

# CHANGING THE TIDE IN PUBLIC HEALTH SYSTEMS IN 75 YEARS

## Role of Indian Council of Medical Research (ICMR)



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**I**NDIA has witnessed substantial achievements in population health improvement during the last seven decades. One of the key developments is the improvement in life expectancy at birth, which has increased from 32 years in 1947 to 69.4 years in 2021 – more than double increase in the last seven decades. The marked reduction in Maternal Mortality from 2000 per 100,000 live birth to 113 and Infant Mortality from 145 per 1000 live birth to 28.7 is again a testament to the tremendous progress in Indian medical research and health interventions.

The country has also been able to eliminate diseases like smallpox, polio, Yaws, guinea-worm and neonatal tetanus through consistent research and ground level implementation. Diseases like cholera, leprosy, tuberculosis, malaria, kala-azar, lymphatic filariasis, which used to cause serious concern, have now been controlled

to a significant degree and are being targeted for elimination.

In recent years, the unfolding of Mission Indradhanush and schemes like Swachh Bharat, Ujjawala Yojna, Ayushman Bharat and Poshan Abhiyan are going to have tremendous impact on various health indicators.

### **Equitable Access to Healthcare**

The public health landscape of a state, nation or country is ever evolving. There is always a need to balance the research efforts between various fields, with the existing availability of resources to achieve equitable access to healthcare and health services. The



Mission DELHI: Tackling heart attack within the first 30 minutes



Mobile Stroke Unit: Providing treatment at the doorstep

Indian Research Fund Association (IRFA) was established with this purpose before independence, in 1911. The primary objective of the IRFA was to carry out medical research in tropical diseases like malaria, tuberculosis and plague.

Post-independence, the Indian Research Fund Association was renamed as the Indian Council of Medical Research (ICMR), under the aegis of the Ministry of Health and Family Welfare. ICMR, in its new avatar, has grown into a pan-India organisation with 27 institutes, over a hundred field Stations/Units and a network of laboratories.

As the leading medical research institute in India, ICMR has become the apex body for planning, formulation, coordination, implementation and promotion of biomedical research. ICMR today carries out pioneering work in areas of epidemic monitoring



Team working in COVID testing

and control, maternal and child health, nutrition, lifestyle diseases and occupational health. The research carried out by the various ICMR institutes forms the basis of various

government programmes and medical protocols.

ICMR is supporting Ayushman Bharat and ensuring a sustainable and cost-effective model through its ongoing programmes like health technology assessment, standard treatment workflows and national list of essential medicines and diagnostics. These programmes would serve as an important tool in prioritising national health spending and providing a uniform guideline to ensure quality healthcare services across the nation.

The health research infrastructure built by ICMR has been critical in turning around the country's health indicators, reduce the spread of infectious diseases, combat non-communicable diseases, save lives and reduce the impact of health challenges. The lead taken by the Council in India's



ICMR team conducting COVID-19 Sero-survey

research response to the COVID-19 pandemic is an example of ICMR's commitment in the area. In addition to developing the nation's first indigenous vaccine against COVID-19, ICMR has made and approved testing kits, built a network of laboratories across the country with over 2600 labs, developed COVID-19 protocols, conducted sero-surveys and essentially informed the policy response for the disease in India.

In addition to this, to achieve the goal of improving the healthcare system in the country through research programmes, ICMR encourages capacity building. Through its research grants and fellowships, the organisation supports innovative research in the field of medicine. The 27 institutes under the umbrella of ICMR cover medical research at a pan-India level and offer both region and disease-specific



Scientists working in High Containment Facility at NIV, Pune

expertise to state health ministries and departments.

ICMR also consistently collaborates with international partners to exchange ideas and work jointly on major research programme thereby contributing to both extramural as well as intramural research in India. ICMR research programmes are aligned with national health priorities and meant to serve the people of India.

### Viral Outbreaks and Epidemics

Epidemics come at a great economic and social cost, not to mention loss of precious human lives. India has witnessed a multitude of epidemics ranging from water-borne diseases like cholera and vector-borne diseases like malaria. Epidemic containment and providing cure to the affected incurs great economic cost and loss of productivity. ICMR has led surveillance of critical diseases, conducted investigations and developed evidence to tackle numerous outbreaks and epidemics.

The organisation has contributed to the study of various virus-induced diseases like acute hemorrhagic conjunctivitis, rabies, polio, etc. ICMR also played a prominent role in India's biggest public health achievement of control and eventual elimination of polio. The country which was once the epicenter of polio in the world has now officially eliminated the disease.

Post H1N1 outbreak, ICMR recognised the gap and took lead to become self-sufficient in tackling the emerging and reemerging infectious diseases. It set up a network of Viral Diagnostic and Research laboratories (VRDL) across the country. ICMR also set up Asia's first BSL-4 laboratory to conduct research on the



Community based survey for epidemiological study in vector borne diseases

most infectious viruses in a contained environment. The combination of BSL-4 with a vast network of VRDL has resulted in successful investigation and containment of CCHF, Nipah & Zika. Not even one sample was sent outside the country.

During the COVID-19 pandemic too, these proved to be an asset in establishing the diagnosis of the novel Coronavirus as well as isolating and culturing it for developing a vaccine.

ICMR has also geared up to be future ready. An international platform 'RESEARCH – Regional Enabler for South East Asia Research Collaboration for Health' in collaboration with WHO and 10 other countries of South-Asian region has been set up to effectively combat emerging and re-emerging infectious diseases in South East Asia region as well as to tackle cross border infections. With increased interaction between humans and animals – domestic and wild, and influenced by climate change, human health can no longer be seen in isolation. To understand the complexities between animal health,



Asia's First BSL-4 laboratory at ICMR-NIV, Pune – played a pivotal role in tackling COVID-19, Nipah, Zika and other viral outbreaks

human health and the environment, a National Institute for One Health is being set up at Nagpur. The Institute will address the issue of zoonosis and anti-microbial resistance through inter-sectoral collaboration.

### Communicable Diseases

Millions of lives in India have been lost due to communicable diseases like malaria, cholera, Kala-azar and HIV in the past. Over the years, ICMR through its various research institutes has been working to tackle major communicable diseases in the country, with proven success.

ICMR pioneered the development of commercial diagnostic kits against dengue and chikungunya, direct antibody tests for early diagnosis of Kala-azar and timely development of vaccines against the Kyasanur Forest Disease (KFD) and Japanese Encephalitis. ICMR also demonstrated for the first time that home-based treatment is as successful as hospital-based treatment for tuberculosis. The Council further simplified tuberculosis treatment by laying the foundation of the Directly Observed Treatment Short Course (DOTS) in 1964. Recently, ICMR has developed TruNAT, a cost effective, PHC friendly diagnostic for TB that has been recommended by WHO after successful multi-country trial. The same platform has also been deployed for Point-of-Care testing in Nipah, Leptospirosis & COVID-19.

Other communicable diseases like Malaria, Leprosy, Lymphatic filariasis and Cholera have also



Environmental surveillance for viral outbreak by NIV team

been under the purview of the organisation's research areas. Several malaria elimination demonstration projects (Konkan Railways, CCMP in Odisha, MEP in Mandla) have successfully shown 85-90% decrease in malaria cases. To combat death and illness caused due to diarrhea, ICMR demonstrated the efficacy of Oral Rehydration Therapy. It established that Home Available Fluids (HAF) such as *sherbet* or tender coconut water and pressed rice water were effective.

Following the successful elimination of polio in India, ICMR is now working towards eliminating diseases like Kala-azar, filariasis, leprosy, malaria and tuberculosis in mission mode by setting up multi-stakeholder platforms, India TB Research Consortium (ITRC) and Malaria Elimination Research Alliance (MERA) India. Over these years, ICMR has continued to perform research and develop strategies for treatment, prevention and control of enteric infections and HIV/AIDS that threaten the nation's health.

There has been continuous influx of evidence into national policy decisions, be it the malaria drug policy change in North-East (due to demonstration of rising resistance towards Chloroquine) or addition of triple drug therapy for accelerated elimination of lymphatic filariasis from the hotspot-areas of the country.

### Non-Communicable Diseases

Non-communicable Diseases (NCDs) are not contagious, but they pose a



Field Station at Sagar (Shimoga) in Karnataka for study of KFD

great risk to the overall wellbeing of the society. In the recent past, such diseases have grown exponentially. The burden of non-communicable diseases weighs heavily, since they can go undiagnosed and lead to severe decline in individual productivity and even death. Early detection and prevention of non-communicable disease is one of the key focus areas of ICMR.

ICMR has dedicated institutes to carry out research on various non-communicable diseases like cancer, environmental and occupational hazards, disease informatics and implementation research. ICMR also maintains national registries for cancer, stroke, cardiovascular diseases, diabetes, etc. Due to the efforts of the national cancer registry programme, cancer has been made a notifiable disease in 12 states.

ICMR's researches have often shaped health policy mechanisms. For example, an *India State-Level Disease Burden Initiative* was launched in collaboration between ICMR, the Public Health Foundation of India (PHFI), Institute for Health Metrics and Evaluation (IHME), and senior experts and stakeholders from nearly a hundred institutions across India. The data estimates were based on the analysis of all identifiable epidemiological data from India over a quarter of a century, led by ICMR and the collateral aided in informing health planning to reduce health inequalities prevalent amongst states in India. This study led to the identification of the rising burden of NCDs thus guiding states to develop more nuanced policies.

In another major initiative, ICMR along with the Cardiology and Emergency Medicine departments of All India Institute of Medical Sciences (AIIMS), launched a pilot project called *Mission DELHI* (Delhi Emergency Life Heart Attack Initiative) where people would be able to call prescribed toll-free numbers for a motorbike-borne emergency medical assistance unit in the eventuality of a heart attack or chest pain.

ICMR has also successfully initiated mechanisms to provide stroke treatment through the state-of-the-art Mobile Stroke Unit (MSU) in Tezpur and Dibrugarh area of Assam, India. The MSU was a commendable piece of work in light of the ongoing pandemic.

### Nutrition

ICMR has also made salient contributions in nutrition, like assessment of nutritive values of commonly consumed Indian foods and studies of nutrient deficiency disorders. It has led intensive work in areas like iodine deficiency, anaemia, night blindness where it has addressed gaps in diagnostics and affordable treatment mechanisms to tackle the diseases paving the way for implementation of national programmes in these areas.

ICMR dispelled the myth that protein deficiency is the main reason for malnutrition and highlighted calorie gap as the actual bottleneck in Protein Energy Malnutrition (PEM). The organisation also laid the foundations for Recommended Dietary Allowances (RDA) which is used as guiding information for RDA values by government organisations and other statutory bodies till date.

ICMR has pioneered other inspiring work in the field of nutrition – from assessing dietary intake of individuals, households and nutritional profiles of different communities through periodic surveys to developing simple and sensitive biochemical indicators for assessment of vitamin nutritive and pathogenic mechanisms of various nutritional deficiency syndromes, to identifying and establishing growth norms for Indian children and even

generating database on nutritive values of over 650 Indian foods, which is used by various national organisations, planners and academic research institutions. Now it is working in close partnership with the National Nutrition Mission to improve nutrition related deficiencies across India.

### Reproductive, Maternal and Child Health

India has a high burden of morbidity and mortality in women, children and infants. ICMR has pioneered exemplary research in maternal and child health. In 1981, ICMR pioneered *in vitro* fertilization and successfully supported the delivery of the first Test Tube baby in India – Harsha – on 6 August 1986. This was a landmark step in the field of infertility treatment and placed India on



First scientifically documented Test Tube Baby Harsha – a contribution of ICMR-NIIRH in collaboration with KEM Hospital, Mumbai

the world map in the arena of assisted reproductive technologies.

ICMR has also developed effective indigenous diagnostic kits for the detection of *Chlamydia trachomatis*, pregnancy detection, sperm quality assessment and fertility assessment tests to assist quick diagnosis and intervention. A quarter of India's population constitutes adolescents. Majority of young and growing children have poor or limited knowledge and lack of awareness on sexual and reproductive health. The ICMR-NIRRH, Mumbai, developed service delivery models for adolescent reproductive and sexual health and guidelines on sexually transmitted infections, to help build awareness among the youth of the country.

## ICMR's contribution in last 75 years

S.No.	Activities	Relevance
1.	Network of 27 disease-specific institutes and more than 100 field Stations/Units	<ul style="list-style-type: none"> <li>Evaluation of new drugs, insecticides, vaccines, devices, diagnostic kits &amp; other interventions relevant for every corner of the country</li> </ul>
2.	Clinical Trial Registry – India (CTRI)	<ul style="list-style-type: none"> <li>Registers clinical trials conducted in India to improve transparency and accountability, ensure conformation to accepted ethical standards and reporting of all relevant results of the trials.</li> <li>ICMR also provides ethical guidelines for clinical trials</li> </ul>
3.	National Cancer Registry Programme	<ul style="list-style-type: none"> <li>Generate reliable data on the magnitude and pattern of cancer in India</li> <li>Undertake epidemiological studies based on results of registry data</li> <li>Help in designing, planning, monitoring and evaluation of cancer control activities under the National Cancer Control Programme (NCCP)</li> <li>Develop training programmes in cancer registration and epidemiology</li> </ul>
4.	Surveillance networks (IDSP, rotavirus, polio, Antimicrobial resistance, etc.)	<ul style="list-style-type: none"> <li>Generate timely and geographically representative data on the clinical, epidemiological, and pathological features of several diseases in Indian population</li> </ul>
5.	Nutrition	<ul style="list-style-type: none"> <li>Identified priority areas, conducted research in a multicentre mode and found effective, practical, economically viable and sustainable solutions for nutrition related problems</li> <li>Nutritive value of Indian Foods and Food Fortification are landmark achievements of ICMR.</li> </ul>
6.	Support in outbreak/epidemics/pandemics/National Emergencies	<ul style="list-style-type: none"> <li>Leading the fight against COVID-19</li> <li>Successful containment of Nipah and Zika Virus</li> <li>Surveillance of health impact due to Indian Ocean Tsunami in 2004 (NIE, NIRT, NICED, CRME, VCRC, RMRC-PB)</li> <li>Environment and health impact assessment for Bhopal Gas Tragedy, 1984 (NIOH, NIMS, BHRMC, NIP, NICPR)</li> <li>Earthquake in Gujarat, 2001 (NIMR, DMRC)</li> <li>Supercyclone in Odisha, 1999 (NIMR)</li> </ul>
7.	Inputs for policy implementation	<ul style="list-style-type: none"> <li>Covaxin for COVID-19</li> <li>DOTS for Tuberculosis</li> <li>UMDT for Leprosy</li> <li>Malaria Drug Policy in North-East</li> <li>ORS implementation in diarrhea</li> </ul>
8.	Guidelines/Regulations	<ul style="list-style-type: none"> <li>National Guidelines for Accreditation, Supervision and Regulation of ART Clinics in India</li> <li>Ethical Guidelines for Biomedical Research on Human Participants</li> <li>Guidelines for Good Clinical Laboratory Practices</li> <li>Guidelines for Safety Assessment of Foods Derived from Genetically Engineered Plants</li> <li>Intellectual Property Rights Policy</li> <li>Guidelines for Stem Cell Research</li> <li>Dietary Guidelines for Indians</li> </ul>
9.	Isolation/characterisation of new pathogens	<ul style="list-style-type: none"> <li>Asia's first BSL-4 laboratory developed</li> <li>Cholera strain O139</li> <li>Kyasanur forest disease (KFD)</li> <li>Leptospirosis</li> <li>Paragonimiasis</li> </ul>
10.	Research support to Medical Colleges	<ul style="list-style-type: none"> <li>Funds majority of research in medical colleges</li> <li>Short Term Studentship Program to promote interest and aptitude for research among medical undergraduates</li> </ul>
11.	Capacity building	<ul style="list-style-type: none"> <li>Generate and nurture human resources for health research activities through fellowships (JRF, SRF, RA, STS) and trainings/workshops</li> </ul>



Community study in nutrition during the 1960s

ICMR has also been a pioneer in the validation of contraceptive methods for incorporation in national programme. It has also led decisive work in contraception and family planning including research on efficacy of postpartum Intrauterine Devices (IUDs), evaluation of improved contraceptive implants, among others.

### Promoting Health Research and Ethical Practices

Across all these years, ICMR has paid close attention to ensuring and promoting ethical practices in medical and health research by means of correct biosafety infrastructure, capacity building of doctors and scientists and much more. ICMR's guidelines related to ethical standards for human research are well recognised. The Central Ethics Committee on Human Research, a national level committee chaired by distinguished luminaries, has played a critical role in guiding ICMR policy and overcoming complex ethical challenges.



Demonstration by VCRC staff on the use of Insecticide treated Bed Nets for personal protection to the community in a tribal village in Koraput District, Odisha

It has now become mandatory to follow the National Ethical Guidelines for Biomedical & Health Research and to register ethics committees with the Department of Health Research under the New Drugs & Clinical Trial Rules, 2019. The ICMR Bioethics Unit at NCDIR, Bengaluru, has been recognised as the first centre in WHO South-East Asia Region to become a WHO Collaborating Centre for Strengthening Ethics in Biomedical Research. Recently, ICMR added another feather to its cap when in April 2020, India became one of the first countries in the world to release Guidelines for Ethics Committees reviewing research during the COVID-19 pandemic.

### Regional Health Issues and Tribal Health

Habitat shapes our lives and the food we eat. Rural and urban habitats influence our diet and lifestyle, which in turn impacts our overall health and

susceptibility to particular illness or disease. In India, apart from rural and urban habitats, some communities also live in isolated remote with varying terrains and ecosystems. Such tribal people have different health care needs.

ICMR conducts research on health issues of the tribal populations of the country, including nutritional disorders, common communicable and non-communicable diseases, environmental health problems, etc. ICMR played a pivotal role in addressing the problem of fluorosis in the tribal hinterland of Madhya Pradesh leading to a drastic decrease from 51% prevalence of disease to 2.6% post-intervention.

ICMR also has four Regional Medical Research Centres (RMRC) at Gorakhpur, Port Blair, Dibrugarh and Bhubaneswar. These regional centres work towards regional health challenges in these areas. For instance, the JE/AES disease, which was claiming the lives of thousands of children in the Gorakhpur area, now with a combination of ICMR research and state-led initiatives has been drastically reduced. In the Andamans, ICMR helped in diagnosis and control of leptospirosis (earlier known as Andaman Haemorrhagic Fever), a zoonotic infection that was haunting the island. Similarly, lymphatic filariasis is on the verge of elimination from Nancowry Islands due to the implementation of DEC-fortified salts.

### Committed to Research

Since its inception, ICMR has been an enabler of success for improved and accessible health systems across the nation. Through its research capacity and several areas of expertise, it has played a pivotal role in establishing evidence-based theories and diagnostics that have directly impacted government schemes as well.

The apex organisation has been instrumental in improving the health landscape of the country over the years and ever since Independence. ICMR is committed to strengthen its research to benefit the society in the future too.



Laboratory facility at RMRC, Port Blair, Andaman & Nicobar

