# **Original Research Article**

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20174268

# Screening 35 million for hypertension and diabetes mellitus through public system: experiences of Tamil Nadu, India

## T. S. Selvavinayagam\*

Institute of Community Medicine, Madras Medical College, Chennai, Tamil Nadu, India

Received: 13 August 2017 Revised: 09 September 2017 Accepted: 11 September 2017

### \*Correspondence:

Dr. T. S. Selvavinayagam,

E-mail: drsvinayagam@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

#### **ABSTRACT**

**Background:** Non communicable diseases (NCDs) is one of major public health challenge to be handled across the world particularly in low and middle-income countries. Government of Tamil Nadu in partnership with World Bank attempted to tackle this issue. Our State's experience in implementing NCD control program from piloting and then expanding it to entire state with learning's are described in this article.

**Methods:** A comprehensive NCD control program with four major interventions namely clinic, school, community and workplace based interventions covering hypertension and diabetes that was implemented successfully through public health system in Tamil Nadu is elaborated.

**Results:** The program yielded a magnificent performance in screening around 4 crore persons and the challenges in implementing the program covering human resources, drugs and reagents logistics, protocols, awareness creation, data capturing and effective monitoring etc. are highlighted.

**Conclusions:** This knowledge in implementing NCD control program in Tamil Nadu will be useful to other states in India as well as in other low and middle-income countries in planning their NCD programs.

Keywords: Non communicable diseases, Tamil Nadu health system project, Screening in public health system

#### INTRODUCTION

Non-communicable diseases (NCDs) are one of the major health and development challenges of the 21st century. Human suffering it causes and harm they inflict on socioeconomic fabric of developing countries is high.<sup>1</sup>

In recent years, NCDs, such as cardiovascular diseases (CVD), diabetes, chronic obstructive pulmonary diseases (COPD) and cancers have become an emerging pandemic globally with disproportionately higher rates in developing countries. In LMICs, poverty exposes people to behavioral risk factors for NCDs and in turn, resulting NCDs become an important driver for poverty.<sup>2</sup>

Mortality and morbidity data reveal the growing and disproportionate impact of the epidemic in lower resource settings. Over 80% of cardiovascular and diabetes deaths, and almost 90% of deaths from chronic obstructive pulmonary disease, occur in low- and middle-income countries.<sup>3</sup>

As per WHO report on Non Communicable Disease in South East Asia 2011, among the various strategies to tackle the non-communicable diseases, the health system strengthening with early detection and management of NCDs is critical.<sup>4</sup>

In India, as per NCDs country profile 2014 report of WHO, 26% of deaths are due cardio vascular diseases, 13% due to chronic obstructive pulmonary diseases, 7% due to cancer, 2% due to diabetes mellitus and other NCDs constituting 12%, totaling 60% of death due to NCD in India.<sup>5</sup>

In this scenario, Government of Tamil Nadu through World Bank funded project decided to implement a program to combat NCDs like hypertension, diabetes, cancer cervix and cancer breast and this article concentrates on intervention related to hypertension and diabetes. The project implemented through Tamil Nadu Health System Project (TNHSP).

#### **METHODS**

Tamil Nadu is one of the southern states in India with population of 72 millions with 48.4% urbanization and 80.1% literacy as per Census 2011.<sup>7</sup> State health indicators are better than rest of country and it is presented in Table 1 and Table 2.<sup>8</sup>

NCD pilot project in Tamil Nadu conceptualized in 2005-2006 and rolled out in two districts namely Virudunagar and Sivagangi. The pilot was implemented for 25 months from September 2007 to October 2009 for 30+ age group of population covering Hypertension and Diabetes in the name of CVD (Cardio Vascular Disease) intervention.

The services of the National Institute of Epidemiology (NIE), the Public Health Foundation of India (PHFI) along with national and international resources from World Bank (WB) are used in designing and field-testing this pilot. The experts available locally both within Government and also from private sector are extensively involved at every level during pilot phase.

Based on the inputs, a comprehensive NCD control program covering Hypertension, Diabetes, was planned with four components of intervention namely

- Clinic based interventions
- School based interventions
- Community based interventions
- Workplace based interventions

In clinic based intervention we decided to do opportunistic screening for the public who attend public health facilities for other illness or accompany the patients. The program covers population above 30 years and they were screened for hypertension and diabetes.

School based intervention target students in 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> class as advised by education department in view of relatively less academic work and also corrects age to introduce life style changes. This intervention aims to create awareness and encouraging adoption of healthy lifestyle from a young age. The school children expected to act as change agents for rest of the family and

neighborhood, spreading messages of healthy living. Physical education and science teachers sensitized by the program to coordinate this intervention. The activities include drawing, posters and caption writing etc. competitions. Further specific NCD message delivered in school prayers, parent teachers association meetings. A component of NCD included in educational curriculum also. All these efforts expected to create awareness in the minds of students, teachers and parents etc. This intervention plans to cover about 16,369 Government schools and seed money of Rs 1000/- (Approximately 150 USD per school) is provided to each school for managing the activities.

Community based intervention focused on creating awareness on NCD in the community and mobilize them to undergo screening through self help groups (SHG), The SHG women after sensitization encouraged undergoing screening and conveying the significance to community. Tamil Nadu Corporation for Development of Women (TNCDW) and Tamil Nadu pudhu vazhvu project (TNPVP) executed the intervention and hopes to reach 2, 93,993 SHGs in the state.

Intervention at place of employment called as work place based intervention and is implemented through Gandhigram Institute of Rural Health and Family Welfare Trust. 11 a well-known NGO in Tamil Nadu. This intervention concentrates on motivating employees and employer to adopt of healthy life styles. This was proposed in 400 workplaces with more than 100 employees each.

#### RESULTS

Pilot program that was running for nearly 2 years was successful completed in the two districts. Based on pilot experiences, program expanded to 16 districts from April 2012 and remaining 16 districts in April/June 2013 so as to cover entire state, addressing all major areas of challenges experienced in pilot program namely,

- The need for dedicated human resources with periodic training.
- Ensuring uninterrupted supply of drugs, reagents and to upkeep equipment's.
- Requisite for a simple protocol for screening, treatment and follow up.
- Data management including collection of quality data and interpretation.
- Improving the responsiveness of health system.
- Need for creating awareness on NCD at all levels including general public.
- Importance of support supervision and monitoring.

Further scientific evidences described in the package of essential non-communicable (PEN) interventions for primary health care in low resource settings by WHO are also taken into consideration while expanding the program to entire state. 12

Table 1: Demographic, socio-economic and health profile of Tamil Nadu State as compared to India figures.

Indicator	Tamil Nadu	India
Total population (in crore) (Census 2011)	7.21	121.01
Decadal growth (%) (Census 2011)	15.60	17.64
Infant mortality rate (SRS 2013)	21	40
Maternal mortality rate (SRS 2010-12)	90	178
Total fertility rate (SRS 2012)	1.7	2.4
Crude birth rate ( SRS 2013)	15.6	21.4
Crude death rate (SRS 2013)	7.3	7
Natural growth rate (SRS 2013)	8.3	14.4
Sex ratio (Census 2011)	995	940
Child sex ratio (Census 2011)	946	914
Schedule Caste population (in crore) (Census 2001)	1.18	16.6
Schedule Tribe population (In Crore) (Census 2001)	0.065	8.4
Total literacy rate (%) (Census 2011)	80.33	74.04
Male literacy rate (%) (Census 2011)	86.81	82.14
Female literacy rate (%) (Census 2011)	73.86	65.46

Source: RHS Bulletin, March 2012, M/O Health & F.W., GOI

Table 2: Health infrastructure of Tamil Nadu.

Particulars	Required	In position	shortfall
Sub-centre	7555	8706	*
Primary Health Centre	1254	1227	27
Community Health Centre	313	385	*
Health worker (Female)/ANM at Sub Centres & PHCs	9933	9253	680
Health Worker (Male) at Sub Centres	8706	1266	7440
Health Assistant (Female)/LHV at PHCs	1227	1027	200
Health Assistant (Male) at PHCs	1227	2393	*
Doctor at PHCs	1227	2271	*
Obstetricians & Gynecologists at CHCs	385	0	385
Pediatricians at CHCs	385	0	385
Total specialists at CHCs	1540	0	1540
Radiographers at CHCs	385	151	234
Pharmacist at PHCs & CHCs	1612	1412	200
Laboratory Technicians at PHCs & CHCs	1612	1073	539
Nursing Staff at PHCs & CHCs	3922	7046	*

Source: RHS Bulletin, March 2012, M/O Health & F.W., GOI

Table 3: Performance of NCD control program as on July 2017 at Tamil Nadu.

Disease for which screening is done	No. of people screened (crores)	No. of people detected positive (in lakhs)	Percentage of positive (%)
Hypertension	4.47	41.48	9.27
Diabetes mellitus	3.62	15.50	4.27

World Bank supported the entire program, both technically and financially and implemented the program through Tamil Nadu Health System Project (TNHSP). Performance of project as on now is given in table 3 and it shows the effectiveness of various steps taken as described above. The performance at the clinic site because of the contribution from the every other intervention namely community based, school and work placed intervention which focus on awareness and demand creation at different locations.

#### **DISCUSSION**

As on now the NCD control program being implemented in 1753 primary health centers, 267 Government hospitals, 100 municipal dispensaries, 23 medical college and allied institutions totaling 2143 institutions in the state. Tamil Nadu is the only state in the country implementing NCD control program in such a huge number of places.

All the centers are supplied with BP apparatus, weighing machine, stadiometer, measuring tape and centrifuge machine. According to the need ECG machine and Echocardiogram are provided. NCD corner was created with in PHC/GH for screening patients, using these equipment and exclusive staff nurse posted for NCD screening. Semi auto analyzers available in most of public institutions and wherever needed the same is procured using NHM<sup>14</sup> funds. Biomedical engineers are roped in to upkeep equipment's including calibrations when required. It is proposed to enter annual maintenance contract (AMC) with suitable agencies.

All NCD intervention places also supplied with reagents like, glucose kit, cholesterol kit and creatinine kit with standards along with urine albumin stick and distilled water.

Separate NCD drug budget provided to each health facility to meet additional requirement over and above routine supply through State budget. Drugs, reagents and equipment are being procured through Tamil Nadu Medical Service Corporation (TNMSC) and distributed through regional warehouse of TNMSC according to local requirement. 15,16 This arrangement ensured uninterrupted drug and regent's supply.

Further the program has designed a well-structured human resource to manage the implementation of NCD activities, which needs special mention. State NCD and district NCD cell is created with sufficient technical and non-technical staff to oversee the implementation. Totally 2,432 exclusive NCD Staff Nurses positioned at the rate of one each per Primary health centers (PHCs), 2 per each Government hospitals, medical college hospitals and municipal dispensaries in addition to existing staffs. These staff nurses are suitably trained on general NCD training along with various skill trainings like laboratory testing, quality assurance, online entry and counseling etc. with provision for refresher training. In addition all the members of the hospitals like pharmacist, lab assistants and field workers (VHN) etc. where also given suitable orientation and training on NCD.

Training modules both in English and in local language Tamil along with training plan including TOT's, training contents, duration, costing and schedules etc. are designed. Periodic gap analysis with required training and refresher training is planned.

Simplified protocol for screening, treatment and follow is designed with experts input. Everyone in the system is oriented and clarified on importance of protocols. All public health facilities displayed protocols for easy reference, which gives clear step-by-step instructions at each level.

For example as per hypertension screening protocol, all the people above 30 years are measured blood pressure. If the BP is less than 120/80 mmHg they are stated as

normal and advised to come for annual screening after counseling. If BP is 120-139/80-89 mmHg they are declared as pre hypertensive, given counseling on NCD and advised to review every 3 months. If the BP is above 140/90 mmHg they are labeled as new hypertensive and referred to medical officer for treatment. The medical officer will have separate protocol for confirmation and treatment.

In the similar way for diabetes screening all the people above 30 years are subjected to random blood sugar (RBS) testing using venous blood sample. If the RBS value is less than 110 mg/dl, they are stated as normal and advised to come for annual screening after counseling. If RBS value is 110-200 mg/dl, they are subjected to fasting (FBS) and 2 hours postprandial blood sugar (PPBS) testing. If the FBS, PPBS value is less than 100 mg/dl and 140 mg/dl respectively they are declared normal and advised annual checkup. If the FBS, PPBS is between 100-125 mg/dl, and 140-199 mg/dl respectively, they are declared as pre diabetic, given counseling on NCD and advised to review annually or earlier if needed. If the FBS, PPBS is more than 126 mg/dl, and 200 mg/dl respectively, they are declared as new diabetic and are referred to medical officer for treatment.

Further in the initial screening, if RBS is more than 200 mg/dl with symptoms of diabetes they are declared as new diabetic referred to medical officer for treatment. RBS more than 200 mg/dl without symptoms are subjected to FBS and PPBS and results are interpreted as above. The medical officer will have separate protocol for confirmation and treatment.

Minimum investigations provided as per protocol for every new hypertensive and new diabetes include tests like urine albumin, blood sugar (FBS & PPBS), sr. cholesterol, sr. creatinine, and ECG. The results are entered with treatment details in the patient clinic card. Though doctors felt that protocols are invading the professional decisions in treating patients, they understand the value and adopted it later.

The goal of the program and protocol is to maintain blood pressure at less than 140/90 mm Hg for patients with hypertension alone and less than 130/80 mm Hg for patients with Diabetes or chronic kidney disease etc. Likewise diabetic control goal is maintaining blood sugar of FBS 90-130 mg/dl and 2 hour PPBS <180 mg/dl.

As a Government policy only generic medicines are procured through TNMSC and choice of drugs are limited to 12 drugs for initial treatment as per protocol. The choices of 4 Oral anti diabetic drugs are T Metformin 500 mg, T Glibenclamide 5 mg, T. Glipizide 5 mg, T. Glimepiride 1 mg. eight anti-Hypertension drugs recommended are T. Amlodipine 5 mg, T. Atenolol 25 mg, T. Enalapril 2.5 mg, T. Hydrochlorothiazide 25 mg, T. Clopidogrel 75 mg, T. Aspirin, T. Atorvastatin 10 mg and T. Isosorbitrate dinitrate 5 mg.

In specific indications or when first line of management fails, additional drugs and combinations are permitted for which provision is made to purchase the drugs locally. This ensured that all the Drugs are available to public, free of cost in all the public institutions.

There is a provision to treat complications through State insurance scheme, namely Chief Minister's comprehensive health insurance scheme.<sup>17</sup>

For ensuring quality data, NCD screening register, patient identity card, patient clinic card, lab registers and Follow up registers etc. are introduced after field-testing. One statistical assistant (NCD) appointed to each district through NIE as part of concurrent evaluation and they visited the screening centers at periodic intervals and monitored use of protocol. NCD Staff Nurse is responsible for collation of data and online entry.

The NCD online screens have 9 modules that is developed and deployed on the existing HMS platform. <sup>18</sup> First three screens namely NCD screening screen; follow up screen and Medical Officer screen used for all patients. Colposcopy screen, mammography screen, FNAC biopsy, HPE request, pathologist screen, cancer staging and treatment are used on specific requirements. The online screens are provided with clinical decision support system (CDSS) and staff nurses trained for usage and they enter the data directly into it.

Based on the performance of various institutions for the same input given, we understand the importance of responsiveness of health system including the need for proper training and motivation. With suitable Government orders and supportive supervision we improved the performance.

To ensure proper awareness creation among the general public and service providers, media consultancy firm was hired for designing and producing IEC materials liker posters, billboards, pamphlets, flip charts etc. including audio-visuals. Materials carefully designed and prepared; pre-tested before put into wider usage. Precise media plan with TV spots and radio jingles ensured wider reach and generated greater visibility. In addition street plays and fold songs are programs conducted with people interaction and feedback.

Contents of message varied according to target group. Themes on Smoking, importance of controlling high blood pressure, diabetes and obesity, sedentary lifestyle or lack of physical exercise, unhealthy food habits and stress etc. are common ones.

Further concurrent Evaluation of NCD Program is done by National Institute of Epidemiology (NIE) that is part of ICMR (Indian Council of Medical Research). <sup>19</sup> Nine different evaluations were carried out covering all components of intervention. Baseline and end line for school based activities, baseline, end line and concurrent evaluation for community based activities. Workplace based activities had only process evaluation. The clinic intervention had clinic card survey, patient exit survey and coverage survey. The inputs from this evaluation used for mid term corrections.

Quality assurance in lab results is attempted through Christian Medical College Vellore where in EQAS/IQAS implemented in 777 labs from January 2014 and results are encouraging. <sup>20</sup>

TNHSP project planned intensive supervision and monitoring at various levels including monthly reviews, video-conferencing and supportive supervision at regular intervals at levels. The concept of fixed day review introduced in which staff nurses reviewed on every Saturday afternoons and other district officials on first Friday of every month.

The World Bank team provided technical support in a participatory manner through Aid memoirs every sixmonth, with critical analysis of activities and progress. The details are available at World Bank website.<sup>21</sup> Aid Memoirs along with bench marks supported the project to travel in preferred path and entire project details can be accessed at World Bank website.<sup>22</sup>

#### **CONCLUSION**

Though the Tamil Nadu program is first of this kind in the country at such a massive level, it is now concentrating only on opportunistic screening among the individuals coming to public institutions for some other ailments. Exploring opportunity for active screening in the community is planned with National Health Mission support. Active involvement of private sector is another area where we need to concentrate in future.

While strengthening the gains, program needs to focuses on good follow-up mechanism to track those detected with disease, ensure control at the optimal level and prevent complications. Comprehensive NCD care with home-based care and palliative care for complications are needed in future.

Sustainability of the program is critical. It is being created through integration with national program for prevention and control of cancer, diabetes, cardio vascular diseases and stroke (NPCDCS) of Government of India.<sup>23</sup>

#### **ACKNOWLEDGEMENTS**

The article acknowledge the contribution by each and every health worker right from village health nurse, staff nurse, medical officers etc. to district and state officials including DPH, Project director, Health secretary who had role in implementing the program successfully.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

#### REFERENCES

- Non Communicable Diseases, World Health Organization. Available at: http://www.who.int/ mediacentre/factsheets/fs355/en/. Accessed on 23 January 2017.
- 2. Islam SMS, Purnat TD, Phuong NTA, Mwingira U, Schacht K, Fröschl G. Non-Communicable Diseases (NCDs) in developing countries: a symposium report. Globalization Health. 2014;10:81.
- 3. WHO Global Status Report on non communicable diseases 2010. Available at http://www.who.int/nmh/publications/ncd\_report\_full\_en.pdf. Accessed on 23 January 2017.
- Non Communicable Diseases in South East Asia 2011, WHO report. Available at http://www.searo. who.int/nepal/mediacentre/2011\_non\_communicabl e\_diseases\_in\_the\_south\_east\_asia\_region.pdf. Accessed on 23 January 2017.
- Non Communicable Disease Country profile report 2014, India, WHO report. Available at http://apps.who.int/iris/bitstream/10665/128038/1/9 789241507509\_eng.pdf. Accessed on 23 January 2017.
- 6. Tamil Nadu Health System Project, Government of Tamil Nadu, Available at: http://www.tnhsp.org. Accessed on 23 January 2017.
- 7. Tamil Nadu, Demographic details. Available at: http://www.census.tn.nic.in/PCA\_data\_highlights/fig\_glance\_tn.pdf. Accessed on 23 January 2017.
- 8. State Health Indicators, Tamil Nadu. Available at: http://nrhm.gov.in/nrhm-in-state/state-wise-information/tamil-nadu.html#health\_profile. Accessed on 23 January 2017.
- 9. Self help group (SHG) of women for NCD control in Tamil Nadu. Available at: http://www.tamilnadu mahalir.org. Accessed on 23 January 2017.
- 10. Self help group (SHG) of women for NCD control in Tamil Nadu. Available at http://www.pudhu vaazhvu.org. Accessed on 23 January2017.
- 11. Gandhigram Institute of Rural Health & Family Welfare Trust, NCD screening, Available at: http://www.ruraluniv.ac.in/home. Accessed on 23 January 2017.
- 12. Essential non- communicable (PEN) interventions for primary health care in low resource settings by WHO. Available at: http://www.who.int/nmh/

- publications/essential\_ncd\_interventions\_lr\_settings .pdf?ua=1. Accessed on 23 January 2017.
- 13. Tamil Nadu Health System Project. World Bank. 2017. Available at: http://www.worldbank.org/en/news/feature/2014/07/21/tamil-nadu-health-system-project. Accessed on 23 January 2017.
- 14. National Rural health mission, Government of Tamil Nadu, Available at: http://www.nrhmtn.gov.in/. Accessed on 23 January 2017.
- 15. Tamil Nadu Medical Services Corporation. Available at: http://www.tnmsc.com/tnmsc/new/index.php. Accessed on 23 January 2017.
- Tamil Nadu Medical Services Corporation, Regional Warehouse, Available at http://www.tn health.org/directorate/tnmscwar.htm. Accessed on 23 January 2017.
- 17. Chief Minister's Comprehensive Health Insurance Scheme. Available at http://www.cmchistn.com. Accessed on 23 January 2017.
- 18. NCD online screens on HMS module. Available at http://www.hmis-mis.tn.gov.in/mis. Accessed on 23 January 2017.
- 19. Evaluation of NCD Program is done by National Institute of Epidemiology. Available at http://www.nie.gov.in/activitiesdescription.php?id=MjM=&mid=Mw. Accessed on 23 January, 2017.
- Quality assurance in lab results through Christian Medical College Vellore. Available at http://home. cmcvellore.ac.in/clinqc. Accessed on 23 January 2017.
- 21. Tamil Nadu health system project, world bank. Available at http://www.worldbank.org/projects/P075058/tamil-nadu-health-systems-project?lang =en. Accessed on 23 January, 2017.
- 22. Aid Memoirs, Tamil Nadu health system project, World bank. Available at http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/SAR/2015/09/02/090224b0830b3673/1\_0/Rendered/PDF/India000India00Report000Sequence023.pdf. Accessed on 23 January 2017.
- 23. National Program for Prevention and Control of Cancer, Diabetes, Cardio Vascular Diseases and Stroke, Available at: http://mohfw.nic.in/index1. php?lang=1&level=3&sublinkid=3627&lid=2194. Accessed on 23 January 2017.

Cite this article as: Selvavinayagam TS. Screening 35 million for hypertension and diabetes mellitus through public system: experiences of Tamil Nadu, India. Int J Community Med Public Health 2017;4:3882-7.