Cancer Care and Control – Possible Solutions for a complex problem : Role of Department of Atomic Energy

Prof Pankaj Chaturvedi

Surgeon, Department of Head Neck Surgery

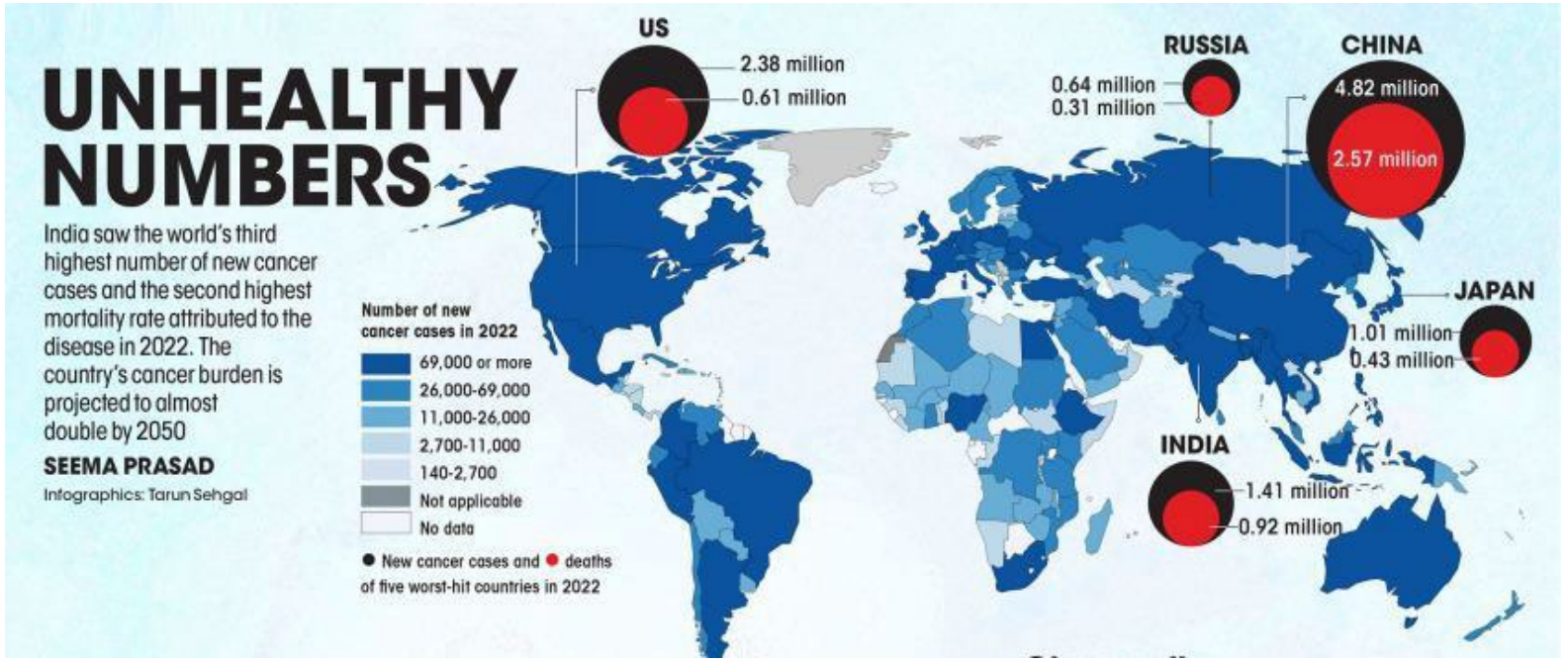
Director, Advanced Centre for Treatment, Research and Education in Cancer

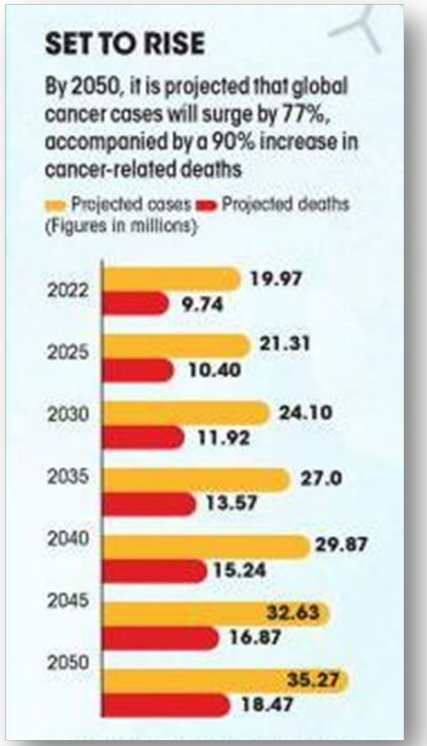
Tata Memorial Centre, Mumbai

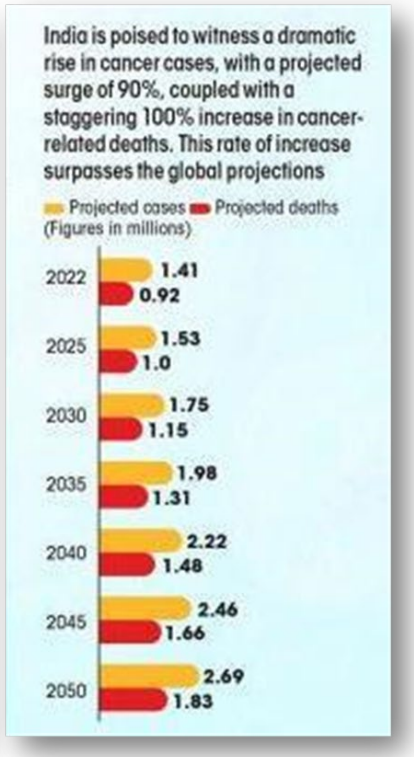
chaturvedi.pankaj@gmail.com

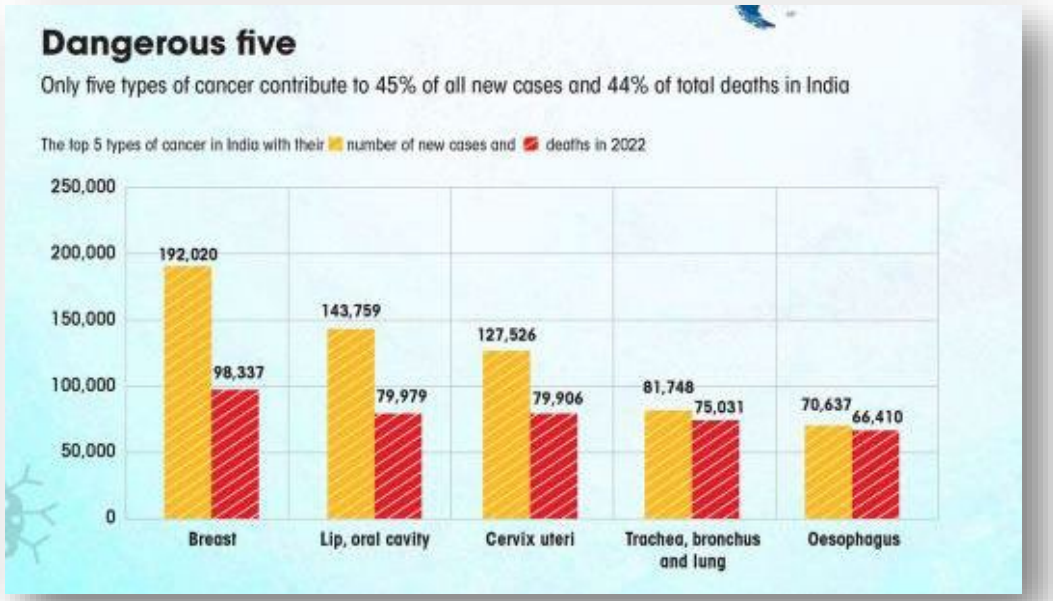
CANCER

THE EMPEROR OF ALL MALADIES









https://www.who.int/news/item/01-02-2024-global-cancer-burden-growing--amidst-mounting-need-for-services

1. Cancer Care in 2047 – Role of TMC, DAE

- Parliamentary committee on Science and Technology, Environment in its 325th report urged TMC to spearhead the strategies to handle the rising cancer burden. Several subsequent reports (326, 334, 341, 350, 351) have been actively pursuing on the Action Taken on 325th report.
- Parliamentary committee on Health and Family Welfare in its 139th report has also requested TMC, DAE to contribute to improving cancer care and control in India.
- The Health Ministry has asked all AIIMS and Regional Cancer Centres to follow the TMH model of cancer care.

A white paper on cancer care and control in India
Tata Trusts Chair
A joint effort by Tata Trusts, TMC, DAE and Ministry of Health

- **A detailed compilation of cancer care in India.**
- **An audit of government cancer facilities (GO and NGO) -**
  - **Non functioning**
  - **Partly functioning**
  - **Fully functional**
  - **Under construction or Proposed**
- **Audit of Manpower / Educational Courses / Research Facility / Governance / Financial Status etc.**

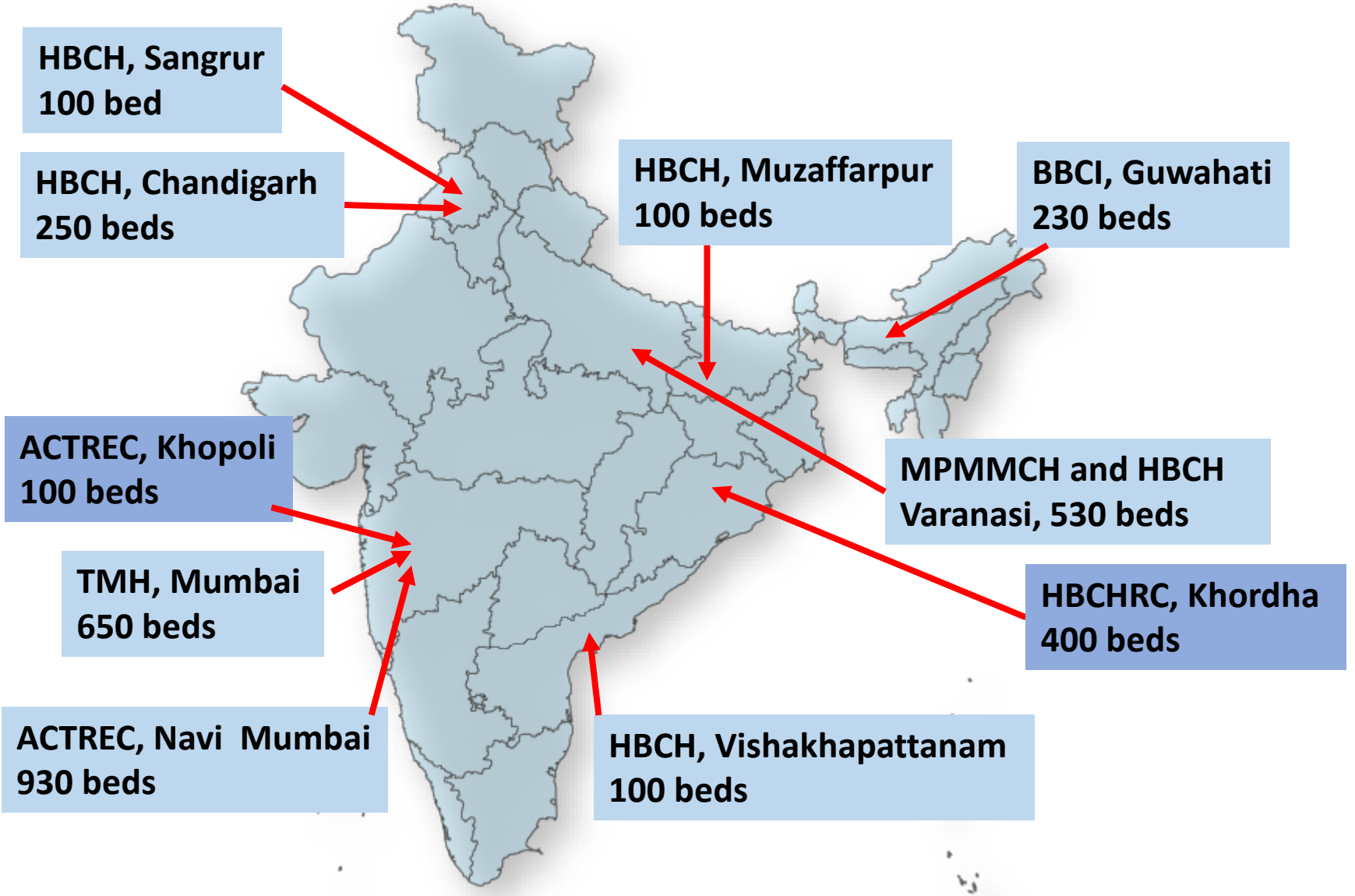
Tata Memorial Centre, DAE, Government of India

National Cancer Grid – 350+ hospitals

Technical Assistance to the State governments –

- Maharashtra
- Uttar Pradesh
- West Bengal
- Bihar
- Jammu and Kashmir
- Punjab
- Andhra Pradesh
- Goa
- Arunachal Pradesh
- Nagaland

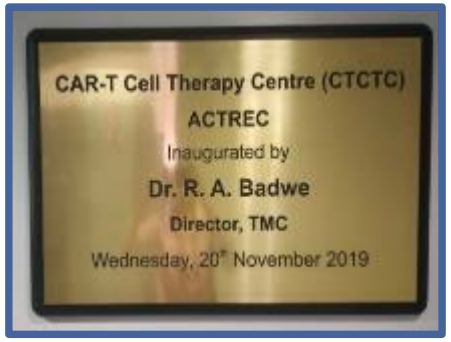
Technical Assistance to several hospitals all across India



We treat nearly 10% of India's new cancers.

Best treatment at highly subsidized affordable cost

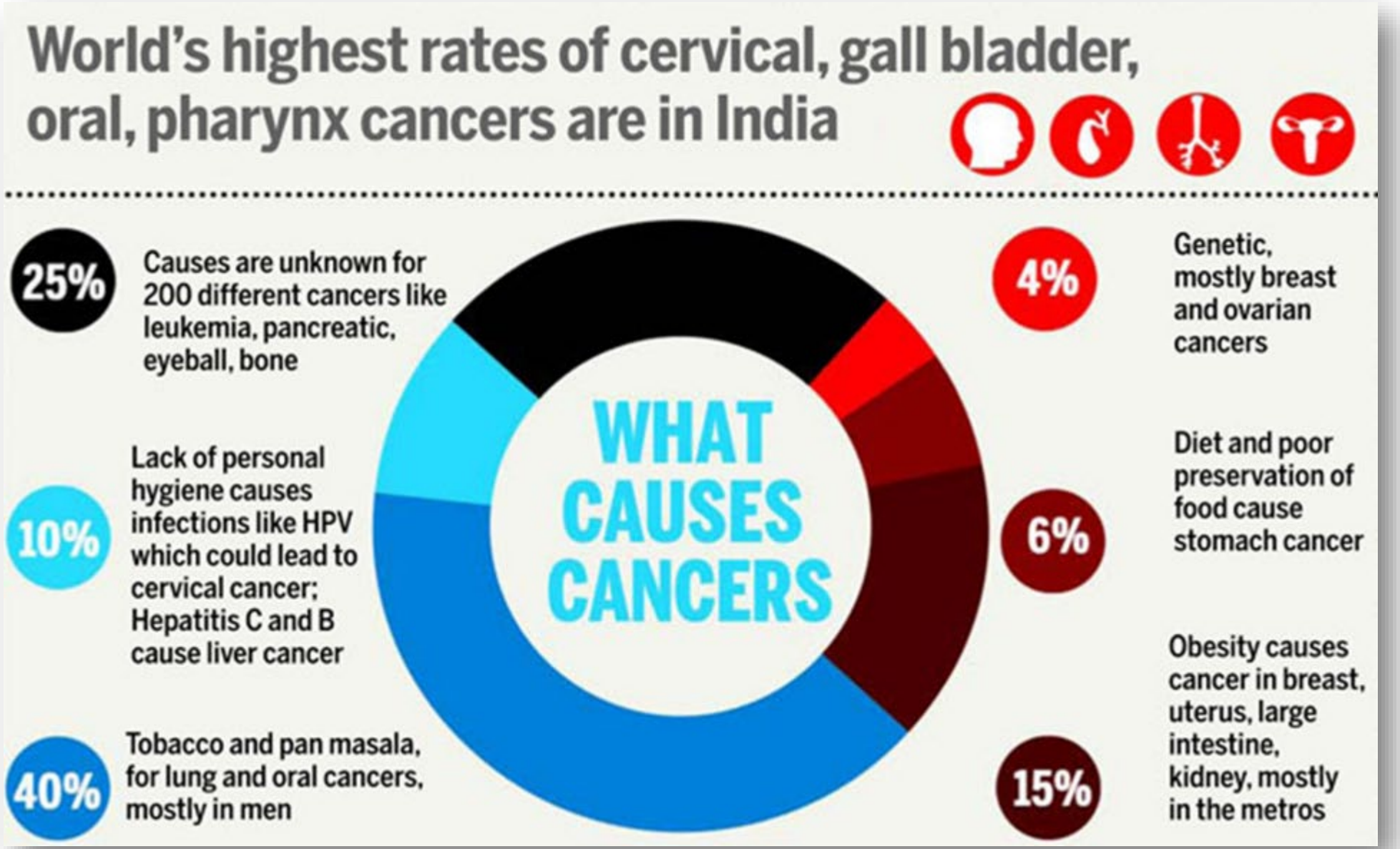
CAR –T-Cellular Therapy Centre at ACTREC



Proton Therapy Unit

Robotic Surgery

2. Cancer Prevention and Control

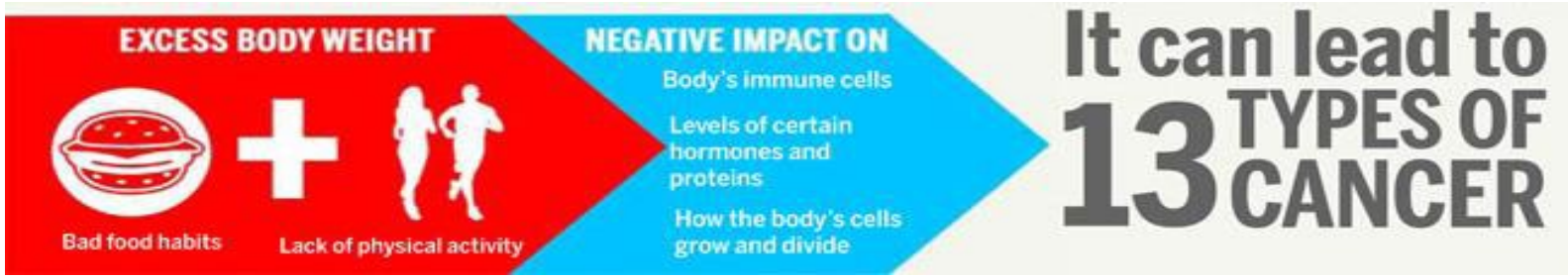


1. Reducing Aetiology

2. Promoting Hygiene

Disease	Number of cases	Number of deaths
a. Diseases directly related to poor water and sanitation		
Diarrheal diseases	1,950,745	NA
Dysentery	3768	6
Typhoid	160,099	438
Cholera	4104	5
Rotavirus	NA	2230
Helminthes (worms)	40%–60%	10%
Schistosomiasis	41	2
Trachoma	911	0
Skin diseases	346,829	246
Hepatitis A	4000	45
Hepatitis E	179	5
Poliomyelitis	303	NA
b. Diseases indirectly related to poor water and sanitation via malnutrition (ages <5 years)		
Stunted children (low height-age)	19.2% cases	NA
Wasted children (low weight-height)	11.0% cases	NA
Associated diseases		
ALRI	625,611 cases	NA
Measles	5811 cases	44 deaths
Malaria	0.02%	53 deaths

3. Tackling Obesity

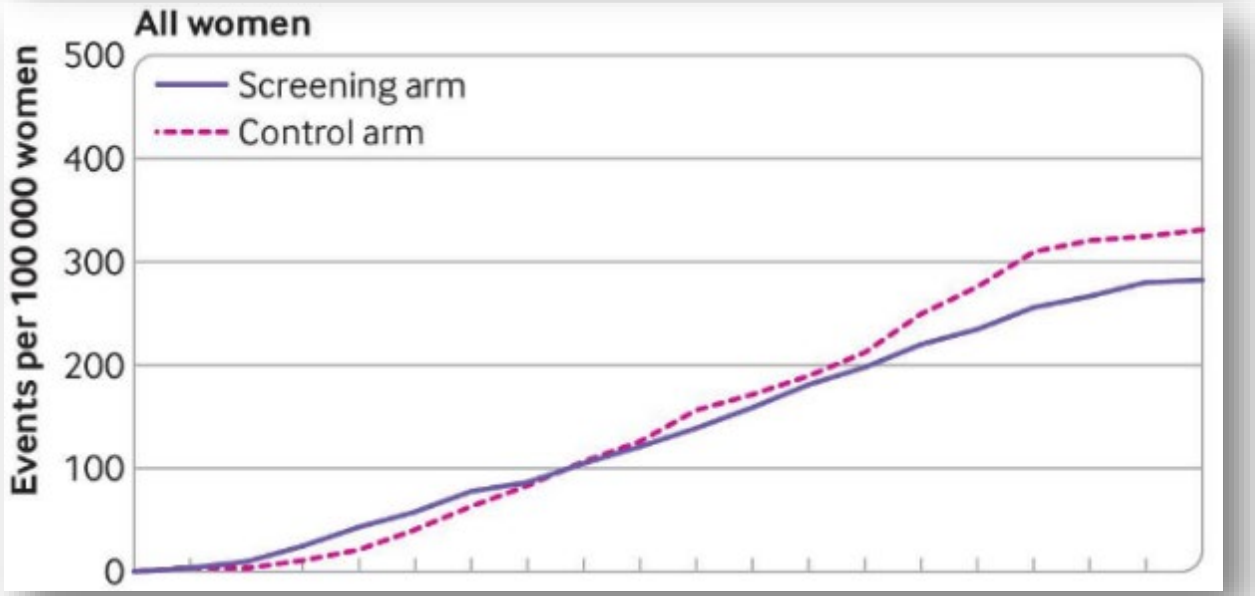


- Tax on Junk food and aeriated drinks
- Curb on advertising – Misleading ads

Tackling breast cancer

Effect of screening by clinical breast examination on breast cancer incidence and mortality after 20 years: prospective, cluster randomised controlled trial in Mumbai

Indraneel Mittra,[1] Gauravi A Mishra,[2] Rajesh P Dikshit,[3] Subhadra Gupta,[2] Vasundhara Y Kulkarni,[2] Heena Kauser A Shaikh,[2] Surendra S Shastri,[2,4] Rohini Hawaldar,[5] Sudeep Gupta,[6] C S Pramesh,[1] Rajendra A Badwe[1]



Breast Awareness & Clinical Breast Examination

Tackling Cervical Cancer

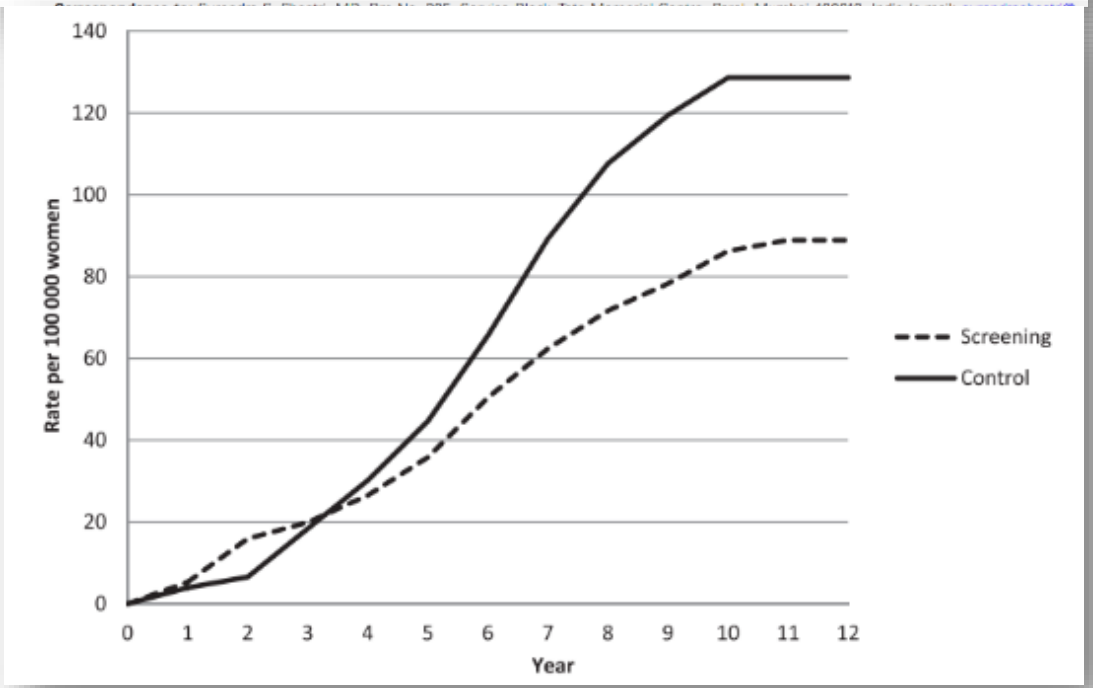
DOI:10.1093/jnci/dju009
First published online February 23, 2014

ARTICLE

Effect of VIA Screening by Primary Health Workers: Randomized Controlled Study in Mumbai, India

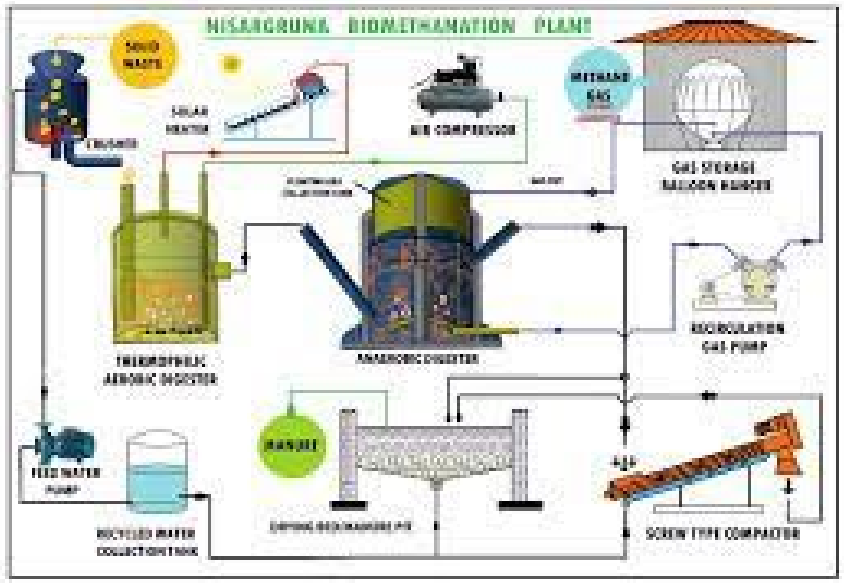
Surendra S. Shastri, Indraneel Mittra, Gauravi A. Mishra, Subhadra Gupta, Rajesh Dikshit, Shalini Singh, Rajendra A. Badwe

Manuscript received August 13, 2013; revised December 20, 2013; accepted December 21, 2013.



Promotion of hygiene and early detection

Pollution related diseases - DAE contribution



Cancer Registries in Nuclear Power Plant Locations

Leading Cancer Sites

TOTAL POPULATION : 86.7 Lacs
Cancer Cases (2012-20) : 34,547
Crude rates per 100,000 : 49.8

Cancer in Men – Mouth, Lung, Stomach
Cancer in Women – Breast, Cervix, Ovary, Gall Bladder

Registry name	Year	Population (in lacs)	ASR (per 100,000)	
			Male	Female
Tarapur (Maharashtra)	2019	5.2	49	45
Rawatbhata (Rajasthan)	2019	1.5	50.6	37.1
Kaiga (Karnataka)	2017	4	68.1	62.3
Kakrapar (Gujarat)	2017	5	67.1	28.7
Kalpakkam (Tamil Nadu)	2017	40	102.7	110.7
Kudangulam (Tamil Nadu)	2017	31	71.8	77.9

Integrated Cancer Biology at ACTREC,TMC

- To accelerate research leading towards deeper understanding of oncology
- Strive towards low cost and affordable treatment options
- Embrace cutting edge technologies developed indigenously for break through research and translation

Cancer and its ecosystem

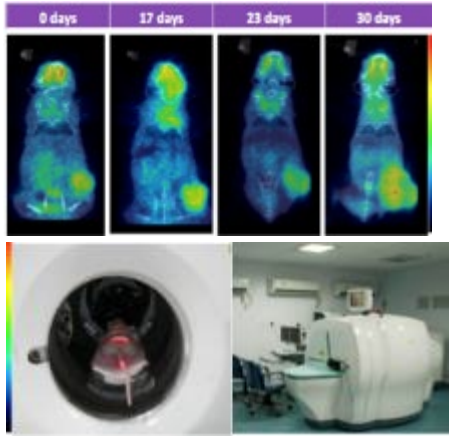
Systems Biology of Cancer

Comparative studies of chronic diseases

Macromolecular assemblies, structure and Interaction

Origin of Cancer and its Evolution

Digital Pathology for Predictive Oncology



3. Big Data management – AI/ML

Population based cancer registry

Organization	Cancer Registry
Indian Cancer Society	Mumbai PBCR is 1st PBCR in India and 2nd in Asia established in 1963
National Cancer Registry Programme (NCRP)	36 Population Based Cancer Registries 236 Hospital Based Cancer Registries
Tata Memorial Centre (TMC), Mumbai	10 Population Based Cancer Registries 4 Hospital Based Cancer Registries 5 Special Purpose Cancer Registries
Technical Assistance for PBCR by TMC	Odisha, West Bengal, Maharashtra, Andhra Pradesh, Punjab, Uttar Pradesh, Bihar

130,000 new patients being treated at TMC.

National Family Health Survey, India

Database that strengthen India's demographic and health policies and programmes . . . .

- **Digitizing the TMC/NCG data**
- **Genetic Susceptibility**
- **Risk Prediction**
- **Prognosis**
- **Resource prioritization**

ICTS International Centre for Theoretical Sciences

tifr

The Institute of Mathematical Sciences

4. Harnessing the power of Digital Technology

Remote Consultation

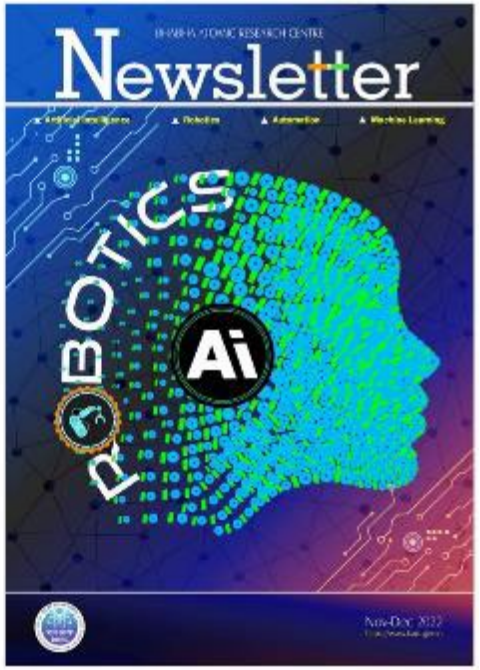
Online Education

State of Art learning Management system (LMS)

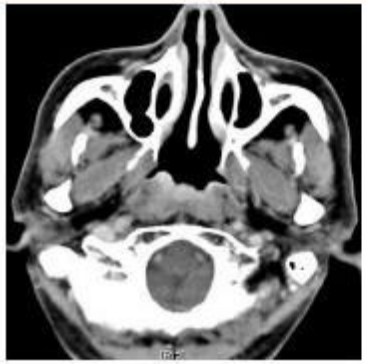
Accessible 24x7 by Mobile/Laptop from anywhere with mobile app

Instant Accredited certification by associations with credit points

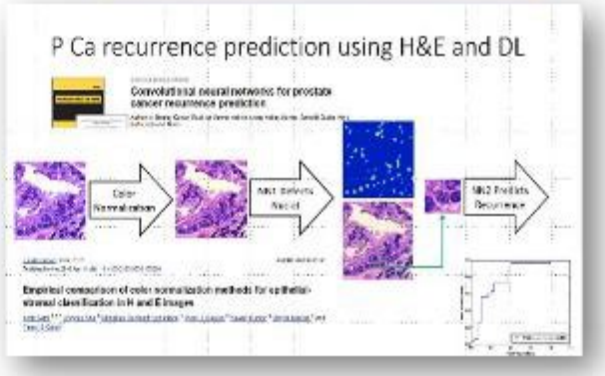
DIGITAL INDIA



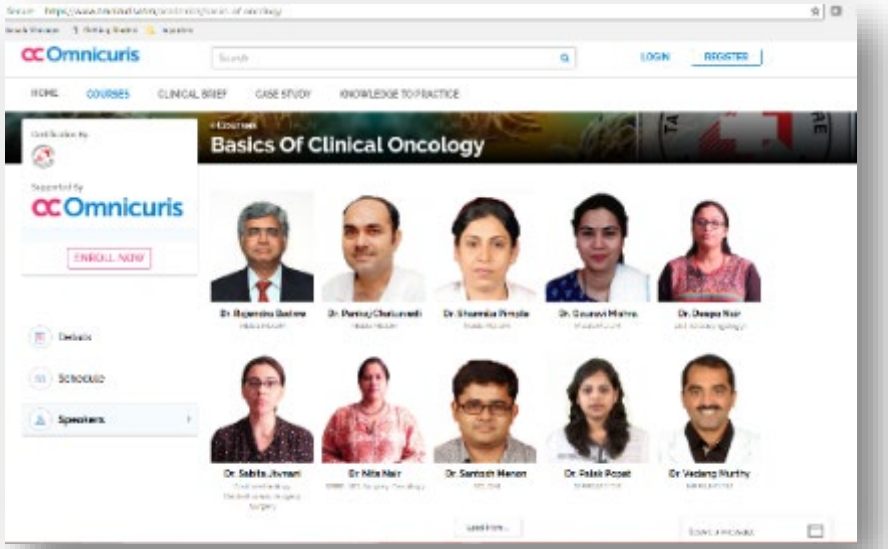
Teleradiology



Tele Pathology



World's first oncology online CME platform



5. Atma Nirbhar Bharat – Medical Technology

- **Price of some Essential Equipment -**
  - **Linear Accelerator – 25 Cr**
  - **MRI – 12 Cr**
  - **Brachytherapy – 8 cr**
  - **Digital Subtraction angiography – 7 cr**
  - **CT Simulator – 9 cr**
  - **NGS – 5 Cr**

Innovation and Start up Eco system

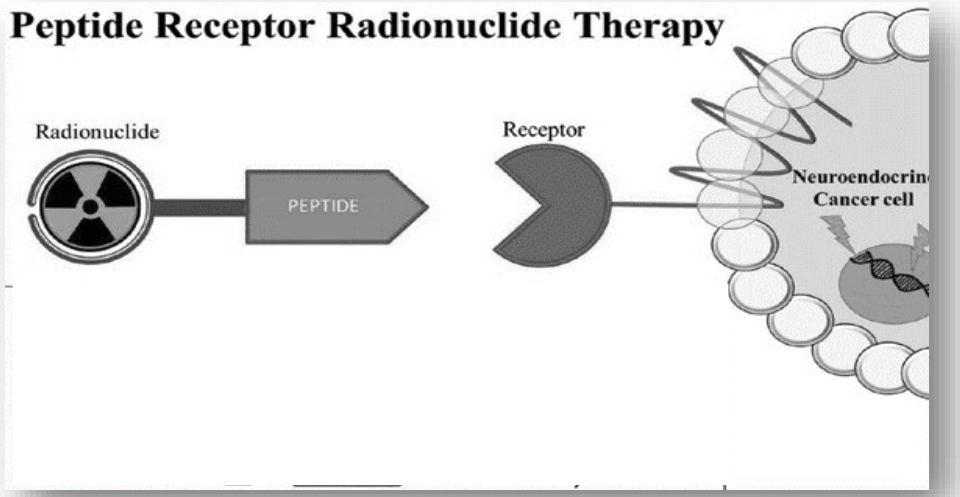
NISER Incubation Center for Entrepreneurship Rubrics (NICER)

-Accelerates Discovery through Innovation

6. Radio-Pharmaceuticals

Some cancers have very specific receptors expressed on their cells e.g. Neuroendocrine Tumors express somatostatin receptors (SSTR)

Lutetium 177 DOTATATE, seeks SST receptors like homing missiles, targeting only the diseased cells.



Prostate Specific Membrane Antigen Therapy

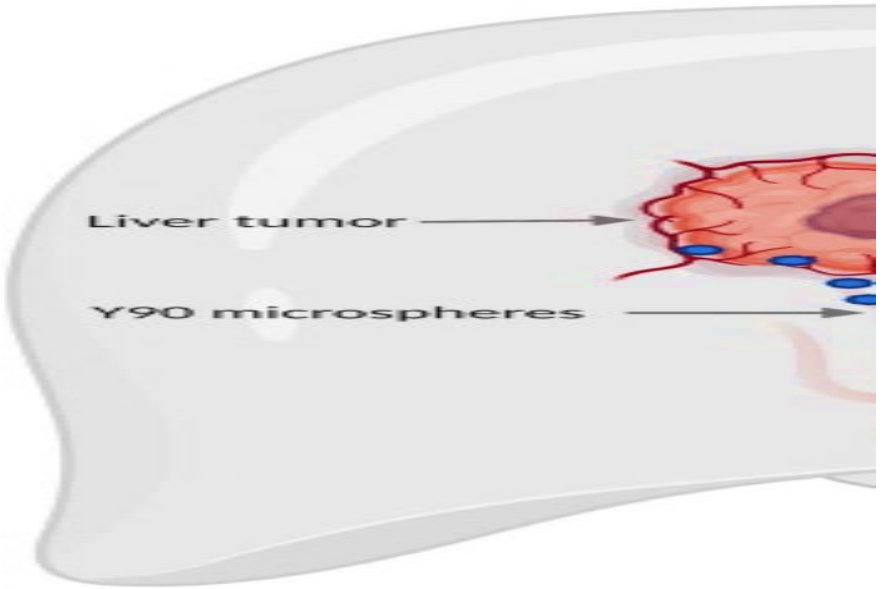
Prostate cancer cells express a certain receptor, called PSMA receptor.

Lutetium 177 PSMA-11, seeks PSMA receptors almost selectively, targeting only the diseased cells.

Trans Arterial Radio Embolisation (TARE)

Radioactive colloidal or micro-glass spheres are directly injected into tumors in liver.

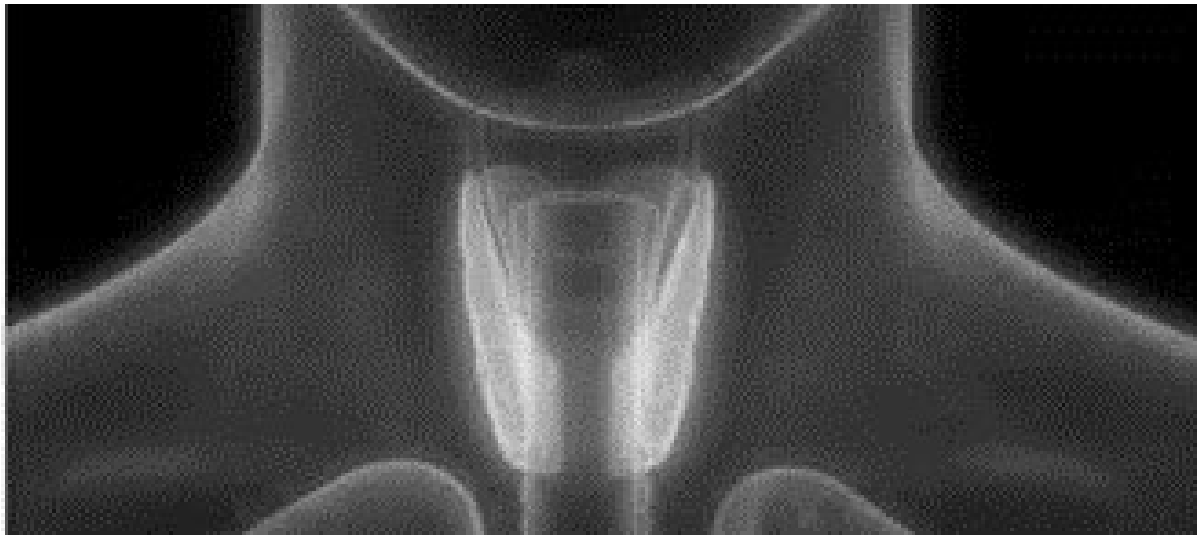
Yittrium 90 microspheres, gets lodged into tumor capillaries, locally irradiating tumors minimising systemic side effects



Radioactive Iodine therapy (RAI):

Thyroid requires iodine to be able to synthesize thyroid hormone. In thyroid cancer patients we inject radioactive form of iodine (I-131).

The thyroid takes it but being radioactive, it destroys thyroid cancer.



7. Think Globally, Act Locally - Implementable Research

CONCLUSION The addition of docetaxel to radiation improved DFS and OS in cisplatin-ineligible patients with LAHNSCC.

DOI https://doi.org/10.1200/JCO.22. 00980

Results of Phase III Randomized Trial for Use of Docetaxel as a Radiosensitizer in Patients With Head and Neck Cancer, Unsuitable for Cisplatin-Based Chemoradiation

Vijay Maruti Patil, MBBS, MD, DM[1]; Vanita Noronha, MBBS, MD, DM
Sarbani Ghosh-Laskar, MBBS, MD[2]; Ashwini Budrukkar, MBBS, M
Vijayalakshmi Mathrudev, BHMS, MBA[1]; Kavita Nawale, PGDCR[1];
Shruti Pathak, MSc[1]; Abhishek Mahajan, MBBS, MD[5]; Suman Ku
Archi Agarwal, MBBS, DNB[6]; Ameya Puranik, MBBS, DNB[6]; Shant
Harsh Sahu, MBBS, MD[1]; Venkatesh Kapu, MBBS, MD[1]; Sayak D
Madala Ravi Krishna, MBBS, MD[1]; Alok Shetty, MBBS, MD[1]; Nav
Rahul Rai, MBBS, MD[1]; Kunal Jobanputra, MBBS, MD[1]; Pankaj C
Devendra Chaukar, MBBS, MS[7]; Sudhir Nair, MBBS, MS[7]; Shivakun

THE LANCET
Global Health

ARTICLES | VOLUME 8, ISSUE 9, E1213-E1222, SEPTEMBER 2020

Low-cost oral metronomic chemotherapy versus intravenous cisplatin in patients with recurrent, metastatic, inoperable head and neck carcinoma: an open-label, parallel-group, non-inferiority, randomised, phase 3 trial

Prof Vijay Patil, DM • Prof Vanita Noronha, DM • Sachin Babanrao Dhumal, BHMS • Prof Amit Joshi, DM •
Nandini Menon, DNB • Atanu Bhattacharjee, PhD • Prof Suyash Kulkarni, MD • Suman Kumar Ankathi, MD •
h Sable, MD • Kavita Nawale, MBA • Arti Bhelekar, MSc • Sadaf Mukadam, MSc •
as, DM • Dilip Vallathol, DM • Hollis D'Souza, DM • Amit Kumar, DM •
• Narmadha Rathnasamy, MD • Ramnath Shenoy, MD • Lakhan Kashyap, MD •
n, MD • Saswata Saha, MD • Swaratika Majumdar, DM •
DM • Vasu Babu, MD • Prahalad Elamarthi, MD • Annu Rajpurohit, MD •
Srikanth, MD • Rahul Ravind, MD • Prof Shripad Banavali, MD •
ow less

Journal of Clinical Oncology > List of Issues > Volume 41, Issue 2 >

ORIGINAL REPORTS | Head and Neck Cancer

Low-Dose Immunotherapy in Head and Neck Cancer: A Randomized Study

Check for updates

Vijay Maruti Patil, MBBS, MD, DM[1]; Vanita Noronha, MBBS, MD, DM[1]; Nandini Menon, MBBS, MD, DNB[1]; Rahul Rai, MBBS, MD[1]; Atanu Bhattacharjee, PhD[2]; Ajay Singh, MBBS, MD, DM[1]; Kavita Nawale, PDCR[1]; Shweta Jogdhankar, MSc[1]; Rupali Tambe, BCom[1]; Sachin Dhumal, BHMS[1]; Riddhi Sawant, PDCR[1]; Mitali Alone, MSc[1]; Devanshi Karla, MSc[1]; Zoya Peelay, MSc[1]; Shruti Pathak, MSc[1]; Arun Balaji, MASLP[3]; Suman Kumar, MBBS, DNB[4]; Nilendu Purandare, MBBS, DNB[5]; Archi Agarwal, MBBS, DNB[5]; Ameya Puranik, MBBS, DNB[5]; Abhishek Mahajan, MBBS, DNB[4]; Amit Janu, MBBS, DNB[4]; Gunjesh Kumar Singh, MBBS, MD, DM[1]; Neha Mittal, MBBS, MD[6]; Subhash Yadav, MBBS, MD[6]; Shripad Banavali, MBBS, MD[1]; and Kumar Prabhash, MBBS, MD, DM[1]

Phase III Randomized trial for efficacy of Oral Metronomic Chemotherapy in palliative/ recurrent HNSCC

Phase III Randomized trial for efficacy of low dose nivolumab in palliative/ recurrent HNSCC

8. Skill development – Teach In India

Skilling at TMH					
M. Ch	DM	MD	M.Sc.	PG Courses	Specialised Courses
Surgical Oncology	Medical Oncology	Radiotherapy	M.Sc. Nursing (Oncology)	ADRT	Various HBNI 2 Years Fellowships
Gynaecological Oncology	Pediatric Oncology	Radiology	M.Sc. in Clinical Research	ADMIT	PhD Program in Life Sciences or Health Sciences
Head & Neck Surgery	Gastroenterology	Anaesthesiology	Patient Navigation	PGDFIT	
Plastic & Reconstructive Surgery	Critical Care Medicine	Pathology		Onco-Nursing	
	Onco Pathology	Nuclear Medicine	@TMH -1200 students per year. All our new centers will also run these courses.		
	Interventional Radiology	Microbiology			
		Palliative Medicine			
		IHBT			

- **Inter-disciplinary courses**
  - Diplomas
  - PhD
  - MSc
  - BSc
  - Workshops
  - Online Education

Since 2013

Unique Interdisciplinary PhD Program in Computational Biology

HBNI Board of Life Sciences

Highly diverse background of students

9. Integrative Medicine

Facility for cultivation, conservation of medicinal plants

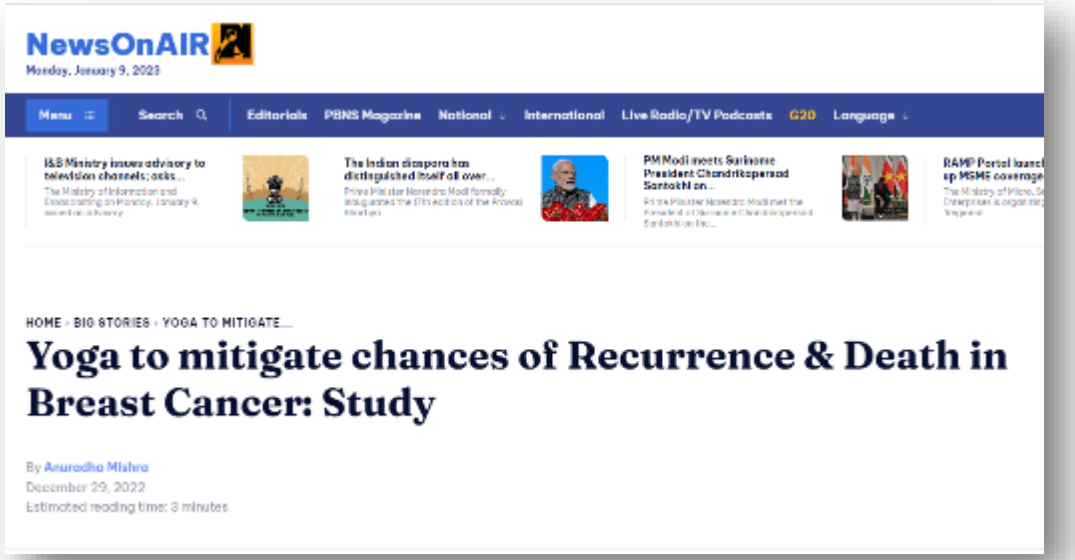
Applied Clinical Research facility including Radiotherapy, Chemotherapy and Surgery

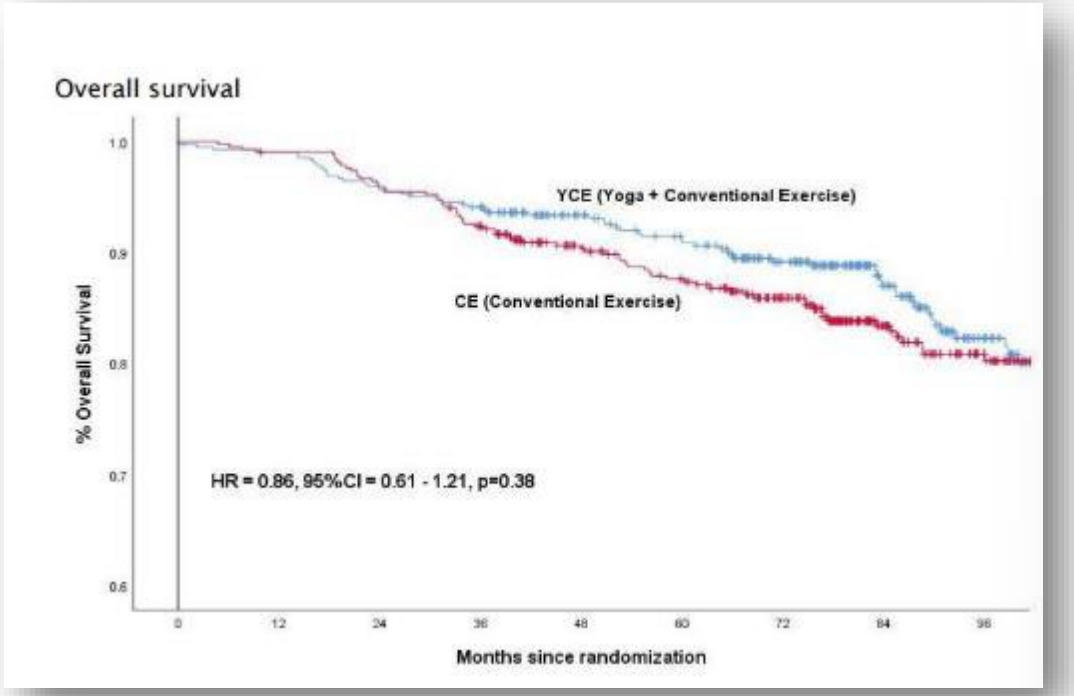
Integrative Center for Treatment, Research and Education in Cancer

Advanced facility for extraction, processing and formulation

State of the art facility for basic research in AYUSH related to Oncology

Skill Development in laboratory and health care for tribal population





The inclusion of Yoga resulted in a 15% relative improvement in disease free survival and 14% in overall survival.

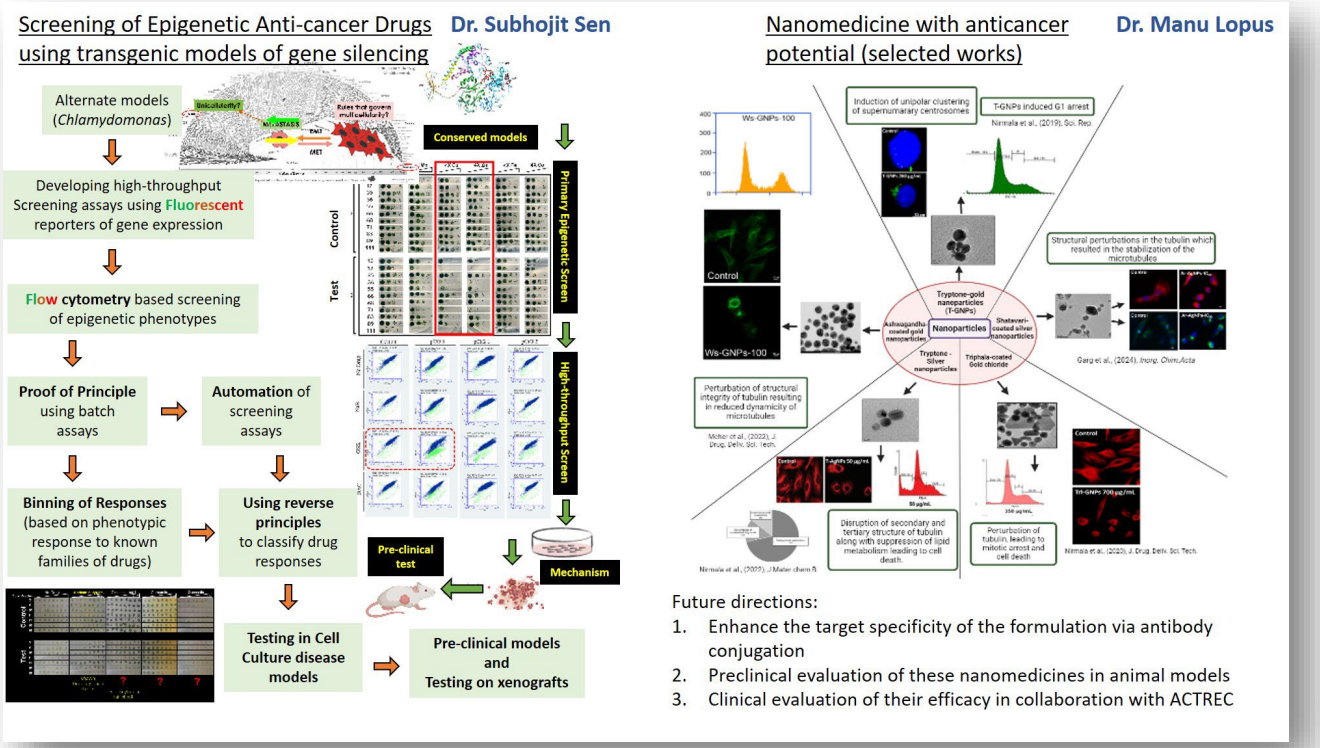
Herbal Drug Development at Tata Memorial Centre

Drug	Collaborator / Industry partner	Indication	Phase	Status
Curcumin	Pharmanza Herbals Pvt. Ltd	Oral mucositis associated with High-dose chemo conditioning in BMT	III	Ongoing
Resveratrol-Cu	Nutriventia	Multiple	II	Completed; FSSAI approval awaited
Chlorophyllin	BARC / IDRS Labs Pvt. Ltd	RT induced hemorrhagic cystitis in patients with pelvic malignancies	II	Completed; FSSAI approval awaited
Withania somnifera extract (WSE)	Pharmanza Herbals Pvt. Ltd	Steroid refractory graft versus host disease	II	Initiated
Oral cannabis	IIIM Jammu	Breast and oral cavity cancers	I	Completed
Cannabis Legyam	Ramaiah Ayurveda Hospital, Bangalore	Oral squamous cell carcinoma	I	To be initiated
Renogrit	Patanjali Research Institute	Cisplatinum induced kidney injury	II	Under IEC review
Mitocurcumin	BARC / JSS college of Pharmacy, Ooty	Platinum resistant lung cancer	Preclinical	Ongoing

Drug Discovery, drug efficacy and Repurposing

Harnessing traditional knowledge and phytochemical space of Indian medicinal plants for drug discovery and wellness research - IMSc

Current status: The group of A.S. has built IMPPAT, the largest resource to date on phytochemicals of Indian medicinal plants. IMPPAT 2.0 compiles information on 4010 Indian medicinal plants and their 17967 phytochemicals and 1095 therapeutic uses, and is a platform facilitating computational approaches towards traditional knowledge inspired and natural product based drug discovery.



Combating Multidrug Resistance (SINP)

- ❑ Bacterial AMR was directly responsible for 1.27 million global deaths in 2019
- ❑ National Health Policy 2017 of India highlighted this issue, and a National Action Plan was developed.
- ❑ Identify novel drug targets and study structure-function relation using ***Biophysical methods*** and leverage this structural information to ***design*** and ***deliver*** precision drugs.

10. Lets join hands in our mission to conquer cancer