

2021|22

MOST IMPORTANT  
OUT COMES

INDIAN COUNCIL OF MEDICAL RESEARCH  
NEW DELHI



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# Most Important Outcomes 2021-22



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Published on behalf of the Secretary DHR & DG, ICMR, New Delhi.

# MOST IMPORTANT OUTCOMES (2021-22)

## NEW HEALTH TECHNOLOGIES

### A. PRODUCTS COMMERCIALIZED

- A point of care rapid detection kit for semi-quantitative estimation of CC16 in human samples was developed. The technology has been transferred to two companies (Axiva Sichem Biotech-Delhi and Acrannolife Genomics Pvt. Ltd, Chennai).
- Nipah Point of Care Assay in collaboration with Mol Bio Diagnostics Pvt. Ltd, Goa, for the detection of Nipah viral RNA from clinical samples was developed.
- KFDV Point of Care Assay in collaboration with Mol Bio Diagnostics Pvt Ltd, Goa, for detection of KFD viral RNA from clinical samples was developed.
- Truenat™, an indigenous molecular test has been validated for TB, MDR TB, Extra pulmonary TB (EPTB) and Paediatric Pulmonary TB (PPTB) and is currently being used under National TB Elimination Programme. The test has also been recommended by WHO for detection of TB and MDR-TB.
- C-Tb (New Skin test for Latent TB): ICMR validated more specific new skin test C-Tb for detection of latent TB in adult population (18yrs and above) for use under the NTEP.
- TB Detect for improved smear microscopy to strengthen microscopic detection at periphery has been validated. It has better sensitivity as compared to conventional microscopy and has been recommended for use under NTEP.
- ICMR developed Standard Treatment workflow for paediatric pulmonary TB and Extra-pulmonary TB for all levels of health care system to facilitate management of Tuberculosis under NTEP (Till date no such thoroughly prepared document for peripheral health setup is available on TB). The document, posters and the App was launched on World TB day on March 24<sup>th</sup> 2022 by MoHFW.
- ICMR deposited “RD-Knockout polio non-permissive cell line” using CRISPR Cas9 to ATCC, USA. The development of CD155 (poliovirus receptor) gene knockout cells from the RD cell line can be widely used for virus culture of non-polio enteroviruses without the fear of poliovirus growth as inadvertent contamination.
- The technology for rapid, simple and cost-effective lateral flow immunoassay for the diagnosis of severe Haemophilia A and von Willebrand disease was developed and transferred for commercialization to Bhatt Biotech and has been approved by CDSCO for marketing. The World Federation of Haemophilia has shown keen interest in this technology and will promote it in other developing countries.
- X-ray based AI tool for COVID-19 diagnosis was validated. Indian Novel Claim Portal *inovecop* was developed.
- ICMR in collaboration with IMGENEX INDIA Pvt. Ltd. developed and performed the clinical validation of an indigenous SARS CoV2 Antigen detection kit (Im-CoV-Ag™). The kit is commercialized and presently in market.

- A technology to diagnose the cause of male infertility (Y chromosome microdeletions) was handed over to the industry partner APS Lifetech.
- ICMR has developed and transferred Bti- a mosquito bio-larvicide technology to the public sector undertaking - Hindustan Insecticides Ltd.

## **B. PRODUCTS IN PROCESS OF COMMERCIALIZATION**

- An Artificial blood free Diet formulation has been developed for adult mosquitoes. It will be helpful in control of dengue, Chikungunya, Zika and Yellow Fever.
- ANM Mosquito Feeder-A microcontroller device has been developed for artificial diet/blood-feeding for mosquito rearing in the laboratory. This device reduces cost, space requirement and is very handy to use.
- Invention of a cost-effective mosquito attractant and lethal non-electric ovitrap was done.
- There was development of portable Protein Gel Electrophoresis Unit.
- A Mechanical Aspirator for the Safe Transfer of Mosquitoes was made.
- A novel process was developed for the production of a mosquito larvicidal formulation based on Solid-State Fermentation (SSF) of *Bacillus thuringiensis* var. *israelensis* (serotype H14) which is potentially a cost cutting technology with high commercial value.
- Immunodiagnostic kits were developed for detection of aspergillus fumigatus in sera of patients with bronchial asthma and pulmonary tuberculosis.
- Colorimetric isothermal (RT-LAMP) assay for rapid detection of Nipah virus infection has been developed. It does not require a thermal cycler and can be performed using a single-temperature heating device within 40 minutes.
- There was development of Nipah virus-specific IgM & IgG ELISA for screening of human serum samples.
- A functional food formulation for diabetic complications has been developed. This formulation is currently under preclinical safety evaluation. A MoU is signed with an industry for developing the products for clinical trials.
- A sensitive and easy-to-adopt assay to detect BPA in urine, milk and water samples has been developed and optimized.
- ICMR validated a novel point-of-care Hb measurement in pooled capillary blood by a portable autoanalyzer which has better Hb estimates than conventional methods being used.
- A new indigenous sputum transportation kit for bio-safe sputum transportation at room temperature was validated. It has been recommended for use under NTEP.
- ICMR validated quality of the Handheld X-rays with comparison to that of the standard X-rays, which was found to be at par and can be used for screening of TB under NTEP.

## **NEW INTERVENTIONS WITH IMPLICATIONS FOR PUBLIC HEALTH OR CLINICAL PRACTICE**

- ICMR has developed a combo assay for the detection of SARS CoV 2, Influenza A, B and RSV in a single tube, which will be helpful in early diagnosis and better clinical management of respiratory infections.

- Target Product Profiles for the rapid diagnosis of sepsis in adults and neonates were developed to detail the criteria for performance and operational specifications of a “fit-for-use test” as per needs of healthcare in India.
- The *i-DRONE* study was first of its kind in the South Asian region where drones were used for delivering of COVID-19 vaccines from land to islands of Manipur and Nagaland. These drones delivered 21,000 units of medical supplies including multivitamin tablets, syrups, COVID-19 vaccines and routine vaccines.
- WHO-ICMR-Solidarity trial highlighted little / no effect of remdesivir, hydroxychloroquine, lopinavir and interferon regimes on hospitalized patients with COVID-19. These findings formed the basis for revised clinical management guidelines for COVID.
- A phase 2/3, multicentric randomized controlled study was implemented by ICMR to determine the safety and immunogenicity of COVOVAX in Indian adults. Emergency use authorization for vaccination in adults was accorded to COVOVAX by WHO and DCGI in India.
- Study for detection of anti-SARS-COV-2 IgG antibodies among unvaccinated HIV-infected individuals (PLHIV) attending ART Centre showed an estimated seroprevalence of 54.6% in unvaccinated, asymptomatic PLHIV. These findings highlighted the need of COVID-19 vaccination among this vulnerable group.
- ICMR has prepared ‘Red cell panels’ suitable for Indian population and have distributed them to >70 centres across India. This will help in accurate identification of rare donors and improve transfusion medicine services in India.
- A quasi-experimental pilot study among 138 mild to moderate anaemic (Hb <12 g/dl) adolescent girls (aged 17-19) supplemented with 100 gm/day pearl millet-peanut chikki for 3 months, showed that there was 23.9 % reduction of anaemia without any adverse events.
- Evaluation was done of immunogenicity and protective efficacy after vaccine interchangeability in a selected population of Eastern UP. The findings suggested that immunization with a combination of Covishield and Covaxin was not only safe but also elicited better immunogenicity.
- The mobile app “MosquiTracker” was developed for remote area entomological collection, monitoring and analysis. This can have major implications for the vector control strategies in the region.
- Tuberculosis Verbal Autopsy Tool was developed and validated. This tool will help to estimate the deaths occurring in the community due to Tuberculosis with high accuracy and will help the NTEP to understand the mortality due to TB.
- Visceral Leishmaniasis cases co-infected with HIV may be treated with AmBisome and Miltefosine combination with reduced treatment duration i.e. 14 days instead of 38 days. It has been accepted as treatment guidelines in the National Program / WHO.
- Digital autopsy with CT scanning was developed for dignified management of dead.
- Mutational analysis in MODY & NDM helped in changing treatment from insulin to OHA. IDRS (Indian Diabetes Risk Score) was evaluated across the nation and is found to be suitable, for cost effective screening for diabetes in Asian Indians.
- ICMR-INDIAB study recommended for using age-specific cut-offs while utilizing HbA1c to diagnose diabetes and pre-diabetes, so as to minimize the risk of over diagnosis and unnecessary initiation of treatment in elderly people, who could have physiological increase in HbA1c levels.

- ICMR-INDIAB study recommended reduction in carbohydrates and an increase in protein, for both, T2D remission and for prevention of progression to T2D in pre-diabetes and individuals with normal glucose tolerance, hence, underlining need for new dietary guidelines that recommend appropriate changes in macronutrient composition for reducing the burden due to diabetes in South Asia.
- Guidelines for Management of 20 cancer sites in the body were published, which will serve as a guidance document for treating physicians.
- Integration of ICMR e-Mor cause of death module with Tamil Nadu CRS software was completed and implemented in September 2021. This is of public health significance as it strengthens MCCD-CRS system to provide cause specific mortality statistics in the state.
- Framework for audit of Medical Certification of Cause of Death (MCCD) at Health Facility was developed by ICMR in collaboration with CBHI-DGHS and WHO. Implementation of this framework by hospitals would help minimize errors and ensure completeness of MCCD forms at the hospital.
- Based on the need for standard data collection on stroke for assessment of quality of care, the data fields from the Hospital based stroke registry core form of the National Stroke Registry Programme (NSRP) of ICMR-NCDIR have been identified and are being included in the Ayushman Bharat Transaction management database. Recording of standard data on stroke management in the AB-empanelled hospitals can facilitate data analysis of patterns of care and outcomes of stroke.
- Situational analysis of childhood cancer care services in India was conducted using a cross-sectional survey design. The most frequent challenge which patients and their caregivers faced was, treatment denial and treatment abandonment, for which, financial constraint was the most commonly cited reason. It is recommended to formulate a National Childhood Cancer Policy, as well as integrate childhood cancer in RBSK, ICDS and other child health welfare schemes.
- Due to absence of proper diagnostic measures for enteric viruses, diarrhoea with viral aetiology is misdiagnosed as bacterial, leading to irrational prescription of antibiotics. ICMR has developed a conventional RT-PCR assay for detection of 4 major viruses, Group A Rotavirus, Human enteric adenovirus species F, Astrovirus and Norovirus GI/GII.
- There was development and testing of a Behavioural Change Intervention (BCI) tool for smokeless tobacco quitting. The tool encompasses interactive booklet for healthcare providers which includes details related to different types of smokeless tobacco products, chemical compositions, its effect on human health & wellbeing and advantages of quitting smokeless tobacco.
- There was Establishment of Utility of Blood as the Clinical Specimen for the Molecular Diagnosis of PKDL.
- There was development of improved lid of underground tanks where *An. stephensi* used to breed (20-40%) that prevented *An. stephensi* from breeding in Western Rajasthan.
- ICMR developed an intervention package for smokeless tobacco (SLT) cessation among tribal women in Manipur that consists of 4 sessions delivered on one to one basis to women SLT users, at home, over a duration of 4 weeks.
- There was development of Behaviour Change Communication (BCC) intervention for improving utilization of Maternal and Child Health (MCH) Services through Male Participation among Saharia Tribes in selected districts of Madhya Pradesh.



- HTA study on linking HIV and Family Planning services to promote dual contraceptive use among women living with HIV (WLHIV) demonstrated that it was not only cost-effective but could avert many unintended pregnancies, abortions, maternal deaths and infections among newborns.
- Mass distribution of DEC double fortified salt (Diethylcarbamazine (DEC) at 0.2% w/w and iodine) was implemented in two phases in Nancowry group of islands, sublimating to ongoing MDA. This resulted in elimination of persistent foci of diurnally sub-periodic *Wuchereria bancrofti* among Nicobarese tribe in the entire group of Nancowry group of islands, a lone focus in India.
- ICMR developed food-based recipe using an indigenous flower called Mahua for tribal pregnant women. The results showed increase in haemoglobin levels when compared to control group. The recipe is under consideration with Govt. of Telangana.
- Studies on the Impact of *Salmonella* killing lytic bacteriophages on probiotic microbiota showed that the administration of lytic bacteriophages will not harm the probiotic microbiota and are likely to be safe for use in food preservation.
- Active case finding in severely malnourished children admitted to Nutritional Rehabilitation Centres (NRCs) has shown very high (5%) incidence of TB. Case detection was improved with proper training and providing point of care diagnostic tests under National Programme. The intervention has potential to increase quality and yield of the TB case detection at NRCs.
- Based on recently concluded study by ICMR, for screening of TB in High-risk groups (all patients aged 60 years or more, diabetic, living with HIV, & admitted to medical wards), current diagnostic algorithm (2 spot and one overnight sputum sample) can be simplified by limiting sputum collection to a single spot sample only.
- The White Paper on "Infectious Diseases Beyond COVID-19" highlights the measures needed to tackle other infectious diseases during the current pandemic. This paper intends to create awareness among healthcare professionals regarding the need to focus on the other infectious diseases in such unprecedented times, and to minimize the impact of COVID-19 pandemic.
- ICMR developed a comprehensive neuropsychological and behavioural test battery, the Multilingual Dementia Research and Assessment Toolbox (MUDRA—previous name) ICMR Neuro Cognitive Tool box (ICMR-NTB), in five different Indian languages that can be used to assess cognitive impairment due to stroke and other dementias in different populations within India.

## **IMPLEMENTATION RESEARCH THAT LED TO HIGHER COVERAGE AND/OR QUALITY OF HEALTH PROGRAMS**

- India Hypertension Control Initiative is a large implementation project which has been implemented in public health facilities in 141 districts of 25 states. Best practices of IHCI have been integrated into the NPCDCS program. This project has received a UN Award.
- National TB Prevalence Survey for prevalence of national and state-wise data on TB and latent TB along with health seeking behaviour has been concluded by ICMR and the report shared with CTD. This mega survey is a significant contribution towards tackling TB elimination Programme of India.
- A study on introduction of quality management system with well-defined modules and processes under National programme laboratories has shown significant improvement in quality of TB diagnosis and increased yield of TB cases at these facilities. This will have a larger impact on quality of TB diagnosis under the National Programme.



- ICMR constituted an Expert Committee to review the indicators used in the Global Hunger Index (GHI). The Committee concluded that the four indicators used in the GHI [undernourishment, stunting, wasting, and child mortality] do not measure hunger per se, as these are not the manifestations of hunger alone. The deliberations of the Expert Committee were published in Indian Journal of Medical Research as a White Paper entitled “Global Hunger Index does not measure hunger - An Indian perspective.”
- Field feasibility evaluation of one kit based rapid diagnostic test (Rapidogram) for UTI detection provided evidence on its usefulness in peripheral healthcare settings with 99.6% specificity, 90.6% sensitivity, 96.7% PPV, 98.9% NPV and 98.7% test accuracy. Diagnostic test was recommended to National Health Systems Resource Centre (NHSRC) under NHM for pilot study.
- Cost effectiveness assessments of two indigenously developed rapid diagnostics for diagnosis and management of uncomplicated symptomatic UTI among women provided evidence on the test associated cost-efficient clinical decision-making. Net Monetary Benefit of ₹ 37,715 (RightBiotic) and ₹ 37,281 (Rapidogram) were obtained for using these diagnostics based on GDP per capita income of ₹1, 45,679 in 2022.
- For lymphatic filariasis, ICMR is advocating DEC fortified salt (cooking salt) as an adjunct tool which when consumed by endemic communities, accelerates elimination of microfilaremia from the communities. There is in principle agreement to adopt the DEC salt (DECIDE – DEC and Iodine fortified salt) in the National policy.
- Impact of Anti-retroviral therapy (ART) under National AIDS Control Programme (NACP) was evaluated and free ART programme was found to be cost-effective. Issues highlighted for future action include focus on ageing HIV population, co-morbidities, retention, establishment of more centres in underserved states, immediate linkage to ART and improved CD4/viral load monitoring.
- Seroprevalence of Hepatitis B virus (HBV) and Hepatitis C virus (HCV) among High-Risk Groups and Bridge Population in India at regional and national level was conducted. This resulted in evidence-based planning for the National Viral Hepatitis Control Programme (NVHCP) in India.
- It was recommended that Vitamin D3 is efficient than Vitamin D2 in improving the reduced vitamin D levels, thereby, Vitamin D3 supplementations may be given rather than the vitamin D2 supplements.
- In a recent nationwide survey of Indian children, it was found that only 7 states had a prevalence of Vitamin A Deficiency (> 20%) requiring a VAS program. This raises the need for considering a targeted state-based VAS program, unlike the nation-wide VAS program that is currently the norm. An additional reason is that there may be an overlap of ongoing vitamin A fortification (oil and milk) and VAS program in India, resulting in hazardous effect by exceeding the upper limit of vitamin A. Based on this, the current universal VAS program is being considered for a revision by the Child Health Division of Ministry of Health & Family Welfare.
- School students/Public bus conductors were used as TB Ambassadors for creating TB awareness to increase diagnostic coverage in the country. There was usage of Nutrition supplement to increase adherence and treatment completion in TB patients in Jharkhand state (RATIONS study).
- Adverse Events Monitoring for COVAXIN vaccine for the entire state of Tamil Nadu was undertaken by ICMR.
- During the evaluation phase of the Sickle cell disease project, it was observed that the patients could take their medication from the PHCs itself instead of going to DHH, which saved them from out-

of-pocket expenditure. Given the success of the project, it will be undertaken to the entire CHCs of Kandhamal district, Odisha.

- During ICMR surveys, it was noted that the coverage of livestock vaccination against anthrax was very minimal, so the vaccination was made free of cost for all livestock by District Collector, Koraput District, Odisha. In the last 2 years, there are no outbreaks of Anthrax or mortality due to Anthrax disease in the district.
- There was reporting of massive shortage of Long Lasting Insecticide Treated Nets (LLINs), villagers sleeping without any bednet protection, expiry issues of existing LLINs, and vector and malaria caseload increase in very remote Tribal areas to the authorities, prompting the district authorities to distribute Insecticide Treated Bednets (ITNs) in all malaria endemic villages of Dhalai District, Tripura.
- Constant monitoring of the malaria surveillance system by ICMR, assisted by the Fever Tracker app, led to the identification of several gaps and continuous feedback to the District Health Authorities.
- Scrub typhus prevalence and the risk factors responsible for the spread in the endemic foci of Tamil-Nadu and Kerala was identified. An educational pamphlet was prepared, both in English and Malayalam and handed over to the DHS, Kerala for creating awareness among the public.
- The productive period of a malarial larval habitat was estimated, enabling target larval sources to reduce adult populations. It was noted that implementing larvicidal strategy before monsoon season is presumably the most cost-effective strategy. The output can be utilized for environmental monitoring of mosquito breeding risk in other malaria endemic areas, particularly where medium/large water bodies are the predominant breeding sites for malaria vectors.
- A rapid study was carried out to assess the nutritional status of the children in litchi growing areas of Muzaffarpur district of Bihar, where an outbreak of Acute Encephalitis Syndrome (AES) was reported. Most children reportedly consumed Litchi fruits and were exposed to hot sun during summer. Litchi fruits contain hypoglycin A or Methylene cyclopropylglycine (MCPG) known to cause hypoglycemia and metabolic derangement. Therefore, parents were sensitized not to allow their children to skip the night meal and not to play outdoors in hot sun.
- ICMR STEMI ACT has helped to improve the thrombolytic rate in STEMI patients in Hub (Medical College in a District) and Spoke model (CHCs, Civil hospital, District hospital). STEMI ACT has been initiated in 8 districts and 7 states and successfully implemented in Shimla, (HP) and Ludhiana, (Punjab) districts. The STEMI guidelines under NPCDCS are being modified to incorporate the ICMR-STEMI ACT model.
- Stroke Care Pathway is being developed through stroke unit at medical college hospital level and Mobile Stroke Unit (ambulance equipped with CT scanner, telemetry, small laboratory facility, and provision of giving thrombolytic therapy under supervision of a neurologist or a physician) at community level. A stroke code/green channel was implemented at hospital emergency to provide thrombolysis to ischemic stroke patients. Door-to-CT time and door-to-thrombolysis time in government colleges improved following establishment of stroke unit and implementation of stroke code.
- ICMR demonstrated for the first time that the two existing rotavirus vaccines in public health program in India (Rotavac & Rotasiil) can be used in an interchangeable dosing schedule safely and effectively for routine immunization. It aided in overcoming vaccination shortages and supply chain challenges. The findings were translated into policy decisions for vaccination delivery by India's health ministry.

- Typhoid Conjugate Vaccine (TCV) mass vaccination campaigns were found as effective population-based tools to prevent typhoid fever. The vaccine has been recommended in the NTAGI meeting to be included in public health program.
- There is strengthening of Early Detection of Breast Cancer, involving Strategic Education and Awareness Among Women, as a joint program of ICMR and State Government. A total of 47,943 women (30-65 years) from Jalore, Pali, and other Jodhpur districts of Rajasthan were covered. After the knowledge assessment, women (age of >18 years) were trained in breast self-examination (BSE). Suspected cases of breast cancer were suggested to visit the tertiary care centre. The women trained in BSE were followed up periodically to reinforce BSE.
- Screening of Sickle Cell Anaemia was carried out by ICMR, jointly with Rajasthan State Medical and Health Department. A total of 43,908 population was screened for Sickle Cell Anaemia and prevalence of 7.49% (3365) was reported. Sickle status card was distributed to the participants along with counselling.
- Referral system for silicosis suspects has a potential to improve clinical assessment and certification of patients with suspected silicosis and improve awareness among sandstone miners and mine owners about the silicosis. It will help in diagnosing silico-tuberculosis in light of National Strategic Tuberculosis Elimination Program of India which has a Goal of Tuberculosis Elimination by 2025.
- ICMR developed and validated discriminatory concentrations of nine insecticides with bottle bioassay and 2 insecticides with filter paper test against *Aedes aegypti* (first time) and *An. stephensi* mosquitoes, which are currently in use or under evaluation for various vector control applications (IRS, LLIN, space spray, household products, etc). This information is key to establish the baseline susceptibility of vector populations to the new insecticides and to detect any change in phenotypic resistance after their deployment. It will help the national programme in monitoring of insecticide susceptibility of mosquito vectors of public health importance. Results were included in a report published by WHO in March 2022.
- It was established that adding Tranexemic Acid to the management of all cases of PPH saves more lives, prevents surgical interventions or ICU admissions and is cost effective. The results were communicated to the Maternal Health division for incorporating the same into the LaQshya-Guidelines and Dakshata checklist.
- Cost-effectiveness of different Point of Care tests for diagnosing Sickle Cell Anaemia was assessed by ICMR. Since the existing costs of two clinically effective tests did not prove to be cost-effective, threshold analysis was done which showed that if the kit cost was reduced to less than Rs. 100, it would be cost-effective. The Ministry then negotiated the price with the companies and a notice was sent to all state and UT health secretaries to procure the said kits at Rs. 100 and increase coverage to sickle tests.
- A validation study commissioned by MoHFW on comparing methods assigning causes of death via verbal autopsy for non-institutional deaths was conducted by ICMR. The study findings established that the existing manual method (Physician certified verbal autopsy) being currently used are superior to automated methods (computer coded verbal autopsy). The study findings were presented to the Technical advisory committee constituted by MOHFW.
- The malaria elimination demonstration project (MEDP) was conducted by ICMR in collaboration with FDEC, India and State Govt. (in Public-Private Partnership mode) in Mandla district of M.P. The project covered population of 11.5 Lacs in 1233 villages of Mandla district and adopted T4 strategy

(Track, Test, Treat, and Track) for control and management of malaria along with vector control measures. The study demonstrated that malaria elimination in India is feasible and achievable within a stipulated timeline using existing tools.

- A study was carried out in all seven Saharia-dominated districts of Madhya Pradesh in which there is an alarmingly high TB prevalence. The interventions comprised of case detection and treatment through village TB volunteers; involvement of traditional healers & community members; Advocacy, communication, and social mobilization (ACSM) activities. A total of 5,30,002 individuals from 1,814 Saharia villages in seven districts were evaluated. The treatment success rate was above 90%. This study highlights the significance of innovative community-based approaches in controlling TB.
- A program to control of Tuberculosis among the Nicobarese of Car Nicobar was initiated with a special focus on detection of Latent TB infection among contacts, screening of hepatitis B infection in TB patients, treatment strategy based on levels of liver enzymes, follow-up of the children who were on chemoprophylaxis, counselling of parents on importance of chemoprophylaxis, and involving Traditional knowledge practitioner (TKPs) in surveillance. The efforts resulted in the decline of occurrence of new cases per year and mortality due to pulmonary TB.
- A screening model, along with an Android-based registry, was developed and instituted locally to screen Sickle cell disease (SCD), and subsequently treat the patients through PHC doctors. So far, the screening and treatment for SCD are available only at tertiary care hospitals. This intervention study has influenced the state health departments and made them to supply hydroxyurea and other drugs for SCD care to SCD endemic areas. Some of the intervention components can be incorporated into the forthcoming National programme.
- ICMR-NIN proposed revision to nutrition norms for schedule II of the NFSA, 2013 for energy and protein. Further, the centre provided norms for protein quality and micronutrients such as calcium, iron, zinc, vitamin A, dietary folate and vitamin B12, for beneficiaries of Poshan 2.0 and PM Poshan Programme.
- A 2-minute film was developed to showcase the journey of Covaxin development and other achievements of ICMR in tackling COVID-19. The film was showcased in Geneva during ‘Going Viral’ Book launch and Postal stamp Launch.

## **INFRASTRUCTURE AND CAPACITY BUILDING**

- There was inauguration of Made in India ‘Mobile BSL-3 Laboratory’ by Dr. Bharati Pravin Pawar, Hon’ble Union Minister of State for Health & Family Welfare, Govt. of India at Nashik on 18th February 2022.
- There was establishment of the Polio essential facility (PEF) at ICMR-NIV, Pune, as per the Global Action Plan III guidelines.
- A state-of-the-art Rabies Laboratory offering the full range of molecular and serological tests for antemortem and post-mortem diagnosis of human rabies has been established by ICMR.
- The Department of Neurosurgery at ICMR-BMHRC, Bhopal, has started carrying out “awake craniotomy” surgeries. This enables the Neurosurgeon to ensure minimal damage to normal brain tissue during surgery. The outcomes are much better as compared to traditional surgeries.
- The Department of Cardiac Surgery at ICMR-BMHRC, Bhopal, has started carrying out “minimally

invasive coronary artery surgery” (MICAS). The procedure is as effective as the traditional method, but there is a much faster recovery time.

- Under the DBT UMMID initiative, ICMR has established facilities of antenatal screening for hemoglobinopathies and newborn screening for six inherited diseases in 'Aspirational District' Nandurbar, Maharashtra.
- Under the DBT UMMID initiative, ICMR has been recognised as the training centre for genetic diseases and started a fellowship program in 'Clinical genetics' for in-service clinicians aimed at focused training in the diagnosis of various inherited haematological and immunological disorders.
- Under the multicentric study on Systemic Lupus Erythematosus (SLE) from the North-Eastern (NE) region of India, diagnostic facilities for autoimmune diseases have been established in 5 centres in the region.
- ICMR developed effective intervention model for the Sickle Cell Disease (SCD) patients in tribal areas for accessing government health care system and capacity building in terms of knowledge, skill and training of the health care workers at different levels of health system for prevention and management of SCD.
- Mobile pictorial app for real-time surveillance and drug compliance monitoring was prepared with Dashboard in collaboration with North Eastern Space Applications Centre (NESAC).
- ASHAs empowered for establishing chain for diagnosis and referral mechanism in Cachar, Assam.
- ICMR developed Interventions on control of Anthrax in endemic district of Koraput, Odisha, using One Health approach. Three capacity building & training modules for different stakeholders as well as audio content in local tribal language for creating awareness were developed.
- Three regional trainers workshops were conducted on the 'National Guidelines for Data Quality in Surveys', developed by ICMR, for building capacities of researchers engaged in implementing surveys. These guidelines have the potential to improve data quality in demographic, health, and nutrition surveys conducted in India.
- The 'Education for Effective Nutrition in Action (ENACT) and Food Systems' modules were developed in coordination with FAO. Six e-learning modules on "Nutrition and Food Systems" were also developed and six universities were contacted to include these modules in the undergraduate curriculum.
- ICMR developed and released 3 volumes of "Contribution of ICMR to world science literature in the area of COVID-19" containing consolidated research articles on COVID-19 published in peer-reviewed journals by ICMR and its institutes.
- A total of 27 Scientists and young researchers were awarded in 24 different ICMR Awards/Prizes categories in the field of biomedical research. A total 3,690 Adhoc proposals, 3,220 Fellowships, and 1,126 special call proposals were processed. Under ICMR-MD/MS/DM/MCh/DNB/DrNB/MDS thesis support program, 101 proposals have been selected for financial support. 21 students have joined ICMR JR fellowship programme, whereas 12 students joined Post Doctoral fellowship programme.
- The Clinical Trial registry of India has registered around 50,000 clinical trials till date. ICMR developed Customized dataset items for Ayurveda studies in CTRI portal. The National COVID Registry has registered more than 55,000 cases and provides information to the MoHFW for development of policies and programmes.



## SELECTED HIGH IMPACT PUBLICATIONS

1	Ella R, Reddy S, et al; COVAXIN Study Group. Efficacy, safety, and lot-to-lot immunogenicity of an inactivated SARS-CoV-2 vaccine (BBV152): interim results of a randomised, double-blind, controlled, phase 3 trial. <i>Lancet</i> . 2021 Dec 11;398(10317):2173-84.	202.7
2	Fleming KA, Horton S, et al. The Lancet Commission on diagnostics: transforming access to diagnostics. <i>Lancet</i> . Oct 2021; 398: 1997-2050.	202.7
3	Zhou B, Carrillo-Larco RM, et al. Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. <i>Lancet</i> . 2021;398(10304):957-80.	202.7
4	Saxena N, Singh S. South Africa's Health: Traditional healers in South Africa: a parallel health care system connecting tribal healers to primary health care: A dire need to alleviate health of indigenous and tribal populations. <i>BMJ</i> Mar 2022. <a href="https://www.bmj.com/content/310/6988/1182/rr-0">https://www.bmj.com/content/310/6988/1182/rr-0</a>	93.3
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40	Shukla P, Singh KK. Uncovering mitochondrial determinants of racial disparities in ovarian cancer. <i>Trends Cancer.</i> 2021 Feb;7(2):93-97.	19.1

## PATENTS

A total of 26 Indian patent applications, 1 design application, 5 copyright applications, 10 PCT applications and 6 International patent applications were filed during this period. 5 Indian patents and 3 International patents were granted.

**Table 1: Patent Applications.**

S N	Title of Invention	Patent Application No.
1.	An Assay And Method For Detection of SARS-CoV-2 From Human Respiratory Samples	202111015708
2.	Fluorescent Polystyrene Based Nanohybrid Array For Estimation Of Circulating Cell-Free MiRs	202111031427
3.	Screening assay for detection of epidemiologically important SARS-CoV-2 variants	202111032470
4.	A pharmaceutical composition with a recombinant fragment of human surfactant protein-D for pulmonary infection including SARS-COV-2	202111030956
5.	Novel method for concentration of polio viruses and other entero viruses from sewage	202111037829
6.	Development of microneedle patch for trans-scleral administration of triamcinolone acetonide to enhance choroid, retinal and vitreal concentration	202111042201
7.	A simple user friendly method for extraction of nucleic acids	202111043228
8.	Fever tracker app for the health workers	202111049722
9.	Development of HEK293 knock-out cell line of EV-A71 receptors SCARB2 and PSGL1 genes	202111048030
10.	Human Monoclonal antibodies against SARS-CoV-2 and a method of generation thereof	202111052088
11.	Simple, novel and cost effective Lateral Flow Immunoassay for diagnosis of Glanzmann thrombasthenia	202211003648
12.	Compositions for metabolic reprogramming of cells by modulating the expression of Tumor Suppressor Candidate 1 (TUSC1)	202211003978
13.	Fiber optic nano antenna based excitation of whisper gallery mode resonator and various sensing applications	202211004683
14.	A nano -dendritic cell construct for selective targeting of tumor cell	202211005691
15.	Hydroxyapatite-responsive cell-attachable and stable surface-active biocompatible mats	202211009698

16.	Suture resistant antimicrobial biodegradable and biocompatible fibrous patch constructs	202211008790
17.	Portable Protein gel Electrophoresis Unit	202211008794
18.	Probiotic Bael based nutraceutical for remission of ulcerative colitis	202211012630
19.	VCRC-ANM Mosquito Feeder-A microcontroller-based device for artificial diet/blood feeding for mosquito rearing in the laboratory	202211016261
20.	Development of universal method for simultaneously detection of diseases caused by inter and intra species using Hybrid LAMP kit	202211019752
21.	Vaginal Lactobacilli for urogenital health	202211019761
22.	Hydroxyapatite-responsive cell-attachable and stable surface-active biocompatible mats	202211009698
23.	Invention of a cost effective mosquito attractant and lethal non-electric ovitrap	202211015554
24.	Suture resistant antimicrobial biodegradable and biocompatible fibrous patch constructs	202211008790
25.	A probiotic bael based nutraceutical and a process of preparation thereof	202211012630
26.	Biomarker panel to diagnose the malaria severity with statistical predictive model method	202211014867
27.	Mobile Application based System for Adherence to prescribed analgesics and adjuvants in Cancer patients receiving palliative care - Part 2	21105/2021-CO/SW
28.	Mobile Application based System for Adherence to prescribed analgesics and adjuvants in Cancer patients receiving palliative care- Part-1	21107/2021-CO/SW
29.	Health Diary	22461/2021-CO/L
30.	Sehat ki Diary	22462/2021-CO/L
31.	Fever Tracker App for the Health Workers	1826392/2021-CO/SW
32.	A Mechanical Aspirator for the Safe Transfer of Mosquitoes	348640-001
33.	A rapid and sensitive method for detecting SARS-CoV-2	PCT/ IN2021/050549
34.	Herbal Composition for the treatment of menopausal syndrome	PCT/ IN2021/050592
35.	A paper disc based method for determining the drug susceptibility of Mycobacterium tuberculosis	PCT/ IN2021/050414
36.	A diagnostic device and method for differentiating Asthma-COPD Overlap Syndrome (ACO) from Asthma and COPD	PCT/ IN2021/050793
37.	A method for developing a rapid immunochromatographic assay for identifying hepatitis E infection	PCT/ IN2021/050758
38.	An assay and method for detection of SARS-CoV-2 from human respiratory samples	PCT/ IN2022/050173
39.	RT-LAMP assay for detection of human $\beta$ -actin housekeeping gene	PCT/ IN2022/050183
40.	A pharmaceutical composition with a recombinant fragment of human surfactant protein-D for pulmonary infection including SARS-CoV-2	PCT/ IN2022/050237

41.	Rapid LAMP assay for detection of <i>Corynebacterium diphtheria</i>	PCT/ IN2022/050276
42.	Fluorescent polystyrene based nano-hybrid array for estimation circulating cell-free MiRs	PCT/ IN2022/050239
43.	Device for Germfree and gnotobiotic mosquitoes	i) Indonesia App. No. awaiting ii) Singapore App. No. 11202202863Q
44.	Apparatus, Method and Kit for Detection of Von Willebrand Factor and Factor VIII	
45.	Biomarkers for predicting malaria severity and methods thereof	

**Table 2: Patents granted**

S. No	Title of invention	Application No
1	A PCR method for the detection of <i>Chlamydia Trachomatis</i>	362608
2.	Rapid detection of drug resistant <i>Plasmodium falciparum</i> through a novel approach using loop mediated isothermal amplification	380417
3.	Method of processing of feeder cells suitable for adult stem cell proliferation	385296
4.	Water re-circulated garment for auxiliary body cooling for protection against high heat exposure	384530
5.	A process for the preparation of a fibrinolytic enzyme	391961
6	A novel molecular diagnostic technique for detecting the different species of plasmodium	Congo Democratic Republic 373/2016
7	RNAi agent for inhibition of chikungunya virus	Australia AU 2014285701
8	Alginate Chitosan Nanoformulation of OmpA - a Shigella Protein Subunit	US 11,298,415

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5. **ICMR- National Institute for Research in Environmental Health (NIREH)**  
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7. **ICMR- Regional Medical Research Centre (RMRCBB)**  
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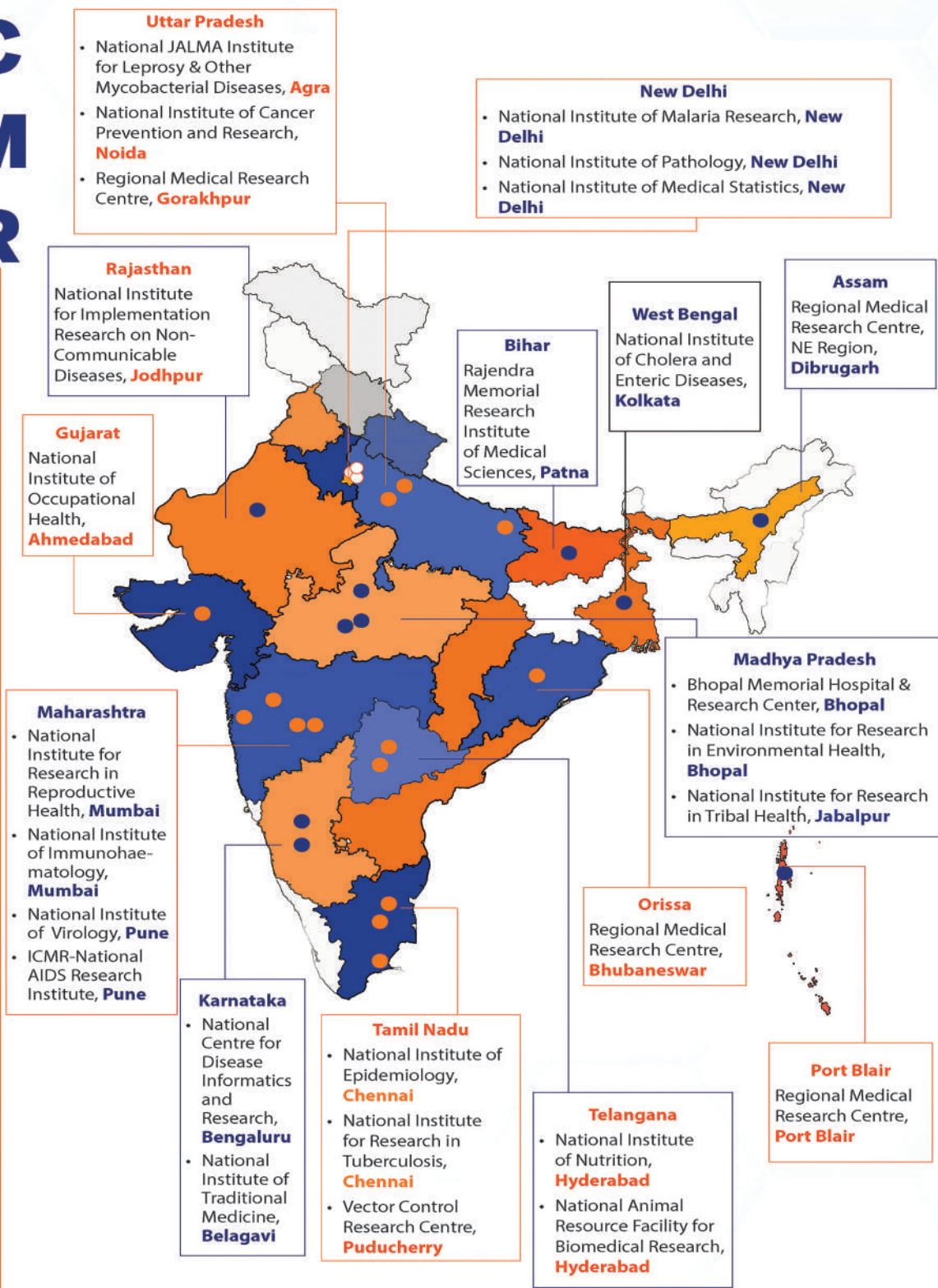




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