

# Tata Memorial Centre: The Hub for Cancer Treatment and Research

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## **Preamble**

The life expectancy at birth in India in the year 1800 was 25 years, in 1947 was 33 years and is currently about 70 years, while the corresponding total population was 169 million, 358 million and 1380 million, respectively. The Indian population above the age of 50 years was about 68 million in 1970 and this increased to about 268 million in 2020. One of the most important risk factor for developing cancer and other non-communicable diseases is increasing age. As India's population ages and increases, the incidence and burden of cancer will increase, as they have in the past few decades. Despite the lower incidence of cancer in India compared with many high-income countries, because of its large population, the number of cancer cases is high. It is estimated that there are about 1.3 million new annual cancer cases and approximately 0.85 million deaths due to cancer every year currently in India, and these are estimated to increase to about 2.1 million and 1.3 million by 2040. These numbers also suggest that approximately 60% of patients who are currently diagnosed to have a cancer in India will die of it, a proportion that is about 20-25 percentage points higher than that seen in developed countries. Lack of population-based systematic screening for common cancers, presentation in advanced stage and deficiency of geographically and socially well-distributed and adequate healthcare infrastructure are the main reasons for the relatively high case-fatality ratio.

The Tata Memorial Centre (TMC), founded in 1941 by the Tata Trusts and under the Department of Atomic Energy since 1962, is the apex cancer Centre in India with a mandate and mission of delivering high-quality cancer care to all sections of the society, creating models of training and human resource creation for India,

and performing basic, translational, clinical and public health research that is locally relevant and implementable. The Tata Memorial Centre has evolved from a single hospital institution to currently 11 hospitals (started operations or under construction) in seven states of India. This is in line with the hub-and-spoke model of cancer care advocated by TMC.

In this chapter, we give a historical perspective about TMC's role in cancer care and describe its current activities and initiatives towards providing and demonstrating models of cancer-related service, education and research that are applicable to India and are worthy of being replicated.

### 1. The history of Tata Memorial Centre

Tata Memorial Hospital (TMH) was established by Sir Dorabji Tata Trust on 28th February, 1941, and is the largest cancer hospital in the country. Dorabji Tata's wife, Meherbai Tata, succumbed to leukemia in 1931. This tragedy spurred him to start the Dorabji Tata Trust for the advancement of learning and research, disaster relief and other philanthropic activities 'without any distinction of place, nationality or creed'. He died in 1932, soon after creating the Trust. TMH, and the famed Indian Institute of Science, are both enduring legacies of Dorabji's visionary philanthropy. Incidentally, Homi Jehangir Bhabha, the founding director of TIFR (Tata Institute of fundamental research) and BARC (Bhabha Atomic Research Centre) was Meherbai Tata's nephew (brother's son).



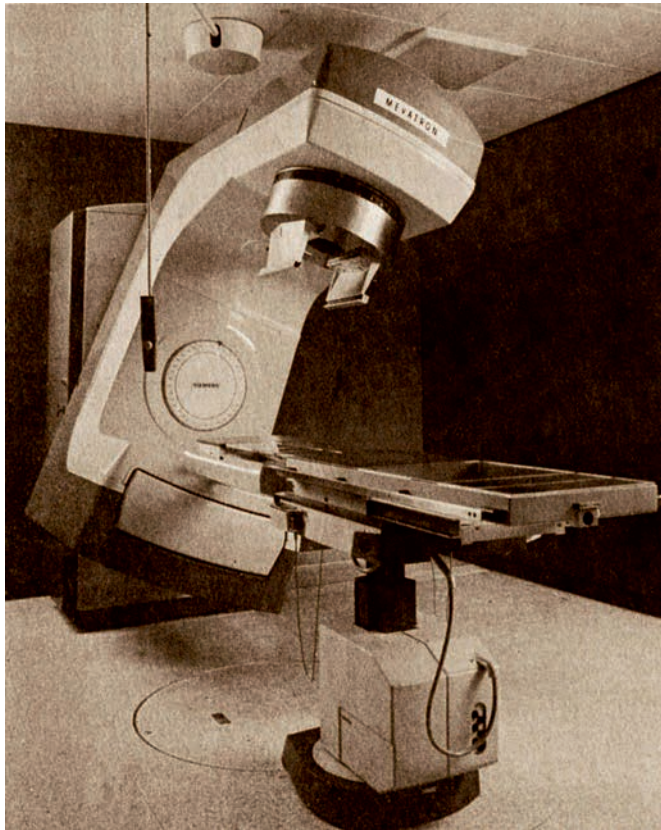


**Tata Memorial Hospital**

Multiple landmark events eventually lead to the formation of Tata Memorial Centre (TMC). In 1952, the Indian Cancer Research Center (ICRC) was founded in Mumbai, to pioneer basic research in cancer. The Ministry of Health took over the management of TMH in 1957. Administrative control of both TMH and ICRC (renamed Cancer Research Institute – CRI) was then transferred to the Department of Atomic Energy (DAE) in 1962, and these two arms merged to form ‘TMC’ in 1966, with a mandate for service, education and research in cancer. TMC remains a grant-in-aid institution administered under the DAE. The Advanced Center for Treatment, Research and Education in Cancer (ACTREC) at Kharghar was inaugurated in 2002. It is an integral part of TMC which now houses the CRI and the Clinical Research Center (CRC), along with a state-of-the-art research hospital. The 13-storey Homi Bhabha Block of TMH was inaugurated in 2011. TMC has expanded its outreach across the country with nodal centers established at multiple places across the country, following the ‘hub and spoke’ model.

TMC has many ‘firsts’ to be proud of. These include India’s first linear accelerator in 1978, bone marrow transplant in 1983, tissue bank in 1988, PET/CT in 2004, and the first proton therapy unit in a government setup (and second overall) in 2023. It has spearheaded the CAR-T cell trial which has led to the approval indigenous CAR-T cell therapy in India. The TMC name instils enormous faith in patients as demonstrated by over 70,000 new patients and over 500,000 follow-up patients every year, a legacy we are proud of and which we aspire to emulate and recreate every passing day.

Just as Rome was not built in a day, achieving this required focused and continuous spadework across decades. We share some of our experience and insights into ensuring cancer-focused service, education and research for all Indians.



**India's First Linear Accelerator**

## **2. Clinical services**

TMC prioritizes Multidisciplinary Team (MDT) management through disease-specific groups, ensuring holistic care for every new patient deliberated in tumor boards. Our comprehensive cancer care includes cutting-edge treatments like Bone Marrow Transplantation, Stereotactic Body Radiotherapy, and Proton Beam Therapy, besides emphasizing preventive oncology and community collaboration. With a mission centered on comprehensive cancer care for all, 60% of patients receive free or highly subsidized treatments.

TMC also works closely with NGOs like Indian Cancer Society, St Jude India, V Care, Jeet Association for The Support of Cancer Patients (JASCAP), Improving Pediatric Cancer Care and Treatment (ImPaCCT) foundation, and Anjeze Charitable Trust to provide financial and social support to patients and ensure holistic care.

Despite various efforts, the small number of comprehensive government cancer centres across India remains an issue of major concern. With a view to offer affordable and quality cancer care closer to the patient's home, TMC now follows a 'hub and spoke' model, encompassing many satellite cancer hospitals across India, treating over 100,000 new cancer patients and a million follow-up patients annually. The spokes are comprehensive cancer hospitals created under the TMC umbrella in geographically diverse locations of the country.

Sl. No	Name of Hospital	Nos. of Beds	Place	Established
1	Homi Bhabha Cancer Hospital (HBCH)	202	Visakhapatnam, Andhra Pradesh	Operational since 2015, completed in 2022
2	Dr. B Borooah Cancer Institute (BBCI)	262	Guwahati, Assam	Part of TMC since 2017
3	Homi Bhabha Cancer Hospital & Research Centre (HBCH & RC)	300	New Chandigarh, Punjab	2023
4	Homi Bhabha Cancer Hospital (HBCH)	125	Sangrur, Punjab	2015
5	Homi Bhabha Cancer Hospital (HBCH)	189	Varanasi, Uttar Pradesh	2019
6	Mahamana Pandit Madan Mohan Malaviya Cancer Centre (MPMMCC)	393	Varanasi, Uttar Pradesh	2019
7	Homi Bhabha Cancer Hospital & Research Centre (HBCH & RC)	200	Jatni, (Bhubaneswar), Odisha	Under construction
8	Homi Bhabha Cancer Hospital & Research Centre (HBCH & RC)	100	Muzzafarpur, Bihar	Under construction



HBCH &amp; RC, Visakhapatnam



**MPMMCC, Varanasi**

It is noteworthy to mention that all Units of TMC continued cancer care during the COVID epidemic, besides contributing to various COVID care initiatives.

The National Cancer Grid (NCG) was established by TMC in 2012, and showcases the power of collaborative effort by partnering with over 300 cancer centers across the nation. The primary focus remains on establishing uniform standards of patient care, providing specialized training, and conducting extensive research. The NCG cancer management guidelines are pragmatic, with a resource-stratified ‘essential’, ‘optimal’, and ‘optional’ set of management strategies provided based on the patient’s affordability and institutional infrastructure. Adherence to the NCG guidelines have been made as a prerequisite for reimbursement under the Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB PM-JAY) scheme, underlining their national impact. The successful pooled drug procurement initiative across multiple NCG centers has allowed a median of 82% savings compared to the maximum retail price, and pragmatic multi-centric research studies have been initiated, funded, and are underway. It is no exaggeration to state that the TMC and the NCG have played a pivotal role in advancing cancer care standards on a national scale.

### 3. Enabling clinical cancer research

Clinical research is important in advancing medical knowledge, improving patient outcomes, and developing new treatments. While we have a wealth of healthcare information from our patients, research often gets neglected in India due to overriding clinical demands and lack of requisite training and infrastructure to conduct meaningful research. TMC recognised the importance of clinical research and developed infrastructure to support it over more than two decades.

A state-of-the-art unit for clinical trials, Clinical Research Secretariat (CRS) was started at TMH in 1997 with a mandate to support clinical research. Since 2003, with the help of funding from the DAE, the DAE-Clinical Trials Centre (DAE-CTC) at CRS has focused on three key goals: funding and infrastructure support for clinical trials, propagation of evidence-based medicine in cancer management and capacity building for research. From these humble beginnings with limited space and manpower, CRS & DAE-CTC has evolved into a state-of-the-art clinical trials unit, with dedicated workspaces and infrastructure, a biostatistics cell, CRS pharmacy for investigational drug storage and management, dedicated defined CRS SOPs (Standard Operating Procedure), trained trial coordinators, intramural funding, organization of the annual Clinical Research Methodology and Good Clinical Practice workshops and the prestigious Evidence Based Management (EBM) of cancer conference (since 2003), and partnership with the National Cancer Grid (NCG). This has supported the planning and execution of many relevant and high impact investigator-initiated clinical trials including trials on screening, early detection and cost-effective treatment options that have changed disease management not only in India but also worldwide.

TMC has thus been a significant part of the global landscape of cancer research and treatment with multifaceted research activities spanning a broad range of clinical trials across diverse subjects like immunotherapy, epidemiology, cancer genetics, and much more, published in leading journals including NEJM, JAMA Oncology, JCO and BMJ. With a commitment to excellence, the hospital continues to push the boundaries of cancer research and is dedicated to improving the lives of cancer patients everywhere.

### 4. Basic and translational cancer research

Cancer is a mass of highly proliferating cells originating within a specific organ of an individual, blood or the lymphoid system and capable of spreading to distant organ/s, a term referred to as metastasis. Quite often the initiating factor can be a single anomalous gene. However, no gene operates in isolation and there are several partners in crime. For the disease to manifest, an extraordinary network of changes is required. Often, when the patient presents with the disease in a cancer center such as ours, cancer is at the crossroads where the cell has gained and lost many functions, rewired its molecular components, triggered a number of redundant mechanisms, learnt to re-express genes that were suppressed after development but now empowered new functions. The cancer cell has manipulated the host defense mechanisms to fuel its own survival and ready for combat against various forms of treatments such as the chemo, radio and targeted therapy. Nonetheless it is not a happy situation for the cancer cell – it is crippled in many ways and has to adapt to the various

challenges created by its own greed to grow (such as a low oxygen environment depleting its ability to produce the much-needed fuel). Although its survival instincts are extremely well evolved, there are vulnerabilities. There are some cancers that are addicted to the so-called 'driver gene' which initiated the tumor, targeting which ('treating the gene') results in an extremely high rate of cure. In some cases, the vulnerability can be nailed to a specific mechanism that is an Achilles heel of the cancer that can now be targeted with precision. The conundrum however is the following: same treatment is effective and effective for a long period of time in some individuals who live without any remission (disease does not come back) but in the less fortunate the disease may go away for a while, but reemerges often with a vengeance. This is true for targeted as well as chemo and radiotherapy. This leaves all the stakeholders helpless, making them feel that they may have won the battle but lost the war. Clearly there are more unknowns and the only way to solve the puzzle is to study it!

The Indian Cancer Research Centre (ICRC) was established in 1952 by Dr. Khanolkar, a renowned pathologist, with the intent to study and solve this puzzle. ICRC merged with TMH in 1966 to form TMC, with ICRC being rechristened Cancer Research Institute (CRI). CRI is dedicated to 'understanding the mechanism underlying the conversion of a normal cell to a cancer cell with the ultimate goal of translating this understanding to the prevention and cure of cancer'.



ACTREC was established in 2002, with a basic research division, which comprised the erstwhile CRI, and a Clinical Research Centre with a hospital and blood bank which would focus on providing novel therapeutic strategies for the treatment of cancer. This is being expanded from its original 50 beds to over 900 beds eventually, combining research and clinical care seamlessly. In addition, ACTREC also houses the Centre for Cancer Epidemiology (CCE), where scientists and clinicians work together to provide valuable population level information on risk factors that may predispose individuals in India to cancer and its progression. These factors include genetics, lifestyle and environmental factors. The department also carries out several population level screening studies for early cancer detection.



Today, ACTREC is uniquely positioned as a singular research body of its kind in the country where units exclusively engaged in cancer research, cancer treatment and study of cancer prevalence and prevention coexist. The ultimate goal is to provide an in-depth understanding of the molecular mechanisms that underpin the origins of cancer, its progression and dissemination called metastasis, failure to therapy resulting in recurrence of the disease or death. The eventual hope is to be able to predict the evolution of cancer through rigorous collaborative research and position ourselves to declare ‘Check Mate’!

## 5. Public health and epidemiological work

Apart from cancer treatment and research, TMC has also conducted landmark studies in cancer screening and early detection. Among the preventable cancers, breast and cervical cancers are the leading cause of death among women and oral cavity cancers among males in India.

TMC has led several landmark studies focused on affordable early cancer screening and detection. These include cervical cancer screening via visual inspection with acetic acid, published in the Journal of the National Cancer Institute in 2014, and the breast cancer screening with clinical breast examination, which lead to a 30% reduction in mortality due to breast cancer in women aged 50 years and above; this was published in the BMJ in 2021. These trials have led to incorporation into national cancer control policies in India adopted by 21 states, and are serving as models for adoption in other LMICs. A similar trial to evaluate the impact of oral examination for screening oral cancers in tobacco chewers is currently ongoing.

TMC has also contributed immensely in the formulation of national Tobacco Control Policies including the “The Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act, 2003 (COTPA), the principal comprehensive law governing tobacco control in India. Its tobacco control advocacy and evidence provided on various Technical Committees resulted in majority of Indian states eventually banning the sale of *gutka* since 2012, helping decreased the burden of oral cancer in India.

## 6. Cancer training and education

Specialty education in cancer diagnosis and treatment has been a mandate of the founding fathers of TMC since the time of its inception in 1941. Since starting in the mid 20<sup>th</sup> century, India's cancer training programs have matured into more focused and specialized courses to train a sizeable number of doctors trained in various facets of cancer treatment.

The division of academics at TMC was formally established in 1982. TMC is a Constituent Institution of the HomiBhabha National Institute (HBNI), a deemed university of the DAE. TMC offers both Health Sciences and Life Sciences courses, including MD and DM/M.Ch programmes in oncology (e.g. Radiation Oncology, Medical Oncology, and Surgical Oncology) and other related subjects (e.g. Anesthesiology, Radiology, Nuclear Medicine, Microbiology, Immuno-Hematology & Blood Transfusion Medicine, Pathology, Palliative Medicine). Superspecialty courses like DM in Pediatric Oncology, Critical Care, Oncopathology, and Interventional Radiology and MCh in Head and Neck Surgery and Gynec Oncology, were introduced for the first time in India at TMC.

TMC also offers paramedical force training in subjects like Radiation Therapy, Imaging Technology, Nuclear Imaging, and Nursing Oncology. The training program on patient navigation (KEVAT) is unique and is another first in the country. TMC also offers multiple fellowship programs under the umbrella of the HBNI in varied specialities.

The Academic Research Program at ACTREC covers diverse areas of Life Sciences with emphasis on Cancer Biology, offering Ph.D. degree programs under HBNI. Shorter term training programs are also offered to those interested. Multiple practical hands-on training sessions, workshops and conferences are regularly organized by TMC. TMC also conducts six-month training programs for sponsored candidates from State and Central Government Hospitals, Public Sector Undertaking Hospitals and Regional Cancer Centres across India. Specialized training in the oncology and related subjects is also provided to doctors from South East Asian and African countries such as Bangladesh, Nepal, Myanmar, Nigeria, Iran, Yemen, Oman, Ghana, and Iraq. Our courses span medical and non-medical domains, including diagnostic and therapeutic medicine, nursing, technical courses, patient navigation in oncology, clinical research, geriatric oncology, and public health and epidemiology.

The NCG also offers multiple educational tools, including Virtual Tumour Boards (VTB), Online Learning, Travelling School of Pathology, and Quality Improvement Hub (QI Hub). TMC, in partnership with King's College, London and the Tata Trusts, has initiated the Summer School of Oncology course for about 150 undergraduate students pursuing MBBS across India, to generate an early interest and understanding amongst them regarding oncology.

The impact of TMC in shaping the future of oncologic healthcare professionals is evident in the fact that approximately 70% of India's oncology workforce have received some form of cancer training at TMC! Despite all this pioneering work, there is definite need for further harmonization in order to achieve the ultimate goal of delivering quality cancer care to patients across the country by qualified and appropriately trained personnel.

## 7. Summary and vision

We have described the historical and current perspectives of TMC and its focus on cancer-related service, education and research that is of high quality and locally relevant. It is also clear that India will need substantial efforts in creating skilled human resources for delivering quality cancer care, at scale, in the coming decades. TMC, in collaboration with like-minded organizations and agencies will continue to lead efforts in this direction. Human resources are also required, along with dedicated funding and vision, to create a pipeline of research activities, the output of which will enable innovation, cost-effective cancer care and establish India's leadership in cancer research. TMC has already shown that well conducted clinical research has the potential to answer questions that are relevant globally. Technological advancements, including platform technologies and artificial intelligence related innovations, will need to be incorporated in routine workflows in the next 10-15 years. TMC will take the lead in adopting these technologies and innovating to make them suitable for local implementation. Some of these technologies also have the potential to make scarce high-skill human resource available regardless of geographical constraints. TMC will provide proof-of-concept that such technologies may have the ability to provide workable solutions. Finally, TMC will provide technical assistance to Departments of Health at the State level to create and operationalize a hub-and-spoke model of cancer care delivery for India with the aim that cancer patients should receive evidence-based medical care close to their homes.

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