To assess the effectiveness of implementing a Smartphone Application in the NCD screening program used by front-line workers (ASHAs) at the level of Chomu Sub-Center Jaipur, India

A Capstone project submitted to
IIHMR University
in partial fulfillment of the requirements for
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by

Dr. Ameera Zain Saeed Ba-Fadhel
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Under the guidance of
Dr. Vinod Kumar SV

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Abstract

India's journey in digital health and its contribution to the landmark resolution has been recognized globally. India has demonstrated its commitment to strengthening the health system by using technological innovation.

The strategies to enhance the implementation of smartphone applications in health programs are drawing attention to capacity building in technology and the best optimization of the health data that will help to facilitate the setting up of health policies regarding evidence-based research, sustaining efficiency and quality of the health services.

In August 2020, at the level of primary care facilities, the National Digital Health Mission (NDHM) launched an application form for non-communicable diseases.

To assess the effectiveness of using the Smartphone App in the NCD screening Program by the first-line workers (ASHAs) at the level of PHC, we chose Chomu CHC to highlight the efficacy of the Smartphone App in the NCD program, technology acceptance by the front-Line workers (ASHAs), socio-economic-political determinants that influence using the technology in NCD screening program, The challenges and best practice of using the smartphone App in NCD screening program.

Methods: This Capstone is based on the observation of the NCD program in Chomu CHC and the interaction between the students and the NCD staff (MOI, Medical Assistant, ANM, ASHAs and the beneficiaries.

I used in-depth interviews and FGD to address the objectives along with some literature review as an evidence-based to support the capstone of this study.

Conclusions:

Implementing of the Smartphone Application for Noncommunicable diseases screening program shows its effectiveness in improving the accessibility to NCD clinics and the acceptability of using technology among ASHAs and ANM at the level of Community health Centers.

Prior understanding of the context, socio-economic and political determinants enhance sustainability in the implementation of any Digital Applications in Health programs.

Reflect the best practices in the implementation of A smartphone application in the NCD screening program in India to another Low-income country like (Yemen).

Acknowledgment

First and foremost, I would like to thank IIHMR University for giving me this amazing opportunity. I want to extend a special thank you to Dr. Vinod Kumar, my faculty advisor, for his insightful criticism and encouragement throughout the completion of this capstone. .

I would also like to thank all healthcare providers in Chomu CHC for their help and cooperation during data collection and Chomu ASHA for cooperation during the interview.

*In the end, I would like to thank my mentors and colleagues in Yemen who supported me and were always there for me whenever I needed them***.**

Ameera Zain

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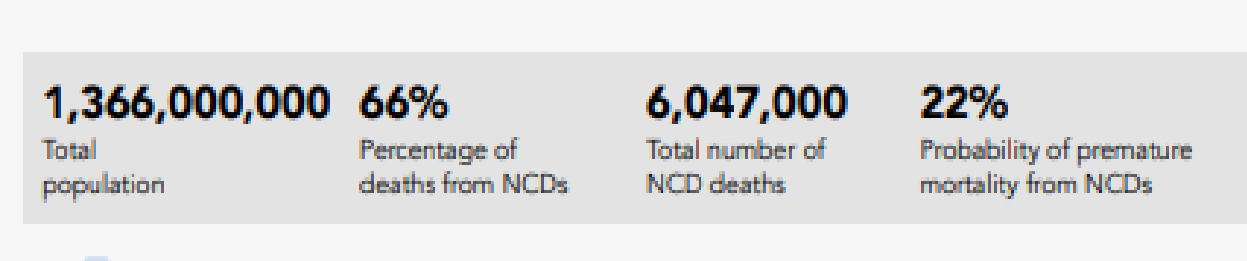
Introduction

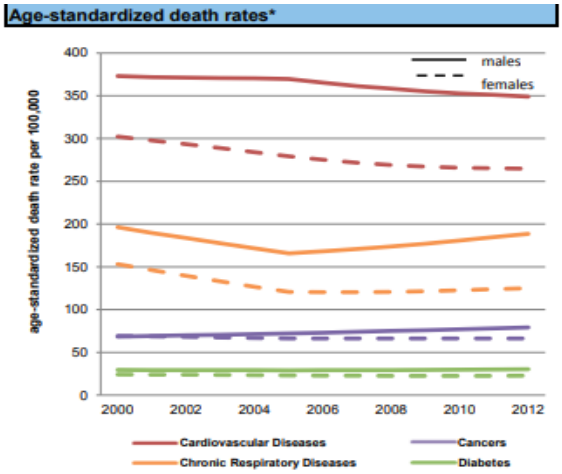
Non-communicable Diseases NCD; are one of the leading global causes of death and responsible for 74% of deaths worldwide according to WHO reports. These NCDs share key modifiable behavioral risk factors like tobacco use, unhealthy diet, lack of physical activity, and harmful use of alcohol, which in turn lead to overweight and obesity, raised blood pressure, raised cholesterol, and ultimately disease [1].

NCD is an important public health challenge in all countries, including low-middle-income countries where more than three-quarters of NCD deaths occur. (WHO 2021)[1].

India is experiencing a rapid health transition with a rising burden of Non-Communicable Diseases (NCD) that are estimated to account for around 66% of all deaths (India Country Profile, WHO 2021)

Diabetes (3%), Chronic Respiratory Disease (22%), Cancers (12%), and Coronary Heart Disease, Stroke, and Hypertension (45%





The National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) was established in 2010 with the goal of preventing and controlling major NCDs. It aims to do this by improving data quality, "technology innovation," screening, early diagnosis, management, and referral processes, and reducing the burden of NCDs. bolster the development of infrastructure and human resources.

Effectively tackling NCDs and their key risk factors requires a detailed understanding of the status and progress being made at the country level. Feasible and cost-effective interventions exist to reduce the burden and impact of NCDs now and in the future. Tracking national implementation of a key set of tracer actions linked to these interventions allows for global benchmarking and monitoring. of progress being made against NCDs. It also serves to highlight challenges and areas requiring further attention.

In the recent initiative under NPCDCS: Early Detection of Diabetes, Hypertension and Common Cancers in the Community, guidelines are being issued to the States for initiating “Population-based Screening of common NCDs” utilizing the services of the Frontline-workers (ASHAs Accredited Social Health Activist) and Health-workers under the existing Primary Healthcare System.

A staged approach to programme implementation would be used for all CHCs (community health Centres). For the full management of patients referred from sub-centers/PHCs as well as those reporting directly, a free NCD clinic is being developed at each CHC. The establishment of the NCD clinic will be assisted by the contractual work of the medical officer, staff nurse, counsellor, data entry operator, and ASHAs.

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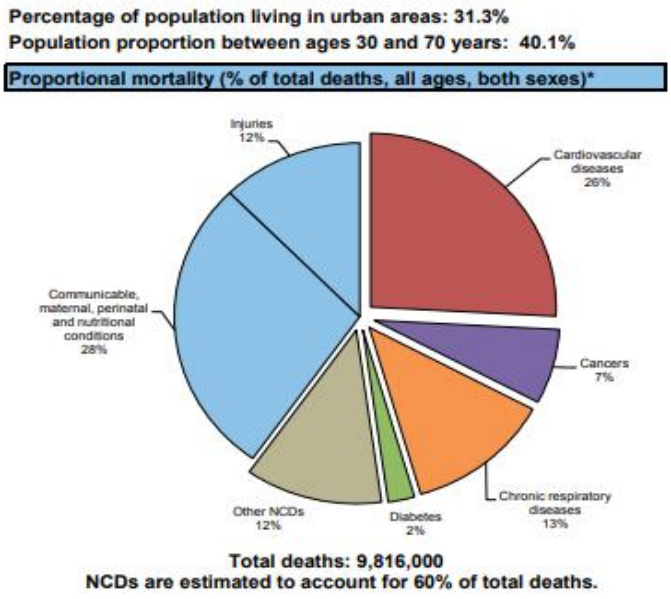
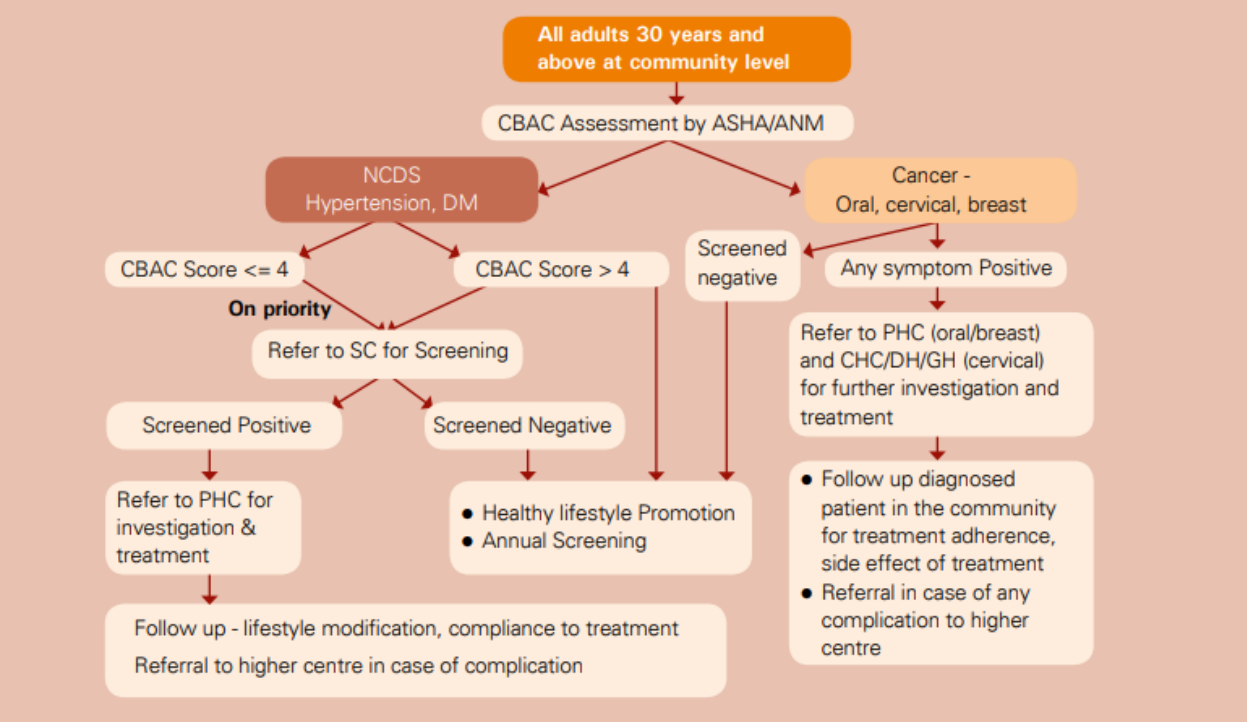


NCD clinic will be assisted by the contractual work of the medical officer, staff nurse, counsellor, data entry operator, and ASHAs.

The Population Enumeration of all people aged 30 and over must be conducted by the ASHA through house visits. All eligible adults, both sexes, will be listed or registered by her, with information about non-communicable diseases filled in and updated every six months. She will be provided with a specific registration to enter this data. Each person will also have a health card filled out by ASHA, which will have a special ID or AADHAR number provided by the state or district. The card will keep track of events relating to one's health (screening, diagnosis, treatment, problems, etc.). By doing so, the medical officer would be able to follow up at the PHC level or at a higher level of facility.

The Community-Based Assessment Checklist, or CBAC, is intended to gather information about the history of symptoms and behavioural aspects. They include the use of cigarettes and alcohol, physical activity level, waist measurement, family history of high blood pressure, diabetes, and heart disease, as well as the presence of common cancer, epilepsy, and respiratory illness symptoms. The CBAC must be filled out by the ASHA for all women and males who are 30 years of age or older. The CBAC helps the ASHAs recall the important risk factors, makes it easier to determine which individuals should be given priority so they can attend the screening day, and helps recommend the individuals. Prioritisation for screening will be necessary for people with CBAC scores of 4 and higher. It is your responsibility to check the CBAC forms that the ASHA in your coverage area has completed to make sure they are complete and accurate. This task may also be carried out by the ASHA facilitator. In some places where ASHAs are currently unavailable, you may also finish the CBAC. (The process of ASHAs with CBAC evaluation).



INDIA'S NATIONAL DIGITAL HEALTH MISSION (NDHM): A NEW MODEL TO ENHANCE USING TECHNOLOGY IN HEALTH PROGRAMS

The NDHM is a digital program launched On August 15, 2020, that brings together multiple and diverse groups of stakeholders in the health sector.

Through NDHM, the patient experience of care, population health, healthcare costs, and healthcare professional efficacy are all intended to be improved.

ASHA Digital Health is a smartphone application used by the community to gather information about the health and wellbeing of the community. It was created as part of the National Health Mission's Community Health Integrated Platform (CHIP), which was authorised by the Rajasthani government.

The NCD screening programme (CBAC assessment App) is one of many programmes with house-to-house surveying capabilities available through the ASHA Digital Health app.

The Objectives:-

1. To assess the efficacy of using smartphone applications in the NCD screening program.
2. To understand the acceptability of using the Smartphone app in the NCD program among ASHAs.

3. To determine the socio-economic and political situations that influence using the Smartphone-App in the NCD screening program.
4. To determine the challenges and the best practice of using the Smartphone application in the NCD screening program.

The area of the study:

Chomu CHC and with a link to the sub-center in the Chomu area, Jaipur, Rajasthan, India.

The study participants and stakeholders: -

To achieve the goal and the objectives of implementing a smartphone Application in the NCD screening program you must ensure that all stakeholders are aligned toward You must make sure that all stakeholders are working towards the same goals and providing valuable insights and resources to assist you get past challenges and continue scaling if you are to accomplish the goal and objectives of introducing a smartphone application in the NCD screening programme.

It is crucial to collaborate with diverse stakeholders to determine who will be involved in determining the strategic direction and policies.

It demonstrates that a variety of stakeholders are actively involved in the NCD screening program's implementation of the smartphone application.one goal and give you useful information and resources to assist you get through the challenges and keep growing

Working with various stakeholders is essential to identify who will be a part of the strategic direction and policy making.

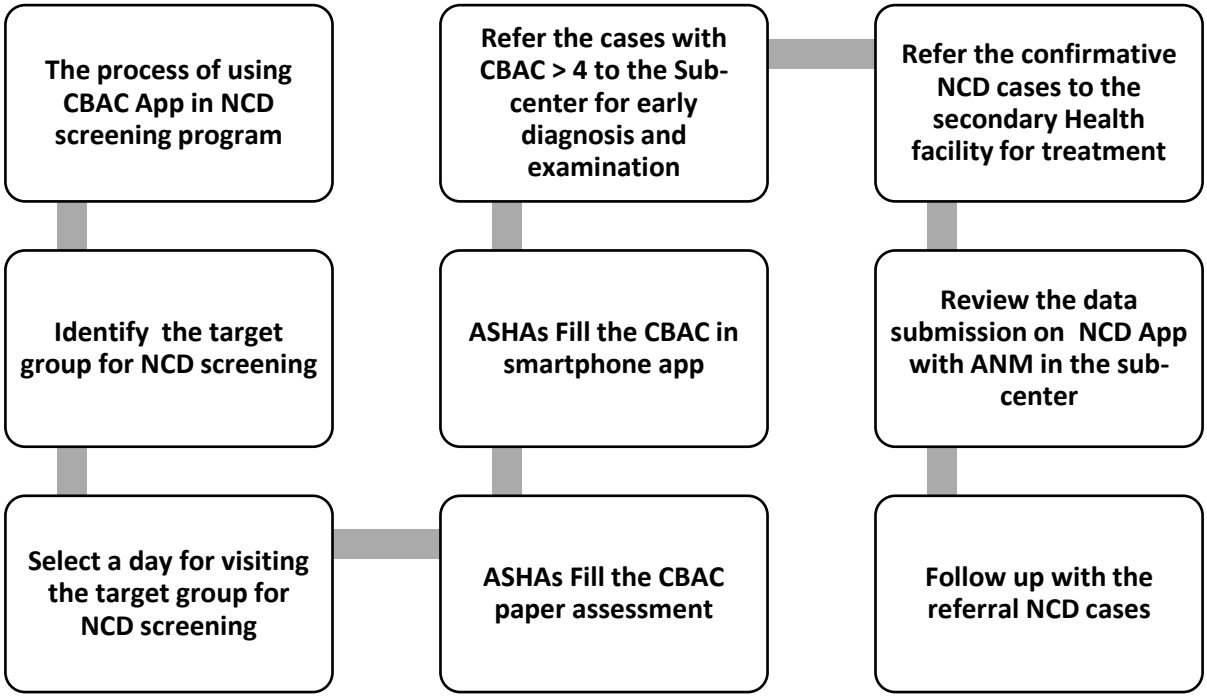
It shows that multi-stakeholders are engaging with implementing the smartphone Application in the NCD screening program.

*Source: National Digital Health Mission.

The workflow of using the CBAC Application in the NCD Screening Program: -

Enable to understand the standardized processes in using the technology in the NCD program by the front-line workers ASHAs and their responsibilities as stakeholders in the program, we visited the Chomu sub-center and meeting with ANM and ASHAs and how they use the CBAC screening tool (screening App) to identify the risky group and referral for early diagnosis and treatment.

The following workflow clarifies the process of using the CBAC screening Application in the NCD program by ASHAs:



The external determinants that affect using a Smartphone application in NCD screening program: literature review related to the socioeconomic and – political factors are proposal below: -

To better understand the context and address bottleneck issues associated to the setting, it is crucial to pay attention to the socio-economic and political aspects in digital health.

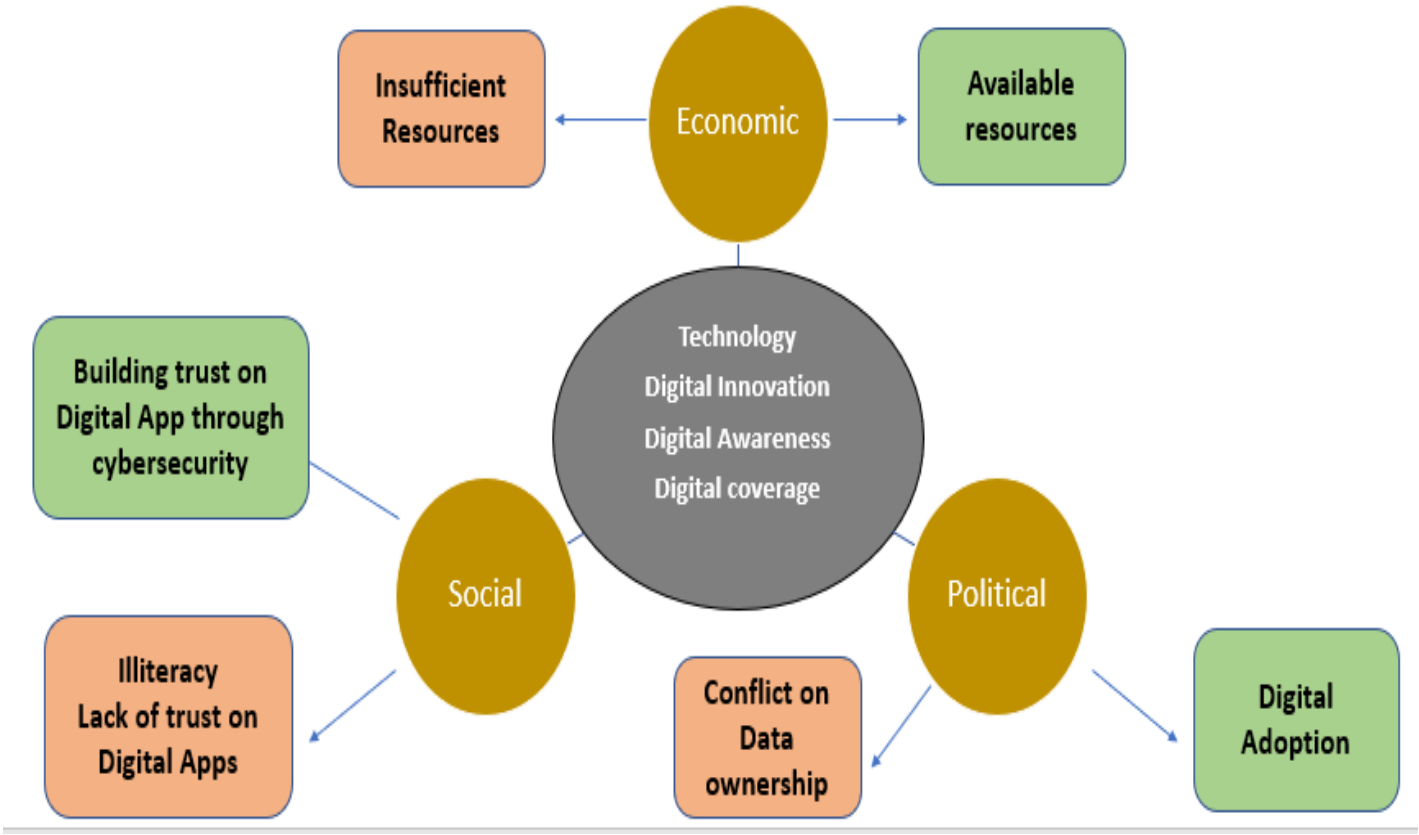
According to the WHO report, improving governance for digital health at both the global and national levels is at the heart of the WHO's first Global Strategy on Digital Health (2020-2025; WHO, 2020). The political determinant is one of the key variables to affect any health programme.

In recent years, there has been an increase in the social scientific literature on digital health, including studies indicating the need for digital health in low- and middle-income nations.[11] On the one hand, the literature shows how engaging in or participating in digital health can benefit the community and the health sectors in numerous ways. These advantages include the chance to create a network and have easier access to and sharing of health information.

The resource is one of the determinants that affect any Digital health applications, insufficient resources with an improper sustainability plan will influence the digital implementation process.

Lack of digital trust in the community is one of the issues that affect the implementation of any digital technology.

Engaging the community with other stakeholders and strengthening cybersecurity, lead to enhance



digital trust and improve digital awareness among them.

Field activity description: -

The field visit started by taking an overview of Chomu CHC and the services they provided especially in the NCD clinic and the role of ANM ASHA in the clinic and the sub-center and the satisfaction of the beneficiaries.

The Chomu NCD clinic has 1 Medical officer in charge, 2 Medical assistants, 1 ANM and 10 ASHAs.

They provide many services including examination for early diagnosis, treatment, and lifestyle consultations in patients with hypertension, diabetes and oral, breast cervical cancers.

ANM and ASHAs help in screening NCD cases, referral to the health facility and follow-up with patients regarding regular taking of medications, checkups, and awareness sessions.

- Conduct multiple interviews with the patients reporting to the NCD clinic for their satisfaction with the NCD services regarding easy access to the health facility, screening assessment and referral at the community level by ASHAs and ANM.

  Early diagnosis, test, and treatment at the level of NCD clinic.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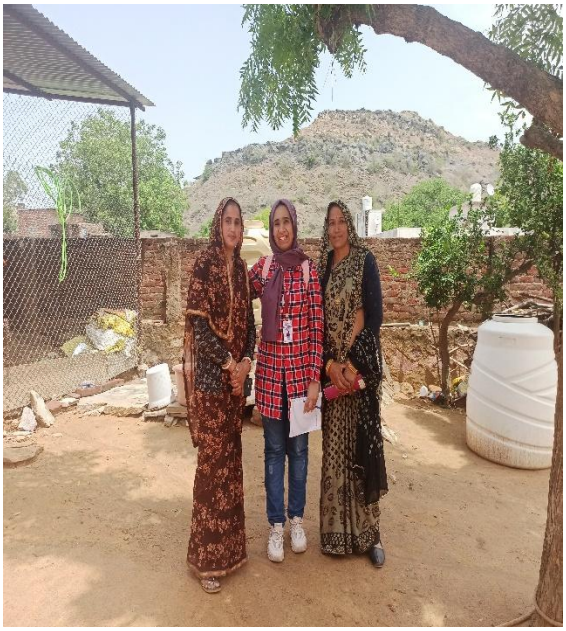
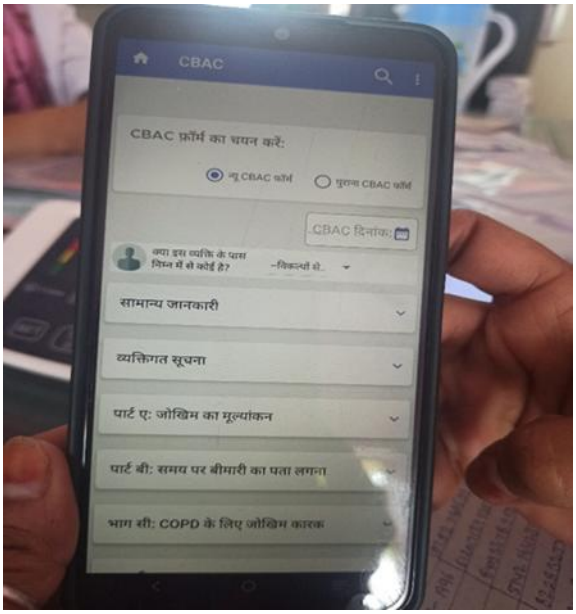
- Meeting with the health care providers in the NCD clinic (MOI and the medical assistants). To know more about the NPCDS program and the training provided during the last 3 years.
- Discussing the main challenges affecting the implementation of the NPCDCS program in Chomu CHC and the best practice to address the challenges.
- Increasing NCD cases referral from the community by ASHAs with a shortage in the health workforce lead to a heavy workload on NCD clinic.

- Visiting Chomu sub-center for an interview and focus group discussion (FGD) with ANM and ASHAs.

To know more about their role in NPCDCS, knowledge, practice and attitude.

- Introducing an NCD smartphone App CBAC assessment to ASHAs at the community level is one of the implementations and strategies in the NPCDCS program to Improve the health status of NCD patients and continue to follow up with the medication and lifestyle.
- Follow with ASHAs in using the CBAC smartphone App in the NCD screening program and how the digital App helps in meeting the strategy of the NPCDCS program.
- Address the most challenges affecting using smartphone applications in the NCD screening program.
- Highlight the best practice in using smartphone applications in the NCD screening program.





Study Design:

1) Study area: Chomu CHC Jaipur which was assigned as part of the capstone project.
2) Study Sample: - Medical officer of NCD clinic, ASHAs and ANM with some beneficiaries from NCD clinic.

Methods of data collection: -

To assess the efficacy of using the smartphone App in the NCD program from the records and statistical data to the medical officer in the clinic to show the reported cases who were referred from ASHAs and ANM for early diagnosis and treatment.

Through observation, in-depth interviews, and focus group discussions with ASHAs and ANM, to comprehend the acceptability of utilising digital applications by ASHAs and to discover the main obstacles and the best practise of using the smartphone application in the NCD programme.

We use a literature review to highlight the socioeconomic and political determinants that affect using digital applications in the community.

The Findings: -

- ✓ Based on the field interactions with ANM and ASHA and observation of the digital application related to the NCD screening program, resource availability, health service accessibility and acceptability to identify the major challenges & enablers and list them here: -

In the interview with the responsible ANM in Chomu CHC, she said that "NCD screening Digital application help her to follow NCD cases with ASHAs."

The application provides real-time data collection, and this is very helpful in early diagnosis, referral, and treatment.

The Application is easy to use and access at any time anywhere (Online and off-line) and ASHAs can use it without difficulties because it is written in a local language (Hindi) with an English language option.

ASHAS said that "Using a Smartphone application in an NCD screening program facilitates their role in early referral of the suspected NCD cases to the CHC for diagnosis, treatment and prevent complications.

They added "The application empowers their skills in using the technology in health programs and hence increases their opportunity to work as fixed volunteers with MOH.

There are some challenges highlighted by ANM and ASHAs in Chomu CHC, the Increasing workload due to additional and separated health smartphone Apps example (Ayushman Bharat Digital Application and other apps).

Duplication of data and lost case records – due to submission of both app and paper records for the same case.

They said also, Absence of an IT person at the level of Chomu CHC affects the work on NCD screening App in case of any technical issues happen to the application (during App download and submissions).

ANM mentioned that the application does not provide the total cases submission detail and she added that only MOH has access to show the cases per week and month through the NCD database and there is a lack of feedback from MOH regarding the Weekly and monthly reports to the responsible ANM to follow up with ASHAs submission to prevent the duplication in data.

Based on the observations and the Interviews with MOI, ANM, ASHAs and the beneficiaries in Chomu CHC to address the main challenges, Enablers, the most important challenges regarding to the Feasibility and Priority and the best practices on using the Smartphone Applications in NCD screening program.

A summary of this findings as below: -

Challenges
• **There is no Integration of NHM digital programs under one Application**
• **Inefficient support from the Surveillance team to ASHAs and ANM in the NCD program**
• **Limitation in training on CBAC smartphone App**
• **Limitation in monitoring and evaluation of the NCD database.**
• **Absence of IT person at the level of CHC and Sub-centres**
• **Delay Following up with ASHAs and ANM for any technical issue in the application**
• **Duplication of data submission and loss of paper-based cases.**
• **Workload on ASHAs due to adding extra applications**
• **Delay in feedback on the solution and adaptation**
Enablers
• **Empowerment of the frontline workers ASHAs and ANM in using the technology in health programs**

• **Ease access, ability to recall the data anytime anywhere**
• **Real-time data collection and submission and referral of NCD cases**
• **Cost-effectiveness of the digital Apps**
• **Enhance participation of different stakeholders**
• **Reduce the overcrowding of NCD patients at the National hospitals for follow-up**
• **Improve access to NCD clinics**

The most important challenges based on the Feasibility and the Priority:-

Problems	**Suggestive Actions**	**Feasibility**	**Priority**
Increase in the workload on ASHAs by using additional and separate health smartphone Apps	• Integration of all health apps in one App	Challenging	Top Priority
	Motivate ASHAs by incentives for internet	Challenging	Intermediate
	• Database for App cases and compare with the previous database to prevent duplication.	Swift	Top
Duplication of data and loss cases report due to submitting cases by App and paper-	• Feedback report on weekly bases from the App responsible in NHM to the responsible ANM to	Swift	Top

based report for the same case.	inform about the duplicated cases.		
	• Hire an IT person at the level of CHC or sub-center	Difficult	Low
	• Monitoring field visits at the level of CHC and sub-center to solve any technical issue with App.	Swift	Top
Absence of IT person at the level of CHC and sub-center to follow up with ASHAs report and Application.	• Conduct training on App to ANM and ASHAs and follow up.	Swift	Top
	• Conduct scheduled field visits to the CHC and Sub-Centers to follow up with ASHAs and ANM in data submission.	Swift	Top
	• Weekly NCD data report to the responsible ANM	Challenging	Top
Lack of feedback from MOH regarding Weekly	• Conduct a video conference to receive any related issues	Swift	Top

and monthly reports to the responsible ANM to follow with ASHAs submission.	from ANM and ASHA.		
	• One Digital Health App for all programs (compile all databases)	Challenging	Intermediate
	• Engagement of all program stakeholders	Challenging	Intermediate

The best practice in using the Smartphone App in NCD screening program: -

Best Practices	**Supporting actions required to sustain the best practices**
1 **Improve access to the NCD clinics.**	Regular monitoring and evaluation of the App and the database.
	Motivate the frontline workers through training, follow up and incentives.
	Support the Media for awareness and motivating the community for early screening and announcement for motivating awards.
	Regular follow-up with the treatment

2 **Improve the health quality of NCD patients through regular follow-up in early screening, diagnosis, referral, and treatment.**	Motivate the community through awards, and role models, and enhance the physical activities and dietary meals.
	Conduct NCD campaigns to support mental health sessions
3 **Empower the frontline workers ASHAs and ANM in using the technology in health programs**	M&E and supervision from the MoH
	Motivate the frontline workers through regular training on Digital Applications.
	Engage the frontline workers in the NHM meeting as one of the main stakeholders
4 Real time of data collection, submission, and referral of NCD cases	Reduce paper-based reports dependence and enhance the digital apps
	Database canter supports evidence-based research and develops health program strategies.
	Enhance digital innovation (Artificial Intelligence)
5 **Ease access to the database and recall data anytime anywhere. (Online, offline)**	Enhance ownership of data
	Conduct training on Cybersecurity consultation to protect digital information.

Based on the statistical data from the Noncommunicable disease clinic in Chomu CHC for the years (2019,2020 and 2022):

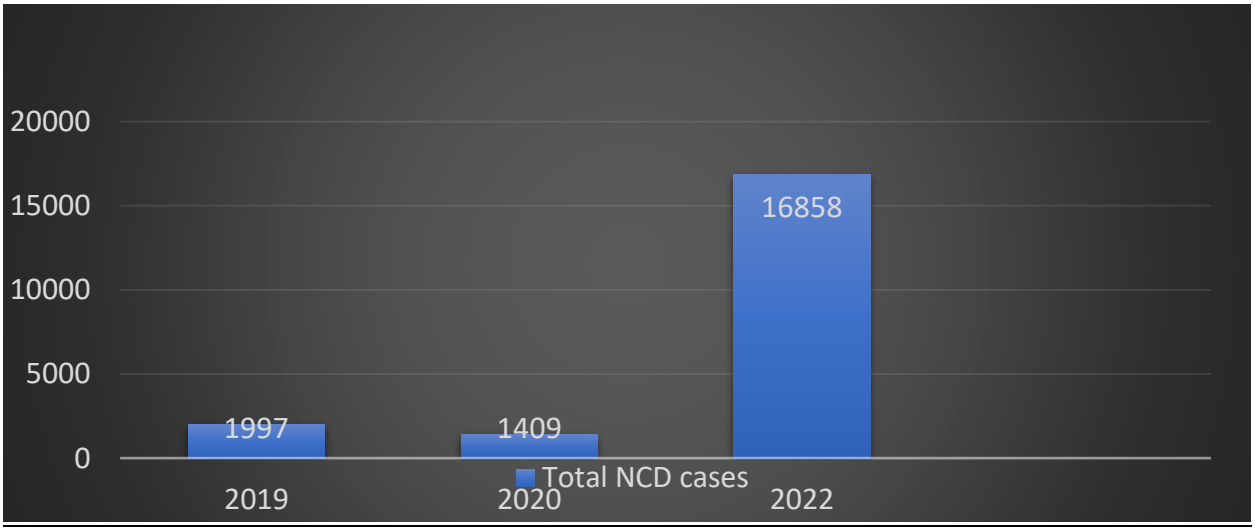
It is showing here in reported NCD cases to the Chomu facility after implementation of the NCD screening Smartphone Application that in 2022 shows the highest percentage of access to the NCD clinic, 16858 cases (83%), compared to 2019 and 2020 (10%, 7%).

Increasing number of cases visiting NCD clinics for early diagnosis and treatment with the statistical data that support the effort of ASHAs in the field for NCD screening, real time reporting and referral for diagnosis, treatment, and follow-up to ensure all cases are visiting the NCD clinic and having their treatment regularly.

Table 1:- Shows the Total number of NCD cases in 2019, 2020 and 2022.

	Year 2019		Year 2020		Year 2022	
Total NCD cases	**1997**	**10%**	**1409**	**7%**	**16858**	**83%**

This histogram shows: the trend of increasing the NCD cases in the past three years,(2019,2020 and 2022 in Chomu CHC:



New NCD diagnostic cases with treatment

The main purpose of using the Smartphone Application in an NCD screening program is to discover the hidden NCD cases in the community and to refer them for early diagnosis, treatment and follow-up.

The statistical data from Chomu NCD clinic shows an increase in registration of new NCD cases in 2022 compared with 2019 and 2020.

Hypertension cases show the highest registration in Chomu NCD clinic records.

Table 2: New NCD cases from Chomu NCD clinic records.

NCD clinic	Year 2019		Year 2020		Year 2022	
Diabetic Mellitus only	**11**	**20%**	**19**	**28%**	**254**	**37%**
Hypertension only	**30**	**54%**	**32**	**48%**	**316**	**54%**
Diabetic + Hypertension	**7**	**12%**	**8**	**12%**	**117**	**17%**
Cardiovascular Diseases	**8**	**14%**	**2**	**12%**	**18**	**1%**

Following up cases with treatment.

One of the important impacts of follow-up with NCD cases is to ensure that all cases are regularly having treatment to prevent relapse and complications.

ASHAs and ANM were more adhered to preventing non-communicable disease complications by following up on the cases via the NCD screening application and regular NCD testing.

This table reported the non-communicable disease cases following up in the Clinic for checkups and treatment.

It shows an increasing number of NCD cases following up at the clinic for check-ups and treatment in 2022comparing with 2019 and 2020.

We take into consideration that 2020 was Covid19 pandemic that prevent many NCD cases to follow up in the clinics.

The details percentage of NCD cases (Diabetic mellitus, Hypertension, Diabetic and Hypertension and Cardiovascular diseases is shown in the table below:

Table 3: Follow up of NCD cases from Chomu NCD clinic records.

NCD clinic	Year 2019		Year 2020		Year 2022	
Diabetic Mellitus only	**127**	**20%**	**191**	**31%**	**5362**	**37%**
Hypertension only	**196**	**54%**	**241**	**53%**	**5058**	**35%**
Diabetic + Hypertension	**97**	**14%**	**218**	**13%**	**3405**	**23%**
Cardiovascular Diseases	**25**	**12%**	**35**	**3%**	**686**	**5%**

NCD Counselling: -

Counseling is one of the strategies of the Noncommunicable diseases program to improve the lifestyle of NCD patients and to encourage physical and mental wellness.

ASHAs and ANM advocate health promotion and Counselling to improve the health status of individuals, families, and communities, enhances the quality of life, and reduces premature deaths and NCD complication by using the NCD screening Smartphone application that ensures regular visits and counseling sessions.

It reported that in 2022 the percentage of counseling increased to 90% percent compared to 2019 which was just 6% percent and 4% percent in 2020.

Table 4: NCD cases were counselled from Chomu NCD clinic records.

	Year 2019		Year 2020		Year 2022	
Total NCD counselled	**487**	**6%**	**321**	**4%**	**7679**	**90%**

Conclusion and recommendations: -

The smartphone application for the Noncommunicable diseases screening program shows the effectiveness of digital applications in improving the accessibility to NCD clinics.

ANM and ASHAs are empowering by using the technology in Health programs (NCD program) and ease access to the application anytime anywhere.

There are many external determinants that influence the implementation of any Digital application in health programs, socio-economic and political determinants are the most factors in technology implementation in health programs.

Improve access to the NCD clinics, improve following and counseling of NCD patients through regular follow-up in early screening, diagnosis, referral, and treatment, Empowerment of the frontline workers ASHAs and ANM in using the technology in health programs, provide real time data collection, submission, and referral of NCD cases and Ease access to the data anytime anywhere. (Online, offline) are the best practice for using the Smartphone Application in the NCD screening program.

Challenges and gaps can be addressed and improved with some suggestions and actions according to feasibility and priority.

One Database for both App and paper-based cases and monitoring of data submission with the technical person in the MOH is the top priority and swift feasibility to reduce the workload on ASHAs and prevent duplications.

Conducting scheduled field visits to the CHC and Sub-Centers to follow up with ASHAs and ANM in data submission and training is one of the top priorities to address the challenges of the absence of an IT person at the level of CHC.

Lack of feedback from MOH regarding Weekly and monthly reports to the responsible ANM to follow with ASHAs submission can be solved in Conduct a video conference to receive any related issues from ANM and ASHA.

To maintain the sustainability of the best practice of using the smartphone App in the NCD screening program some actions should be taken (Recommendations):

- Regular monitoring and evaluation of the App and the database.
- Motivate the frontline workers through training, follow up and incentives.
- Engagement of the mass media for awareness and motivating the community for screening and early diagnosis.
- Conduct NCD campaigns along with mental health support sessions and motivate the community through awards and role models.
- Engagement of the frontline workers in the NHM meeting as one of the main stakeholders

- Establishing of Database canter to support evidence-based research and develops health program strategies and reduce using paper-based records.
- Advocating digital innovation (Artificial Intelligence) in NCD diagnosis and treatment.

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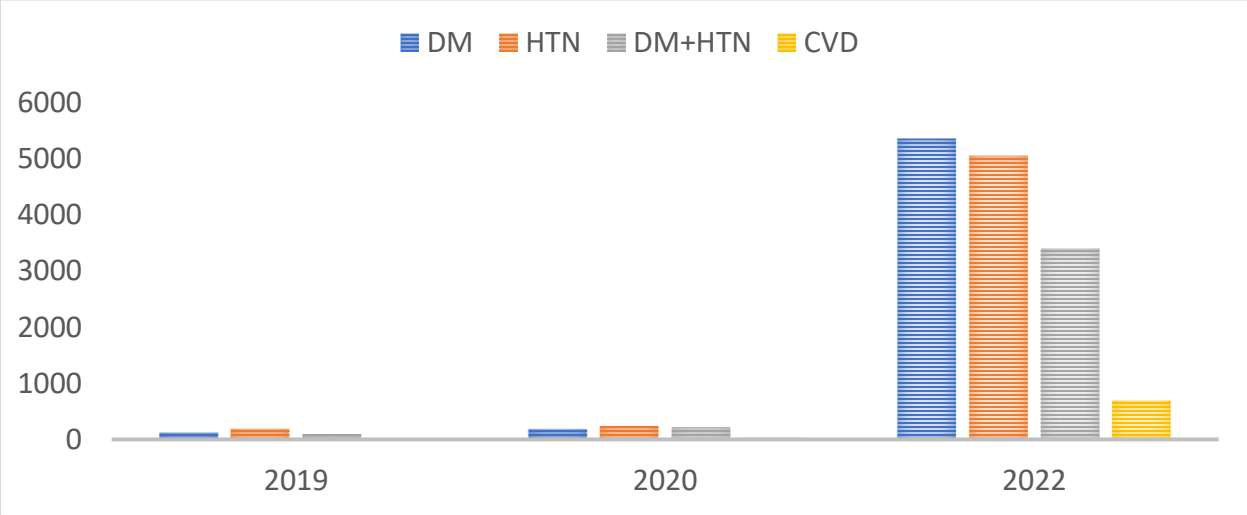
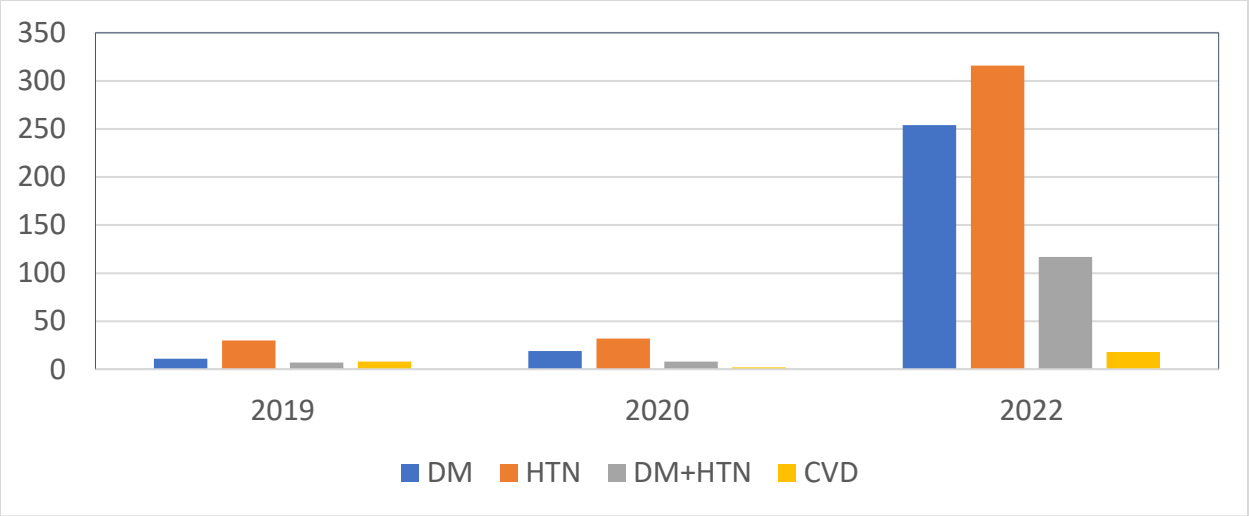
Annexures: -

The histogram1: shows the trend on the New NCD cases in Chomu CHC during the years of (2019,2020 and 2022):-



The histogram 2: shows the trend on the follow up NCD cases in Chomu CHC during the years of (2019,2020 and 2022):-



Availability of sugar test, Blood pressure devises for NCD diagnosis in Chomu CHC: