News from here and there

An omicron wave now

The Omicron variant of SARS-CoV-2 (B.1.1.529) was first detected in mid-November 2021 in South Africa. On 26 November 2021, it was designated by the WHO as a variant of concern (VoC). This initial Omicron wave was primarily due to the Omicron BA.1 sublineage.

As of February 2022, the BA.2 sublineage of Omicron (Nextstrain clade 21L) is fast spreading and likely to become the dominant strain. Compared to BA.1, BA.2 has 32 identical mutations and 28 different mutations. This variant of Omicron appears to be much more transmissible compared to BA.1, if the rising numbers of Covid infections are an indicator. The prevalence of BA.2 has now increased in countries such as South Africa, the UK and Denmark. Over 98% of the 400 000 Covid-19 virus sequences uploaded to the Global Initiative on Sharing Avian Influenza Data (GISAID) were Omicron.

However, the good news is that infection with the BA.1 variant gives a 95% protection against infection with BA.2, as shown in a recent preprint that is yet to be peer reviewed (*www.medrxiv.org/content/10.1101/2022.02.24.22271440v1*).

The WHO's Technical Advisory Group on SARS-CoV-2 Virus Evolution (TAG-VE), which is monitoring the ongoing Covid-19 pandemic, informed that the BA.2 sublineage should be treated as a VoC, based on currently available data on severity, re-infection, transmission, therapeutics, diagnostics and vaccine impact.

While the risk of hospitalization due to Omicron is less compared to the Delta variant, the WHO has warned that stakeholders should not treat it as 'mild', since levels of vaccination are low in vulnerable populations and Covid-19-related deaths continue to increase in many countries. Since the identification of the Omicron variant, over 90 million corona virus cases have been reported. This amounts to over half the cases for 2020.

The emergence of SARS-CoV-2 variants such as Omicron is a stark reminder that the Covid-19 pandemic is still not over. WHO-approved Covid-19 vaccines are effective in minimizing severe illness and death. However, the protection offered against Omicron infection and mild disease is less. Avoidance of crowded spaces, wearing a mask and other precautions continue to be necessary.

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Proportion of permitted 'non-medical' teachers in non-clinical departments in medical colleges restored

As per the erstwhile Medical Council of India (MCI)'s Teachers Eligibility and Qualifications (TEQ) regulations, in case of faculty shortage, a provision existed for appointing 'non-medical' teachers possessing medical MSc/PhD qualifications to faculty positions in medical colleges to the extent of 30% of the total posts in the departments of anatomy, physiology, pharmacology, microbiology; in biochemistry, 'non-medical teachers could constitute 50% of the posts' (*www.nmc.org.in/rules-regulations/teachers-eligibility-qualifications-1998*). When the National Medical Commission (NMC) had replaced the MCI, the same guidelines were incorporated in the draft document 'Amendment to Minimum Requirements for Annual MBBS Admissions Regulations, 2020' released for public feedback on 13 October 2020. However, in the final document dated 29 October 2020 (*www.nmc.org.in/rules-regulations/minimum-requirements-for-annual-m-b-b-s-admissions-regulation2020*) the permissible proportion of 'non-medical' teaching faculty was reduced to 15% in anatomy, physiology and biochemistry and completely abolished in pharmacology and microbiology. (Readers of this column would recall an earlier news item 'Twist in medical education rule will hit those who have done an MSc, PhD', *Natl Med J India* 2021;**34:** 255–6.)

The National M.Sc. Medical Teachers' Association (NMMTA) had filed an appeal on 28 February 2021 with the NMC under provisions of the NMC Act, which was dismissed. The NMMTA had filed a second appeal on 7 September 2021 with the Central Government seeking restoration of the erstwhile MCI norms for 'non-medical' faculty teachers. After examining this appeal, the Ministry of Health and Family Welfare had released a government order stating that the NMC may continue to adopt the erstwhile MCI's pattern of the permissible percentage of non-medical faculty teachers for the time being subject to the outcome of the pending court case.

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Prototype of economical ultra-low-field MRI scanner developed by Hong Kong researchers: Implications for neuroimaging in low- and middle-income countries

A team of researchers from the laboratory of biomedical imaging and signal processing, the University of Hong Kong, published in December 2021 in the journal *Nature Communications* their prototype for a magnetic resonance-based scanner which could be produced and maintained at a cost much less than current-day MRI machines. Ed X. Wu, the corresponding author of this study, is Chair Professor at the Department of Electrical and Electronic Engineering, and affiliated to the School of Biomedical Sciences, Li Ka Shing Faculty of Medicine, at the University of Hong Kong, Pokfulam, Hong Kong SAR, China. The ultra-low-field machine used less power as it was based around a compact two-pole 0.055 T permanent samarium–cobalt (SmCo) magnet, compared to conventional high-field superconducting MRI scanners of 1.5 T and 3.0 T, and was powered by a standard AC power outlet. This low-noise 0.055 T machine was able to successfully replicate and interpret commonly used brain MRI sequences such as T1- and T2-weighted protocols, FLAIR and DWI, and produce signal-to-noise (SNR) ratios and contrast characteristics similar to clinical high-field MR images for the 25 patients enrolled in a pilot study (13 with brain tumours, 8 with

subacute to chronic strokes and 4 with subacute to chronic intracerebral haemorrhages).

The addition of an indigenous 'deep-learning-driven electromagnetic interference (EMI) cancellation technique' made this prototype radiofrequency shielding-free, and saw fewer artefacts being created by metallic clips and cerebrovascular stents. This can expand the pool of patients who could have neuroimaging, since conventional high-field MRI cannot be used for scanning of patients with metal medical implants or accident-related metal fragments.

The device, which was built at an approximate cost of under US$ 20 000 has been proposed as a supplement to mainstream MRI machines costing approximately US$ 1–3 million, excluding installation and maintenance charges. To put these figures in perspective, the Organization for Economic Co-operation and Development (OECD) has estimated that at present approximately 70% of the world's population has little or no access to MRI.

This MRI can have widespread use in a variety of neurological conditions including brain tumours, stroke, chronic intracerebral haemorrhages, accident-related injuries and metal device-based intracranial screening.

The authors of the study have provided free online access to the key code and designs for this model in a public online repository in the hope of more patient-centric and wallet-friendly MRI machines being developed. An estimated 30% of clinical MRI cases involve the brain, with MRI being the most valuable clinical tool used for assessing brain injuries and disorders.

Dr Bhavin Jankharia (Consultant radiologist, Picture This, Mumbai), opined in an email to this correspondent, 'Imagine a situation in the not-too-distant future, where you suddenly have weakness of the upper limb and face, which resolves on its own in 2 hours. You go to a neurologist, who examines you thoroughly, then tells his assistant to perform an MRI of your brain in the next room, looks at the images half an hour later and tells you that there is no fresh infarct, just old ones in the brain, suggesting that this was a transient ischemic attack (TIA), for which he prescribes appropriate medicines. The entire interaction with the neurologist, inclusive of the MRI, takes about 90 minutes.

'If the facial and limb weakness were to happen today, the neurologist would examine you, then ask you get an MRI done, for which you would make an appointment with a nearby, reputed MRI centre or hospital, then go another time or day to get the MRI done, then wait a day for the results, which you would then carry back to the neurologist on the third or fourth day, after which they would prescribe the necessary treatment.

'In the first scenario, everything happens in one short visit, while in the second, there are multiple visits over an extended period, which is what happens currently.

'Point-of-care testing has many advantages. Apart from saving time and simplifying the logistics involved in diagnosis and management, it allows technology to be placed in underserviced areas and to be taken to people and patients, who otherwise may not have the time, energy, money or the ability to avail of these technologies. X-rays were the first to be used in this manner, but their point-of-care use has always stuttered and stumbled for a variety of reasons. It is only now, with the advent of portable digital handheld X-ray machines, coupled with the use of deep learning systems, which can help with acquisition and initial triage of the radiographs that we are looking at finally unleashing the potential of X-ray technology at the doorstep of the patient. The same is true of sonography, where handheld machines have been available for some time, but because of the constraints of trained workforce . . . is unable to reach its full point-of-care potential.

'MRI has revolutionized the fields of neurology and orthopaedics, among others. Low-field office MRIs have been around for some time, but they are still expensive to run, occupy space and need shielding and infrastructure. The article by Liu and colleagues in *Nature Communications* describes a low-cost, ultra-low field, 0.055 T MRI that has the potential to change how MRI is used in daily practice. While the technology still has many hoops to go through, the fact that it is possible to build an MRI machine for US$ 20 000 (₹16 lakh) with reasonable quality images that can tell us whether the patient's brain is normal or not and if abnormal, whether there is any major pathology that needs further work-up, has the potential to create a paradigm shift for patients and doctors.

'Hyperfine, which has a 0.064 T magnet, is already available commercially as a portable system that can be taken to the patients' bedsides for brain scans. Unfortunately, it is sold on a subscription model of US$ 10 000 (₹8 lakh) per month, which makes it unviable at present, and it is not available in India. It cannot be difficult for a smart Indian Institute of Technology or similar engineering institute to create a low-cost, ultra-low-field MRI indigenously that could then be made available in every district and perhaps could even be taken into a patient's home with the images read initially by an artificial intelligence (AI) system and then by a radiologist hooked up through a cloud system. Yes, we will always need the 1.5 T, 3.0 T and eventually 7.0 T MRI machines in non-emergent situations for the quality they provide to allow accurate diagnosis. But low-cost, ultra-low-field MRI scanners that can be deployed in offices, small nursing homes, primary care centres, along with handheld X-ray and sonography machines can revolutionize the way radiology is used. Instead of the patient coming to radiology, radiology can finally go to the patient.'

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