWars. And these are umbrellas that shelter under them a joyous jambalaya of conspiracists

from ideologies that range from the Alt Right to anarcho-capitalists to the radical Far Left, some of these opposites getting their feed from the very same disseminators. Far-left conspiracists quote the far-right Zero Hedge, and are often found on Reddit mixing it up with QAnonists, who insist that Trump was made president by the US military to save the country from a ring of paedophilic Satanists, which includes the eponymous Mr Gates.

In India, conspiracy theories that target China as having engineered and released the neocoronavirus are being plugged by several TV newschannels, and websites such as Great Game India. Coronacrisis spin-doctoring is not going to go away, because COVID-19 is being used to reset Sino-US and Sino-India relations, and state-sponsored conspiracy theories have become part of the arsenal. In a sense, conspiracy theories are now born and propagated in plain sight as 'infodemics' with explicit statal purpose, their purveyors no longer visionary, echoic cabals but auditable government departments. Fake news-busters are not built to deal with this—and, sometimes, fact-checkers are conspiracy theorists themselves.

BLOOMBERG Quint reported that in late-February, "a little-known division of the US State Department, the Global Engagement Center, or GEC, said the Russian government had pushed the Gates rumour. On May 8, the GEC said it had identified a network of fake Twitter accounts being used to spread disinformation, this time on behalf of China." The problem with the GEC is that it is wedded to the Trump administration, which has been trying on overdrive to pin the coronacrisis on China (and, just as a bonus, on Russia). The GEC was a tiny division of the US State Department with a pointed mandate to "direct, lead, synchronise, integrate and coordinate efforts of the Federal Government to recognise, understand, expose and counter foreign state and non-state propaganda and disinformation efforts aimed at undermining or influencing the policies, security or stability of the United States, its allies, and partner nations". In pursuit of this mandate, the GEC has built up a history of carrying out disinformation, often photoshopping images to suit its purpose. After it fingered Russia and China for disseminating misinformation (which charge Facebook has actively disputed), it proposed to the Trump administration that its budget for 2021 be doubled to $138-million. And Trump is said to be amenable to the thought.

Conspiracy theories live on despite—and in many cases, because of—government denial. Governments denied conspiracy theories by reflex, because most conspiracy theories were acridly anti-government. Today, however, aside from an unravellable welter of non-state conspiracism, what we have are, seemingly, conspiracies by state actors about conspiracies by other state actors!

There exists a conspiracy theory that the term "conspiracy theory" was invented by the CIA in 1967 in a dispatch titled "Psych" (for 'psychological operations'), sent out by a unit named "CS" (for 'clandestine services') *The New York Times* obtained this document—which is real—through the Freedom of Information Act. But an Ngram viewer accessed through Google Books shows that the term was born in 1874. Then again, a deep search of its origins led to a letter in the correspondence section of the *New York Times* dated January 11, 1863, that mentioned—vis-à-vis England taking the side of the South in the Civil War—the "right-about-face movement of the English Press and public, which is most readily accounted for on the conspiracy theory". (It is particularly delicious that a conspiracy involving the press is at the heart of the first mention of a conspiracy theory.)

In truth, though, the seeds of a conspiracy mindset had been sowed during the Anti-Masonic Party's 1931 convention where Freemasonry came in for a walloping. It's another matter that the conspiratorial Freemasons carried on but the anti-conspiracy Anti-Masonic Party, which was founded by a lapsed Mason, imploded and disappeared seven years later. Wheels within wheels.

It was a fecund time for theories, in general, that would lead on to both great sociological ideas and great intellectual presumptions in the 20th century: murder theory was born in 1867, suicide theory in 1871, blackmail theory in 1874, and abduction theory in 1875. (Source: *Conspiracy Theory: The Nineteenth-Century Prehistory of a Twentieth-Century Concept, from Conspiracy Theories and the People Who Believe Them*; Joseph E. Uscinski; OUP; 2018). It would take nearly a century for the term 'conspiracy theory' to come into frequent usage. It gained quotidian popularity in the mid-1950s, taking off steeply during the anti-establishment UFO hysteria, and never quite halting its ascendance in the decades that followed. Today, the term roams unchecked worldwide, and is, indeed, championed—if as an upstart cause célèbre—as a valid expression of people's political scepticism and even democratic impulse.

That the word 'conspiracy' is derived from the Latin conspirare ('to breathe together') is seen as a good thing. Both the Left and the Right view conspiracy theories as essentially anti-establishmentarian: valid in principle and correct in content. But belief in the same things means that ideologies will be diluted, adulterated or altogether dispensed with.

Conspiracism is now defined severally as a mindset, a predisposition, a need to see conspiracies behind everything, innocuous and ostentatious, personal and public, secret and declassified. But conspiracism remains poorly defined. There are those who, like the historian Karl Popper, conflate conspiracy theory with pseudoscience and superstition about "powerful men or groups whose wickedness is responsible for all the ills we suffer from". The opposite camp thinks of conspiracy theories as fairly reasonable responses to modern life and its unprocessability. This camp also believes that, given time and air, most conspiracy theories eventually turn into conventional wisdom.

All it takes for a conspiracy theory to establish itself as conventional wisdom is sober presentation by a conventionally respectable face. Luc Antoine Montagnier, 2008 Nobel laureate in physiology or medicine, endorsed the conspiracy theory that the COVID-19 is human-made and went public claiming that its genome has elements of both the HIV retrovirus, which he had discovered, and the malaria germ. Both claims are deeply questionable, but the theories themselves are now embedded in layperson and quasi-scientific circles. The fact that Montagnier has earlier supported anti-vaxxers and claimed that DNA emits "electromagnetic waves" has done nothing to diminish his oracular stature.

Another sort of conventional wisdom is that the coronacrisis is a 'plandemic' (a portmanteau of 'plan' and 'epidemic')—the belief that it was designed by a shadowy cabal of US health experts and vaccine manufacturers. The 26-minute video that hardsells this idea is a study in the craft of making documentaries: polished, low-key, with entirely believable (if unqualified) interviewer and interviewee (whom the *NYT* called a "discredited scientist" in a study of the social-media virality of the video).

While the Plandemic video is slick, its USP is that it is that rare thing—a product that hit a starved and chaotic market, more by accident than by intent, at just the right time. From the time that it was launched to million-views reactions in the social media on May 4, to its banning by Facebook, YouTube, Vimeo and Twitter for content-falsity, to its resurgence through a rash of smaller sites such as BitChute and Brighteon, every move to shut it down has only helped it to keep going. Plandemic employs a rhetorical technique known as the "Gish Gallop", after the US creationist-biochemist Duane Gish, who often successfully buried Darwinists under avalanches of rapid-fire factoids in the final two decades of the 20th century. Plandemic's gallop cannot be halted by conventional means of countering with hard-science facts. In effect, its narrative about the COVID-19's cabalistic roots has, like the most enduring of modern-day conspiracy theories—former BBC sports reporter David Icke's idea of a global reptilian elite, aliens squirelled away in Area 51, that Paul McCartney is dead (and Elvis is not), that the moon landings were shot in a studio—probably come to stay at a slow but permanent boil.

KAJAL BASU, A FORMER EDITOR OF *TEHELKA*, IS A SENIOR JOURNALIST AND WRITER BASED IN CALCUTTA

Blaming 5G
Easily debunked: Viruses do not spread using the electromagnetic spectrum. But this hasn't stopped 5G towers from being vandalised in the UK.

Bill Gates done it
An "abstract bogeyman" for the Far Right as well as the Extreme Left, he has no reason to want a global pandemic—not even a connection with big pharma.

Chinese lab
It's plausible, but not probable. The serendipity of China's leading institute studying bat coronaviruses being located in the same city as the COVID-19's origin is a dog-bone for conspiracists.

US military plot
Tired of right-wing conspiracy theories targeting it, the Chinese government let loose Zhao Lijian, a Ministry of Foreign Affairs spokesperson. He let off a tweetstorm accusing the US of using its military attendees at the 2019 Military World Games to spread the virus to the Huanan seafood wetmarket, where the source of the outbreak was eventually traced. This conspiracy theory, in turn, set off Trump's by-now-infamous takedown during a White House presser of the "Chinese virus", and his series of anti-China trade threats that has now culminated in a bilateral faceoff between the world's two leading economies.

Bioweapon
In a survey in April 2020, the Pew Research Center reported that "nearly three-in-ten [Americans] (29%) say it most likely was created in a lab". Some 23 per cent of adult Americans believe the neocoronavirus was intentionally developed in a lab, while another 6 per cent say it was accidentally invented.

GMOs
In an article published in early March 2020 in the Italian newspaper *Il Manifesto*, an attorney named Francesco Bilotta blamed GM crops, claimed falsely that GM crops cause genetic contamination, allowing viral proliferation and interspecies transmission. Researchers debunked the claim as "scientific absurdity". Indeed, it's almost inescapable that genetically modified organisms (GMOs) will play a big role in the COVID-19 vaccine solution.

Covid doesn't exist
Überconspiracists like David Icke and Alex Jones of InfoWars are peddling the idea that COVID-19 is no worse than the common flu and is an enchaining ploy by the globalist elite. It has gained traction in India, among liberals, the Left and the Right, because of the country's notable deathcount deficit.

Deep State ploy
A global Deep State would make for a borderless Illuminati with a remarkable confluence of intent and purpose, which is why this idea might sound extreme. In the US's case, the Deep State is exemplified not by Donald Trump, a practising capitalist himself, but by Dr Anthony Fauci, the (mildly rebellious) face of Trump's neocoronavirus response. The Far Right believes Fauci is working with Hillary Clinton to discredit Trump by causing an economic collapse. For the Euroright, it's German chancellor Angela Merkel. India's Deep State, the radical Left believes, exists as a part-and-parcel of the incumbent government.

Big pharma plot
A few major pharmaceutical manufacturers will make millions from the vaccine, but most pharma companies currently engaged in vaccine research will bite the dust. The anti-pharma narrative has been written by anti-vaxxers (for the uninitiated: those against vaccination, a goodly number)—and they have notable support from Greeners, Right Libertarians, and the Far Right that is militantly leading anti-lockdown protests in the US.

Alien organism
British-Sri Lankan astrobiologist Chandra Wickramasinghe believes COVID-19 arrived in a meteor-fall in northeast China on October 14, 2019. The theory caught on in the global community of UFOlogists, already primed by the appearance of the strange, cigar-shaped extrasolar object, the 'Oumuamua', in October 2017. Wickramasinghe also insists that SARS originated in space. Since 1979, ever since he co-wrote the book *Diseases from Space* with Fred Hoyle, he has been trying to establish that the flu and the common cold have extraterrestrial origins.

IS SOCIALISM THE VACCINE?

Not specifically...political ideologies take the backseat in global pandemics, but leadership counts

TOBBY SIMON

THE world, irrespective of the political ideologies of its constituent ruling dispensations, has been brought to its knees by COVID-19. But the fight against this common enemy has shown that efficient administrations—and not political principles—have had an edge. On the shortlist of countries that have experienced remarkable success are Vietnam, Cuba, South Korea, Australia and New Zealand. The first two are Communist-ruled, the rest are not. In each, however, it's efficiency at the top that has been vital. A culture of according primacy to healthcare matters everywhere—a key factor in this fight is the robustness of public healthcare systems. Even in China, the chief strategy was early detection, followed by free treatment and care to anyone with an infection. Indeed, it tested ten million Wuhan residents at the height of the pandemic there and put the city under total lockdown. Result: Wuhan is now infection free. Private healthcare systems have been found wanting, especially in India, and have not been at the forefront in the fight against the virus.

It may be true that the socialist approach to governance brings greater focus on public healthcare and social support systems. But an inefficient socialist/communist dispensation could be worse than an efficient capitalist approach that has focused on public healthcare. In India, we have a point of analogy—partial though it is, because states do not have total policy autonomy during epidemics. That's Kerala, which has a Communist-led government right now, and has had one for 33 of its 63 years of existence. While Kerala's commendable success can invoke comparisons with Vietnam and Cuba, the key differentiator

Rio de Janeiro

may not be ideology per se but the fact of having a responsive, empathetic administration.

Kerala's old object of infatuation, Russia, is flailing meanwhile—partly under what *BloombergQuint* called "an authoritarian regime that dislikes bad news". A microbe has outwitted President Putin's helmsmanship: from among the lowest caseloads in March, Russia soared to world number two (nearly 5 lakh cases), till it was replaced by Brazil. The 75th Victory Day Parade—the military showpiece commemorating Nazi Germany's capitulation to the Soviet Union—scheduled to be held later this month might hand it the silver yet again.

A dizzy, sobering case of hubris, helped along by inexperience with pandemics and an insufficiently funded/reformed health sector. The talking points now: allegations of fudged mortality rates (still among the lowest) and a new Russian drug, Avifavir, to restore public confidence. For a picture of nationalistic bravado and chest-thumping denialism, however, Alexander Lukashenko next door in Belarus needs an honourable mention. President since 1994, the ex-Soviet soldier has sought to dismiss corona "psychosis" by mouthing a string of gems—saying "the tractor and fields will heal everyone", that ice hockey is "better than antiviral medication", and asking his people to "wash their hands with vodka". No lockdown, no border sealing, and (even if fudged) among East Europe's highest caseloads; the situation is being called a 'viral Chernobyl'. But let's go away from the mavericks and loo k at four 'good' case-studies, country-wise, to appreciate the variety of ways in which leadership can affect an epidemic's passage (for a continent that merits separate treatment, see *la América, Going South*)....

There was a touch of authoritarian surveillance in Vietnam's strategy, but the difference with more 'democratic' nations wasn't much.

New Zealand

The expeditious and calmly fervent reaction of New Zealand Prime Minister Jacinda Ardern to the Christchurch shooting a year ago epitomised a leader who seemed almost a perfect fit for a crisis. The compassionate messaging of March 2019 affirmed New Zealand's commitment to remain a liberal and free country that stood against hate-filled ideologies—it's the same spirit she took to the COVID-19 battle. New Zealand managed to meet the goals of mandatory quarantines, country-

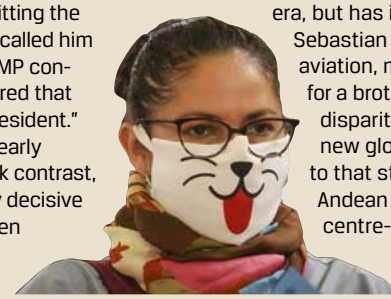
LA AMÉRICA, GOING SOUTH

The Covid footprint in Latin America is characterised by wide disparity

A grim shadow stalks the Andes, playas and Pampas—the continent is "losing its battle against coronavirus", CNN reported on June 7. WHO calls it "the new Covid epicentre". With good reason: 1.2 million cases, over 60,000 deaths—amid soaring food prices. But South America offers an illuminating, if frequently tragic, case-study of how political ideology can interface with pandemic control: a full panoply that defies generalisations. The most flagrant violator? Of course, Brazil's army-man-turned-strongman Jair Bolsanaro, a "polarising and controversial" figure who comes closest to fitting the description of a far-right despot. *The Lancet* called him "the biggest threat" for Brazil; an opposition MP concurred, saying: "We've unfortunately discovered that the virus's main ally and best friend is the president." Brazil now is second on world charts, with nearly 7 lakh cases and over 36,000 deaths. In stark contrast, President Alberto Fernandez's comparatively decisive Peronist government in Buenos Aires has seen perennial rival Argentina score higher on the responsiveness index (concerns about testing and data quality notwithstanding): to the tune of 22,000 cases and around 650 deaths.

Mexico, polar south to a Trumpian 'North' ideal, has been a study in contrasts. President Lopez Obrador asked, with cultivated casualness, what "pandemics can do to us" and also shook hands with a drug lord's mum—but Mexico also rolled out a comprehensive response plan in January, ahead even of WHO's declaration of the pandemic. But, despite being the first 'Latam' nation to use a mathematical model to map/predict the disease, systemic weaknesses and policy gaps have left its leftist government red-faced. With 1,14,000 cases and upwards of 13,500 deaths, a gradually-easing lockdown likely means more blushes ahead. Peru too is struggling, despite a responsive centrist leader in President Martin Vizcarra and one of the earliest lockdowns. Its case graph mirrors India's: now inching close to 2 lakh, with infection reaching even interior Amazonian communities. So do other factors—a large informal economy with severe income inequalities forcing people into poor observance, a "severely underfunded" and decentralised healthcare, even a balcony show five days before India.

Costa Rica is poor too—16th in the world in fact—but has one of the lowest Latin American Covid mortality rates (0.2 deaths per lakh). Why? A robust democracy, unified healthcare with universal coverage, and a centre-left president in Carlos Quesada—a 40-year-old journalist and political scientist, pro-gay rights, serious about the environment, quite the antithesis to Bolsanaro. Chile has recovered politically from the Pinochet era, but has its first right-wing president since him in Sebastian Pinera—a billionaire with interests in banking, aviation, media and a publicity hound nightclub-owner for a brother. But, down the line, there are stark income disparities. Result: 1.3 lakh cases and food riots. (The new global popularity of quinoa as health food has led to that staple grain being diverted to exports from all Andean countries.) By contrast, Uruguay too has a centre-right president in Luis Lacalle Pou, but registers only 845 cases and 23 deaths. Then there's Venezuela—that other US bugbear, where Nicolas Maduro, operating with a $15 million US bounty hanging overhead, presides over a Communist lodestar-turned-red dwarf. Stuck between a crude oil-shocked economy and wider socioeconomic crises, it has recorded scarcely-believable (and widely dismissed as under-reported) pandemic figures: the 28 million-strong country has apparently had just 2,300 infections and 22 deaths. Everywhere, it seems, politicos self-congratulate while the credibility gap widens.



Costa Rica is poor, but has one of the lowest S. American Covid mortality rates. A robust democracy, unified healthcare with blanket coverage did the trick.

wide lockdown and social distancing without being too draconian about it. Some blips were seen along the way—including eager mobs outside a burger store chain and a trip to the beach by the health minister! But, on June 8, New Zealand cleared its last active case, and with no new cases for over a fortnight, it's geared to ease all restrictions. The good news prompted "a little dance" around the lounge by the PM, as she herself put it. Still, Ardern was holding off firmly against opening up a 'travel bubble' with even Australia, saying the latter was still grappling with cases!

Cuba

For a country nicknamed 'El Cocodrilo', there's one thing Cuba is not: that's being cold-blooded when it comes to human health. Its renowned free public healthcare system is in the limelight again, leading the fight against COVID-19 with much aplomb. Cuba has the highest ratio of physicians to population, a key factor in its low caseload of 2,173, with just 83 deaths. Besides, it called on nearly 28,000 medical students who, under supervision, offered door-to-door assistance across the country and hands-on care to those who contracted any sort of pulmonary infection. Cuba also made headlines with its 'medical internationalism'—sending doctors and support staff to crisis-hit Italy. Also integral to reducing the number of deaths globally—from Wuhan onwards—is a Cuban antiviral drug, Interferon alfa-2b. The Canadian pharma major BetterLife is now en route to taking up this 30-year-old Cuban invention for trial and mass production—medicine sans frontiers and ideologies, if you like.

South Korea

Here we have a swift response that stood out as an exemplar of the key principles of crisis management. It was evident that South Korea had begun stockpiling coronavirus

Havana

testing kits long before the outbreak had occurred there. It was able to provide close to 10,000 tests per day when the infection rate started to climb, and supplemented it with a mobile app that allowed citizens to keep themselves constantly updated. Despite the fiasco over the Shincheonji cult, Patient No. 31 and threats of recrudescence, the country is on the ball, as it were—even if 50 new cases reported on June 6 have sparked a debate on whether lockdown restrictions were eased too soon.

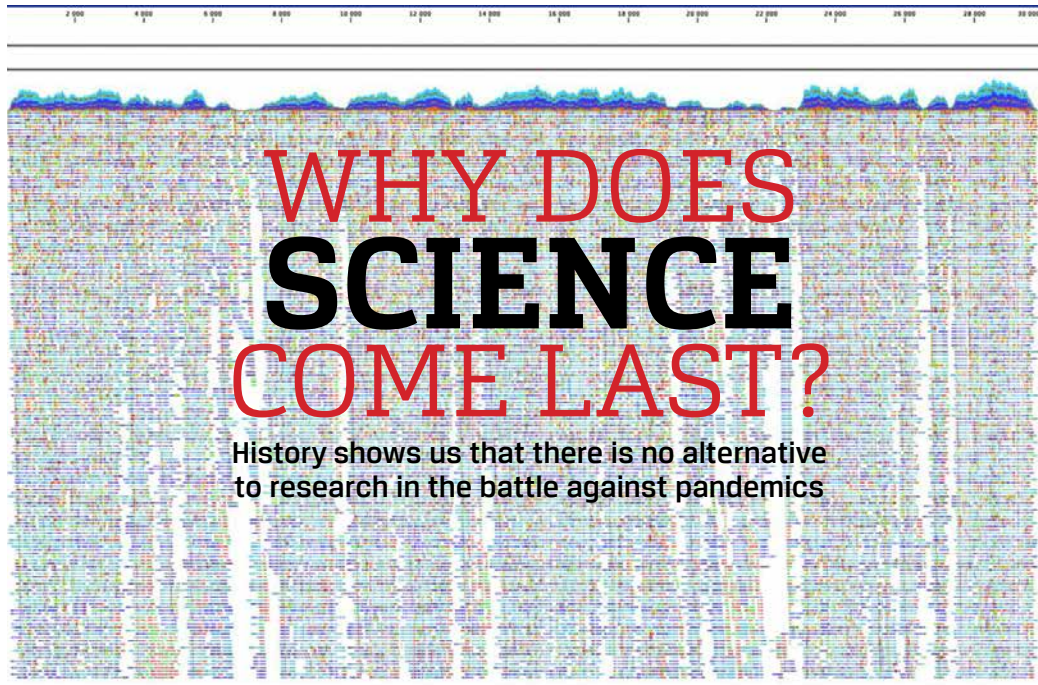
Vietnam

Vietnam and China share a land border stretching about 1,444 km. With a population of 95 million and a relatively low per capita income, Vietnam is an outlier success story. It has had only 329 cases and no reported deaths so far. The country is beginning to lift the strict lockdown measures it imposed in February, reopening restaurants and barber shops last week. It has yet to generate the global applause many other nations have received, perhaps only because Vietnam does not fit the political narrative required for a success story. There was a touch of authoritarian surveillance built into its control strategy, but the difference with more 'democratic' countries tackling the pandemic was not much—either in degree or in kind—and there was wide social consensus for the same.

RESPONSIVENESS begins, well, in the beginning. Look at Kerala: its efforts to address the pandemic started as early as January. As *The Guardian* noted, on January 20, K.K. Shailaja, the state's health minister, read about "a dangerous new virus spreading in China" and enquired if Kerala needed to be on guard. Result: it was combat-ready "by the time the first case arrived from Wuhan on January 27". Its signature moves: participatory contact tracing, a supportive quarantine for nearly 2 lakh people, feeding and supplying provisions to some 87.28 lakh ration card holders and 1,50,000 migrant labourers, daily public dissemination of information, and a hands-on health minister, out in the field. The approach was empathetic and grassroots-oriented, not one driven top down. In a country of India's scale and inequities, a bottom-up approach that ensures economic and social security also proved the best pandemic shield.

"There's no playbook for leadership when the stakes are high, no playbook for what must be done in the face of a 21st century pandemic," leadership consultant Mark Nevins wrote in Forbes. An inclusive, cohesive society, one not polarised on ideological, racial, ethnic, or religious faultlines, cannot harm the cause though. Both finally come down to biological security—*life* itself. A lot of focus has now shifted to Africa, an understudied continent where COVID-19 has affected all countries by now—and Congo battles it as part of a "triple threat", alongside a recrudescent Ebola outbreak and measles. Africa is largely caught between a picture of stark leadership deficit and a vulnerable populace. At one end, Tanzanian President John Magufuli ridicules testing kits, saying even "a goat and a pawpaw" (papaya tree) had tested positive. At the other, a French scientist said on TV, "If I can be provocative, shouldn't we be doing this study in Africa...", prompting outrage across La Francophonie and beyond. Among the angry decrials: the Ivorian football star Didier Drogba memorably proclaiming that Africans are "not guinea pigs". Racism, of course, is alive and well on other continents too. To face down such an unprecedented assault on human security as COVID-19 represents, what one needs is collaborative, people-oriented leadership—and a Trumpesque spirit may not ensure that security in either a medical sense or a social one. No country in the world matches the US's nearly 2 million cases and upwards of 1.1 lakh deaths.

TOBBY SIMON IS THE FOUNDER AND PRESIDENT OF SYNERGIA FOUNDATION, A STRATEGIC THINK-TANK BASED IN BANGALORE



WHY DOES SCIENCE COME LAST?

History shows us that there is no alternative to research in the battle against pandemics

Genome sequence of SARS-CoV-2. The coronavirus genome has 30,000 base pairs, a human has over 3 billion.

P. BALARAM

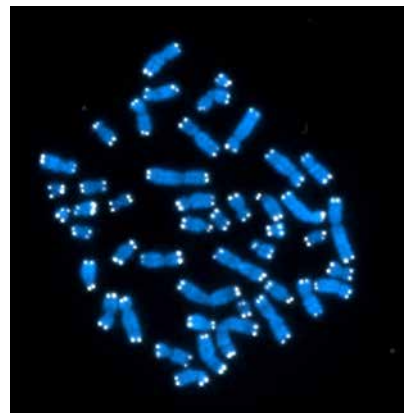
THE term coronavirus entered the scientific literature with little fanfare in 1968, when a short news item appeared in the journal *Nature*. A letter had been received from a group of virologists, suggesting the name for a recently discovered class of viruses causing mild human respiratory infections. A couple of years earlier, a new group of viruses had been identified in the nasal secretions of persons suffering from the symptoms associated with common colds. David Tyrrell at Britain's Common Cold Research Unit in Salisbury and Dorothy Hamre at the University of Chicago had independently managed to grow the new virus in the laboratory. The strain 229E, isolated by Hamre in 1966, yielded the now-famous image, visualised under the electron microscope by Tyrrell and June Almeida in 1967. In cross-section, the approximately circular image revealed a spiky exterior with uniform projections, a corona or halo, from which the virus derived its name. The new virus seemed to be the cause of a significant number of common colds, which until then had been thought to be almost entirely caused by a different class of viruses, the rhinoviruses.

A relatively benign, new infectious agent did not really attract a great deal of attention in the world of biomedical research. Over 35 years were to pass before the coronavirus bared its fangs. In late 2002, reports of a new and life-threatening respiratory infection emerged from Guangdong province of China. At the end of February 2003, a hospital in Hanoi requested help from the WHO to study the case of a patient with an unusual, influenza-like infection. Dr Carlo Urbani, a specialist in infectious diseases, arrived in Hanoi. He quickly realised a new and virulent infection was emerging and set in motion the appropriate public health response. Three weeks later, on March 29, 2003, Dr Urbani died in Bangkok, of the infection contracted in Hanoi. Five healthcare workers died shortly thereafter. By the time the spread of infection was halted, 774 people had died out of a total of 8,098 infected persons. *(https://www.cdc.gov/sars/about/fs-sars.html).*

A truly extraordinary scientific effort, coordinated by the WHO, was mounted by a worldwide network of laboratories, primarily across Europe and the US, to understand the coronavirus. A full genome sequence became available as early as May 2003. In a tribute to Carlo Urbani, an article in the *New England Journal of Medicine*, on May 15, 2003, noted, "In some ways, the SARS outbreak in Hanoi is a story of what can go right, of public health's coming before politics". But with that first SARS epidemic ending quickly, with it the coronavirus too faded from public view...for a handful of years. It swam back into the spotlight briefly in 2007-2008, with the outbreak of infection in the Middle East. The disease was named after the region, as the Middle East Respiratory Syndrome and the causative agent was

christened the MERS-CoV virus.

But 17 years after Carlo Urbani's death, a new coronavirus strain, SARS-CoV-2, now has much of the world locked down—a public health crisis of unprecedented magnitude. The lessons of the 2003 epidemic have been forgotten. Politics has determined public health responses. Witness the dominant role of China in determining the WHO's initial response to the outbreak in Wuhan, and the increasingly antagonistic attitude of the US to international organisations—capped by President Donald Trump's announcement of American withdrawal from the WHO. Ironically, in the aftermath of SARS (and with news dominated by the US invasion of Iraq), Barry Bloom of Harvard University had touched on precisely this aspect in the May 2003 issue of *Science*: "In a world...increasingly angry at the US, the lesson here is that it is time to support a global war on disease. The US should be investing efforts and funds to strengthen health structures in countries around the world. If we were to help train experts in epidemiology and surveillance, strengthen laboratories in key regions and link them to the best labs in this country and around the world, and support WHO, we would help to create a true global health network. This investment would protect our country and every other against global epidemics, save millions of lives, and change the US image from one of self-interest to one of human interest".



Chromosomes where our DNA resides

IN 2003, WHO had emerged as the key protector of global health. Today, the novel coronavirus has exposed how international power struggles can render such organisations irrelevant. The political leadership in many countries has been found wanting too, with responses that sometimes seemed poorly thought out, leading to chaotic situations. The virus has exposed the cavalier approach to public health even in the developed world. The spectacle of ever-inflating defence budgets and declining emphasis on health and social security must concern those who determine the course of public policy. The misplaced priorities of governments have been brutally exposed. Many world leaders have displayed a unique combination of arrogance and ignorance; a combination invincible in political arguments, but woefully inadequate in confronting the forces of nature.

The general public, caught in an unanticipated crisis, has been left learning the new vocabulary. Terms like 'social distancing', 'flattening the curve', 'sanitising' (a term hitherto reserved for security operations) and R0 (a mathematical descriptor of viral infectivity) now roll off the tongues of most educated people, who a few weeks ago would have had little interest in viral disease. Tongue-twisters like hydroxychloroquine find their way into the speeches of the US President, albeit with a little slurring. Our Supreme Court is now able to weigh in on the issue of middle-seat occupancy in planes—with a sudden, but touching, interest in public health.

Viruses, vaccines and drugs are suddenly centrestage, with the world waiting impatiently for science to deliver a solution. It is this very science—the acquisition of basic, fundamental knowledge absolutely essential for practical solutions—that has been neglected and downgraded in India over the past several years. The catchy phrase 'translational research' and related slogans like 'bench to bedside' have forced researchers to work in 'fundable' areas, determined by agencies that are under governmental pressure to make extravagant claims for the outcome of funded projects. A heavy price will be, and is being, paid for inadequate support of fundamental studies in disciplines like immunology, virology and many allied disciplines of cellular and chemical biology. The sudden flurry of calls by government agencies for proposals to do 'Covid research' in ridiculously short timescales, with unrealistic goals, is patently a kneejerk reaction to the current situation.

The virus is a formidable foe. We might do well to remember Michael Corleone's sage advice in the sequel to *The Godfather*: "Keep your friends close, but keep your enemies closer". Scientists, diverted from their favourite problems to the task of attacking the coronavirus, will be confronted with a formidable body of scientific literature that needs to be assimilated. The international scientific response to both the 2003 SARS outbreak and the current SARS-CoV-2 pandemic has been staggering, with the full power of modern technologies being focused on understanding the virus. Yet a solution does not seem within our grasp. In an March 23 editorial in *Science*, the journal's chief editor Holden Thorp had good advice: "When science addressed the HIV/AIDS crisis, it took years of careful virology, drug development, and epidemiology. The global scientific assault on COVID-19 is faster, and as I see the research that comes to *Science* and that appears on preprint servers, I am hopeful that science will deliver on this challenge, too. But I worry that engendering false hope will cause complacency that will deprive us of the time needed to find a lasting solution. And I worry about lasting damage if science overpromises. Let's underpromise. Let's overdeliver".

There are no drugs or vaccines in sight, even in the US and Europe, as everyone moves to an 'unlocked' world. Politicians and their advisors are already preparing us for this future, by pronouncing that the coronavirus is here to stay and that the world must get ready to coexist with the latest addition to the pantheon of viruses. Nature, as always, has the last word. A constant exposure to microbial pathogens can enhance the level of human immune competence. In the words of Joshua Lederberg, one of the high priests of microbiology: "Paradoxically, improvements in sanitation and vaccination sometimes make us more vulnerable because they leave the larger human herd more innocent of microbial experience."

THE AUTHOR, A BIOCHEMIST AND FORMER DIRECTOR OF THE INDIAN INSTITUTE OF SCIENCE, IS WITH NCBS, BANGALORE

AUD·5

'I enjoy being at home, reading and singing'

Starting her career with Khichdi: The Movie, Kirti Kulhari has delivered power-packed performances in diverse roles. She has never shied away from talking about issues in society and the film industry. Currently, Kirti is basking in the success of the second season of Four More Shots Please Season 2. She talks to Lachmi Deb Roy about life during the lockdown and her post-pandemic plans.

Streaming platforms during the lockdown

→ It is the best time for OTT platforms because everybody is at home. We have to admit that there is nothing much to do and people are getting bored. There are no other forms of entertainment for many of us. We can't go to theatres or malls. So, it is understandable that the viewership of web shows has gone up during the lockdown. OTT platforms have become the most happening place for entertainment and people are busy consuming content non-stop. This is indeed a great time to catch up on shows—people in big cities with busy schedules are hardly left with much time for leisure when they return home from work. So, this is the best time to be with your loved ones and pamper yourself.

Staying at home

→ I enjoy being at home. I have got back to reading and since I love singing, I am doing *riyaz* regularly.

Post-pandemic plans

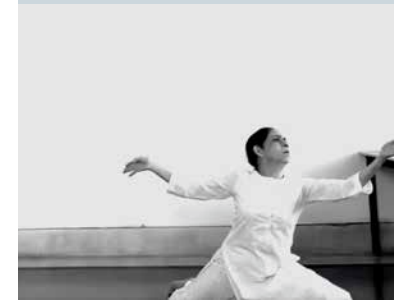
→ I have a bunch of things waiting to be released and shot, but I don't know if these will be released during the lockdown. I am hopeful that things will start returning to normal. I have quite a few series that will be releasing this year. *Four More Shots Please* Season 2 has already been released and the response has been overwhelming. The show is doing well—it feels good that people have embraced it in a bigger way this time. And I am glad that women are connecting with the series and getting inspired.

PEGASUS

Camera Confined

Oddbird Theatre and Foundation, New Delhi, has commissioned 13 teams of artistes, dancers, musicians and thespians under its Quarantine Video Project 2020. "Projects are on hold, performance spaces are closed, and planning seems speculative. We wanted to put together an initiative that encourages continued creation of artistic work, within confines—literal and otherwise," their statement reads.

So far, they have released five films on their website (oddbird.org). *Dilli Kiski Hoti Hai?* by BAAN G and Khwaab Tanha Collective features visual art and footage of migrant workers walking to their homes overlaid with an evocative poem. Kathak dancer and choreographer Aditi Mangaldas's *Amorphous—The Zero Moment* explores how time has become warped during the pandemic. Shot with a microscopic lens attached to a phone camera, Miya Biwi's brilliant *Corona Cam* stands out. It begins as an intimate exploration of domesticity and effortlessly transforms into a biting satire. Tadpole Repertory's *Private Language Argument* and Aranyani's *Lockdownatyam* are some of the other films commissioned under this project.



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BASU CHATTERJEE (1930-2020)

Middling **Perfection**

His self-deprecatory movies about middle-class society trod the fine line between popular and art house cinema

Giridhar Jha

IF Basu Chatterjee had a middle name, it would be simplicity. One of the pioneers of middle-of-the-road cinema, he passed away after a protracted illness at 90 in Mumbai on June 4. His movies neither looked like hardcore masala ventures of the likes of Manmohan Desai nor the art house cinema championed by Shyam Benegal and others. Instead, he chose to be the Buddha among the storytellers of his time, choosing the middle path traversed by only a few in the film industry.

A veritable institution in the art of simplified filmmaking, he churned out an array of wholesome family entertainers, from *Saara Akash* (1969) and *Rajnigandha* (1974) to *Chitchor* (1976) and *Baton Baton Mein* (1979) without leaning on any superstar. In fact, his films with some of the big stars of the time—*Priyatama* (1977) with Jeetendra, *Chakravyuh* (1979) with Rajesh Khanna, *Manzil* (1979) with Amitabh Bachchan, *Dillagi* (1978) with Dharmendra and *Manpasand* (1980) with Dev Anand—failed to click at the box office. It was his collaboration with everyman actors such as Amol Palekar, who played the quintessential middle-class hero in eight of his

Stills from *Rajnigandha* (top) and *Baton Baton Mein*

films, that elevated his status as an auteur extraordinaire with a refined sensibility.

Basu da, as his colleagues affectionately called him, excelled in telling stories of common people and their struggles with dollops of subtle wit and humour. The USP of his films was that he did not present any of his heroes as a superman with a traffic-stopping eye candy in his arms, capable of demolishing an army of 40 armed goons at one go without batting an eyelid. Instead, his protagonist was invariably a middle-class youth with follies and foibles, who was at times upstaged by a smarter adversary. His actors were anything but larger-than-life or over-the-top and looked no different from the man-next-door, someone the audience could instantly relate to. It was the sheer simplicity of his movies that made Basu da's repertoire stand out.

He began his career as an illustrator-cartoonist in the now-defunct *Blitz* tabloid in Bombay before he moved to cinema to work as an assistant to director Basu Bhattacharya on *Teesri Kasam* (1966). In 1969, he began his innings as an independent director with *Saara Akash*, based on a novel of the same name by litterateur Rajendra Yadav. It was the year when Mrinal Sen released his iconic *Bhuvan Shome* and Khwaja Ahamad Abbas introduced a new actor called Amitabh Bachchan in *Saat Hindustani*. Moreover, a new sensation called Rajesh Khanna had taken the industry by storm with *Aradhana* and yet, Basu da's 'small' movie received rave reviews and set the template for his signature style of cinema—no tropes or frills of masala movies that Hindi cinema was notorious for in those days.

Basu da went on to make *Piya Ka Ghar* (1972), *Us Paar* (1974), *Chhoti Si Baat* (1976), *Safed Jhooth* (1977), *Priyatama* (1977), *Swami* (1977), *Khatta Meetha* (1978), *Apne Paraye* (1980), *Shaukeen* (1982), *Kirayadar* (1986), *Chameli Ki Shaadi* (1986) and a slew of other movies. He also ventured out of his comfort zone by making experimental films such as *Ek Ruka Hua Faisla* (1986) and *Kamla Ki Maut* (1989), which underlined his versatility and control over his craft.

There was hardly any filmmaker of his generation as prolific as him in his heyday. During his illustrious career, he directed 40 feature films, including five Bengali movies. *Trishanku* (2011) was his swan song. He also found time to direct a handful of successful television serials, such as the iconic *Rajani* (1985), *Darpan* (1985), *Kakaji Kahin* (1988) and *Byomkesh Bakshi* (1993) for Doordarshan.

It is to his credit that his heavy workload could never bog him down nor diminish his passion for quality cinema. Considering that the Hindi film industry was under the sway of action-packed multi-starrers, it is remarkable he dared to make such films. For nearly two decades, Basu da arguably remained the only successful filmmaker alongside Hrishikesh Mukherjee to buck the trend and make self-deprecatory movies about middle-class society.

BOLLYWOOD FOLLOWED BASU DA 30 YEARS TOO LATE BY ACKNOWLEDGING THAT NO STAR IS BIGGER THAN THE CHARACTER HE PLAYS ONSCREEN.

Basu da's style of filmmaking went on to inspire generations of filmmakers in the decades to come. One could say that Bollywood began to follow his filmmaking template 30 years too late by acknowledging the fact that no star is bigger than the character he plays onscreen. It is a greater tribute to him than all the awards and laurels he deserved, but did not get in his lifetime.

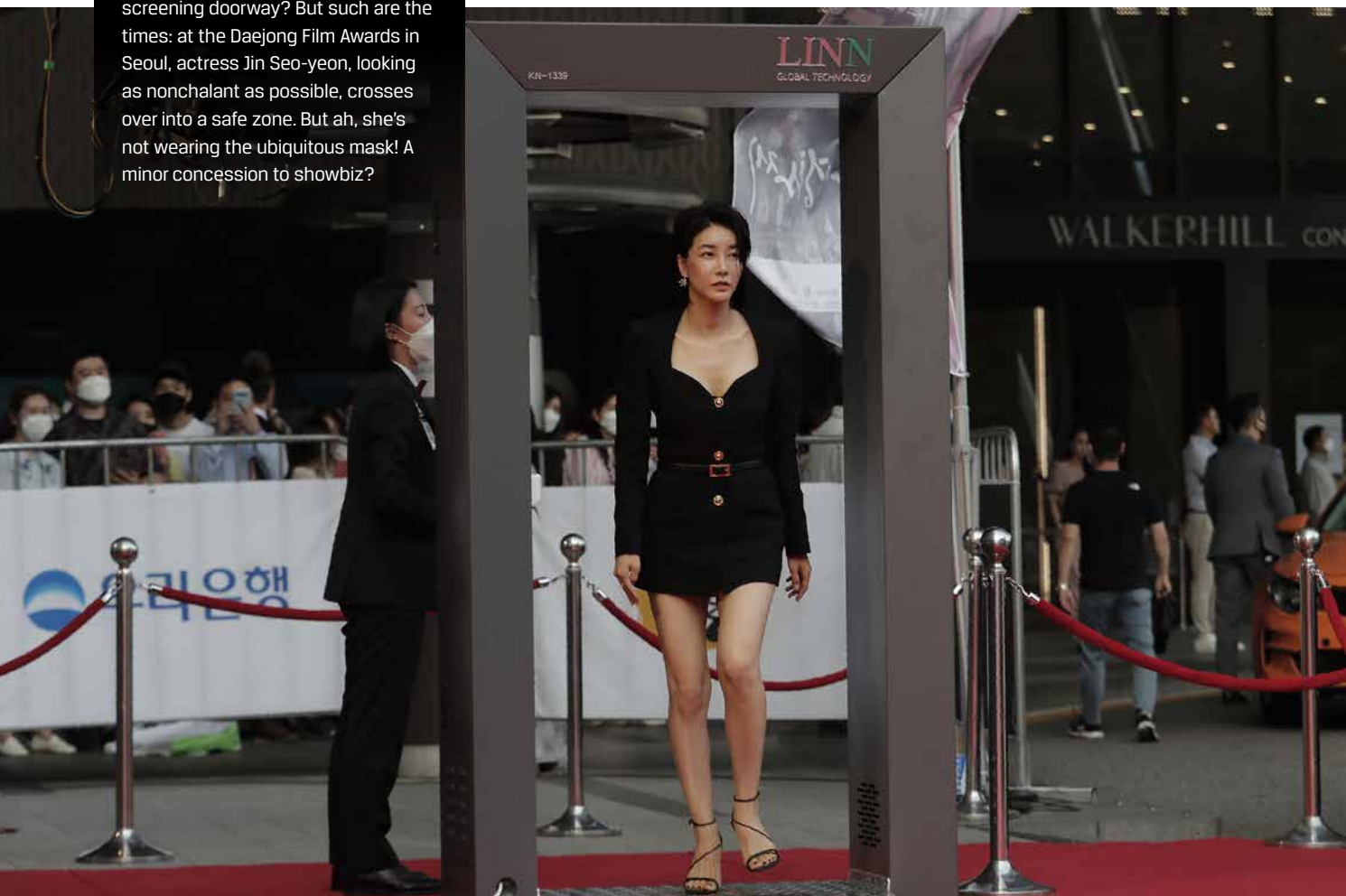
la dolce vita

Craig's Added List

Something changed in the very soul of James Bond when Daniel Craig took over—the stiff upper-lipped, upper-class debonair rakishness was replaced by a muscular, strong-jawed, thin upper-lipped show of serious intent. Bond's latest, the topically named *No Time To Die*, will now release in November (instead of February). Still more serendipitous is the theme: Bond rescues humanity from a pandemic. And, in the most shattering departure ever, Bond is married (what!!!), with a child. Will wife Madeleine (Lea Seydoux) and daughter Mathilde cramp Bond's free-ranging style as a buccaneer of boudoirs? But listen; Daniel, it looks, performs better with responsibility.

Not So Loverly?

Is this the new normal? The pandemic imposing a new danse macabre, an equalizing hand that falls on commoner and royalty alike? When did we ever think the glamorous and good—in tuxedos and gowns, weighed down with stones—would be subject to a walk through a thermal screening doorway? But such are the times: at the Daejong Film Awards in Seoul, actress Jin Seo-yeon, looking as nonchalant as possible, crosses over into a safe zone. But ah, she's not wearing the ubiquitous mask! A minor concession to showbiz?



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Never Get Out

It's one thing to pose in bikinis—you're well-acquainted with those here—it's another to cavort in workaday lingerie, with its frisson of intimacy, abandon, a whiff of cool, stale, slept-in sheets. That's what Mandana Karimi suggests, as she digs her knees in and tells us that the bed is her favourite place these days. At the height of the Vietnam War in 1969, as American and Vietnamese kids reaped the tragic fruits of a generaton of US politicians' pig-headed folly, John Lennon and Yoko Yono staged their famous bed-ins for universal peace. Mandana here aims for universal love.

A Victim's Tale

We don't know much about Meera Chopra—though she looks inviting enough here, tumbled down on a fine-sanded beach in a swimsuit that bears closer inspection than we are allowed—but the actress has had a traumatic experience at the hands of livid, and criminally stupid, NTR jr fans when she said in a social media chat that she liked Telugu superstar Mahesh Babu, but was ignorant about the junior. Abuse followed, together with threats of assault, morphed photos and curses of coronavirus on her parents. NTR jr, meanwhile, kept up a loud silence. Meera deplores this sick dictatorship of the 'fans', and has reported this to the police. We hope their fetid ardour gets a good shellacking.

COVID-19 Diary

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The Biggest Test

Oath may seem like a tiny word, but it contains a universe of expectations. To live up to the vows one swears allegiance to is a big challenge. Our leaders, unfortunately, have failed to serve and protect the people of India during the pandemic.

I, however, hope I have remained honest to the Hippocratic oath I had taken in August 2017. In the past few months, I have faced the biggest test as a doctor. April-May will be engraved in my memories for the rest of my life. I treated patients, tested positive for COVID-19 and emerged from the disease a stronger person. Within three days of testing negative, I was back in the COVID-19 ward at Calcutta's Peerless Hospital.

It's been a fortnight since I returned. As patients with other diseases too come to the hospital, the COVID-19 section has been completely isolated. It can be mentally damning to stay so secluded. But that's the nature of our work. As they say, it's the new normal.

March Of The Virus

From March onwards, we started getting patients—both symptomatic and asymptomatic. There was a paucity of testing kits. One day, we admitted an 86-year-old Bengali lady. She suffered from Parkinson's and was weak and feverish—practically bed-ridden. We didn't test her for COVID-19 though. Old people need a lot of attention and I, along with some nurses, looked after her fondly. Unfortunately, we could not save her. Soon, I too started showing symptoms, as did a couple of nurses and other staff attending to the lady.

As far as testing is concerned, things have gotten better compared to the initial days of the pandemic. Earlier, we relied on Chinese kits that sometimes gave erroneous results. Now we have two types of kits—GeneXpert and RT-PCR. The former is cheaper (Rs 1,500 per test) and is being used more often as cases increase. It gives results in five to six hours. RT-PCR is more expensive (Rs 4,500 per test) and can take up to 10 hours to provide accurate results. Both tests are equally good.

Positive to Negative

I had weakness, chills at night and bouts of high fever—symptoms of COVID-19. This escalated to breathlessness, chest pain and anosmia (loss of smell). I tested positive on April 25. The hospital gave me a separate room and the staff took good care of me. Since no cure has been discovered, there is not much one can do for a COVID-19 patient. Apart from the usual checks, I was on medicines as per the WHO protocol—Vitamin C, antibiotics, hydroxychloroquine and paracetamol. Since I had lost my sense of smell, I couldn't taste food either. It was frustrating at times, but since I was a house physician, I could at least talk to the nurses. And thank god for my smartphone!

I was still positive after two weeks, but I knew I would get well. Age was on my side, so it was only a matter of time.. When I did not show any fresh symptoms for more than a week and my chest X-ray showed signs of improvement, I knew I was recovering. Finally, when I did not get a fever for three consecutive days and my vitals were stable, I was allowed to go home, but only on the condition that I would be quarantined for a week. It was relaxing as I was back in an intimate space and my parents and sister were around. On May 26, my result was negative.

Flatten The Fear Curve

When I joined the hospital after four weeks of treatment and quarantine, I was not forced to join the COVID-19 ward—I made a conscious decision to work there. As a doctor, it's my commitment to serve humanity to the best of my ability, without discriminating among patients. While people do not stimgatise COVID-19 like they do tuberculosis, leprosy or sexually transmitted infections, there is still tremendous fear of the disease. However, to treat a person with coronavirus as if they were untouchable is unacceptable. Indeed, the curve is anything but flattening in India, but unless medical personnel eschew fear, we will not be able to stop the spread of the disease. That motivated me to return to the isolation ward and work for people battling the virus.

However, to see people risking their lives being treated like outcastes was shameful. Fortunately, the attacks on health workers and nurses attached to COVID-19 wards have stopped. Cases are rising though—we are getting an average of five patients every day, quite a high number. Unlike before, we are unable to trace the source of the infection. This shows that lockdown rules have been thrown to the wind. With things unlikely to get better soon, we have to step up as a team. Right now, our commitment, willingness and courage matter as much as our MBBS degrees.

(As told to Soumitra Bose)

ILLUSTRATION: SAAHIL