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Non-Communicable Diseases in Urban Mysore, Karnataka

A situational assessment report

KHPT | 2019

Non Communicable Diseases in Urban Mysore, Karnataka: Situational Assessment Report 2018

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The Mysore NCD Project

The Mysore NCD Project (Strengthening Continuum of Care of Select Non-Communicable Diseases (NCDs) in an Urban PHC area in Mysore City) is being implemented in partnership between Landmark Group, India, Karnataka Health Promotion Trust (KHPT) and the Department of Health & Family Welfare, Government of Karnataka.

Report context

Most Lower Middle Income Countries (LMICs) are going through epidemiological transition and NCDs are on a rise. Health systems are underprepared to tackle NCDs effectively. While effective diagnostics and interventions to detect early and manage NCDs are well established, integration of prevention and health promotion for NCDs, and implementation of these interventions remains a challenge especially at primary health care. Thus, there is a need to understand the gaps across the prevention to care continuum of NCDs to be able to plan comprehensive programs.This report presents the situational needs assessment that informed the design of comprehensive NCD Programmess in uran Mysore, South India.

Contents

Executive Summary

Four major non-communicable diseases (NCDs); cardiovascular diseases, cancer, diabetes and chronic respiratory diseases, are the leading global cause of death and are responsible for 70% of all deaths worldwide in 2015. Three-fourths of all these NCD deaths occurred in lower and middle income countries (LMICs). With around 6 million deaths annually, India shares more than two-third of the mortality due to NCDs in the South-East Asia Region and is striving to respond to and tackle their epidemiological and demographic transitions, and the consequent rise in NCDs. Evidence shows that the burden of NCDs and the prevalence of related risk factors are relatively higher in urban areas of India, and the prevalence is on the rise among the poor, making them particularly vulnerable to catastrophic health expenditure, in addition to life-long morbidity and increased mortality. Gaps exist at multiple levels which hinder effective implementation of services for NCDs. Although tangible efforts have been made by the national and state government on NCD services, progress towards integration of care especially at primary care level has remain limited.

We used a mixed methods implementation research design to assess and address the gaps in an urban primary health centre (UPHC) catchment area covering around 58000 populations in Mysore city in Karnataka, India. We conducted a population-wide screening to detect prevalence of hypertension and diabetes in UPHC catchment area; a representative sample survey was also conducted to detect prevalence of risk factors in the population, understand out of pocket expenses and treatment adherence. Facility audits were undertaken to assess readiness to provide NCD care; we also conducted qualitative research (focus group discussions (FGDs), and in-depth interviews (IDIs)) to understand client experiences and perceptions on NCD care, management, and lifestyle changes.

Of a total population 58000 in the UPHC area, 35212 were found out to be over 18 years' age, which constituted the project target population. We could reach 32596 for screening of blood sugar and blood pressure. A total of 6.6 percent of the people reported to being known diabetic and 6.8 percent reported to being known hypertensive. Around 6% and 13% were found to be suspected cases (RBS>=140 mg/dl) of diabetes and hypertensive (Systolic>=140 or Diastolic>=90) respectively. The mean age of the respondents was 40 years. 24% of the respondents belonged to the age group

[1]*The primary focus of this report is on diabetes and hypertension among four major noncommunicable diseases: cardiovascular diseases, cancers, diabetes and chronic lung diseases which are largely associated with four shared behavioural risk factors such as: Diet, Physical Exercise, Tobacco and Alcohol consumption. NCDs also includes health problems like gastrointestinal diseases, renal diseases, and neurological and mental health disorders. These conditions account for a substantial portion of the global burden of disease as well. Although this report does not report specifically on these conditions including cancer and cardiovascular diseases, many of the strategies for tackling NCDs described are very apt for these conditions.*

of 50 and above. Around one fifth of the population are working population either as labourers or running self-business. Around 62% of all people reported to be known high blood pressure belonged to low or middle income group. Overall, 60% of the study population were assessed as physically active; however, this proportion was less among people with diabetes and hypertension. We found current tobacco and alcohol use among only among one-tenth of the population; no difference was seen among people with disease or without in terms of tobacco use. Consumption of vegetables and fruits was generally poor in both the general community and among people with NCDs. However, the consumption of processed and oily food seemed to be very less and in control, and so was use of extra salt. In terms of adherence to treatment, the population is found to have good adherence. The health seeking at facility for consultation, medicines and diagnostics were found to be very good; medicine availability at home of people with diabetes and hypertension was also found to be good. While public primary care facilities were better staffed than private clinics, specialist positions were filled up in both sectors. NCD counsellor, an important player at primary care level was missing in both sectors. Both types of facilities showed better availability of basic diagnostics and drugs. However, some crucial tests such as: HbA1C test, lipid profile and electrocardiogram (ECG) that help to assess complications related to NCD were found missing in many private primary care facilities.

We found that, although health seeking was quite good, many patients visited private facility and incurred high out- of- pocket expenditure in diagnostics and treatment. In this context, we felt the need for bringing cost effective diagnostics at the UPHC level, improving awareness on effectiveness of generic medicines in the community. Integration of NCD services is well envisaged in recent policies and guidelines, however, evidence as to how to implement them on ground is limited. Fragmented urban health system adds further challenge as there are multiple stakeholder which needs to be consulted upon, and multiple levels where interventions are required to plug the gaps in service. It is critical to plan and implement NCD interventions across its prevention to care continuum comprehensively at primary care level. In this context, a pilot implementation research initiative was undertaken during 2017-18 in urban city of Mysore in Karnataka to undertake in-depth situation analysis and develop a comprehensive urban health systems based NCD implementation model. This report present detailed situation assessment of NCD care provision at an urban primary health centre in Mysore.

Background

Non-communicable diseases (NCDs) contribute to around 5.87 million deaths that account for 60 % of all deaths in India (1). India shares more than two-thirds of the total deaths due to NCDs in the South-East Asia Region (SEAR) of WHO (2). The probability of an Indian, in the age group of 30-70 years, dying at present from the four main non-communicable diseases - cardiovascular diseases (coronary heart disease, stroke, and hypertension), diabetes, cancer, and chronic respiratory disease is about 26 percent (3). The NCD burden in India will significantly worsen in the future; it is estimated that the people with diabetes will increase from 69.2 million in 2015 to 123.5 million by 2040; and obesity, which is associated with hypertension, CVD, diabetes, and some cancers, will affect 52.1 million by 2030 (4). India's demographic and socio-epidemiological transition in recent years have its' impact on health. While India is already grappling with communicable diseases and maternal and child health related issues, increase of NCDs in alarming rate pose serious public health and developmental threats for the country (5). Evidence further shows that the burden of NCDs and the prevalence of related risk factors are relatively higher in urban areas of India (6,7), and the prevalence is on the rise among the poor, making them particularly vulnerable to catastrophic health expenditure, in addition to life-long morbidity and increased mortality (8). The burden of NCDs is also high in the state of Karnataka, one of the largest states in southern India. As per recent estimates, four major NCDs constitutes around 25% of all disease burden among 15-39 aged population in the state; this burden reaches more than 70% among people aged more than 40 years. A study done in coastal Karnataka in 2006-07 showed the prevalence of hypertension among people over 30 years at 43.3% and out of them, only half knew that they had hypertension, and 20.2% were newly detected during the study. The prevalence of type 2 diabetes ranges from 3.77% to 16%.

India was the first country to frame national targets on NCDs in line with the global NCD action plan , and was among the first few to ratify and implement the WHO's Framework Convention on Tobacco Control; yet high burden of NCDs demonstrates the challenges in the implementation of national guidelines at state and district level. Critical gaps exist at multiple levels and pose as roadblocks for effective and comprehensive NCD care in India. While gaps in early screening of NCDs ranges from challenge to enumerate and track eligible population for intervention to lack of capacity building of frontline workers; health services gaps include issues with timely referral of suspected cases for disease confirmation, issues with facility readiness and provider preparedness for NCDs. Lack of standardisation of treatment and diagnostic protocols across government and private health care facilities for many NCDs is yet another concern. On top of that, challenges of regular supplies

[2] *Available at http://www.who.int/features/2015/ncd-india/en/ Accessed on 13th Feb 2018.*

of drugs and consumables especially for NCDs at public health facilities are well known. In addition to programme implementation gaps is the lack of an effective data monitoring system: both on the disease burden and resource at hand. Lack of quality implementation research especially in health prevention and promotion is yet another clear gap as current researches and program evaluations are highly skewed towards therapeutic/curative side.

The government of India launched the National NCD programme called the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases & Stroke (NPCDCS) in the year 2008. This national programme is being implemented under the flagship National Health Mission (NHM) from 2013 aiming to integrate NCD-related programme activities related to health promotion, early diagnosis, treatment and referral, and further facilitate partnerships with the private sector in both urban and rural areas (9). Government of Karnataka too has embarked upon providing preventive, promotive, curative and supportive services at various levels of care. Recently, six districts were selected to pilot the population-based screening for diabetes, hypertension, and cancers. Despite efforts and initiatives by the government since the NCD programme inception, presently there is no effective model in place which can demonstrate the integration of NCD related services.

With this context, Karnataka Health Promotion Trust (KHPT) and the Landmark Group in collaboration with Government of Karnataka are trying to develop a model of integrated care to address the growing burden of NCDs, especially in urban areas. KHPT is implementing the project in an Urban PHC (UPHC) area in Mysore City focusing on the NCD care continuum. The project consists of two phases; phase one consists of population level screening of diabetes, hypertension, understanding the levels of risk factors in the population, qualitative research involving patients and service providers, and series of consultations with the officials from Government of Karnataka with an aim of developing the continuum of care package. Phase two consists of implementing the intervention package to establish continuum of care at the urban PHC area of Mysore city. This report focuses on key activities and results from the phase 1 period (1 July 2017- 31 March 2018) of the project.

Objectives of the situational assessment phase of the project

- To understand the burden of diabetes and hypertension in the UPHC area
- To understand the levels of modifiable risk factors for NCDs (inappropriate diet, inadequate physical activity, tobacco and alcohol consumption) in the population
- To understand treatment seeking behaviour among diabetic and hypertensive
- To understand average out of pocket expenditure for treatment of diabetes and hypertension

Methodology

Study design and framework

We used mixed methods implementation research design consisting of both qualitative and quantitative methods. We adapted an established continuum of care framework to identify gaps and design NCD interventions across the care continuum in low resource settings (10).

Initial state and district level consultative workshops

Through a series of consultative workshops, the project teams identified the gaps that informed situation analysis (Table1).

Table 1: Information gaps for designing NCD interventions

Sl.no	Information pre-requisite	Utility of information	Level of action (intervention)
1	Population burden of diabetes and hypertension, their risk factors	To plan adequate resources and infrastructure for screening and management, prevention, promotion	Facilities and frontline health workers in the community
2	Facility readiness to offer NCD care	To plan interventions to strengthen the availability and quality of NCD care	Health systems and Facility level
3	Community characteristics: Lifestyles, treatment adherence, out of pocket expenses.	To plan adequate prevention and health promotion measures	Facilities and frontline health workers in the community
4	Community characteristics: myths, beliefs and practices around hypertension and diabetes that affect health seeking and compliance	To plan educational and behaviour change initiatives	Individual, family and community level

This project started with a consultative workshop at state level followed by another workshop at the district with a wide range of stakeholders including district government officials, officials from district NCD cell, senior medical officers, faculty of Mysore medical college, senior representative from the donor, and project team from KHPT. The aim of the district level workshop was to inform relevant stakeholders on the objective of this implementation project and gather further inputs. An adapted continuum of care framework for non-communicable diseases (Fig 1) was used to facilitate discussions and refine the intervention.[3] This workshop helped to refine project objectives, tools and activity plan based on the understanding of the context and experience of the government officials.

[3]*Wollum A, Gabert R, McNellan CR, Daly JM, Reddy P, Bhatt P, et al. Identifying gaps in the continuum of care for cardiovascular disease and diabetes in two communities in South Africa: Baseline findings from the HealthRise project. PLOS ONE. 2018;13(3):e0192603*

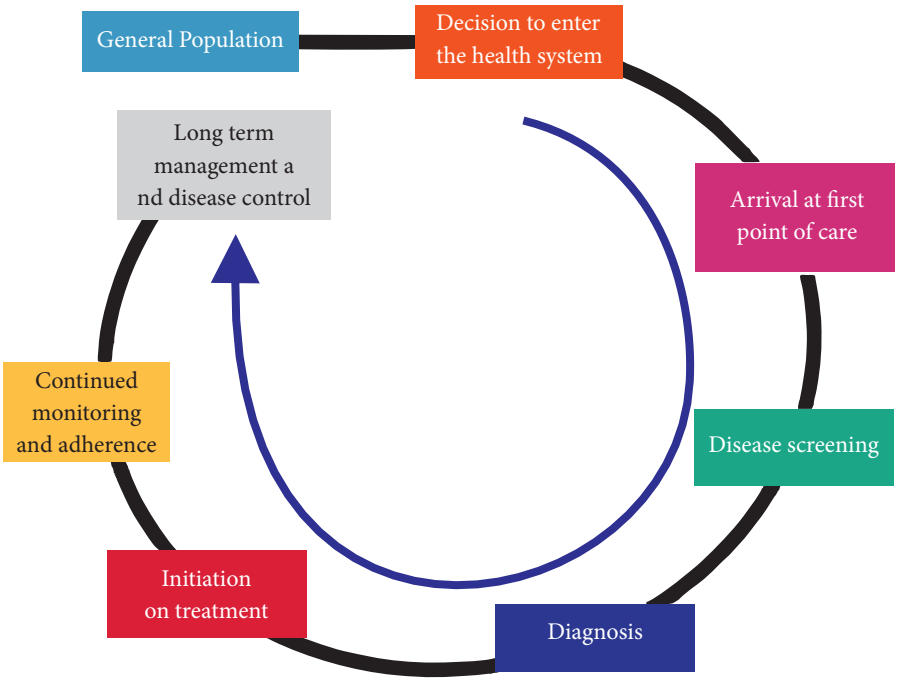

Fig 1: Adapted continuum of care model for NCDs from the Health Rise project

Project setting and population

The project is being implemented in an UPHC at Mysore City which is about 160 kilometres from Bangalore (Annex 1: Map of Mysore city). Mysore is the second-largest city in the state of Karnataka, India, located at the base of the Chamundi hills southwest of the state capital Bangalore. The total population of Mysore Metropolitan area which includes Mysore city is 990,900. It is the second biggest city area in terms of population in the state. The study was carried out in Kumbarakoppalu UPHC which covers a population of 58,000 (Source: National Urban Health Mission, 2017) including ward nos. 27 & 28 of Mysore city. Socio-economically these wards have a mixed population which makes it an ideal setting for this project.

Study phases, sample, and instruments

This situational assessment per se, was implemented between September 2017 and March 2018 in different phases; phase 1: Population-wide screening to detect prevalence of hypertension and diabetes in UPHC area; phase 2: Sample survey to detect prevalence of risk factors in the population, understand out of pocket expenses and treatment adherence. Facility audits were undertaken to assess readiness to provide NCD care; and phase 3: Qualitative research (focus group discussions(FGDs), and in-depth interviews (IDIs)) to understand client experiences and perceptions on NCD care, management, and lifestyle changes.

Phase 1 study targeted all adults aged 18 years and above in the UPHC area. An initial listing followed by adjusting for inaccessible households using census data helped to estimate the adult population to

37,943. The screening tool had two sections. 1) Household section, that captured address and age-gender composition of members, 2) NCD section captured values of systolic/ diastolic blood pressure as measured by a digital sphygmomanometer, blood glucose levels as measured by point of care (POC) random blood sugar tests (RBS) and anthropometric tests (height, weight) for calculation of BMI. The specifications of diagnostics used in the study are described in the Annex 2.

Phase 2 study of risk factors was undertaken on a random sample of 1,470 individuals out of the study population. The W.H.O STEPs questionnaire[3] was adapted to assess risk factors in the sample population. The questionnaire captured socio-demographic details in addition to modifiable risk factors such as physical activity, alcohol, tobacco, and diet, and health seeking behaviour among known diabetics and hypertensive (Annex 3). Field testing of this questionnaire was conducted prior to the actual survey to validate it. Facility audits were done in 11 out of 12 health facilities, that included 4 public facilities and 7 private facilities. 1 private facility refused to share information with the study team. The audit tool captured data about human resources, medicines, diagnostics, documentation systems (Annex 4).

In sub-phase 3, 30 NCD clients were purposively selected for in-depth interviews and focus group discussions. The list included both men and women, aged above 45 years, illiterate and daily wage labourers.

Data collection

19 field investigators (designated as Community Resource Persons or CRPs) from the nursing background were supported by a study coordinator for data collection. They received a 3-day training on various topics ranging from NCD epidemiology, definitions, disease signs and symptoms, diagnostics and current treatment standards, community and health systems context, and on use of tools. The training included both theoretical lectures, practice sessions in the training room and in the field. The training was done by a team of public health, clinical, and research experts from KHPT.

The quantitative data was captured using CSPro's computer-assisted personal interviewing (CAPI) based mobile application. Mobile phones with Android OS were arranged in-house in KHPT and were loaded with the CAPI data entry software. The qualitative data were collected by three researchers (2 males and 1 female) who were well versed with qualitative interview techniques. FGDs were conducted in UPHC premises and the IDIs were carried out in either the homes of respondents or at the health facilities. All interviews were audio recorded.

Household listing

Household listing exercise was carried out by CRPs in all 5 ANM areas of the UPHC. CRPs underwent training prior to the listing exercise and were supported by the Project Co-ordinator. A unique identification number was assigned to each household. The number of households and the number of adults recorded in the listing exercise is mentioned below.

[3]The WHO STEPS Instrument (Core and Expanded) could be accessed from https://www.who.int/ncds/surveillance/steps/STEPS_Instrument_v2.1.pdf . Accessed on 19-12-2018

Table 2: Details of household listing exercise

Total number of households	**12,985**
Total Number of Male Adults (18 years and above)	17,321
Total Number of Female Adults (18 years and above)	17,891
Total Adults (18 years and above)	35,212
Doors Locked	1,007
Estimated adults in door locked	2,731
Total estimated adults	37,943

Screening, equipment and consumables

Screening for diabetes, hypertension and their associated risk factors was started on 10th October 2017. Screening equipment (Fig 2) Glucometer, glucometer strips, lancets, digital blood pressure apparatus, digital weighing machine, measuring tape were procured from a vendor through competitive bidding. Adults with hypertension (systolic>=140 or diastolic>=90) and RBS >= 140 were referred to UPHC for confirmation of diagnosis and initiation of treatment. Referral protocols, referrals forms, follow-up register have been designed and are used by the field team and staff at the UPHC. Client referral protocols were prepared and are currently being used by field investigators to refer diabetic (Annex 5) and hypertension (Annex 6) clients.

Figure 2: Screening equipment

Study of risk factors

A sample survey was conducted among 1,319 adults in Kumbarakoppalu UPHC area to understand the pattern and distribution of of NCD risk factors (inappropriate diet, inadequate physical activity, tobacco and alcohol consumption). The study adopted a two stage selection strategy. Firstly, the households were randomly selected systematically from the list of households identified in the household listing process. In order to have a self-weighted sample in terms of gender, the selected households were alternately selected for male and female respondents. The adult respondent in the household was selected randomly using Kish table . In order to estimate the levels of risk of diabetes and hypertension in the population, the required sample size was estimated as 1,470 adults. This was estimated under assumption that 25% of the target population would have either diabetes or hypertension. The sample was adjusted with 80% power at 95% CI and was further inflated with an assumption of 25% non-response. Since the individuals were randomised through Kish table and not through simple random sampling, the sample was further inflated with a design effect of 2. 1,338 adults consented and participated in the study to whom questionnaire on pattern of diet, physical activity, tobacco and alcohol use was administered and for1,319 (response rate of around 90%) respondents the survey could be completed.

Qualitative study

Qualitative research was done to understand the views, perspective and experiences on treatment access, adherence and life style modifications among diabetics and hypertensive. For the present exploration we had few questions on the motivators and barriers for adults to:

- Visit facility for confirmatory test and initiation of treatment
- Adhere to the medications
- Accept for lifestyle modification
- Dietary habits

A detailed discussion around the findings was held and based on the findings strategies were proposed which will be tested and finalised during the project period. We conducted focused group discussion (FGDs) and in-depth interview (IDI) among men and women who were diagnosed with diabetes and hypertension. 6 (women 5, men 1) IDIs, 6 FGDs involving 24 participants (women 15, men 9) were conducted in the phase-1 part of this project. A semi-structured interview guide (Annex 8) was used, that consisted several broad themes for the probing: general health-seeking behaviour, treatment adherence, out of pocket expenses, knowledge & practices about hypertension and diabetes, reasons for not accessing treatment, treatment adherence and life style modifications challenges. This interview tool was field tested and then refined for wordings and its structure.

[4]*The Kish grid or Kish selection grid is a method for selecting members within a household to be interviewed. It uses a pre-assigned table of random numbers to find the person to be interviewed. It was developed by statistician Leslie Kish in 1949. It is a technique widely used in survey research. Available at: https://en.wikipedia.org/wiki/Kish_grid. Accessed on 16-12-2018*

Data analysis

The quantitative data was analysed using STATA SE 14 to provide population estimates for prevalence of hypertension and diabetes. The sample survey data was analysed by various socio-demographic correlates to understand the characteristics of individuals with NCD/ NCD risk factors. Significant associations were ascertained using Chi-square tests. The qualitative data collection and analysis was iterative and occurred simultaneously. The interviews and focused group discussions were translated directly and analysed using a thematic content analysis approach.

Ethics approval

Ethics approval was obtained from the institutional ethics committee of Grassroots Research and Advocacy Movement (GRAAM), Mysore (Annex 9). GRAAM is a public policy research and advocacy initiative based in Mysore that focuses on community based research and policy advocacy driven by empirical evidence through a collaborative approach and dialogue. Written informed consent was obtained from all the participants using a consent form (Annex 10) after a participant information document (Annex 11) was read out for each participant in the local language.

Results: Findings from quantitative and qualitative survey

Screening for NCDs

Figure 3: Screening for diabetes in community

Of the 32,721 individuals reached, 241 and 28 did not give consent for conducting blood sugar and blood pressure measurement, respectively. However, two and four cases each from those who did not give consent reported to being diabetic and hypertensive, respectively. Hence those cases were added in the effective number of persons screened (32,482 for diabetes and 32,697 for hypertension) and those self-reported as diabetic or hypertensive. 6.6 percent of the people reported to being known diabetic and 6.8 percent reported to being known hypertensive. Around 6% and 13% were found to be suspected cases (RBS>=140 mg/dl) of diabetes and hypertensive (Systolic>=140 or Diastolic>=90) respectively (see Fig 4).

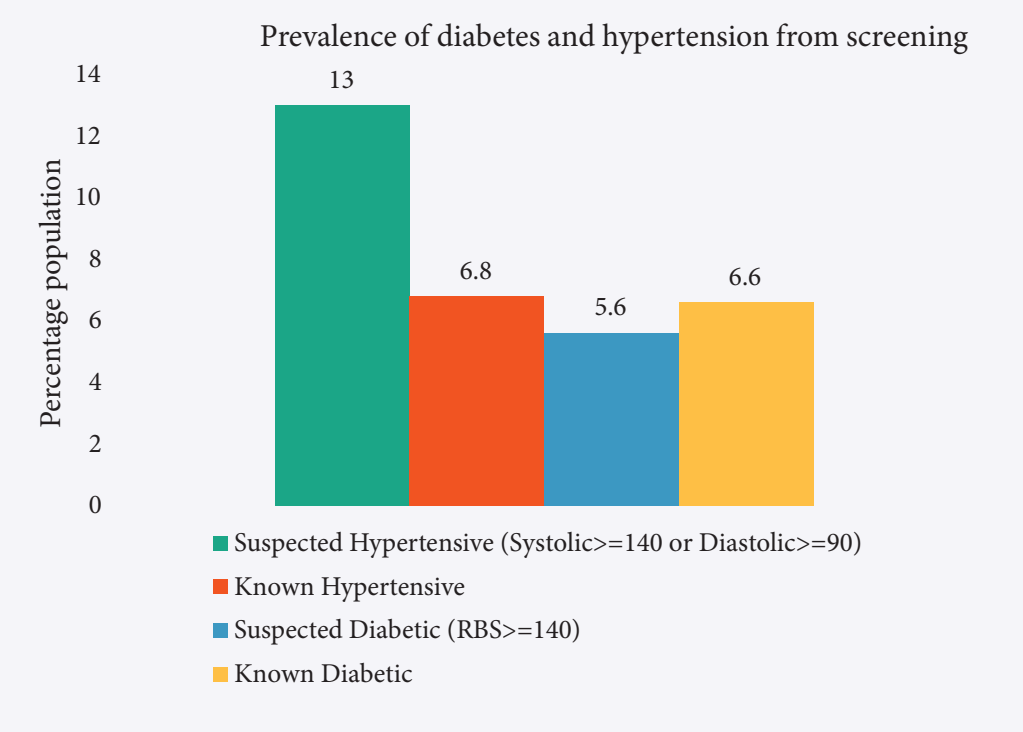

Figure 4: Prevalence of known and suspected diabetics and hypertensive*

**people who are in both diabetic or hypertensive category are in both of the categories i.e. the numbers are not mutually exclusive*

Findings from risk factor study

Socio-demographic characteristics of survey respondents

The sample survey showed very similar results in terms of known cases of diabetes and hypertension. 7% of the respondents mentioned they are known diabetic and 8% said they are known hypertensive. About 5% were suspected diabetic and 13% were suspected hypertensive. Distribution of survey respondents by socio-demographic characteristics is shown in table 3. The mean age of the respondents was 40 years. 24% of the respondents belonged to the age group of 50 and above. 12% of the respondents belonged to SC/ST category. Only 36% completed 12th standard and above. About 18% of the respondent had no formal schooling, but 78% of the respondents could read and write (not shown in table). 47% of the respondents were males and 53% were females. Around 75% of the

female respondents were housewives. 74% of the respondents were currently married and 14% were never married. 11% of the respondents were doing labour work and a similar percent were involved in business or were self-employed. Around 5% were students, 11% worked as drivers or in housekeeping activities, and another 5% were either retired or were not employed. Monthly household income data shows median monthly household income to be around INR 10,000. About 7% could not or did not reveal their household income. About 11% said that they are current users of tobacco (either smoke or smokeless), 7% said they consumed alcohol in the last one month and about 81% said that they consume vegetable or fruits more than twice a day. Though as per STEPS guideline of WHO, one needs to consume at least 5 standard bowls of vegetable or fruits every day, none of the survey respondents reported to comply by such standards (not shown in table).

Table 3: Socio-demographic characteristics of survey respondents and by self-reported diabetes and hypertension

	Total	
Categories	**N**	**%**
Age		
Mean	1319	40 years (Min:18-Max:90)
<35 years	524	39.7
35-49 years	475	36.0
50=> years	320	24.3
Education		
Mean standard completed	1319	9th (Min:0-Max:22)
<5 years	289	21.9
5-11 years	553	41.9
12=> years	477	36.2
Caste		
Scheduled Caste or Tribe	169	12.8
Others	1150	87.2
Gender		
Male	615	46.6
Female	704	53.4

Table 3: Continued

	Total	
Marital Status		
Currently married	981	74.4
Widowed/Divorced/Separated	151	11.4
Never Married	187	14.2
Occupation		
Retired	52	3.9
Business/Self	152	11.5
Housekeeping/Driver	161	12.2
Housewives/non-paying work	535	40.6
Labour	143	10.8
Student	61	4.6
Service	215	16.3
Median monthly household income (INR)	1234	10,000 (Min:1,000-Max:1,50,000)
Tobacco		
No Tobacco	1176	89.2
Any Tobacco	143	10.8
Alcohol (last month)		
No Alcohol	1226	93.0
Consumed Alcohol	93	7.0
Physical Activity		
Less than appropriate or none	527	40.0
Appropriate physical activity	792	60.0
Diet		
None or once daily consumption of vegetable or fruit	246	18.6
Regular veg or fruit more than twice a day	1073	81.4

**people who are in both diabetic or hypertensive category are in both of the categories i.e. the numbers are not mutually exclusive*

In terms of appropriate physical activity (minimum 75 minutes of vigorous activity or 150 minutes of moderate activity every week), 60% were categorised under appropriate physical activity. Consumption of processed and oily food seemed to be very less and in control, and so was use of extra salt. Less than 10% of the population consumed processed food more than twice in a week and 15% did not consume processed food at all.

Difference in characteristics among known diabetic in comparison to non-diabetics with respect to socio-economic characteristics and associated risk factors for raised blood sugar

Table 4 shows, there are some significant differences among the self-reported diabetic and non-diabetics in terms of age, education, occupation, socio-economic status and alcohol consumption. There were no significant differences in gender or caste groups in terms of self-reported diabetic and non-diabetic. Around 22% in the age group of 50 years and above reported to be diabetic and around 14% of those with educational level below 5 years reported to be diabetic. As we found more diabetics in the aged population, hence when explored within occupation, more than 35% of retired persons, and about 20% of divorced/widowed or separated, reported to be diabetic. Among those in higher socio-economic status, 12% reported to be diabetic- higher than lower and middle socio-economic status. In terms of tobacco use and diet, no significant difference was observed between diabetic and non-diabetics. About 9% of those who practice no or less than appropriate physical activity reported to be diabetic compared to 6% of those who reported of appropriate physical activity. Those who consume alcohol (based on consumption in last month), 14% reported to have diabetes as compared to 7% among those who did not consume alcohol.

Table 4: Distribution of Socio-demographic characteristics by self-reported diabetes and non-diabetic

Categories	N	Non-Diabetic (N=1149)	Diabetic- Self reported (N=93)	P*
Age				**<0.001**
<35 years	508	99.4	0.6	
35-49 years	449	94.0	6.0	
50=> years	284	77.8	22.2	
Education				**<0.001**
<5 years	264	86.4	13.6	
5-11 years	520	94.0	6.0	
12=> years	457	94.3	5.7	
Caste				**0.535**
Scheduled Caste or Tribe	161	91.3	8.7	
Others	1080	92.7	7.3	
Gender				**0.454**
Male	580	93.1	6.9	
Female	661	92.0	8.0	

Table 4: Continued

Categories	N	Non-Diabetic (N=1149)	Diabetic- Self reported (N=93)	P*
Marital Status				**<0.001**
Currently married	917	92.9	7.1	
Widowed/Divorced/Separated	141	80.9	19.9	
Never Married	183	99.4	0.6	
Occupation				**<0.001**
Retired	48	64.6	35.4	
Business/Self	144	95.1	4.9	
Housekeeping/Driver	150	97.3	2.7	
Housewives/non-paying work	493	90.7	9.3	
Labour	137	94.2	5.8	
Service	209	94.7	5.3	
Social and Economic category				**<0.001**
Low	423	95.7	4.3	
Medium	421	93.8	6.2	
High	397	87.7	12.3	
Tobacco				**0.864**
No Tobacco	1114	92.6	7.4	
Any Tobacco	127	92.1	7.9	
Alcohol (last month)				**0.016**
No Alcohol	1156	93.0	7.0	
Consumed Alcohol	85	85.9	14.1	
Physical Activity				**0.070**
Less than appropriate or none	491	90.8	9.2	
Appropriate physical activity	750	93.6	6.4	
Diet				**0.162**
None or once daily consumption of vegetable or fruit	1014	92.0	8.0	
Regular veg or fruit more than twice a day	227	94.7	5.3	

**p values generated out of chi-square or Fisher's exact tests*

Assessing difference in characteristics of known hypertensive and non-hypertensive with respect to socio-demographic and associated risk factors for raised blood pressure

Table 5 shows similar differences between hypertensive and non-hypertensive across socio-demographic and lifestyle factors as observed for diabetic and non-diabetic. More than 30% in the age group of 50 years and above reported of hypertension. As in case of diabetes, larger proportion of people (~21%) with less than 5 years' education, and 28% of divorced/separated/widowed reported of hypertension than people with higher levels of education or people who are currently married or never married. Similarly, a larger percentage of retired people (45%) reported of hypertension. No significant difference was observed between caste groups as around 10% of both scheduled caste or tribes and people belonging to other caste groups reported of hypertension. Unlike diabetes, significantly more proportion of females (11%) reported of hypertension than males (7%). About 11% belonging to higher socio-economic status reported of hypertension, and almost similar percentage from other economic groups reported of hypertension. In terms of lifestyle activities, about 18% of those who consumed alcohol in the last month and 14% of those who are categorised in less than appropriate physical activity, reported of hypertension.

Table 5: Distribution of Socio-demographic characteristics by self-reported hypertension and non-hypertensive cases

Categories	N	Non-Hypertensive (N=1149)	Hypertensive-Self reported (N=93)	P*
Age				**<0.001**
<35 years	489	99.6	0.4	
35-49 years	392	93.4	6.6	
50=> years	258	69.0	31.0	
Education				**<0.001**
<5 years	233	78.5	21.5	
5-11 years	477	92.2	7.8	
12=> years	429	95.1	4.9	
Caste				**0.452**
Scheduled Caste or Tribe	133	88.7	11.3	
Others	1006	90.8	9.2	
Gender				**0.021**
Male	531	92.7	7.3	
Female	608	88.7	11.3	

Table 5: Continued

Categories	N	Non-Hypertensive (N=1149)	Hypertensive-Self reported (N=93)	P*
Marital Status				**<0.001**
Currently married	837	91.5	8.5	
Widowed/Divorced/Separated	127	71.7	28.3	
Never Married	175	99.4	0.6	
Occupation				**<0.001**
Retired	42	54.8	45.2	
Business/Self	129	88.9	10.1	
Housekeeping/Driver	132	94.7	5.3	
Housewives/non-paying work	458	87.1	12.9	
Labour	125	97.6	2.4	
Service	195	96.4	3.6	
Social and Economic category				**0.413**
Low	387	91.7	8.3	
Medium	381	90.8	9.2	
High	371	89.0	11.0	
Tobacco				**0.838**
No Tobacco	1019	90.6	9.4	
Any Tobacco	120	90.0	10.0	
Alcohol (last month)				**0.010**
No Alcohol	1067	91.1	8.9	
Consumed Alcohol	72	81.9	18.1	
Physical Activity				**<0.001**
Less than appropriate or none	444	85.8	14.2	
Appropriate physical activity	695	93.5	6.5	
Diet				**0.381**
None or once daily consumption of vegetable or fruit	924	90.2	9.8	
Regular veg or fruit more than twice a day	215	92.1	7.9	

**p values generated out of chi-square or Fisher's exact tests*

Treatment cost and adherence: Diabetic and Hypertensive

We assessed out-of-pocket expenditure (table 6) towards medicine, investigations and consultation per month. As expected the expenditure at private facilities in all three heads: medicine, investigations and consultations was higher than expenditure in government facilities. Those who procured medicine from Govt. facilities, paid around INR 24 on average as compared to INR 144 per month. For tests conducted in Govt. facilities, INR 12 was spent on average as compared to INR 76. To consult Govt. doctors, INR 13 was spent as compared to INR 57 for private facilities every month. Though it is known that services at Govt. facilities, some people might have ended up paying some amount either on demand or as token of appreciation.

Table 6: Out-of-Pocket expenditure among diabetics and hypertensive

Category	Government facilities (Median INR)	Private facilities (Median INR)
Medicines	24	144
Investigations	12	76
Consultation	13	57

In terms of adherence to treatment (not shown in table), 98% of known diabetic (N=93) cases visited facility for consultation at least once in last 12 months (Mean=~5 visits). Similarly, 96% of known hypertensive (N=108) cases visited facility for consultation at least once in last 12 months (Mean=~5 visits). Around 97% and 96% of known diabetic or hypertensive had medicine in their homes at the time of interview, respectively and they reported to usually procure medicine for around 27days. 82% and 80% of known diabetic or hypertensive reported they took medicine regularly. However, 54% of the reported diabetic and 27% of the hypertensive cases, had their blood sugar and blood pressure under control (RBS < 200 mg/ dl; systolic and diastolic below 140 and 90 respectively). Hence, to find independent effect of any socio-economic or lifestyle factors on raised blood sugar or raised blood pressure, tables 7 & 8 shows adjusted effect. For both raised blood sugar and pressure age shows an independent effect. None of the lifestyle factors show any independent effect on raised blood sugar (table 7). But, alcohol consumption and inappropriate physical activity shows independent effect on raised blood pressure (table 8).

Table 7: Adjusted odds of raised blood sugar on demographic and risk factors

Factors	Odds Ratio	Std. Error	p	Confidence Interval	
Occupation				lower	upper
Retired	Ref				
Business/Self	0.29	0.13	0.01	0.12	0.69
Driver/Housekeeping/Labour	0.42	0.16	0.02	0.20	0.89
Housewife/non-paying work	1.11	0.46	0.81	0.49	2.51
Service	0.44	0.19	0.06	0.19	1.04
Age					
<35 years	Ref				
35-49 years	3.41	1.03	0.00	1.88	6.17
50=> years	12.03	3.72	0.00	6.56	22.07
Education					
<5 years	Ref				
5-11 years	0.96	0.22	0.87	0.62	1.49
12=> years	1.23	0.34	0.46	0.71	2.12
Caste					
Scheduled Caste or Tribe	Ref				
Others	1.04	0.29	0.88	0.61	1.78
Gender					
Female	Ref				
Male	1.17	0.39	0.64	0.61	2.24
Tobacco					
No Tobacco	Ref				
Any Tobacco	1.17	0.37	0.63	0.63	2.18
Alcohol					
No Alcohol	Ref				
Consumes Alcohol	1.61	0.52	0.14	0.86	3.02

Table 7: Continued

Factors	Odds Ratio	Std. Error	p	Confidence Interval	
Physical Activity					
Less than appropriate or none	Ref				
Appropriate physical activity	1.19	0.23	0.38	0.81	1.75
Diet					
None or once daily consumption of vegetable or fruit	Ref				
Regular veg or fruit more than twice a day	0.94	0.23	0.81	0.59	1.51

Table 8: Adjusted odds of raised hypertension on demographic and risk factors

Occupation	Odds Ratio	Std. Error	p	CI: lower	CI: upper
Retired	Ref				
Business/Self	0.64	0.23	0.22	0.31	1.31
Driver/Housekeeping/Labour	0.46	0.16	0.03	0.23	0.91
Housewife/non-paying work	0.67	0.25	0.28	0.32	1.39
Student	0.41	0.29	0.21	0.10	1.64
Service	0.48	0.19	0.06	0.22	1.04
Age					
<35 years	Ref				
35-49 years	3.66	0.79	0.00	2.40	5.58
50=> years	8.21	1.92	0.00	5.18	12.99
Education					
<5 years	Ref				
5-11 years	0.83	0.15	0.31	0.58	1.19
12=> years	0.81	0.18	0.34	0.52	1.26
Caste					
Scheduled Caste or Tribe	Ref				
Others	0.56	0.11	0.00	0.37	0.83
Gender					
Female	Ref				
Male	0.82	0.20	0.40	0.51	1.31

Table 8: Continued

Occupation	Odds Ratio	Std. Error	p	CI: lower	CI: upper
Tobacco					
No Tobacco	Ref				
Any Tobacco	0.64	0.18	0.11	0.37	1.11
Alcohol					
No Alcohol	Ref				
Consumes Alcohol	2.13	0.58	0.01	1.24	3.64
Physical Activity					
Less than appropriate or none	Ref				
Appropriate physical activity	0.77	0.12	0.09	0.57	1.04
Diet					
None or once daily consumption of vegetable or fruit	Ref				
Regular veg or fruit more than twice a day	0.85	0.17	0.41	0.58	1.25

Facility Audit Findings

This UPHC also runs a free NCD Clinic every Tuesday at the facility in the morning. Evening clinics are conducted regularly. The facility also conducts outreach camp once in 2-3 months to screen diabetes and hypertension in the slums. Out of few such camps already completed, we found that, people who were diagnosed with diabetes mellitus and hypertension in this community were predominantly from elderly age group. Awareness about NCDs was reported to be low among those newly detected cases especially in slums. We found that the UPHC was loaded with oral antidiabetic and anti-hypertensive medicines. We found patients requiring Insulin and tertiary level care were referred to nearby hospitals (KR Hospital and ESI Hospital). The facility also offers basic laboratory investigations. We found that the facility had following staff at the time of start of this project– one medical Officer, five auxiliary nurse midwives (ANMs), two staff nurses, one-part time laboratory technician, one pharmacist, and two group D workers. We found that positions for counsellor, data entry operator (DEO) and ASHA workers were vacant.

Four public and seven private hospitals in the vicinity of the population were audited. Five (two public and three privates) facilities offered primary care whereas the rest offered specialist services (Table 7). Public primary care facilities were better staffed than private clinics. Specialist positions were filled up in both sectors. NCD counsellor, an important player at primary care level was missing

in both sectors. Both types of facilities showed better availability of basic diagnostics and drugs. However, HbA1C test that helps to understand the long-term control of blood glucose, lipid profile and electrocardiogram (ECG) that help to assess complications related to NCD were found missing in primary care facilities. Availability of insulin and anti-lipid drugs was better in private facilities; NCD related records were better maintained in public facilities. The availability of advanced diagnostics to detect complications of the eye (retinopathy), kidneys (nephropathy) and heart (echocardiogram), etc. was suboptimal across both public and private facilities.

Table 9: Facility audit findings

Section 1: Availability of human resources in facilities					
		Staff availability			
#	Staff Designation	Public (n=4)		Private (n=7)	
		UPHC (n=2)	Higher hospitals (n=2)	Primary Clinics (n=3)	Higher hospitals (n=4)
1	Endocrinologist/ Diabetologist	0	2	0	4
2	Cardiologist	0	1	0	1
3	MBBS Medical Officer	2	2	2	2
4	Alternative Medicine Medical Officer	0	0	1	1
5	Pharmacist	2	2	0	2
6	Laboratory Technician	2	2	0	3
7	NCD Counsellor	0	2	0	1
8	Junior Health Assistant/ Staff Nurse	2	2	0	3
9	Data Entry Operator	1	2	0	1
10	Office Assistant	2	2	1	3

Table 9: Continued

Section 2: Availability of NCD related diagnostics, treatments, equipment and records					
#		Government (n=4)		Private (n=7)	
	Availability of basic equipment	**UPHC (n=2)**	**Hospitals (n=2)**	**Primary Clinics (n=3)**	**Hospitals (n=4)**
1	Adult Weighing Scale	2	2	3	4
2	Blood Pressure Apparatus	2	2	3	4
3	Stethoscope	2	2	3	4
4	Stature Meter (Height measurement)	2	2	3	4
	Availability of diagnostics#				
5	Blood glucose- FBS, PPBS	2	2	3	4
6	HbA1C	0	1	0	3
7	Lipid Profile	0	1	0	3
8	ECG	0	2	0	2
	Availability of medicines				
9	Any one of oral antidiabetic (T. Metformin 500mg, T. Gilibenclamide 5 mg, T.Glimipride 1 mg etc.)	2	2	2	4
10	Any one of oral Anti-Hypertensive (T. HCTZ 12.5 mg, T. Enalapril 5 mg, T. Amlodipine 5mg, T.Atenolol 25 mg, T. Telmisartan 40 mg etc.)	2	2	2	2
11	Insulin- Injection/ Premix	1	2	2	3
12	Anti-dyslipidaemia drugs (T. Atorvastatin 10 mg etc.)	1	2	2	4
	Documentation				
13	NCD screening register / follow up register	2	1	0	1
14	Laboratory register	2	1	0	1

Qualitative study findings

Most of the respondents were in the age group of 45 and above, few were in the age group of 35 to 40. Three forth of male and female respondents were daily wage labourers (agriculture, carpenter, mason, driver) and some women were housewives. One man was a retired Govt. employee and two men were working as priest. Some women and men had left their job after diagnosed with hypertension and diabetes and due to health consequences. While most of the respondents were illiterate; few had completed secondary education and very few were graduates. Most of the participants were diagnosed to have diabetes and hypertension since 5 to 8 years and few were living with diabetes and hypertension since more than 15 years. Three respondents were diagnosed in recent screening process. More than half were having both diabetes and hypertension.

Knowledge on disease

Except two, none had a clear idea about aetiology of diabetes and hypertension. Some said it is related to tension - "but I am never tensed, despite that I got it…why?". It occurs genetically- "but none of our ancestors had this…why?" Some identified the disease with symptoms like blurring of vision, tiredness, getting angry, difficult to do physical activity, swelling in the leg and sweating.

Access of treatment

More than half were diagnosed as diabetic and hypertensive in private facilities. All of them had visited the health facility for treatment but it was only at the later stage. Most were accessing treatment in private hospitals since doctors were easily available and accessible, better understanding and rapport with doctor, doctors charge but provide a better care. Few were accessing treatment from government facility but raised concerns like need to wait in the queue for longer time, timing was an issue since most of them were labourers, lack of drugs in some instances. The participants were happy that services were provided free of cost at government facilities.

Challenges pertaining to adherence

Participants reported poor adherence to treatment due to a varied reason. Some of these reasons were habit of taking tablet only when they feel tired, misconceptions like medicines leads to kidney problem, family members object the regular consumption of medications, don't like smell of tablets, scared of reactions that tablets/injections cause, forget to take tablets because of busy work schedule. Some participants also believed that medicines were not effective for hypertension and diabetes treatment. One person quoted "Kandu sayokinta kanade sayodu melu", meaning to say that it is good to die in ignorance instead of knowing that they have disease. Few participants suggested some strategies to improve adherence among people with diabetes and hypertension such as: home visits by the health worker, frequent health check-up/awareness camps, support group meetings, education sessions for family members, easy accessibility of medicines through Anganawadi workers, ANMs, Asha etc., reminders by sending SMS/ postal letters.

Food habits

Most respondents expressed anxiety on their food habits as a result of misconceptions. They were worried that people with high BP should eat less salt, diabetics shouldn't eat certain fruits like banana,

not allowed to eat rice, chicken, mutton. Family members got irritated to prepare two sets of food, one for patients and one for others. One person said, "BP/sugar ootane kittukondu bidutte sir, chicken/mutton tinnuvangilla" meaning to say that "the disease snatched away their foods, now we are not supposed to eat non-vegetarian foods at all"; yet another person said "When we go to others house, they offer some tea/coffee with sugar unknowingly, in such time we are not able to avoid their hospitality".

Few of them reported that after they were diagnosed with HTN and DM they started to consume millets (Siridhanya) daily.

The consolidated common food consumption pattern is as below:

- Breakfast: Idli/dosa/rice items/ragi ball/roti with sambar/chutney
- Lunch: Ragi ball/rice/chapathi with sambar
- Dinner: Ragi ball/rice/chapathi with sambar
- Mid-meal snacks: Biscuits, coffee/tea (rare)
- Common fruits consumed: Banana, guava, orange/sweet lime
- Common cereals consumed: Ragi, rice, wheat, other millets

Knowledge and source of knowledge

Misconceptions of healthy diet or food choices were frequently observed among participants. For example, "millets reduce the sugar levels". "Consumption of a mixture of few spices and condiments alone can control blood sugar levels, there is no need for any medication". Some participants reflected on the notion that eating healthy was eating everything in moderation, or "enough," but what constitutes "enough" was not clear. Sources of food and dietary knowledge were also discussed. These sources included media/Internet, health care providers, neighbours, elders, those already with DM or HTN and past dieting experience. While considering their awareness about the foods to be consumed, they are mostly misguided. They are flooded with information from everyone around and they are mostly not given the right information. Few have clarity about the reductions in portion sizes but unaware as to what foods to be consumed and what should be avoided. Eating a "balanced" diet was also considered healthy, but what constituted a "balanced" diet was often poorly understood.

Perceptions about food and diet

Few participants considered food as just food. Some participants, demonstrated an almost love-hate relationship with food stating that they perceived that it was "scary". Attitudes are greatly affected by how people were raised, social and family pressures. Current diets were influenced by childhood eating habits and beliefs about food. They were disappointed that they cannot eat all that they want to eat.

Sense of control over dietary Intake

Some participants clearly maintained control over their diets, articulating good eating habits. None of the participants said that their eating desires were out of control or they lacked control over their eating.

Eating Behaviours, barriers and willingness to adopt a healthy diet

The eating behaviours were influenced by knowledge, attitudes, and sense of control. Some participants clearly described good eating habits/patterns, including eating breakfast, lunch, and dinner with in-between snacks, diet high in vegetables. However, few described irregular habits, such as late breakfast which was common among women who would eat only after their household chores. Even though most participants had adequate knowledge of healthy food, several barriers to healthy eating prevented them from applying their knowledge. One of the barriers observed was general ignorance and that they did not realise the ill effects of not controlling their diet. Although a few participants had no real desire to change their eating habits, most did discuss actual and potential strategies to promote healthy eating. Few are substituting healthy alternatives to their eating regimens: "I drink coffee/tea without sugar". "I drink homemade malt (cereal and pulse) based drink everyday morning". None reported to have reduced their salt intake among those diagnosed with HTN.

Knowledge on physical activity and lifestyle modification

Many had a strong feeling that their work involved physical work and thus, they didn't require a walk or exercise. Somesh (aged 40 years) said "I am doing carpentry job, I climb 6-7 floors a day and I don't think I need any exercise". Malathi aged 45 years said "I do work in gardening department, I need to pour water till evening so, I don't go for a walk and don't do any exercise"

Many women and men said, they never practiced morning walk or the exercise and now feel awkward to do so in front other community members. Two women reported that they have habit of chewing tobacco, and they believe that if they left chewing they will experiences some health problem like headache, giddiness.

Home remedies and herbal treatment

Many of the respondents have been practicing the home remedies and herbal treatment. When they feel that they have high sugar level they used to eat fenugreek seed (menthya), and few also reported that they used to drink the decoction of cumin seeds and turmeric for diabetes and hypertension. Few respondents use some herbs like Basil, tephrosia Purpurea (Egyali in Kannada), Insulin tree, Indian Borage (Dodda patre in Kannada) to cure the disease.

Suggestions to improve adherence to the treatment

Participants also shared possible ideas to improve the situation in the community:

- Hospital staff should visit to their respective house frequently
- Frequent health check-up/awareness camps should be organized at community level
- Tablets should be available in nearby Anganawadi centres
- Awareness pamphlets should be distributed

Monthly meetings with the patients (sending SMS/ postal letters to the houses to attend such meetings).

Discussion

This report presents population level disease burden of diabetes and hypertension, associated risk factors, health system readiness, views and perspective of people on treatment access, adherence and lifestyle modification. Recent studies have reported the regional prevalence for hypertension in India ranges from around 15% to 32% in rural areas and 28% to 32% in urban areas(11,12); large scale national representative studies also echo similar disease prevalence. Although the National Family Health Survey (NFHS) reports a lesser overall prevalence (11.3%), the recent fourth District Level Household Survey (DLHS) reports higher rates (25%) of prevalence(13). The current project has reported an overall prevalence of 19% which was on the lower side when compared to the southern Indian average. The increasing prevalence of hypertension in recent years is being associated with increased occurrence of cardiovascular diseases, and increased mortality and disability. As per the recent Karnataka state disease burden profile, hypertension has jumped up from 5th to 2nd major risk factor responsible for more deaths and disabilities combined(14). Wide regional variations are reported which are attributable to variations in dietary practices, life styles and urbanization. Similarly, in case of diabetes, greater regional variations and rural-urban differences in prevalence is observed in India. This project reports 6.6% prevalence of known diabetics which corroborates with national average as per a recent national representative study(15). Other studies have reported the overall prevalence of diabetes at around 9-16%; the project overall prevalence of 12.6% in urban southern India was consistent with those studies(16). Thus, overall the prevalence of raised blood sugar and raised blood pressure at the study site is par with national and state averages; furthermore, unlike the state-wide pattern that showed the marked difference by gender in terms of disease prevalence(17), the current project showed only a marginal difference making site one of the vulnerable pocket to work with.

The success and effectiveness of any NCD prevention programme depends upon the identification and mitigation of most common risk factors of NCDs. This project used the standardised WHO STEPS questionnaire to identify major modifiable risk factors i.e. tobacco consumption, harmful alcohol consumption, unhealthy diet and insufficient physical activity. The prevalence of risk factors, especially high alcohol consumption and physical inactivity was very high in the study population when compared to national aggregates (5.5% Vs 1.6%; 40% Vs 13.4%)(3). Elderly people, especially those above 50 years and above, were not used to do outdoor physical activity and considered it to be culturally inappropriate. Consumption of alcohol was especially higher among certain sections of the community, particularly among population engaged in physically demanding jobs such as masonry, carpentry etc. Healthy diet practice was expectedly found to be very poor as there were absolutely no one who consumes at least five servings of fruits or vegetables a day; however, consumption of extra salt, processed and oily food was very less and in control. Association of these risk factors with socio-demographic factors such as: elderly age, gender, and poor education was consistent with the findings reported in other studies in the region(6).

Access to healthcare, medicine availability and self-reported adherence to medication regimen were all found to be very good in the community, yet the control of hypertension and diabetes was suboptimal. These raise concerns about actual compliance with prescribed treatment, adoption of healthy lifestyles and quality of treatment. Qualitative findings and the facility assessment audit also brought up question marks on lifestyle behaviour and quality of treatment. Other studies have reported similar findings(18–20). During the situational assessment phase of this project, we found that the health systems was not ready to address chronic diseases and there were limited priority given to NCD care at primary care level. In the absence of integrated care at both government and private primary care set-ups, there were ineffective control of NCDs in the region. Staff shortage were observed in primary care set ups especially in private sector; important diagnostics such as: HbA1c was found missing at most of the primary set-ups and system for early management of complications was poor across facilities. Considering the fact that a larger section of the population goes to private healthcare facilities, and incurs high out-of-pocket health expenses, primary care in private, and specialist care in government needs pronounced attention. Similar observations are reported by other studies locally(21,22). Considering issues with quality of treatment, treatment adherence, and poor readiness of health system, self-care for follow-up tests and medication adherence could be an option to focus in in times to come (23,24), and that obviously demands increased awareness of diagnostics, medications and knowledge of risk factors among NCD patients(25). The qualitative study throws more light on factors influencing poor adherence and hence control of NCDs in Mysore city. Misconceptions about the causes of illness alongside anxiety and stigma about diseases are widely prevalent. Stigma related to disease status, misconception and anxiety about medications and side effects, cultural beliefs and social norms and an unprepared health system are all affecting adoption of NCD friendly lifestyles. Studies in Ghana and India have reported similar factors associated with poor adherence.

Conclusion and Way Forward

The situation analysis provided population based data to plan programs for hypertension and diabetes in the urban primary health canter in Mysore. Although the project involves only the study of care for diabetes and hypertension, the learning and experience is applicable to other NCDs as well.

Consultation workshop will be held with government and other stake holders to consolidate learnings from the phase-1 of the project, discuss and finalise the intervention design, and activities, and discuss future course of action for the pilot project. In the second phase the intervention package will be implemented with embedded monitoring and evaluation system. Formative research will help to refine and revise the model while evaluation data will establish evidence on effectiveness and feasibility to scale up the model. Constant engagement, advocacy and capacity building of Government and other key stake holders will continue to enable uptake and adoption of the model across the district and state.

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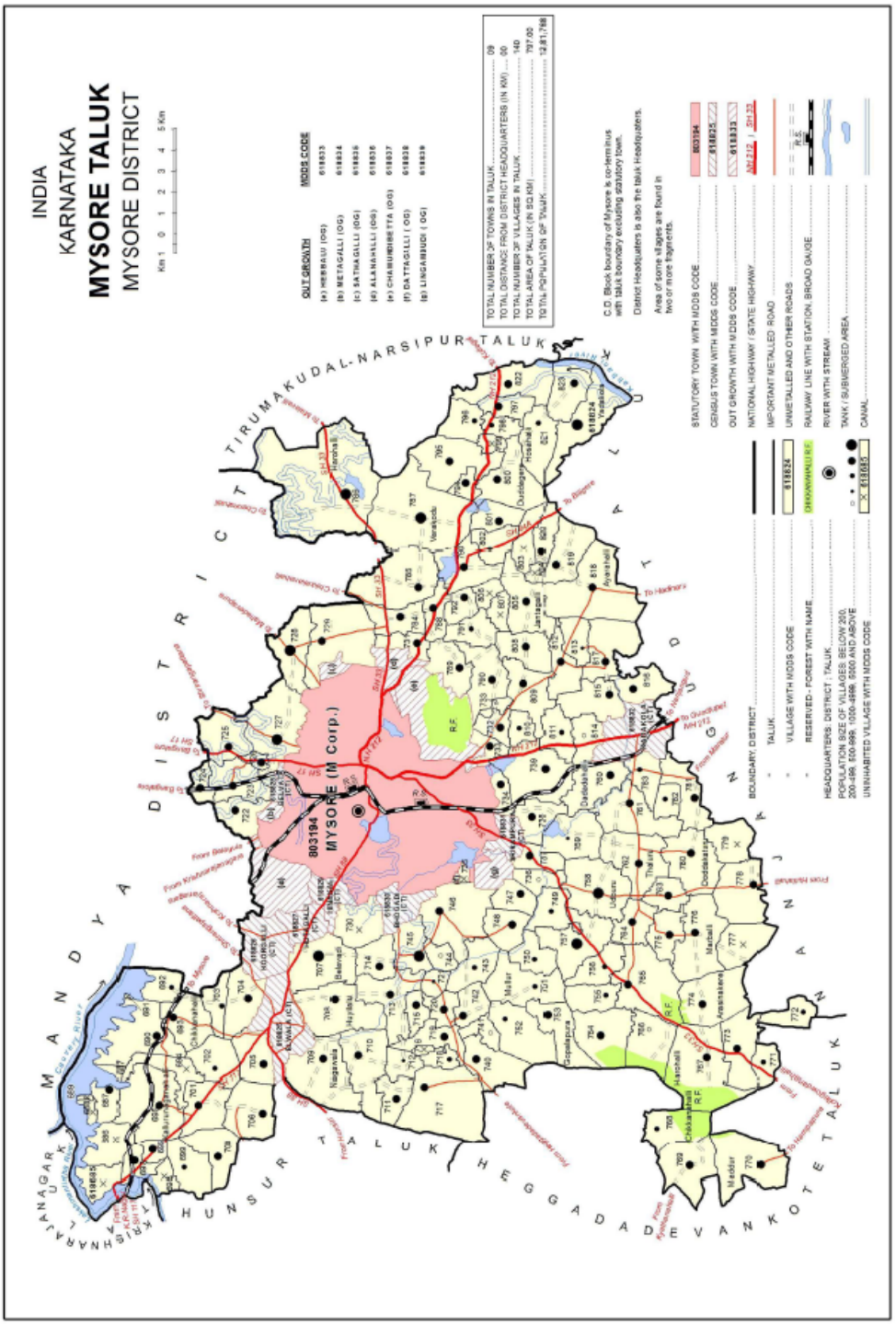
Annexures

Annexures 1: Map of Mysore metropolitan city corporation (Highlighted in pink)



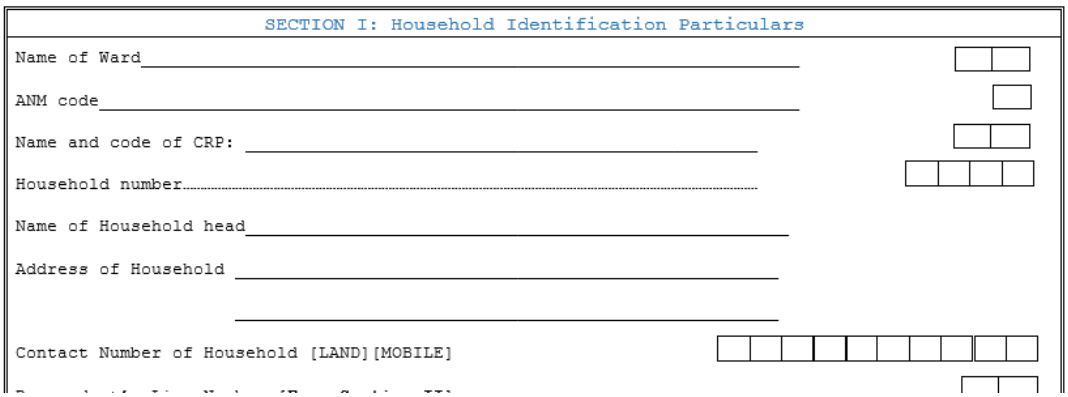
Annexures 2: Specification of diagnostics used during screening

S No.	Parameter measured	Equipment	Equipment Model
1	Random Blood Sugar	Digital Glucometer	Freestyle Optium H Glucometer
2	Random Blood Sugar	Glucometer strips	Freestyle Optium H Strips
3	Random Blood Sugar	Lancets	Peerless on call- Acon Lancets
4	Blood Pressure	Digital BP Apparatus	Omron HEM 7120 BP Apparatus
5	Body Weight	Digital Weighing Machine	Omron HN 286 Digital Weighing scale
6	Height	Standard Measuring tape	Deca 201

Annexures 3: Adapted WHO STEPS Questionnaire

CONFIDENTIAL: FOR PROGRAMME USE ONLY

Prevalence of Diabetes, Hypertension, and their associated risk factors and Health Seeking Behavior Among Adults in an Urban PHC area in Mysore City



SECTION I: Household Identification Particulars

Name of Ward _____ ☐☐

ANM code _____ ☐

Name and code of CRP: _____ ☐☐

Household number..... ☐☐☐☐

Name of Household head _____

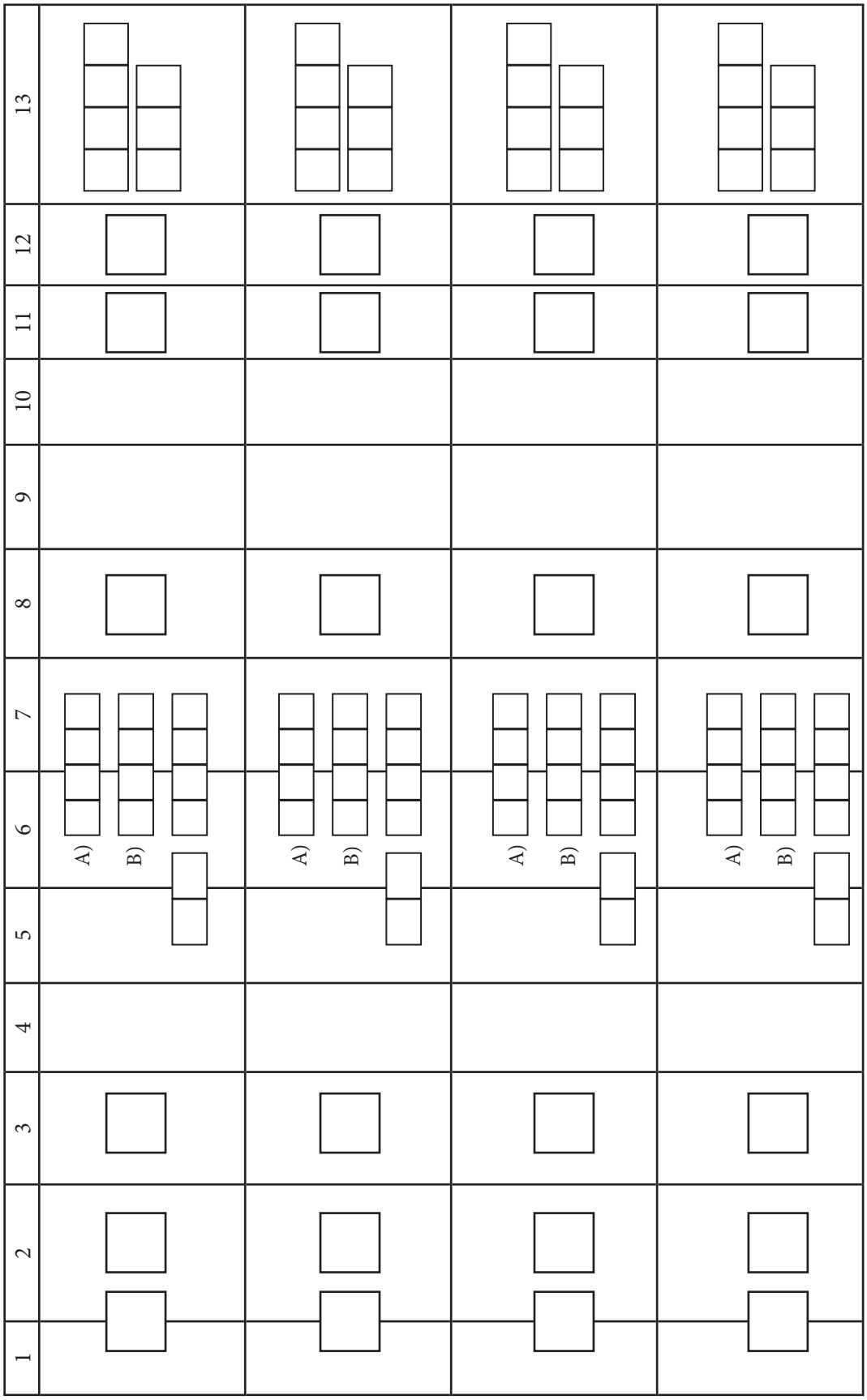
Address of Household _____

_____

Contact Number of Household [LAND][MOBILE] ☐☐☐☐☐☐☐☐☐☐

Now, I will ask you about where you take your treatment from and the cost of medication.

Line. No. Of Members Diagnosed with Diabetes or Hypertension	**STATUS OF DIABETES AND BP FROM SECTION VIII** Knew, Diabetic=1 Knew, Hypertensive=2 Knew Both=3 Identified Now, ONLY Diabetic=4 Identified Now, ONLY Hypertensive=5 Identified Now, Both=6 Knew Diabetic, identified now hypertensive=7 Knew hypertensive, identified now diabetic=8	From this list where would/do you visit (often) for treatment of your diabetes/ hypertension or both? Government hospital (DH/TH/ CHC=1 UPHC=2 Private Hospital/ Clinic=3 NGO Hospital/ Clinic=4 Private Pharmacy=5 Others=6 No Where=7 Do Not Know=8 **IF "7" or "8" GO TO I6**	Name of Preferred Facility and Provider Address IF "4" or "5" or "6" in I2 END	**IF I2 is "4/5/6" THEN GO TO NEXT** How many times did you visit the facility for treatment in last 12 months? **RECORD NUMBER**	**IF I2 is "4/5/6" THEN GO TO NEXT** How much did you spend from your own pocket towards medicines, consultation, investigations for diabetes or hypertension in the **last six months?** **RECORD 998 IF DO NOT KNOW** **M: Med** **I: INV** **C: CON**	How did you pay for the medicines, investigations and consultancy for your diabetes or hypertension or both? No Medication/ treatment=0 Free of Cost form govt. hospital=1 Pay out of pocket=2 Partially covered by insurance scheme=3 Completely covered by insurance scheme=4 M: Med I: INV C: CON	**IF I7 "0" THEN GO TO I13 ELSE ASK ONLY IF I2 is "1" or "3" or "7"** Do you have your medicines for diabetes at home today? **IF Yes, ASK TO SHOW THE MEDICINES AND RECORD ACCORDINGLY** **Yes, Shown=1** **Yes, not Shown=2** **No=3**	**ASK ONLY IF I2 is "2" or "3" or "8"** Do you have your medicines for hypertension at home today? **IF Yes, ASK TO SHOW THE MEDICINES AND RECORD ACCORDINGLY** **Yes, Shown=1** **Yes, Not Shown=2** **No=3**	**ASK FOR THE PRESCRIPTION** IF PRESCRIPTION AVAILABLE-RECORD Names of medicines Consumed **(Only those for diabetes or hypertension)**	Please mention the number of days for which medicines are obtained by you at one time usually?	Have you been able to take medicines as directed? Yes, fully able to=1 Partially able to=2 Not at all=3 IF 1 OR 2 Go TO NEXT MEMBER	ONLY FOR THOSE NOT TAKING TREATMENT/ MEDICATIONS EVEN AFTER KNOWING THEIR STATUS What is/are the reason/s for not fully able to take medicines as directed OR not taking treatment? **MULTIPLE ANSWERS POSSIBLE PROBE AND MARK ALL APPLICABLE** **Could not travel to facility=A** **Medicine not available at facility/ shop= B** **No money to buy medicines/ treatment=C** **Side effects of medicines = D** **Forgot to take medicines as per prescription= E** **Do not know where to go= F** **Do not think that this needs treatment= G** **Self-test at home=H** **Other=X**


13
12
11
10
9
8
7
6
5
4
3
2
1
A)
B)
A)
B)
A)
B)
A)
B)

Annexures 4: Facility Audit Checklist

Strethening continuum of care for select NCDs in an urban PHC area of Mysore, Karnataka

Facility Checklist

IDENTIFICATION	Code
Ward no	☐
ANM area	☐
FACILITY NAME:	
FACILITY TYPE 1. TH 2. UCHC 3. UPHC 4. PRIVATE Hospital 5. PRIVATE Clinic 6. AYUSH Hospital 7. AYUSH Clinic 8. NGO Hospital 9. NGO Clinic	☐
DATE OF ASSESSMENT: DAY ☐☐ MONTH ☐☐ YEAR ☐☐☐☐	
NAME OF INVESTIGATOR	

Human Workforce

Positions	Are these Staff available? Available 7 days a week=1 Partial in the week=2 Not Available=3	If Available Full time or Partially, record the number of staff
Specialist – Endocrinologist/diabetologist/ General Physicial MD		
Specialist- Cardiologist		
Medical officer-MBBS		
Medical officer-AYUSH		
Pharmacist		
Laboratory Technician		
Counsellor (providing tips on life style modification and health education)		
Staff Nurse		
Data Entry Operator (DEO)		
Group D		

General Service Readiness

Basic Equipment	**Yes= 1 No=2**
Adult Weight Scale	
Blood Pressure Apparatus	
Stethoscope	
Stature / Stadio Meter (Height measurement)	
Diagnostic Services	
Blood glucose- FBS, PPBS	
HbA1C	

Lipid Profile	
ECG	
ECHO	
Diagnostic Capacities to identify complications	
Diabetic Retinopathy-Retinopathy screening through Ophthalmoscopy	
Diabetic Nephropathy-Kidney Function Test (B.Urea and S.Creatinine)	
Foot examination to assess diabetic neuropathy	
Medicines	
Oral Anti-Diabetic (T. Metformin 500mg, T. Gilibenclamide 5 mg,	
T.Glimipride 1 mg etc.)	
Oral Anti-Hypertensive (T. HCTZ 12.5 mg, T. Enalapril 5 mg, T. Amlodipine 5mg,	
T.Atenolol 25 mg, T. Telmisartan 40 mg etc.)	
Insulin- Injection/ Premix	
Anti-dyslipidaemia drugs (T. Atorvastatin 10 mg etc.)	
Registers	
NCD screening register / follow up register	
Laboratory register	

Annexures 5: Referral Protocol for Diabetic Clients

Referral Protocol for Suspected Diabetes Case

CRPs need to inform all existing and newly suspected cases of diabetes (or both diabetes and hypertension) on the following.

A. Where to visit for confirmatory test

- People can visit the Kumbarakoppalu urban PHC for confirmation of their blood sugar. Test is free of cost at this PHC and chargeable at private labs.

B. When to visit

- People can visit seven days a week to the UPHC. Medical Officers are available for seven days a week in the morning (8 am-3:30 pm) and evening (5- 7:30 PM).
- The lab technician is available for three days in this UPHC-Tuesday, Thursday and Saturday.
- People should visit for confirmatory test only on Tuesday, Thursday and Saturday.

C. Preparations for Fasting Blood Sugar(FBS) Test

- One should maintain 10-12 hours of overnight fasting before giving blood sample for FBS test.

D. How frequently one should do FBS test

- People with diabetes should check their FBS every 3 months

E. Preparations for 2 hours Post-Prandial Blood Sugar (PPBS) Test

- One should come for PPBS test after around 2 hours of eating a meal that contains carbohydrate. Your blood will be drawn again for the 2-hour postprandial blood sugar (glucose)
- You should rest during the 2- hours between the meal or drink and the blood collection.
- Do not smoke, eat, drink, or exercise during the 2-hours. These activities cause the blood sugar levels to be falsely low or falsely high.
- One should consume his/her medications if already a diabetic before the PPBS test.

F. How frequently one should do PPBS test

- People with diabetes should check their PPBS every 3 months

G. Confirmation value for diabetes from FBS and PPBS test

Table 1: Criteria for diagnosis of Type-2 Diabetes Mellitus using venous blood samples*

	Fasting Blood Sugar (mg/dl)	Post-Prandial Blood Sugar (mg/dl)
Diabetes Mellitus	>= 126 mg/dl or	>= 200
Impaired Glucose Tolerance	< 126 and	>140 to < 200
Impaired Fasting Glucose	>=110 to <126	

**WHO Definition 1999*

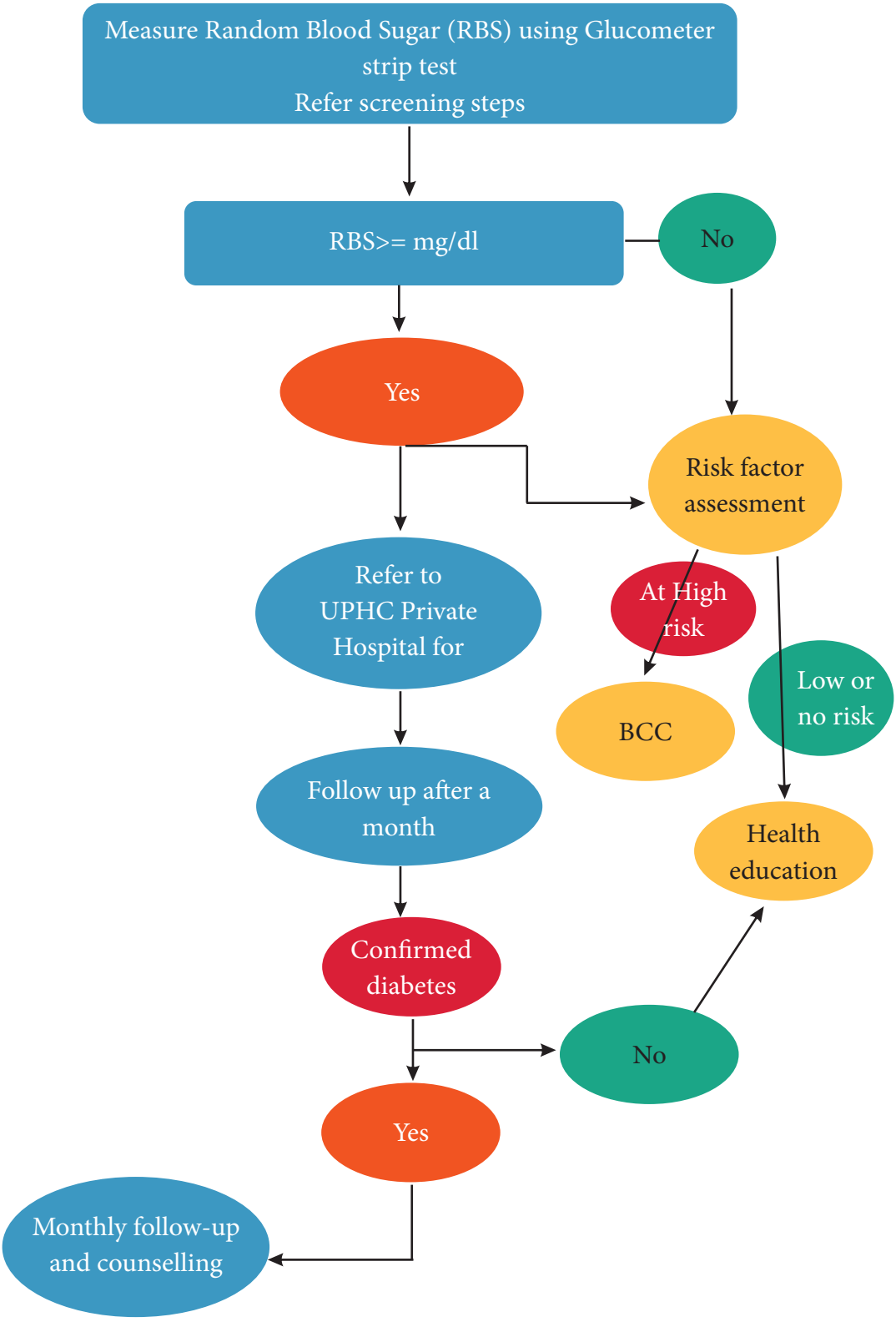
Capillary blood glucose value is also sufficient. Where capillary blood glucose measured by glucometer is used in the fed state (i.e., post food/post glucose/post meal), the >200 mg/dl cut off may be revised to >220 mg/dl

H. What is $HbA1_c$ Test, and how frequently one should do the test?

- The HbA1c test, also known as the haemoglobin A1c or glycated haemoglobin test, is an important blood sugar test that gives a good indication of how well your diabetes is being controlled.
- One should go for $HbA1_c$ test once in every quarter or 3 months' time.

I. Where one would get medications for diabetes?

People diagnosed with diabetes can get diabetic medications free of cost at the Kumbarakoppalu urban PHC and have to pay if intended to purchase from private medical stores.


Measure Random Blood Sugar (RBS) using Glucometer strip test
Refer screening steps
RBS>= mg/dl
No
Yes
Risk factor assessment
Refer to UPHC Private Hospital for
At High risk
Low or no risk
BCC
Follow up after a month
Health education
Confirmed diabetes
No
Yes
Monthly follow-up and counselling

Annexures 6: Referral Protocol for Hypertensive Clients

Referral Protocol for Hypertension Case

CRPs need to inform newly suspected cases of hypertension on the following

A. **Where to visit for confirmatory test?**
   - **People with suspected hypertension can visit the Kumbarakoppalu urban PHC** (UPHC) for confirmation of their blood pressure readings. Test will be absolutely free at this PHC and is chargeable in private hospitals/clinics.

B. **When to visit?**
   - **People can visit seven days a week to the UPHC**. Medical Officers are available for seven days a week in the morning (8 am-3:30 pm) and evening (5- 7:30 PM).

C. **Preparations for Blood Pressure Test**
   - No special preparations are needed for a blood pressure test. However, following points should be best followed to get accurate readings.
   - Empty your bladder before the test
   - **Avoid eating or drinking caffeinated beverages (tea, coffee) and avoid smoking, chewing tobacco, alcohol consumption** for one hour before your test. However, breakfast, lunch and dinner can be taken before conducting hypertension test.

D. **Confirmation of hypertension from BP measurement**
   If average SBP, >=140 mm of Hg or average DBP>= 90 mm of Hg, confirm hypertension. Preferably this should be confirmed in two-three continuous visits within a weeks' time

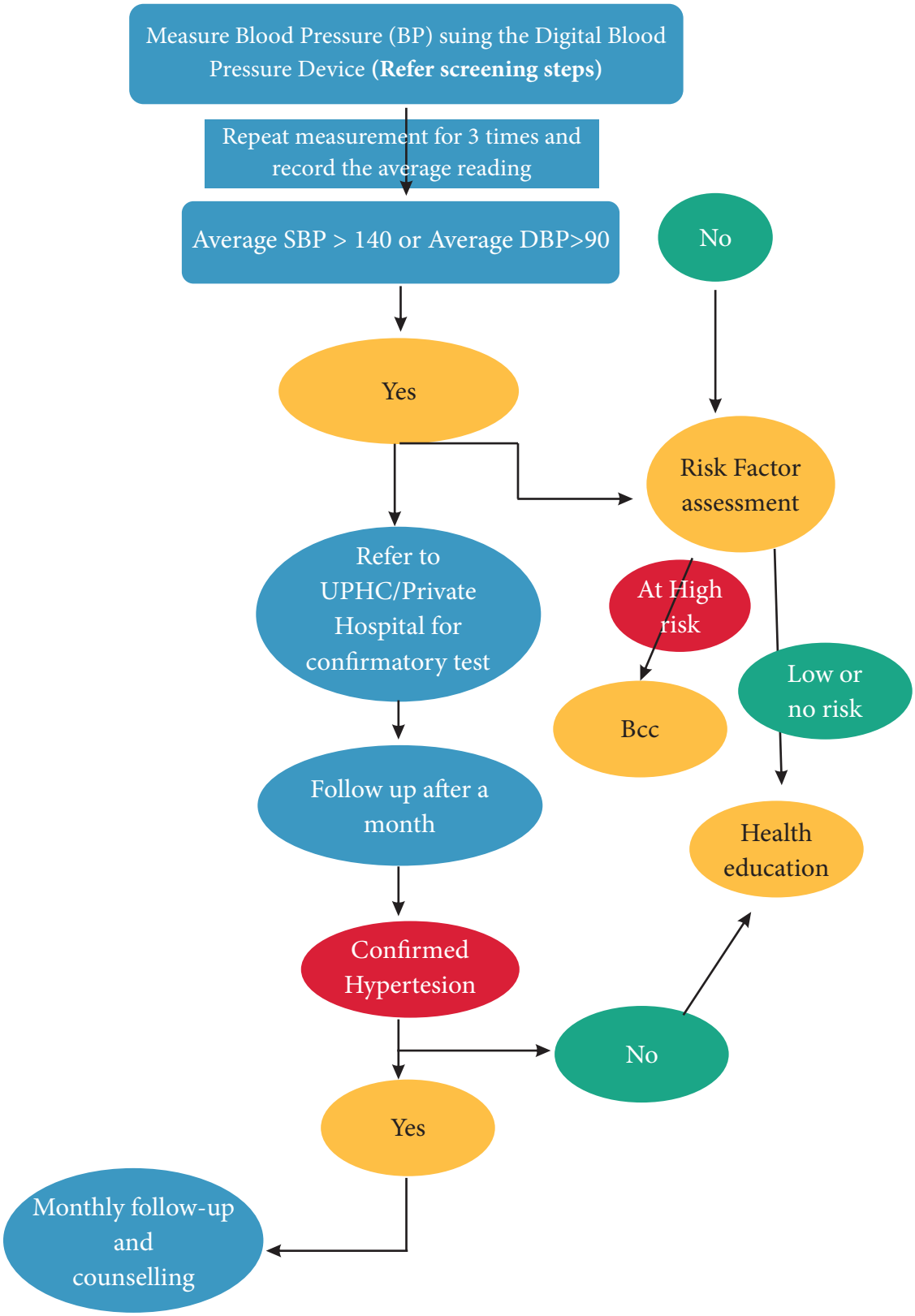
E. **How frequently one should do test?**
   People with hypertension should check their BP once in every month

F. **Where one would get medications for high BP?**
   One will get **free medications for high BP at this Kumbarakoppalu urban PHC**, and one have to pay if medications purchased from private medical stores.

CRPs need to inform existing cases of hypertension on the following

G. **How frequently one should do test?**
   People with hypertension should check their BP once in every month at the UPHC or private facility.

H. **Where one would get medications for high BP?**
   One will get **free medications for high BP at this Kumbarakoppalu urban PHC**, and one have to pay if medications purchased from private medical stores.


Measure Blood Pressure (BP) suing the Digital Blood Pressure Device (Refer screening steps)
Repeat measurement for 3 times and record the average reading
Average SBP > 140 or Average DBP>90
No
Yes
Risk Factor assessment
Refer to UPHC/Private Hospital for confirmatory test
At High risk
Low or no risk
Bcc
Follow up after a month
Health education
Confirmed Hypertesion
No
Yes
Monthly follow-up and counselling

Annexures 7: Screening Assessment Report

Project Title: Strengthening Continuum of Care of Select Non-Communicable Diseases (Diabetes, Hypertension) in an Urban PHC area in Mysore City: Report on *population level screening of diabetes and hypertension*

Background

The Social Initiatives, LANDMARK Group granted KHPT a fund to conduct population level screening for diabetes and hypertension. Further, the plan is to develop an intervention model to be tested in an UPHC at Mysore City which is about 160 kms from Bangalore. Kumbarakoppalu an UPHC covers a population of 58,000 (Source: National Urban Health

Annexures 8: Qualitative FGD & In-depth Interview Guide

Objective:

To understand the adult's views, perspective and experiences on diabetes and hypertension treatment access, adherence and life style modifications in an urban primary health centre context in Mysore

Research questions:

1. What are the motivators and barriers for adults?
   a. To visit facility for confirmatory test and initiation of treatment?
   b. To adhere to the medications?
   c. To accept for lifestyle modification?

I. Socio-demographic details:

1. Age : _____
2. Gender : _____
3. Qualification : _____
4. Occupation : _____
5. Marital status : _____
6. Income (monthly) : _____

II. General health seeking behaviour:

1. Generally, where does people go for treatment? (Probe for where do they prefer to go first for treatment). Where do you prefers to go? Did you face any difficulties there? How was your experience? Please describe.
2. How does the family support you for seeking treatment? Who takes decision whether you should take treatment or not?
3. Do you use any other way to heal the disease? (Probe for the home remedies, natural healers for any specific illness) Please explain.
4. What is your opinion regarding English medicine and home remedies? Which one is most effective? Why?

III. Knowledge, Attitude and Practice on Hypertension and Diabetes

1. In your opinion what is diabetes and hypertension? (Probe for what they know about diabetes and hypertension, if any misconception explores)?
2. What could be the reasons for one to get hypertension and diabetes?
3. How does family/friends/ colleague/ community see a person with diabetes and hypertension? (probe for the stigma, discrimination, stereotypes) Why? What other challenges they face?
4. When did you come to know that you have hypertension and diabetes? And where it was tested? Probe for whether they gone for testing voluntarily or someone referred. Explore the testing process he or she has undergone?
5. What challenges did you faced once you know your health status? Probe for challenges related to treatment, discrimination/ stereotypes from family / friends/ colleague/ community?
6. Do you ever think that you could get better without any professionals help/ moving to hospital for treatment? Why? Or can you do it on your own or do you feel you need any professional help? If yes, what kind of help you expect? Why?
7. Did you ever felt that you have benefited from undergone the treatment/screening? How?
8. Do you think you will be able to resolve your present health problems that brought you here today? If yes, how? If no, why?

IV. Reasons for not accessing the treatment

1. What could be reason for some people to access and others are not accessing the treatment to diabetes and hypertension? (probe for the motivational factors for some to access the treatment and barriers for others to not accessing the treatment) Please give with enough details.
2. What kind of test was performed to you? Where is the test performed? (probe about their prefer time and place for treatment) How would you describe your experience with this testing method? Did you face any problems in testing method? Please describe.
3. In your experience what could be done for people to access the treatment soon after the diagnosis?

V. Adherence challenges for treatment

1. Where do people prefer to go for diabetes and hypertension treatment? (probe for government/private hospital/ natural healers) Why? Are you comfortable speaking with the health professionals? Did you face any challenges in speaking with health professionals?
2. Did you think that some people are regular to the treatment and what could be the reasons? Some others are not adherent to the treatment, what could be the reasons?
3. Does people suffering from diabetes and hypertension have any expectations regarding the treatment? If yes, please explain?
4. How do you want your health care provider to perceive you?
5. Have you ever had any negative experiences with a treatment/ screening? Explain.

VI. Life style modification

1. In your opinion, how do the diabetic and hypertension people should lead their life? What kind of lifestyle modification required?
2. Do you think consuming alcohol and tobacco can worsen the disease? How?
3. Do you have any idea what changes should be done in your/ community lifestyle to prevent diabetes? Explain in detail
4. Do you meditate? What else do you do to help your own wellness?

Thank you for taking your time to participate in this interview!

Annexures 9: Ethics Approval Certificate

SWAMI VIVEKANANDA YOUTH MOVEMENT

Admin Office: Hanchipura Road, Saragur, H.D.Kote Taluk, Mysore District , 571 121 Karnataka

Tel/Fax : (08228) – 265877, 265412, 265413 **Email :** svym@svym.org.in

Website: www.svym.org. **Blog :** http:/blog.svym.org

Communication of Decision of the Institutional Ethical Review Board

	IRB (Health) No: 02/2017-18
Strengthening Continuum of Care of select Non-Communicable Diseases (Diabetes and Hypertension) in an Urban PHC area in Mysore City	
Principal Investigators:	1. *Dr. Swaroop N*
Co Investigators:	1. Dr. Krishnamurthy J 2. Mr. Arin Kar
Name & Address of Institutions: Karnataka Health Promotion Trust, IT Park, 5th Floor, #1-4, Rajajinagar Industrial Area, Behind KSSIDC Administrative Office, Rajajinagar, Bengaluru, Karnataka 560044 **Location of research:** Mysuru, Karnataka, India	
☑ New review ☐ Revised review ☐ Expedited review	
Date of review (DD/MM/YYYY):	
Decision of the ERB: ☑ Approved after satisfactory revisions ☐ Approved with comments for consideration of researchers ☐ Approve conditional to minor / major revisions (Study can commence only after revisions are incorporated and revised documents submitted to research office. ☐ Approval pending for more information. (Protocol needs to be resubmitted with requested information) ☐ Approval denied	
Comments: NIL	
Recommended for a period of: One year from the date of the review	

Please note *

- **Inform ERB immediately in case of any Adverse events and Serious adverse events.**
- **Inform ERB in case of any change of study procedure, site and investigator**
- **This permission is only for period mentioned above. Annual report to be submitted to ERB.**
- **Members of ERB have the right to monitor the trial with prior intimation.**

Name & Signature of Member Secretary
Institutional Review Board (Health),
Swami Vivekananda Youth Movement
Date: 27/09/2017

(Registered with CDSCO; Registration No. ECR/59/Indt/KA/2013 and
The Office for Human Research Protections (OHRP), US Dept of Health and Human Services; IRB #IRB00006661)

Annexures 10: Participant consent form

Karnataka Health Promotion Trust
1-4, Rajajinagar Industrial Area, Behind KSSIDC Administrative Office
Rajajinagar, Bengaluru-560044
Contact: Dr. Swaroop N, Deputy Director, Quality Improvement
080-40400300 (O) Email: swaroop.n@khpt.org

Informed Consent

This is the informed consent form for the study titled, "Strengthening Continuum of Care of select Non-Communicable Diseases (Diabetes and Hypertension) in an Urban PHC area in Mysore City" conducted by KHPT. The principal investigator for this study is Dr. Swaroop N and co-investigators are Dr. Krishnamurthy Jayanna and Mr. Arin Kar. The study team will preserve this consent form for a 12 months' period.

I confirm that I have read the information sheet (or it has been read out to me) and I have understood the contents of the sheet. I have had the opportunity to discuss this research/intervention study with the study staff. I am also aware of the fact that this study involves blood sugar measurement involving finger prick procedures. I have had my questions answered by them in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw at any time. I understand that information regarding my personal identity will be kept confidential and will not be revealed in any information released to third parties or publication. I authorize the inspection of any of my records that relate to this study by the Ethics Board or authorized study staff and study monitors for quality assurance purposes. I agree not to restrict the use of any data or results that arise from this study, provided such a use is only for scientific purpose(s). By consenting to participate in the study, I am not waiving any of my legal rights, nor releasing the investigators or the sponsor from their legal and professional responsibilities.

The study is approved by the Institutional Review Board of Swami Vivekananda Youth Movement with the Protocol Number no *IRB (Health) No: 0212017-18* for up to *12 months*.

I hereby give my consent to participate in this study.

---------- Date:

Name and signature of the respondent (if the person is illiterate, mention and obtain the left thumb impression instead of the signature)

Annexures 11: Participant consent form

Karnataka Health Promotion Trust
1-4, Rajajinagar Industrial Area, Behind KSSIDC Administrative Office
Rajajinagar, Bengaluru-560044
Contact: Dr. Swaroop N, Deputy Director, Quality Improvement
080-40400300 (O) Email: swaroop.n@khpt.org

Participant Information Sheet

This is the participant information sheet for the study titled, "Strengthening Continuum of Care of select Non-Communicable Diseases (Diabetes and Hypertension) in an Urban PHC area in Mysore City" conducted by KHPT. The principal investigator for this study is Dr. Swaroop N and co-investigators are Dr. Krishnamurthy Jayanna and Mr. Arin Kar.

My name is _____ and I am working with Karnataka Health Promotion Trust.

We are conducting this study in Kumbarakoppalu UPHC area, Mysore. This study is funded by LANDMARK and implemented by KHPT, with permission and guidance from the Dept. of H&FW, Govt. of Karnataka and assistance from the staff of UPHC Kumbarakoppalu. During the survey, we will check Random Blood Sugar and Blood Pressure levels along with height, weight, waist and hip circumference. Random Blood Sugar will be measured using glucometer based strips (Capillary method) and involves a minor finger prick with sterilised lancet. Blood Pressure will be measured using digital BP apparatus. We will tell you the results immediately and you would not need to pay any amount for these. We will ask questions related to health-seeking behaviour related to diabetes and hypertension. This information will help us to plan better delivery of health services, along with Government and private doctors. Your participation will therefore benefit many people including you (and your family).

The entire process usually takes 15 to 20 minutes to complete.

The information that you provide will be kept confidential and will be shown to persons who are involved in the data entry, analysis of this information and with UPHC staff/concerned ANM or ASHA of this area. Information gathered in this research study may be published or presented in public forums for furthering knowledge and best practices related to NCD in public health. However, your name, address, phone number and other identifying information will not be used or revealed.

Participation in this survey is voluntary and if you choose NOT to participate, you may withdraw at any time. Apart from knowing the test results free of cost, there will be no direct benefit to you from participating in this study, but we hope that the information learned from this study will help you understand your health status and seek care appropriately; in addition, this will benefit people in this area, city and country in the future. There will be no cost or charge to you for participating in this study and you will receive no payment or reimbursement for any expenses related to taking part in this study.

We hope that you will take part in this survey since your participation is important. At this time, if you have any questions, I would be happy to answer them.

KHPT
IT Park, 5th Floor, # 1-4, Rajajinagar Industrial Area, Behind KSSIDC Administrative office, Rajajinagar, Bengaluru-560 044.

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