

Building the Field of Neuroscience Research in India: The Centre for Brain Research

OVERVIEW: The Centre for Brain Research (CBR) at the Indian Institute of Science in Bengaluru, Karnataka is a pioneering research institution that conducts clinical neuroscience studies focused on brain disorders among the Indian population. CBR's first project addresses aging-related brain disorders.

ESTABLISHED: 2014

PRIMARY PHILANTHROPIST:
Kris Gopalakrishnan



GRANT AMOUNT:
INR 255 crores¹
(USD 38.5 million)
over 10 years



PRIMARY FOCUS:
Health—
clinical
research

ARCHETYPE: Build a field

CBR fills a deep knowledge gap in the field of longitudinal, cohort-based brain research in India.

KEY PARTNERS:

- Indian Institute of Science (IISc)
- Indian Institute of Technology Madras (IIT Madras)
- National Institute of Mental Health and Neurosciences (NIMHANS)
- Sri Devaraj Urs Medical College

QUICK FACTS

WHY BOLD?

CBR fills a white space in the field of brain research by conducting long-term studies to better understand the factors that cause and protect against dementia in the Indian population. CBR emphasizes a collaborative approach through a public-private partnership within India and by partnering with local and global research institutions. It aspires to build the first India-specific reference genome, which will help scientists across disciplines, not just in brain research.

KEY LEARNINGS



Use philanthropic funding as risk capital to seed less-funded initiatives



Fill knowledge gaps that catalyze efforts across the field



Collaborate with partners to accelerate progress

¹ Conversion rates (INR to USD) reflect rates available during the April 2018 to June 2018 time period.

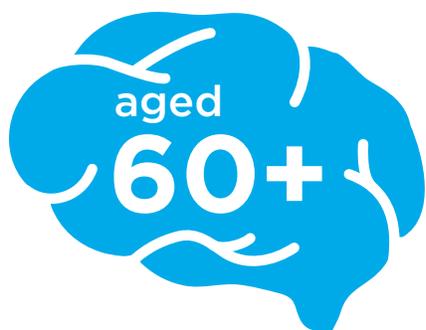
THE OPPORTUNITY FOR IMPACT

As India's population continues to grow, the country is wrestling with a sprawling health burden: escalating neurological disorders.

It is estimated that more than 30 million Indians are living with some type of neurological disorder, such as epilepsy, stroke, and tremors, a number which has steadily been rising in recent years.² For example, while the overall rate of stroke in developing countries has declined by more than 40 percent over the past four decades, India's stroke incidence has doubled, affecting approximately 1.8 million people annually.³



4.1 million Indians



live with dementia

Another worrisome trend is the rising incidence of dementia, a neurodegenerative disorder that causes loss of cognitive function. Alzheimer's Disease International estimates that as of 2015, about 4.1 million Indians, roughly 5 percent of the country's population of individuals 60 years and older, are living with dementia, for which there is no effective cure.⁴ By 2030, the number could double to 8 million, partly because India's elderly population is growing faster than the country's total population.⁵

In India, clinicians have found that fighting dementia is especially challenging. Large swathes of India's population are unaware of its various forms, including Alzheimer's and Parkinson's disease, and their related risk and protective factors. Among this population, memory loss and brain degeneration, two of dementia's

most profound symptoms, are viewed as inevitable signs of aging. As a result, significant portions of the country's dementia cases remain undiagnosed and untreated.

In the context of India's growing incidence of neurological disorders, the quantum of investment in scientific research in the country is particularly sobering. Whereas countries like China, South Korea, and the United States invest 2 to 4 percent of their GDP in research every year, India only invests about 0.8 percent of its GDP in scientific research.⁶ Of the research that is pursued, few projects, if any, are large scale and longitudinal in nature. Rather, the bulk of research is funded by short-term government grants, typically lasting three to five

2 M Gourie-Devi, "Epidemiology of neurological disorders in India: Review of background, prevalence and incidence of epilepsy, stroke, *Parkinson's disease* and tremors," *Neurology India*, Vol. 62, Issue 6, (2014): 588-589. (Abstract)

3 Lipilekha Patnaik, Himanshu Sekhar Sahoo, and Trilochan Sahu, "Awareness of the warning symptoms and risk factors of stroke among adults seeking health care from a rural hospital of India," *Annals of Indian Academy of Neurology*: 18(4) (2015 Oct-Dec): 487-488.

4 Martin Prince, Anders Wimo, Maëlynn Guerchet, Gemma-Claire Ali, Yu-Tzu Wu, Matthew Prina, *World Alzheimer Report 2015 The Global Impact of Dementia An analysis of prevalence, incidence, cost and trends*, Alzheimer's Disease International, (August 2015): 25.

5 Ibid: 22.

6 "India's R&D spend stagnant for 20 years at 0.7% of GDP," *The Economic Times*, January 29, 2018.

years. As a result, India lacks foundational research infrastructure, such as a comprehensive neuroscience data repository, which would serve as a critical resource for future investigations into brain function and genomics. Whereas India has yet to complete a wide-scale genome mapping project, countries such as the United States, United Kingdom, and Japan initiated this type of research in the early 1990s.

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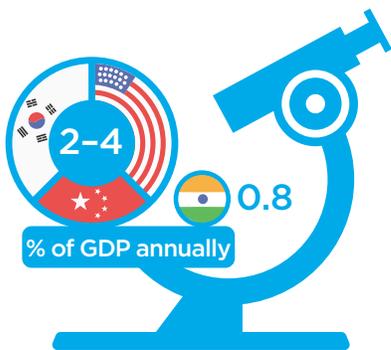
Kris Gopalakrishnan

One of India’s biggest challenges in its fight against neurodegenerative diseases is to fill this gap in knowledge. Only then will India be able to improve the quality of life of its growing population of aging citizens by developing better preventative and treatment strategies for dementia.

A BOLD INVESTMENT IN BRAIN RESEARCH

In 2014, Kris Gopalakrishnan, the former executive vice chairman of Infosys, one of the country’s largest IT companies, worked with faculty at the Indian Institute of Science (IISc) to launch the Centre for Brain Research (CBR), whose purpose is to address this critical knowledge gap. CBR is the result of a unique partnership between the public and private sectors. Mr. Gopalakrishnan privately funds CBR, which is an autonomous institution situated in the Bengaluru-based campus of IISc, one of India’s premier higher education institutions. CBR’s founding also set a new philanthropic benchmark, as Mr. Gopalakrishnan’s donation is the largest investment by an individual in scientific research in India’s history.

GDP spend on scientific research



“I am hopeful that this investment will trigger other people to contribute to [health] research,” says Mr. Gopalakrishnan. “It is an area that I am very passionate about and it is something we need as a nation.”

Faculty at CBR conduct clinical research, with a current focus on understanding how the human brain ages and whether novel therapies can be developed to prevent brain degradation. As Mr. Gopalakrishnan puts it, “We are going to make an impact in India by addressing a looming question: ‘How do we take care of our elderly people?’” In the long run, Mr. Gopalakrishnan is hopeful that through CBR’s work a cure for Alzheimer’s disease may one day be developed.

CBR is unlike other Indian research institutions as it focuses on long-term, longitudinal research projects. It aims to build a foundational brain research infrastructure that is specific to India by collecting clinical data from a large and diverse population of Indian research participants. A fully evolved infrastructure, CBR faculty argue, will enable long-term research initiatives related to the human brain, such as investigations that aim to identify indicators of dementia and factors that might prevent or delay the disorder’s onset.

With the exception of the Centre for Neuroscience at IISc, which is conducting a small research project that longitudinally tracks an urban cohort of 500 individuals, no other institution in the country focuses on long-term, cohort-based research projects designed to better understand how the brain ages. Thus, CBR acts as a “field builder”: an intermediary that aims to fill knowledge gaps in the field of neuroscience research that are specific to India, contribute to India’s science infrastructure, and thereby enable real progress towards reversing the rate of neurological disorders in the country.

“We are looking at a goal that is global, ambitious, and audacious: a cure for Alzheimer’s. That is a big ask,” says Mr. Gopalakrishnan. “We are also demonstrating that India can conduct world-class research. And because of our traditional knowledge of Ayurveda, yoga, meditation, and our multilingual capabilities, we are contributing unique knowledge to solving the problem, which could interest others in working with us.”

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In addition to funding clinical brain research at CBR, Mr. Gopalakrishnan is also funding six chair professorship positions over the next 10 years—three each at IISc and the Indian Institute of Technology Madras (IIT Madras), another of India’s leading higher education institutions. These chair professors are global leaders in brain research and are responsible for forming research cohorts—comprised of faculty and students at each institution—that pursue brain-related multidisciplinary research initiatives. The chair professorship cohorts conduct computational brain research that focuses on using advanced technology to understand basic brain architecture and function. Mr. Gopalakrishnan hopes that this research will result in the development of cutting edge technology and computing methods that could be commercialized, as well as significantly inform CBR’s research pursuit of finding a cure for Alzheimer’s.

HOW THE INITIATIVE CAME TO LIFE

Mr. Gopalakrishnan’s decision to invest in neuroscience stemmed from his interest in brain function and his desire to contribute to the development of India’s basic research ecosystem. His belief that private actors have a role to play in spurring the sector was another motivator. “Of the 0.8 percent of GDP that India invests in scientific research annually, only 0.2 percent comes from philanthropy,” he says. “If this is to change, I need to walk the talk and invest in research myself. India has the institutions and the talent—we just need the funding in order to develop the field.”

Once he decided to fund the establishment of CBR in Bengaluru, Mr. Gopalakrishnan consulted with faculty from IISc and identified two key gaps in clinical research in India. First, India lacks sufficient data on genomics and the prevalence of neurodegenerative diseases, like Alzheimer’s and Parkinson’s. Second, there is insufficient understanding around risk and protective factors, and therapies that can preserve cognitive functions through early diagnosis and intervention. Through its research, CBR aims to narrow both gaps.

Mr. Gopalakrishnan's conception of CBR's work also involved establishing collaborative partnerships with local and international research and medical institutions. The goals of these collaborations are to: gain technical support, ensure that CBR adheres to global scientific standards, and promote knowledge sharing by and with international research institutions. "If India collaborates with the rest of the world, we can jump-start research in the country," says Mr. Gopalakrishnan. "It is a sunrise sector for India."⁷

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HOW THE INITIATIVE WORKS

Mr. Gopalakrishnan funds CBR's research programs through the Pratiksha Trust, which will provide INR 225 crores (USD 34 million) over 10 years. The Trust has also committed an additional INR 30 crores (USD 4.5 million) to construct a purpose-built facility for CBR, which will be completed by 2019 on the IISc campus.

Pratiksha Trust will contribute



+ ₹30 crores
(USD 4.5 million)

to construct a purpose-built CBR facility on the IISc campus



Currently, CBR is engaging in two noteworthy research efforts, SANSCOG (Srinivasapura Ageing Neuro Senescence and Cognition) and Genome India, led by three faculty members (Dr. Ganesh Chauhan, Dr. Bratati Kahali, and Dr. Smitha Karunakaran) and a director who oversees the institution (Dr. Vijayalakshmi Ravindranath).

Over the course of 20 years, SANSCOG seeks to collect biological, genetic, and behavioral data from 10,000 individuals over the age of 45. Research participants all live in Srinivasapura Taluk, in Karnataka's Kolar district. Given the initiative's broad scope, SANSCOG researchers are partnering with the National Institute of Mental Health and Neurosciences (NIMHANS), which has deep relationships with the local government and community stakeholders, and plays a vital role in overseeing field research logistics and codeveloping research protocol. CBR also collaborates with the Sri Devaraj Urs Medical College, which provides medical services to the study's participants.

SANSCOG represents the kind of long-term initiative that is essential for building an infrastructure that can enable further scientific research. Because the project focuses on middle-aged people living in rural areas instead of cities, it may surface unique risk and protective factors for dementia among the bulk of India's aging rural population.

⁷ Raghu Krishnan, "By getting into brain research, we gain and so does the world: S Gopalakrishnan," *Business Standard*, January 05, 2016.

The SANSCOG data repository will allow CBR researchers to identify various biological and lifestyle factors that could indicate the potential risk of developing dementia. With this information, researchers could develop experimental interventions aimed at treating and mitigating dementia's effects, and even preventing or delaying its onset. The project also aims to enhance the government's and the media's awareness of general healthcare issues associated with aging in rural communities, as well as help clinicians identify and treat other disorders that may be revealed during medical examinations, especially when they are still in their early stages.

CBR is spearheading its second project, Genome India, in partnership with 16 other research institutions. As its name implies, the project aims to develop an India-specific reference genome, which seeks to provide a good approximation of much of an average Indian's DNA. Researchers from CBR and its partner institutions are collecting genetic data from at least 1,000 individuals across India, in order to represent the country's diverse ethnic makeup. Once the reference genome is developed, scientists around the world can use it to conduct genetic research that specifically applies to the Indian population. A reference genome will also significantly reduce the cost of researching how genetics give rise to a variety of chronic diseases that affect people living on the Indian subcontinent.



Kris Gopalakrishnan (fourth from left) signs a memorandum of understanding with IISc, initiating the construction of a dedicated CBR facility on the Institute's campus. Dr. Vijayalakshmi Ravindranath (fifth from left) serves as the director of CBR. (Photo: CBR)

PROGRESS AND RESULTS

Given CBR's focus on long-term research and its establishment three years ago, it is too early to measure results. However, CBR has made progress on defined milestones such as designing and launching the SANSCOG project. In its first year, CBR formed partnerships with NIMHANS and Sri Devaraj Urs Medical College and secured government support for

its research activities in Kolar, Karnataka. SANSCOG researchers also recruited participants for the 20-year program and comprehensively assessed the first batch through physical and cognitive tests with the support of medical doctors from NIMHANS. Genome India is also in its early stages; to date, CBR has attracted dedicated research partners across the country, such as the Rajiv Gandhi Centre for Biotechnology in Kerala and the Institute of Bioresources and Sustainable Development in Manipur, and is working with them to develop data collection protocol.

Notwithstanding its progress, CBR is encountering some recruiting challenges. Chief among them is the shortage of highly qualified science research staff in India, especially compared with the United States and Europe. CBR faculty members indicated that many accomplished Indian researchers prefer to work abroad, rather than in India, due to higher funding and better infrastructure. CBR is also finding it difficult to attract enough medical doctors to help the SANSCOG team collect biological data, as many prefer careers in providing critical medical care than in conducting research.

An International Scientific Advisory Board comprised of leading neuroscience researchers advises CBR on critical aspects of the project such as data collection and analysis. CBR faculty disseminate their research findings in peer-reviewed science journals and at international conferences. For example, in February 2018, faculty at the IISc Centre for Neuroscience and CBR coauthored a paper that was published in the *Journal of Neuroscience*, indicating a possible biomarker for Alzheimer's.

LOOKING TO THE FUTURE

The CBR team's first challenge is to identify risk factors that signal the onset of dementia and protective factors that might delay or even prevent it. If researchers succeed on that front, they then plan to develop and test experimental therapies aimed at reducing dementia's burden on the Indian population in collaboration with the chair professorship research cohorts at IISc and IIT Madras.

To achieve this, CBR's leaders aim to recruit more faculty and initiate new research studies (apart from SANSCOG and Genome India). What is clear is that any future study design will continue to be longitudinal and cohort-based. To finance future projects and secure collaborations to further brain research in India, CBR is also looking to secure additional funding streams that deepen Mr. Gopalakrishnan's investment. CBR is expecting to receive additional funding through Tata Trusts' Elderly Care, Wellness and Engagement Programme, which provides monetary support to initiatives that aim to improve the quality of life of elderly people.

LEARNINGS TO DATE

Use philanthropic funding as risk capital to seed less-funded initiatives. Philanthropic capital has the potential to be flexible and risk tolerant, and can therefore support initiatives that might be overlooked by other funding sources. Mr. Gopalakrishnan put his philanthropy to work in an area that neither the public nor corporate sectors have fully embraced: he is privately funding long-term brain research. Unlike public research funding, which is typically supported by comparatively short-lived grants, Mr. Gopalakrishnan's 10-year

funding stream enables CBR's faculty to pursue projects with more distant horizons, demonstrating his risk appetite and commitment to finding a cure for Alzheimer's.

Fill knowledge gaps that catalyze efforts across the field. Field builders typically work to help multiple actors build capacity and achieve a shared, ambitious goal. As the field evolves and new needs and challenges emerge, it is often the field builder that fills the voids in knowledge and skill sets. By conducting original research that might one day help clinicians learn and improve, CBR is filling knowledge gaps in neuroscience.

Specifically, Mr. Gopalakrishnan identified key gaps in the field, including the dearth of hard data on the prevalence of dementia in India and the need to better understand dementia's risk and protective factors. Having pinpointed the field's white spaces, he then decided to fund long-term, basic neuroscience research, a crucial part of developing a foundational research infrastructure in India. Once CBR builds them, its data repositories and an India-specific reference genome will likely augment the efforts of many actors—including the computational brain researchers at IISc and IIT Madras—who are working to stem the spread of dementia and other neurological disorders.

Collaborate with partners to accelerate progress. Funders and nonprofits increasingly recognize that no single organization, no matter how successful, can solve a complex problem at scale. CBR's leaders, who are building strong relationships with external partners in order to leverage their unique strengths, understand that it takes teamwork to achieve ambitious goals.

Consider CBR's collaboration with NIMHANS, which has been instrumental in attracting participants for its longitudinal study. Thanks to NIMHANS' close ties with Kolar's health system, CBR was able to secure buy-in from Kolar health officials and enroll study participants from the local community. NIMHANS, through its medical doctors, has also helped CBR collect biological data from study participants. Similarly, CBR's partnership with the Sri Devaraj Urs Medical College, which provides subsidized care for any study participant who is diagnosed with health issues, enabled research teams to enroll eight out of every 10 individuals they approached for the SANSCOG research project. Study participants are enrolled on a voluntary basis and CBR has established safeguards to ensure the security of study participant data. CBR's collaborative mindset is proving fruitful, especially since CBR is taking on large-scale projects.

CBR's long time horizon and its focus on building a research infrastructure has the potential to significantly impact India's health research landscape and ultimately catalyze the entire field.

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