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Clinical research training and capacity building for prevention and control of non-communicable diseases: A programme in India

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ABSTRACT

Background. Non-communicable diseases (NCDs)—a term which includes diabetes, cardiovascular disease, cancers, chronic respiratory diseases, and mental illness—are now the major cause of death in India and pose healthcare and economic challenges. There is an urgent need for enhanced clinical research training and capacity building for NCD prevention and control in India.

Methods. We describe a multi-pronged approach funded in part by the US National Institutes of Health Fogarty International Center, which was initiated in 2001, to train Indian present and future scientists/doctors in NCD prevention and control. The approaches used were annual national seminars, intensive training courses, in-house workshops, short-term training sessions in the USA and monthly video conferences.

Results. During 2001–2016, a total of 3650 undergraduate, postgraduate and faculty from medical colleges and institutes from almost all states in India and several neighbouring

countries participated in seminars and other capacity-building workshops held at the Madras Diabetes Research Foundation, Chennai and at six other medical colleges; 883 delegates participated in the in-house workshops, 463 in the intensive interactive sessions; 244 in workshops on advanced techniques in genomics; and 37 in short-term training sessions held in the USA.

Conclusion. Through this unique capacity-building programme, more than 5000 individuals representing faculty and students from various medical colleges and research institutes across, and beyond, India, underwent training in the prevention and control of NCDs.

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INTRODUCTION

The key issues for a training programme are a compelling need as well as the availability of a suitable training model. Early in the 21st century, we faced this issue in the context of non-communicable diseases (NCDs) in India. The need was, and continues to be, compelling since the prevalence and incidence of diabetes and other NCDs are increasing dramatically in India—and in many other low- and middle-income countries (LMICs). Further, the number of medical colleges in India has grown substantially in the past 10 years from less than 200 to now more than 400, and this growth is expected to continue. Importantly, each postgraduate trainee is required to complete a research project so that these colleges are expected to undertake much more research than had previously been the case. This represents several hundred new research projects each year. This is both an opportunity and a challenge since this process will generate much larger numbers of competent researchers than have previously been available, but the current demands on training are high. This mixture of the burgeoning burden of NCDs and new medical colleges with both new faculty and a mandate to do more research signals that clinical research training and institutional capacity building were, and continue to be, an urgent need, highlighting the critical need for training programmes such as the one described below.

The spread of NCDs such as diabetes, cardiovascular disease, stroke, cancer, respiratory diseases and mental health presents a global crisis and is a major barrier to meeting the Sustainable Development Goals.¹ Of the 57 million deaths that occurred globally in 2008, 36 million (almost two-thirds) were due to NCDs; the burden of these diseases is rising disproportionately among the populations of LMICs, with nearly 80% of NCD deaths

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(29 million) occurring in these countries in 2008² and 60% of all deaths due to NCD in India.³

With 72.9 million people with diabetes at present, projected to increase to 134.3 million by 2045 by the International Diabetes Federation (IDF), India ranks second in the world,⁴ and will soon hold the dubious distinction as the world leader in diabetes and hypertension as well. In view of these compelling numbers, the government has initiated a National Programme for Prevention and Control of Diabetes, Cardiovascular Diseases and Stroke.⁵ NCDs are a critical health and development issue in India. A key component to realizing progress against NCDs in India is sufficient capacity at the national level to implement effective strategies for NCD prevention and control.

Against this background, we focused on the critical issue of clinical research training and capacity building relevant to NCDs. It was planned to use the degree-seeking model of sending delegates from India to the USA for master's and doctoral degrees. It soon became apparent, however, that this strategy, for a number of reasons, was unlikely to have sufficient impact. Thus, the focus shifted on institutional capacity building and clinical research training in a manner that attempted to enhance and maximize scientists, educators and research and training institutions available in India. Initially, the Madras Diabetes Research Foundation (MDRF) in Chennai was targeted. For clinical research training, the focus was on undergraduate and postgraduate medical students, fellows, faculty and institute staff from across India with our national seminar and intensive interactive sessions.

This paper describes our strategy and the success of our programme, funded by the Fogarty International Center (FIC), National Institutes of Health (NIH), USA initially as the International Clinical, Operational and Health Services Research and Training Award (ICOHRTA) to the University of Alabama at Birmingham (UAB). Later, funding was from a FIC NCD LifeSpan Program awarded to Florida International University (FIU). MDRF, the major collaborator in India, UAB and the University of Minnesota (UMN) were involved from the beginning.

OBJECTIVES OF THE PROGRAMME

The main goal was to create awareness of the burgeoning burden of NCDs and to create a network of scientists across India equipped with useful skills for the prevention and control of NCDs. The specific objectives were:

1. To strengthen capacity of various institutions in India to conduct research in NCDs, to assess the magnitude of NCDs and to undertake interventions to reduce the burden of NCDs in their respective regions.
2. To support multidisciplinary research training in basic, genetic, clinical and implementation sciences (translational) in the field of NCDs
3. To integrate our efforts with others doing similar work to strengthen core research capacity in NCD prevention and control in India and neighbouring countries.

Initially, for capacity building, the focus was on enhancing the capabilities of MDRF; later these efforts were extended to more institutions. The areas of training were research strategy, research methods, biostatistics, epidemiology, data management, laboratory methods, nutrition, genomics and genetics. Training activities focused on staff, investigators, teams and students, by holding mostly seminars, workshops and individual or team-work sessions. For institutions beyond MDRF, workshops and team-work sessions that focused both on enhancing institutional capacity and on

enhancing the skills of clinical research personnel were conducted. These were Karamsad Medical College, Anand (KMC, Anand), Gujarat; Kasturba Medical College, Manipal (KMC, Manipal), Karnataka; Guwahati Medical College (GMC), Guwahati, Assam; Fakhruddin Ali Ahmed Medical College (FAAMC), Barpeta, Assam; Pondicherry Institute of Medical Sciences (PIMS), Puducherry, Tamil Nadu, and the North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences (NEIGRIHMS), Shillong, Meghalaya. Programmatic planning and overview of the programmes were undertaken with the help of the Internal Advisory Group (IAG). The IAG plays a central role in trainee selection and programme activities and evaluation, and also interacts with the Training Advisory Group (TAG), which provided advice and assistance with trainee selection.

METHODS

A multi-pronged approach was developed, implemented and continuously refined to enhance clinical research training and capacity building. The components are discussed below.

National seminar

A national seminar on 'Prevention and control of NCDs' was conducted annually at MDRF, with faculty from the USA (UAB, FIU and UMN), MDRF and from across India for two-and-a-half days. Faculty were distinguished scientists and physicians from prestigious institutes and medical colleges, who were selected on the basis of their expertise in the field of NCDs. The details of the programme were posted on the website and individuals were invited by sending flyers and emails to various academic institutions. All interested individuals attended the programme. The programme had lectures on key current NCD epidemiology and prevention topics, research methods and ethics, study procedures, and how to translate research to practice and to the community. Workshops on the WHO STEPwise approach to Surveillance (STEPS) Programme and group assignments on designing prevention/intervention studies for different NCDs and their risk factors were added. Interactive workshops on research project development and implementation, ethics, and critical review of published articles to help participants better understand and use the literature and organizing and preparing their articles were also included.

Intensive interactive training course

In response to feedback from initial seminar participants, a two-and-a-half day intensive component was added in 2004. The objective was to enhance the ability of participants to conceptualize, design, implement, analyse and critique various NCD research projects. Participants submitted proposals describing a research project either being planned, under way or at the analysis stage. The research projects of the participants were graded by the faculty on the basis of the study design, analysis plan, quality and those consistent with the training objectives and selected for presentation. Initially, the course was restricted to 10 participants, but the sessions became so popular that two levels were created, core participants and observer participants, with about 30 presentations every year. These sessions represent a 'train the trainer strategy,' whereby participants can pass on knowledge to others in their home institution.

In-house workshops

These were primarily intended for MDRF faculty and staff, and had several days of training by the team from USA while they were

at MDRF in February/March of each year. The workshops had:

1. Sessions with PhD students reviewing their thesis projects;
2. Sessions with research staff on their ongoing and planned research; and
3. Lectures and seminars for research staff and physicians covering topics ranging from updates on NCD epidemiology, research methods, updates on genomics and proteomics, a short course on biostatistics or recently published landmark studies.

National workshop for faculty

Three half-day faculty forums were conducted as another method to strengthen NCD training in India. The workshop on the curricula for community medicine training in 2011 to ascertain the focus on NCDs: How teaching strategies relevant to NCDs can be enhanced, innovations and joint research projects shared and undertaken across colleges and regions in India was discussed. In the following year, a half-day workshop on 'Prevention and control of NCDs through nutrition' was organized, with faculty discussing solutions to specific problems related to NCDs from the nutrition point of view and major challenges/barriers on addressing NCDs. In 2013, a workshop on 'Physical activity in India—Taking it forward' was organized. The purpose was to focus on ways to improve physical activity among adults and children in India. Various scenarios were identified such as the workplace, schools, colleges, etc., which can be targeted for improvement in physical activity and recommendations to improve the current scenario in the various sectors were discussed. In each case, experts in the respective field were invited to MDRF for the sessions. These sessions were judged, while informative and helpful, not sufficiently effective for their continuation so they were dropped in favour of more time for the intensive interactive sessions.

Seminars/workshops at other institutions/medical colleges in India

Given the success of the programme for MDRF, it was expanded to other institutions, with the first being a half-day workshop at KMC, Anand, Gujarat in 2009. Next was an initial workshop at KMC, Manipal, Karnataka followed by three annual research meets. These research meets also had faculty and students from other local medical colleges, especially from the Mangalore campus. These workshops focused on guiding participants in research methodology, such as study design, biostatistics and data management. The meetings were organized with a special focus on undergraduates and postgraduates in general and community medicine but also included nursing, physiotherapy and PhD students.

At the specific request of the Indian Council of Medical Research, a focus was added on the Northeast. The institutions that participated were GMC in Guwahati, Assam; the FAAMC in Barpeta, Assam; and NEIGRIHMS in Shillong, Meghalaya. The GMC workshops had faculty from across the college and also from other local colleges. The half-day workshop at FAAMC was the first research seminar/workshop this new college had held. Those who attended were the college leadership, faculty and the initial class of first year medical students. The sessions at NEIGRIHMS had presentations on several topics relevant to NCD research methodology and were attended by the director, faculty, staff, students and postgraduates of NEIGRIHMS and other local colleges.

Short-term training in the USA

This component offered intensive short-term training in the USA to staff of MDRF and collaborating institutions in key areas of

research to enhance knowledge and fill existing gaps in skills. The trainees were selected from various departments at MDRF, such as Epidemiology, Nutrition, Biostatistics, Genetics, Biochemistry, Clinical trials and cell and molecular biology. The training typically was for 4–6 weeks and was conducted at different institutions across the USA. As a part of the training, all participants were required to complete the online University of Miami Collaborative Institutional Training Initiative (CITI) course on the responsible conduct of research. For some years, the training was conducted during September so that trainees on site at UAB could participate in the Vocabulary of Research course operated by UAB's Clinical and Translational Science Awards (CTSA) for medical fellows and researchers. Topics ranged from ethics to study design, biostatistics and epidemiology. Staff trained at MDRF have increased MDRF's capacity in key research areas such as data collection procedures, data management, informatics, study operations and statistical analyses. For faculty and investigator-level participants, the focus was on research methods, biostatistics, epidemiology, study design and management.

Video conferences

A critical component of the success of the programme was 1-hour video conferences twice a month. At the outset, one of these sessions was devoted to overall programme development and management and one was for joint scientific seminars. Technical challenges and the time difference made the seminar strategy less successful than it was expected so this activity was dropped and both sessions focused on programme operations.

Genomics/genetics workshops

This collaboration helped in the implementation of a series of genomics training sessions, with lectures on genomics, genomic studies and workshops held in 2010–12 and 2014. This was a separate set of training sessions, spanning 3- or 4-day periods, with attendees focused on genomic studies. Geneticists from various institutions and MDRF were invited as faculty for this workshop. The participants for this workshop were students interested in learning various hands-on techniques in the field of genetics. These activities included lectures and hands-on demonstrations of basic molecular biology procedures and then advanced and recently developed methodologies of genetic analyses, including next generation methodologies.

RESULTS

The seminar participants between 2003 and 2016 came from all over the country. The international seminar played a critical role in building awareness and credibility for research in the field of NCDs not only in India but also in the Southeast Asia region. The annual training seminars which started as national became international in scope with participants from Bhutan, Cambodia, Maldives, Nepal, Sri Lanka, Thailand, Vietnam and some from the USA. However, the major focus was on undergraduates, postgraduates and faculty from India's medical colleges, primarily from community medicine departments with 1471 representatives from most states in India, including the northeastern states.

Of the 1471 delegates, undergraduate and postgraduate students, epidemiologists and community health specialists in NCD research from 96 institutes and medical colleges from all over India and other countries participated in the national seminar; 463 delegates in the intensive interactive sessions; 883 in the MDRF in-house workshops, some several times; 244 in the training on advanced techniques in genomics; and 37 in short-term training in the USA,

TABLE I. Number of delegates who attended the training and capacity-building programmes, classified by type of training activity and year for sessions held at the Madras Diabetes Research Foundation and in the USA, 2002–2016

Activity	Year												Total
	Before 2006	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Training in USA	12	–	4	4	4	4	2	3	–	3	1	–	37
National seminar	291	113	103	101	106	108	112	100	116	103	102	116	1471
In-house workshops	116	70	61	68	65	70	68	70	75	75	70	75	883
Intensive seminar	20	19	28	33	30	32	45	53	61	53	47	42	463
Genomics workshop	–	–	–	–	50	54	55	15	–	41	29	0	244
Total	439	202	196	206	255	268	282	241	252	275	249	233	3098

TABLE II. Number of delegates who participated in clinical research and capacity-building training workshops, 2009–2016

Medical college	Year							Total
	2009	2011	2012	2013	2014	2015	2016	
Karamsad Medical College, Anand, Gujarat	45	–	–	–	–	–	–	45
Kasturba Medical College, Manipal, Karnataka	–	145	151	200	200	250	–	946
Government Medical College, Guwahati, Assam	–	195	205	195	–	–	–	595
Fakhruddin Ali Ahmed Medical College, Barpeta, Assam	–	–	–	151	–	–	–	151
Pondicherry Institute of Medical Sciences, Puducherry	–	–	–	–	–	143	102	245
North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences, Shillong	–	–	–	–	–	–	197	197
Total	45	340	356	546	200	393	299	2179

* No activity in 2010

18 of whom were women and 3 were from India’s northeastern region (Table I). Over 3000 delegates from various medical colleges participated over the years, some attending more than once.

A total of 2179 delegates participated in clinical research and capacity-building training workshops during 2009–2016 (Table II). One workshop at KMC, Manipal in 2015 had 6 platforms and 65 poster presentations.

DISCUSSION

A long-standing example of NCD-focused short-term training is the Ten-day International Teaching Seminar on Cardiovascular Disease⁶ with the 47th Annual Session in Fiji in 2015. These sessions, typically with a strong international faculty and 36 international scholars, were held in Mysore, India, in 2014. Two other important examples are the American Heart Association Ten-day Seminar on the Epidemiology of Prevention of Cardiovascular Disease⁷ initiated in 1975, typically with 32 scholars per year, and the American Thoracic Society Methods in Epidemiological, Clinical and Operations Research Program launched in 1994.⁸ The latter is an extensive programme which imparts training for clinical practice as well as for research methods in many countries, including India, and has now trained at some level over 1000 trainees. Until very recently most public health training programmes in India, undertaken largely by the departments of Preventive and Social Medicine or Community Medicine of medical colleges, focused on the problems of communicable diseases, health, hygiene and undernutrition. There were few training opportunities focusing on prevention and control of NCDs, which led to the evolution of the ICOHRTA programme.

This programme evolved over time, in response to feedback received from faculty and delegates, the evaluation process, and to the changing needs in India. Fourteen national seminars were conducted between 2003 and 2016. Annual training seminars

were the focal point for increasing awareness of diabetes and NCD burden in India and neighbouring countries. The approach to addressing the NCD issue in India via training workshops in various institutions apart from MDRF has been popular. The focus was on increasing capacity in clinical, translational and implementation science across India, and beyond, and on addressing the research needs associated with this burden.

Notably, 8 of the 37 short-term trainees have completed their PhDs, 6 others already had MDs or PhDs and several now have responsible positions at their institutions, including one Head of Medicine. Of these short-term trainees, 8 have been granted 24 projects by various international and national funding agencies. Importantly, about 25 of the delegates for the MDRF in-house workshops have now completed their PhDs and several more are in progress. MDRF researchers have published over 400 articles in peer-reviewed journals since 2002.

Some who initially attended the intensive interactive sessions subsequently served as faculty for the national seminar. Capacity building was enhanced by providing training for 9 district nodal officers from six states for the National Prevention and Control Programme for Diabetes/Cardiovascular Disease/Stroke (NPDCS).

The collaborative training programmes have played a critical role in building awareness and credibility for research and for research careers in the field of NCDs among scientists not only at MDRF but in several medical colleges across India. Within a span of 14 years, over 5250 physicians, community medicine and public health specialists have been trained through a network of 122 physicians and scientist, both international and national, working in the field of NCDs. With this collaboration the research capacity of MDRF has been increased due to the training opportunities that the grant has provided and are bringing this new knowledge to bear on the ongoing research. Leaders and staff have benefited by receiving practical guidance, research and statistical skills, and gained new knowledge, increased confidence,

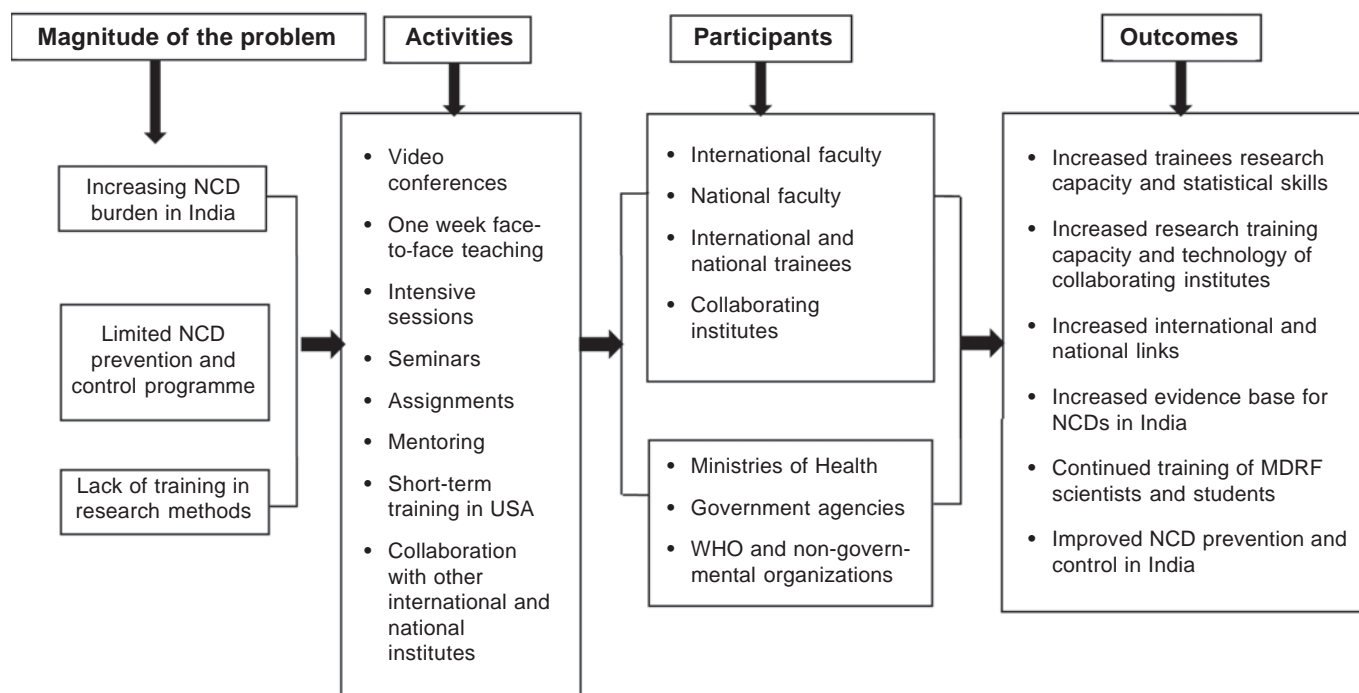


FIG 1. The Madras Diabetes Research Foundation (MDRF)–University of Alabama at Birmingham–Florida International University model for capacity building for prevention and control of non-communicable diseases (NCDs) in India (from 2003)

and improved approach towards research in the field of NCDs. Many trainees were in the early stages of their careers and the activity helped them develop a foundation for a career focusing on NCDs epidemic in India. The ICOHRTA training programme was the only NCD training activity conducted in India in 2001 and serves as a model for capacity building for prevention and control of NCDs in India (Fig. 1).

In all programmes, the feedback obtained from both faculty and participants were scrutinized carefully and necessary actions were taken in the subsequent year to improve the quality of the programme. The feedback provided was subjectively assessed. A limitation of this programme was that no quantitative assessment was done. Hence, the enhancement of the participants' skills/knowledge could not be assessed.

The success of the programme served as a model for others to conduct similar programmes in various parts of the country (Kerala, Chandigarh, New Delhi). Despite these accomplishments, however, much remains to be done as India faces a veritable tsunami of NCDs and related conditions. Thus, a collaborative effort through public health training by government agencies, public health training institutions, and key players in the field of NCD prevention and control would play a big role in reducing the threat of NCDs in India.

CONCLUSIONS

The clinical research training and capacity building that began under the US NIH Fogarty International Center's ICOHRTA programme and then continued under the LifeSpan programme serves as a model for meeting challenges posed by NCDs and other training needs. The programmes, conducted continuously over a period of 15 years, have helped to increase research

capacity and research methodology skills of trainees and collaborating institutions in India. While this is an important accomplishment, much more work is needed to reduce the burden of NCDs, which is rapidly increasing in India and other developing countries.

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REFERENCES

- 1 Beaglehole R, Bonita R, Horton R, Adams C, Alleyne G, Asaria P, *et al*. Lancet NCD Action Group; NCD Alliance. Priority actions for the non-communicable disease crises. *Lancet* 2011;**377**:1438–47.
- 2 World Health Organization. Global Health Observatory—NCD mortality and morbidity. Available at www.who.int/gho/ncd/mortality_morbidity/ncd_total_text/en/ (accessed on 28 Jul 2015).
- 3 World Health Organization. Non-communicable diseases Country Profile. Available at www.who.int/nmh/countries/ind_en.pdf?ua=1 (accessed on 28 Jul 2015).
- 4 International Diabetes Federation (IDF). *IDF Diabetes Atlas*, 8th ed. Brussels, Belgium: International Diabetes Federation; 2017.
- 5 National Programme for Prevention and Control of Diabetes, Cardiovascular Disease and Stroke. A manual for medical officers. Developed under the Government of India–WHO Collaborative Programme 2008–2009. Available at www.searo.who.int/india/topics/cardiovascular_diseases/NCD_Resources_COMBINED_MANUAL_for_medical_officer.pdf?ua=1 (accessed on 28 Jul 2015).
- 6 Labarthe D, Khaw KT, Telle D, Poulter N. The Ten Day International Teaching Seminar on Cardiovascular Epidemiology and Prevention: A 30-year perspective. *CVD Prev* 1998;**1**:156–66.
- 7 American Heart Association. Ten Day Seminar on the Epidemiology and Prevention of Cardiovascular Disease. Available at my.americanheart.org/tenday (accessed on 28 Jul 2015).
- 8 Buist AS, Parry V. The American Thoracic Society methods in epidemiologic, clinical, and operations research program. A research capacity-building program in low- and middle-income countries. *Ann Am Thorac Soc* 2013;**10**:281–9.