

Editorial

Medical Research in India – Past, Present & Future



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Great Poet Sukumar Roy in his poetry “Vigyansikhsa” specially written for children depicted invention of instrument to understand normal human physiology and pathology. Four inevitable incidences in life cycle – Janma-Mrtyu- Jara-Vyadhi. Our ancestors tried to find out way how to get rid of these clutches. Philosophers got pathway through Meditation, sacrifice, Where Science by analyzing natural consequences and inventing methods to overcome the clutches. So from the birth of Adam and Eve there was need and inquisitive human mind tried to get a solution. So necessity was mother of invention.

“Our Need will be the Real Creator”
— Plato’s Republic 375 BC

PREHISTORIC MEDICINE :

Illness or disease were integral part of life even in Prehistoric period. In the absence of an obvious explanation, illness was thought a result of anger of God, the invasion of the body by evil spirits or the influence of stars and planets. Medicine practised by appeasing God through prayers and rituals and sacrifices, driving out evil spirits from the human body.

It is thus obvious that medicine in the prehistoric era (5000BC) was intermingled with superstition, religion, magic and witchcraft.

ANCIENT INDIAN MEDICINE :

India, with its rich cultural heritage, had been in the forefront in contributing the medical science of World. Practice and research in Indian Medicine can be traced back to Vedic age (5000 BC). Medical Practice was placed so high, Practitioner were placed in same height as God. Ashwinikumars, Dhanvantari were given a divine status.

One of the first Indian text dealing with medical practice was Atharva Veda which described Ayurveda. Indian medicine was synonymous with Ayurveda means “The Science of Life”(ayur, which means life, and veda, knowledge). Ayurveda was based on knowledge on role of different herbs and metals in healing process. Atreya Samhita is the oldest medical book in the World. Atreya was the son of Rishi Atri. Atri was the son of god Brahma. Rishi Atri was Acharya (Teacher) of Ayurveda.

It is believed that the Vaidyas received their training of Ayurveda during meditation which were later transcribed into book form.

Maharshi Atreya is acknowledged as the first great Indian Physician and Teacher. Atreya revolutionized the medical system of Ayurveda into the system we have today.

He held formal teachings with his students and established Code of Medical Ethics in India (150 years before Hippocratic oath). Two great physicians in ancient India were Susruta and Charaka.

Susruta (600 BC) in his book Susrutasanghita stressed more on curative medicine specially on surgery. Sushruta, was one of the first physician to study human anatomy, described in details about various anatomical structures in his compendium. Also Shashtrakarma, the art of surgery, was recognized as an important part of therapy in this compendium. Susruta was the first surgeon to perform rhinoplasty and ear lobe construction.

Susruta Samhita was re-edited by Chakrapani in the 11th Century.

Charaka written Charaka Samhita in the second century (200AD).- Charaka Samhita described Anatomy and Physiology and pathology. So focus shifted from natural forces as causation of diseases to external agents as diet, seasons, lifestyle etc. Charaka described more on preventive aspects than curative aspects. Charaka (200AD), the most popular name in Ayurveda medicine was the Court Physician to the Buddhist king Kaniska during Buddhist time.

The Golden Age of Indian Medicine was between 800BC to 600AD. Charaka and Susruta Samhita were translated in Arabic by the order of Haran al-Rashid (786-806 AD) the Khalif of Bagdad. In Arthasastra of Kautilya there was a mention of Postmortem. Learned men from different countries such as China, Tibet, Afganistan, the Greeks, Romans, Egyptians, Persians came to the Indian Ayurvedic Schools to learn about this World Medicine. This Indian Ayurvedic System became popular in Europe and helped to form the foundation of the European tradition of medicine. Ayurveda grew tremendously during Buddhist Kings like King Ashoka (226 BC), who patronized Ayurveda as State Medicine and established Schools of Medicine and Hospitals. Fa-HIEN (399-414 AD) Chinese Buddhist traveller in his book described rich heritage of Ayurveda in Patliputra during Gupta Dynasty.

The Indian materia medica was extensive and consisted mainly of vegetable drugs, all of which were from indigenous plants. Charaka knew 500 medicinal plants, and Sushruta knew 760. But animal remedies (such as the milk of various animals, bones, gallstones) and minerals (sulfur, arsenic, lead, copper sulfate, gold) were also employed. The physicians collected and prepared their own drugs. Among those that eventually appeared in Western pharmacopoeias were cardamom and cinnamon.

But in Hindu Dynasty due to the doctrine of "Ahinsa"

(non-violence) Indian Surgery suffered a setback.

Astasthanapariksa :

In South India there appeared an amalgamation of the traditions – the Brahmin tradition of Ayurveda, rasa tradition (said to be revealed by Siva and described in Rasarnava) and the third Siddha tradition revealed by Agastya. "The examination of the eight places" appears to be the result of this confluence. Pancalaksanani-dana (diagnosis based on five manifestations) gradually gave place to astasthanaparkisa. Marcopolo Italian Traveller described rich heritage of practice of medicine and herbal treatment in Souther states particularly in Kerela.

Medieval Period :

With the advent of Muslims in India, Hindu Medicine eroded due to the lack of State help and support by the rulers. Firoz shah Tughluq (1388) patronized Unani system of medicine in India. In this system of medicine, any external factor if introduced in body encountered by internal forces within body which is responsible to maintain health, the failing of which may lead to derangement of the normal equilibrium that is disease. This concept brought the idea of immune system of body. But science failed to delink itself from religion and mysticism during mediavel period . Real darkness prevailed in India in terms of scientific advancement.

Advent of Europeans :

In the 16th century, it was the Portuguese who first introduced Western medicine into India. It got momentum with arrival of British merchants. East India company gradually established its grip over India both politically and in Trade. They had little faith on Traditional Indian Medicine. In 1775, hospital boards which comprised the Surgeon General and Physician General were formed. These were essentially constituted by staff of the Commander-in-Chief of the British Indian Army in each presidency. British people was struck by different tropical diseases. As compulsion they established first medical school in 1822 ,followed by First Medical College in Calcutta – Calcutta Medical College in 1835 by Lord William Bentink. Next year Madras Medical College was established. Gradually more Medical Colleges established in different part of Country like Dhaka, Lahore etc. Attempts at planned medical research may however, be said to date back to 1894 when the 'Indian Medical Congress' submitted resolutions to the Government urging the establishment and endowment of research institute. End of nineteenth century was notable for repeated epidemics in different parts of

country. Facing repeated occurrence of certain epidemics in the country, British Govt established central laboratories to investigate epidemics. In 1884, the foundation stone of India's first medical laboratory was laid down in Kasauli near Shimla and followed by Plague Research Laboratory (Bombay Bacteriological Laboratory) Pasteur Institutes. In 1900 for rabies. Indian Research Fund Association was established in 1911 to further prosecution of research and propagation of knowledge and experimental measures generally in connection with the causation, mode of spread and prevention of communicable diseases and to fund and support research activities in other areas as well. IRFA done commendable work on Malaria, Kalaazar, Plague, nutritional diseases. Two more institutes was given armament in combating infectious diseases. In 1914 School of Tropical Medicine for research in Tropical Diseases and in 1932 All India Institute of Hygiene and Public Health with help of Rockefeller Foundation for training and research in Public health. But unfortunately all these institutes were dominated by imperial people. To ensure self sufficiency (Swaraj) group of Proud Indians like Dr Radha Govinda Kar, Dr B C Roy etc established first nongovernment college R G Kar Medical College in Kolkata in 1916 for medical education and research in Colonial era.

RESEARCH IN COLONIAL INDIA :

In British period Medical research was chiefly confined to Tropical diseases. Few notable advents were work on Plague, Malaria, Cholera.

Plague :

There are reports of various plague outbreaks in India - 1812 outbreak in Kutch that spread to Gujarat and Sind, and lasted for approximately 10 years. 1828 and 1929 in Hissar district of Punjab, In 1836, in the Marwar state of Rajputana.

Being on the international trading route, there was immense pressure on the British Imperial government of India to control this emergency. The Plague Commission was constituted in 1896 under the chairmanship of Prof. T.R. Frasar, Professor of Materia Medica at the University of Edinburgh. The report of the Plague Commission in 1904 concluded that the disease was highly contagious and considered human transit as an important source of spreading the disease as they carried the germs with them. The Plague Research Committee was formed, various types of research was conducted in 1897.

Cholera :

People of British East India Company were not

familiar with cholera. Before 1817, cholera was confined to Bengal but the 1817–1821 cholera epidemics in India shocked the Company. By 1830s, Cholera was known to be a life-threatening disease to the Western World. In India, it gained the focus of medical services due to its serious impact on the troops and officers of the Company; otherwise, it was a disease of poor people. After the 1868 Cholera epidemic in India, the Cholera Committee was set up to investigate the causes of the disease. The origin and generation of Cholera, the epidemicity and endemicity of the disease in India, transmissibility and propagation of Cholera, and measures necessary for its prevention were studied. The committee concluded that Cholera was frequent especially at religious festivals and fairs. Epidemics were attributable to the importation of disease by pilgrims, travelers, and troops.

Malaria and Sir Ronal Ross (1857-1932) :

Fever was one of the leading causes of deaths in India. The situation worsened in the early 19th century. One of the contributing factors was the establishment of the railways and irrigation network by the British government of India without keeping in view the efficient drainage systems for floods and rainwaters. This created many fresh water reservoirs for the propagation of mosquitoes. Due to the heavy death toll, economic loss, and risk to the lives of British officers serving in vulnerable areas like Punjab, a lot of research was done for malaria control.

Surgeon Major Sir Ronald Ross joined the Indian Medical Services in 1881. He started to study malaria in 1882. In August 1897, he demonstrated the life cycle of the malarial parasite stating that anopheles mosquitoes carried the protozoan parasites called "plasmodia". He was awarded Nobel Prize in Medicine in 1902. This discovery opened new horizons in malaria research and shaped the malaria control programs toward a new direction mainly focusing on the eradication of mosquitoes.

Upendranath Brahmachari (1873-1946) :

He started work in the Campbell Hospital (presently NRS Medical College) to discover a new drug to cure Kalaazar. After 5 years of toiling, Urea Stibamine was discovered, which quickly became essential for the treatment of Kalaazar.

Yellapragada Subbarow (1895-1948) :

Subbarow can best be described as an unfortunate scientist who did not get his due recognition.

His research led to the discovery of Polymyxin, an agent used even today. Aureomycin, the first of

tetracycline, was also discovered by him. He also developed a cancer treatment called methotrexate that has been used to treat numerous types of cancer and discovered diethylcarbamazine, the only known treatment for filariasis or elephant foot.

Ramnath Chopra (1882-1973) :

He worked as first professor of pharmacology in the newly established Calcutta School of Tropical Medicine in 1921. In his tenure, he conducted various studies on general pharmacology and pharmacotherapy, along with surveys on drug addiction. His work encouraged research on Indian medicinal plants.

Medical Publications in Colonial India :

The establishment of the Asiatic Society of Bengal by Sir William Jones in 1784 was an outcome of the interest created at that time in scientific research. The society played a prominent part in the development of scientific activities and publication in that time India. The society also brought out Asiatic Researches which was the first Indian periodical started in 1788 and was later changed to Journal of the Asiatic Society of Bengal in 1832. The Medical and Physical Society of Calcutta was formed in 1823 and its Transactions were the first professional medical periodical published in India. During the nineteenth century a number of organizations were set up for encouraging scientific publications notably Indian Medical Gazette in 1866 , Indian Journal of Medical research in 1913, Journal of Indian Medical association in 1930.

It is worthy to mention achievements of Indians in Medical Science in Colonial era was without much contribution from Imperial Government. In terms of funding or patronization basically were self or help from few rich and novel Indians. So also in Public health. Hardly 10% population was under cover of medical care. Large population were neglected. Whatever they done only to save their population and to prevent spread from this part of the country to Europe .

In autobiography of Sir Prafulla Chandra Roy, 'Life and Experiences of a Bengali Chemist' in 1932, great Indian Scientist written with broken heart - **'While a student at Edinburgh I found to my regret that every civilized country including Japan was adding to the world's stock of knowledge but unhappy that India was lagging behind. I dreamt a dream that, God willing, a time would come when she too would contribute her quota. Half-a-century has since then rolled by. My dream I have now the gratification of finding fairly materialized. A new era has evidently dawned upon India. Her sons have taken kindly to the zealous pursuit of**

different branches of Science. May the torch thus kindled burn with greater brilliance from generation to generation!'

This sorry state of science and scientific research in colonial India was supposed to get a momentum after installation of democratic Govt after 1947. But major hindrance was poor state of public health, limited medical graduates , limited medical Colleges, research infrastructure and moreover no structured health policy to push forward medical education and research Policies. In editorial of JIMA in 1946 poor health structure was narrated by that time hon editor.

"In this unfortunate country we have never had public health services in the sense in which they are understood in the West. We have a few hospitals and dispensaries , hardly one for a taluka , considering the vastness of the population. We have no facilities for the curative and preventive side of disease. No country in the world is medically so badly served as India because the Government never considered the health of the people as its first and foremost concern and its national wealth, as much as it considers law and order and the police and the military to be."

— JIMA Editorial, April, 1946

Significant breakthrough was establishment of Bhore Committee in 1943 (sir Joseph Bhore) which in recommendation first time laid down what should be the future health structure in India. Though this committee recommended on public health, given future direction on medical education and research also. Medical education is intimately related to medical research. Bhore Committee laid down that " from the first, medical education must be carried out against a back ground of original investigation and research". But committee given more stress on bedside research or clinical research rather than laboratory based research.

1947- INDIA GOT INDEPENDENCE :

Bhore committee recommendation was largely accepted by newly formed Govt of Independent India. But as condition of public health was in bad shape , GOI taken more initiative for elimination of disease, establishment of health Units, Medical Colleges for education and training of More Medical Graduates.

Research in Science and technology was in core of heart of Pandit Nehru first Prime Minister of India, He was the first person to initiate schemes to promote science and technology in India. For Nehru, scientific temper is something to be inculcated in society at large.

“Science was not merely an individual’s search for truth; It was something infinitely more than that if it worked for the community”.

— **Pandit Nehru**

Indian Research Fund Association was renamed in 1949 as Indian Council of Medical Research (ICMR). Principal activity were laid down by Govt were to investigate on Communicable diseases – tuberculosis, leprosy, formulate guideline on different Tropical diseases – Malaria, Kalaazar, Hepatitis, filariasis etc. Also to be involved in capacity building and foundation of Apex laboratories in India.

Research Institute in Immediate Post Independence era :

Cholera Research Centre, Kolkata was created to study various aspect of cholera problem. Govt of India converted Malaria Institute of India to National Institute of Communicable Diseases to deal with communicable diseases.. GOI also established 2 other institutes for Tuberculosis in Banaglore and the Leprosy Research Institute in Madras. In 1951, when the first Five year Plan was to begin, institute for virus research in Poona i.e. Virus Research Centre eshtablished. Nutrition Research Laboratory which originally started as Deficiency Disease Enquiry was shifted from Coonoor to Hyderabad with enhancement in the scope of its activities.

ICMR (Indian Council Of Medical Research) :

ICMR has made outstanding contribution as a knowledge generating agency and contributed in understanding various diseases of national importance such as malaria, Japanese encephalitis, tuberculosis, AIDS, Kala-azar, Filariasis, Leprosy and Poliomyelitis, Additionally, ICMR has made extensive contributions in the areas of nutrition, reproduction and maternal and child health, occupational and environmental health and research complimenting health systems. Training and capacity building of young investigators, medical and allied health professionals and providing funding support for research projects to investigators all over the country are other very unique and significant contributions of ICMR.

Few Significant Contributions :

- **TB Diagnostic Initiative** — TruNAT Rif, an indigenous, cost effective, rapid molecular diagnostic kit for TB/MDR-TB has been developed, validated and has been recommended for roll out under RNTCP at

Primary Health Centres (DMCs) in a phased manner. WHO also recognized this project.

- **Vector Borne Diseases Science** — to identify and prioritize gap areas in the control of various vector-borne diseases in the country such as dengue, chikungunya, Malaria, Filariasis, Kalaazar etc. PCR-based diagnosis procedure for visceral leishmaniasis from Urine samples- (Non- invasive method) was developed. Novel non-invasive method for diagnosis of visceral leishmaniasis by rK39 testing of sputum samples has also been developed.

- **Sentinel surveillance for Congenital Rubella Syndrome (CRS) in India** — Aim is assess the impact of Measles Rubella vaccination in India.

- **The JE diagnostic kits (MAC-ELISA)** — manufactured by ICMR-NIV is used by the National Vector Borne Disease Control Programme (NVBDCP) as one of the most sensitive serological test for JE.

- **ICMR-INDIAB** — an epidemiological study on diabetes: The study is a landmark study providing epidemiological data on diabetes, prediabetes, hypertension, dyslipidemia and obesity from the various States of India

- **Hypertension initiative** — Roll out of India Hypertension Management Initiative has been done for better control of hypertensive patients in the Public health system.

- **Reproductive Biology, Maternal & Child Health Development of Male Contraceptive RISUG:** An intravasal, non hormonal once injectable male contraceptive called Reversible Inhibition of Sperm Under Guidance (RISUG) has been developed and evaluated and was found to be safe, effective and acceptable by male of all religions.

Development of Female Contraceptive:

(1) A subdermal contraceptive implant - ImplanonR was evaluated as a spacing method and was found to be safe, efficacious and acceptable in Indian women.

(2) Development of Recombinant CG-LTB vaccine for prevention of pregnancy: A recombinant CG-LTB vaccine against Human Chorionic Gonadotropin (hCG) with high immunogenicity has been developed and found safe under pre-clinical toxicity studies.

Role of probiotics : in prevention of suspected sepsis in LBW infants was studied and found that Daily supplementation of LBW infants with probiotics for 30 days led to a non-significant 21% reduction in risk of neonatal sepsis

- **Anti-Microbial Resistance** — Antimicrobial Resistance Surveillance Research Network (AMRSN) is a comprehensive portal for collecting, validating and analyzing antimicrobial resistance data from

collaborating Centres in Hospitals across India.

- **Nutrition** — ICMR has taken up a project involving Nutrition Interventions in adolescent girls. ICMR also brought out the Indian Food Composition comprising of data of 526 varieties of Indian foods and their nutritive values.

- **Outbreak/epidemics/pandemics/ Disease Burden**

Preparedness of ICMR to handle Zika virus outbreak — NIV, Pune has strengthened its capacity to test the samples for Zikavirus received during the acute phase of the disease by RT-PCR.

National Hospital Based Rotavirus Surveillance Network : The study has been carried out at 4 Major referral labs, 7 ICMR Regional labs and 23 hospital sites to observe the trend in burden of rotavirus diarrhoea as well as impact of Rotavirus vaccine under Universal Immunization Program (UIP).

Working successfully to combat COVID-19 pandemic — by development of Diagnostic kits, testing laboratory , preparing guideline, COVID registry , clinical trials , vaccine research and capacity building. As a ambitious project National Institute of Virology in collaboration with Bharat Biotech is developing Inactivated vaccine against COVID19 – **Covaxin**.

RESEARCH IN DRUG DEVELOPMENT :

Since the initiation of drug discovery by Dr. Reddy's Laboratories in 1994, Indian companies have disclosed a total of 214 proprietary preclinical and clinical stage development compounds, of which 168 originated from large pharma companies, and 46 from contract research and biotech companies. Of these, 83 compounds were progressing in the pipeline despite this significant number of compounds, Zydus Cadila's saroglitazar, launched in 2013, remains so far the only compound that was entirely discovered and developed by an Indian company. In COVID era also Zydus cadila invested in vaccine development - a plasmid DNA vaccine targeting the viral entry membrane protein.

Before Globalization India had policy of process patent. This reduced need of clinical research and invention of new drug and its patent. But Globalization and GATT agreement in 1995 pushed India giving more attention on drug discovery . 2005 was watershed year in drug trial. Indian drug research policy undergone paradigm shift in 2005. Phase lag which was a major barrier was removed . There were blooming of Clinical research Organizations in India. There were several criticism on drug trial -lack of transparency, proper compensation etc. In 2013 Supreme court of India in a judgement Swastha Adhikar Mancha vs Union Of India directed to make a transparent and ethical policy in

Clinical trial. In 2019 new policy on Clinical Trial laid down by DCGI and ICMR both for Clinical research and epidemiological study.

CONTRIBUTION OF INDIAN SCIENTIST AFTER INDEPENDENCE :

H N Chatterjee

Oral rehydration therapy (ORT), that is, drinking water with controlled amounts of salt and sugar, considered as “potentially the most important medical advance of the 20th century”, was first discovered by H. N. Chatterjee, a medical practitioner working on cholera patients in Calcutta. Despite being published 1953 in The Lancet, it was unfortunately ignored, only to be rediscovered in 1968 by Western scientists.

Subhas Mukhopadhyay

A physician from Calcutta, Dr. Mukhopadhyay was the first one to create India's first test tube baby in 1978, but never got due recognition of the same. Unfortunately, all the bureaucratic interventions and false accusations were too much for this eminent researcher. Being frustrated, he decided to leave this world in 1981.

Hari Gobind Khorana

A genius before his time, Khorana was one of the pioneers in genetics and biotechnology. His work with Marshall W. Nirenberg and Robert W. Holley on the order of nucleotides in nucleic acids, carrying the genetic code, earned him the Nobel Prize for Physiology or Medicine, in 1968. He also made another breakthrough in the field, becoming the first to synthesize an artificial gene into a living cell..

Asima Chatterjee

Worked on periwinkle-derived alkaloids that have anti-cancer properties. She also contributed to the development of powerful anti-malarial and anti-epileptic drugs.

Dr J B Chatterjee

His researches and contributions have played a significant role in understanding the hematological aspects of tropical diseases. His work on nutritional and iron deficiency anemia and biophysical, biochemical, genetics of Hemoglobin E in Bengali people established him as a stalwart and an international figure in hematology.

Other Medical Breakthroughs From India :

(a) Cardiac Stents :

Former President of India Dr A P J Abdul Kalam

had significant contributions to medical science which are less discussed in Indian media and literature. He advocated, the role of biotechnology in medical science research, emphasized the use of science and technology for the benefit of common man. India's first indigenous low cost cardiac stent was developed by him in collaboration with Dr. Somaraju Bhupathiraju known as Kalam-Raju stent during 1994 – 1996. It reduced the cost of stents by 1/4th compared to prevailing market rate. In 2012, they developed a tablet computer for purpose of rural health care service, which was named the 'Kalam-Raju tablet'.

(b) Neurosurgery Techniques:

Dr. Atul Goel of Mumbai's KEM Hospital has been instrumental in neurosurgery creating an innovative technique that he calls atlantoaxial facetal distraction and craniovertebral realignment. The technique used to treat basilar invagination is fast being adopted across the world as a better alternative to the conventional procedure of surgery via the mouth.

(c) Potential Cancer Cure:

Indian scientists Partha Dasgupta and Sujit Basu made a breakthrough recently, that dopamine could also help kill tumors. If the human trials are successful, treatment for cancer could get a whole lot cheaper.

(d) New Vaccine For Hepatitis B:

A large part of the global burden of hepatitis rests with India, making an effective vaccine for the deadly hepatitis B virus a holy grail of sorts for India's medical researchers. Researchers at the All India Institute of Medical Sciences (AIIMS) may have found the solution with their creation of nano-particles that can be used in oral vaccination. Human trials on the vaccine are still underway and if successful could be approved for use by 2021.

ARE THESE ENOUGH TO MATCH WORLD COMMUNITY ?

India having immense potentiality of innovation contributed very less in modern medicine in terms of discovery. Post Independence Govt of India put stress more on elimination of diseases through different health programmes rather than innovation. 1st and 2nd Planning commission put more stress on Agriculture and Industrial development and preventive health. In last few decades of twentieth century there were significant advancement in research in nuclear science, defence technology, space and satellite technology, but not in medical science. But fortunately Union Govt gradually realized importance of medical innovation. India having dream of being superpower both politically and economically can not achieve without having patent

of different drugs and vaccines. This require lot of investments from both Public and corporate side and encouragement from Govt side. Making regulations transparent and easier (without hampering safety of people out of research), lucrative opportunity for researchers, incentives for pharmaceuticals who are involved in research on drug development can bring new light in future India. So many Indians are working successfully in abroad in different research Institute. Why we can not attract them to work in India.

There are sporadic publications /research/award from Indian researchers, but lacking structured and patent research products which can give benefit both commercially and politically (what India done in ISRO).

RESEARCH POLICY IN 21st CENTURY IN INDIA :

The National Health Policy 2002 defined the goal for Health Research as follows: **“Over the years, health research activity in the country has been very limited. In the Government sector, such research has been confined to the research institutions under the Indian Council of Medical Research, and other institutions funded by the Central/ State Governments. Research in the private sector has assumed some significance only in the last decade. In our country, where the aggregate annual health expenditure is of the order of Rs. 80,000 crores, the expenditure in 1998 99 on research, both public and private sectors, was only of the order of Rs. 1150 crores. It would be reasonable to infer that with such low research expenditure, it is virtually impossible to make any dramatic break through within the country, by way of new molecules and vaccines; also, without a minimal back up of applied and operational research, it would be difficult to assess whether the health expenditure in the country is being incurred through optimal applications and appropriate public health strategies. Medical Research in the country needs to be focused on therapeutic drugs/vaccines for tropical diseases, which are normally neglected by international pharmaceutical companies on account of their limited profitability potential. The thrust will need to be in the newly emerging frontier areas of research based on genetics, genome based drugs and therapies, vaccine development and molecular biology etc.”**

Medical Research in the country needs to be focused on creating our own therapeutic drugs/ vaccines and other interventions especially for tropical

diseases for which there have been only few inventions in the last century. However, the development of new health products (diagnostics, drugs and vaccines) is a long and complex process and we need to have systems in place to encourage innovation and appropriate ethical and regulatory frame work for pre clinical work and clinical trials for bringing our health products to market.

“In Europe, Industry and Scientific Pursuits have gone hand in hand ... one helping the other.... The gigantic progress in Industry achieved in Europe and America is a history of the triumph of researches in the laboratories.”

— Acharya Prafulla Chandra Roy

Happy to feel GOI in 2010 put his “Pharma Vision 2020”, to have “one out of five to ten new drugs discovered in the world originating from India by 2020”, which would have represented an average of at least three to six new medical entities (NMEs) per year, to a more realistic, but still highly ambitious target of “one NME per year and 10–12 incremental innovation launches per year by 2030”.

It is absolutely essential to enhance the number of researchers and supportive workforce in the ICMR. ICMR will continue to be the fulcrum of future Health Research. To address this challenging task and to give a greater thrust and focus to Health Research, a new Department of Health Research (DHR) under the Ministry of Health & Family Welfare was created on 2007.

The Department has a vision “To bring modern health technology to the people through innovations related to diagnostic, treatment methods and vaccines for prevention”.

MRU (Multidisciplinary Research Unit) :

Government of India approved the scheme for ‘Establishment of Multi -Disciplinary Research Units (MRUs) under ICMR in the Government Medical Colleges/Research Institutions’ as a path- breaking initiative to develop/strengthen the health research infrastructure in the country in 2013 under 12th plan. Aim was to strengthen research environment and infrastructure in Medical colleges, increase awareness and aptitude among young medical graduates. MRUs are established to enhance research in Noncommunicable diseases and issues based on local needs .

FUTURISTIC VISION :

We have glorious past , have resources , now have

dream. But to fulfil have to walk a long. Foreign invasions, loots, colonial regimens put research motivation at a lowest level. We Indians accept research of western world without giving much thought even in sector of Public health and communicable diseases. It is well known that genetic, environmental, sociocultural, and dietary factors greatly influence manifestations and management of diseases; hence, health research done locally would have the greatest impact on the health of local populations. Multidrug-resistant tuberculosis, HIV/AIDS, malaria, and noncommunicable diseases (NCD) such as diabetes, heart diseases, chronic pulmonary obstructive diseases, and cancers are the biggest health-related challenges facing India today. Our research effort in these areas is not commensurate with our needs. Through research in Indian context we should prepare our own guideline to combat these diseases.

The reasons for such a sorry state of affairs are many. The often cited ones are lack of sophisticated research infrastructure, paucity of funds, and physicians “overburdened” with patient care. These certainly are there, but at a more basic level, the reasons may be hidden in our education system that promotes rote learning over a spirit of scientific inquiry and lateral thinking.

“The True laboratory is the mind, where behind illusion we can uncover the laws of truth”.

— Acharya Jagadish Chandra Bose

India was ruled by foreign invaders centuries after centuries, society submerged with superstitions, divided on the basis of caste and religion, scientific thought taken a back stage in mind of Indian people. Medieval cloud obscured rational thinking of Indian youth.

In words of Acharya Prafulla Chandra Roy **“I have been teaching for half a century; in this period I have told thousands of students that solar and lunar eclipses are not caused by the demons Rahu and Ketu devouring the sun and the moon . . . They listened and agreed. But during the eclipses, the moment conch shells are blown in the houses, the moment prayer processions come out in the streets, these educated people also join the processions and throw away their food.”**

So first and foremost duty is to create a scientific environment , environment of rational thinking.

"Where the mind is without fear and the head is held high
Where knowledge is free
Where the clear stream of reason has not lost its way
Into the dreary desert sand of dead habit
Into that heaven of freedom, my Father, let my country awake."

— **Rabindranath Thakur**
(Collected from *Gitanjali*)

Our Population starting from Politicians, Bureaucrats, media, including educated middle class tend to view any form of medical research as "using Indian patients as guinea pigs," or done "for the benefit of pharmaceutical industry." Every even honest attempt judged against political loss or gain. Or our parents thought opting of Medical researcher as carrier is sacrifice of a bright carrier.

More importantly, our medical education and institutions lack training curriculum in conducting systematic research; neither is there any emphasis on recording and documenting observations systematically in medical practice. In Indian psychology Medical graduates opt more clinical branches as future carrier having more lucrative packages. While medical research as carrier or opting basic medical sciences not priority to medical graduates.

If we want more medical research to happen in India, we need to address these shortcomings systematically. We need to encourage scientific inquiry and rational thinking in our young population; our medical education needs overhaul to include training programs in systematic research methodologies, and our medical institutions must nurture and mentor budding scientists treating them on par with clinical specialists. We should invest in building proper research infrastructure, and make resources available for supporting medical research at the institutional level. In addition, perceptions of the stakeholders including the general public need to be addressed to create a more open environment for medical research.

Equally, we must remember that research need not happen only in advanced institutions under sophisticated settings, it can be done at patient bedside in clinical practice. An astute, observant, and reasoning clinician can seek answers to many clinical questions through simple yet well-designed clinical experiments in his day-to-day practice, as beautifully illustrated through many well-known examples by

Nanivadekar in his thoughtful essay. To this effect, we must inculcate in our medical students and clinicians an attitude of scientific curiosity and reasoning, and a habit of systematically recording and documenting their observations.

We must firmly believe that while clinicians are the patient interface working to perfect the existing practice of medicine, medical scientists are needed to generate new knowledge and test new theories and therapies to bring about betterment and innovations in healthcare. Contributions by both are equally essential to medical science and patient care.. We need both clinicians and medical scientists to make this world a better place.

Conclusion :

India has a rich cultural heritage, a strong social base and an impressive history. Her contributions to medical science over ages cannot be underestimated. But today, we seem to have lost our zeal to contribute.

অতীতকাল যত বড়ো কালই হোক

নিজের সম্বন্ধে বর্তমান কালের একটা স্পর্ধা থাকা উচিত।"

"মনে থাকা উচিত, তার মধ্যে জয় কবিবার শক্তি আছে"

Probably in arena of Medical research we forget our power. Very few medical students are going for a full-fledged research, and very few contributions are made to the medical science. Prime minister Narendra Modi said Indian doctors have made a name for themselves world over but the country was far behind other countries in the field of research. Let us try to rectify it, and try to contribute something for the sick. Only then can claim to be real ancestor of Charaka and Susruta.

"It would be our worst enemy who would wish us to live only on the glories of the past and die off from the face of the earth in sheer passivity. By continuous achievement alone we can justify our great ancestry".

— **Acharya Jagadish Chandra Bose**

Like Prime Minister of India I am hopeful

"India to be at Centre of Global Healthcare Effort With Its Experience, Research Talent"

JAIHIND JAIBHARAT BANDEMATARAM

রবীন্দ্রনাথের প্রকৃতি ও শিক্ষার সমন্বয়-

রবীন্দ্রনাথের শিক্ষাচিন্তায় প্রকৃতি, মানুষ ও শিক্ষার সমন্বয় ঘটেছিল। তিনি শান্তিনিকেতনে বিশ্বভারতী প্রতিষ্ঠা করে প্রকৃতি মানুষ ও শিক্ষা বিষয়ে হাতে কলমে পরীক্ষা-নিরীক্ষা করেছেন। রবীন্দ্রনাথের মনে করতেন যে শিক্ষা হবে মুক্ত প্রকৃতির কোলে মুক্ত আকাশের নিচে। চার দেওয়ালের মধ্যে আবদ্ধ শিক্ষা প্রতিষ্ঠানকে তিনিও **খোপওয়ালা বড় বাস** বলে অভিহিত করেছেন।

The aim of education or research according to Rabindranath, is the harmony of the students with the environment. The student should know his environment and create harmony with it. To quote Rabindranath, **“True education consists in knowing the use of any useful material that has been collected to know its real nature and to build along with life a real shelter for life”.**

