Technical assistance for planning the implementation of a research study on the feasibility of HIV Viral Load Testing approaches in Rajasthan and Odisha

A Practicum Report Submitted to

Johns Hopkins Bloomberg School of Public Health & IIHMR University

in partial fulfilment of the requirements for

the award of the degree of

Master Of Public Health

by

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Cohort IX (2021-23)

Under the guidance of

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April 2023

Certificate by advisor

To whomsoever it may concern

This is to certify that Dr. Mayuri Ghule, a student of the Master of Public Health program offered by the Indian Institute of Health Management Research University, Jaipur in cooperation with Johns Hopkins Bloomberg School of Public Health, Baltimore has undergone practicum training at the Indian Council Of Medical Research-National AIDS Research Institute, Pune from 1st Feb 2023 to 30th March 2023. The candidate has successfully carried out the study designated to her during the practicum training and her approach to the study has been sincere, scientific, and analytical.

The practicum training is in fulfilment of the course requirements.

I wish her success in all his future endeavors.

Dr.Anoop Khanna

Practicum Advisor

Certificate by Scholar

This is to certify that the Practicum project titled ‘ Technical assistance Technical assistance for planning the implementation of a research study on HIV Viral Load Testing in Rajasthan and Odisha ‘ submitted by Dr.Mayuri Ghule, under the supervision of Dr.Anoop Khanna (Practicum Advisor) and Dr.Suchit Kamble (External Advisor) for the award of Masters of public health.The training was carried out during the period of 1st Feb 2023 to 25th April 2023 and embodies my original work and has not formed the basis for the award of my degree, diploma associate ship, fellowship titles in this or any other institute or other institution of higher learning.

Dr.Mayuri Ghule

MPH Cohort 09

2021-23

Certificate by organization

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(भारतीय आयुर्विज्ञान अनुसंधान परिषद)
स्वास्थ्य अनुसंधान विभाग
स्वास्थ्य एवं परिवार कल्याण मंत्रालय, भारत सरकार

ICMR - NATIONAL AIDS RESEARCH INSTITUTE
(Indian Council of Medical Research)
Department of Health Research,
Ministry of Health and Family Welfare, Govt. of India

NARI/SR/23-24/181

25th April 2023

Certificate of completion

This is to certify that **Dr. Mayuri Ghule** student of the Masters of Public Health offered by **IIHMR University, Jaipur** in cooperation with Johns Hopkins Bloomberg School of Public Health, USA has successfully completed her practicum training at the Indian Council of Medical Research -National AIDS Research Institute, Pune at Division of Epidemiology from **1st February 2023 to 25th April 2023**. She has submitted her practicum report on **Technical assistance for planning the implementation of a research study on the Feasibility of different HIV Viral Load Testing approaches in Rajasthan and Odisha state.**

Her performance was found satisfactory. I extend her good wishes for a bright and successful career ahead.

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Acknowledgment

I would like to express my heartfelt gratitude to my practicum advisor Dr. Anoop Khanna sir, who supported and guided me throughout my practicum as well as my MPH journey. I also would like to to extend my thankfulness to Dr. Marie Diener West at the MPH office at JHSPH and Dr. Seema Mehta at the MPH office at IIHMR for immense encouragement and assistance during the journey of my MPH program.

I would like to give a sincere vote of thanks and gratitude to my practicum preceptor Dr. Suchit Kamble, Scientist E, Head of the epidemiology department, Indian Council of Medical Research -National Aids Research Institute and also who is the principal investigator of the project "Feasibility of Genexpert platform and DBS for HIV viral testing among people living with HIV (PLH) attending ART centers in India", for giving me the opportunity to work in this prestigious project. His sheer knowledge and guidance has helped to evolve into a competent public health professional. I would also like to thank Mrs.Suvarna Sonavale, Technical officer at ICMR-NARI for her constant help and valuable suggestions.

Last but not least I would like to appreciate my family and specially my brother Dr.Kunal Ghule ,who constantly supported and encouraged me to achieve and be the best in every task to be completed.

Contents

List of Abbreviations

AIDS: Acquired Immune Deficiency Syndrome

ART: Antiretroviral Therapy

CBNAAT: Cartridge-Based Nucleic Acid Amplification Test

CD4: Cluster of Differentiation 4

DBS: Dried Blood Spot

DNA: Deoxyribonucleic Acid

HBV: Hepatitis B Virus

HIV: Human Immunodeficiency Virus

HPV: Human Papillomavirus

ICMR: Indian Council of Medical Research

MRSA: Methicillin-Resistant Staphylococcus Aureus

NACO: National AIDS Control Organization

NACP: National AIDS Control Programme

NARI: National AIDS Research Institute

PCR: Polymerase Chain Reaction

PLH: People Living with HIV

PLHIV: People Living with HIV/AIDS

RT-PCR: Reverse Transcription Polymerase Chain Reaction

SACS: State AIDS Control Society

UNAIDS: Joint United Nations Programme on HIV/AIDS

VL: Viral Load

VLTC: Viral Load Testing and Counselling

1.Background of the organization

HIV infection was detected in India for the first time in 1986.Early in the 1990s, it became clear that HIV was rapidly spreading throughout the nation, necessitating multidisciplinary study encompassing virology, immunology, microbiology, clinical research, epidemiology, field-based trials, and socio-behavioural studies in order to limit the infection. So, National AIDS Research Institute(NARI) was set up in October 1992 under the agesis of Indian Council Of Medical Research(ICMR) to devote exclusively to HIV/AIDS research.

The institute has a mission to establish research initiatives that have an interface with intervention and policy development to prevent and control the spread of the HIV/AIDS epidemic.

The Goal of the NARI is " To achieve control of HIV spread and to provide care to HIV infected population (Care, Treatment & Vaccine) and strive for the achievement of zero new infections, zero deaths due to AIDS and zero discrimination." The institute envisions "To build a research capability of distinction to face the challenge of growing HIV/AIDS in India."

Since the National AIDS Control Programme's inception, the Institute has provided strong assistance, particularly in the areas of surveillance, capacity building, laboratory services, and drug resistance research. ICMR-NARI derives strength from wide ranging National and International Collaborations.

A Scientific Advisory Committee made up of eminent scientists from various fields directs the research activities of the Institute. All research projects are reviewed and approved by the Institutional Ethics Committee, which ensures that a research activities are conducted maintaining highest ethical standards. From the inception of new ideas to implementation and final results dissemination, community involvement and participation in the studies have always been core principles.

Section A: Brief of the research study involved

2.Title of the project

Feasibility of genexpert platform and dried blood spots for HIV viral load testing among people living with HIV(PLH) attending ART centers in India

3.Introduction

HIV/AIDS is still causing significant harm to health worldwide, leading to more than 39 million deaths related to the disease so far, and over 36 million people are currently living with HIV. Although there have been remarkable developments in antiretroviral therapy (ART) and efforts to implement treatment-as-prevention programs, about 2 million people are newly infected with HIV each year. (1) In 2019, India had an estimated 2.35 million people living with HIV (PLHIV) and an adult prevalence rate of 0.22%, making it the second-largest HIV/AIDS epidemic globally. However, due to efforts by the National AIDS Control Programme (NACP), the country saw a 37% decrease in new HIV infections and a 66% decrease in AIDS-related deaths from 2010 to 2019. (1,2) Achieving the objective of eliminating the AIDS epidemic by 2030 is crucial in realizing the third Sustainable Development Goal (SDG), which aims to ensure good health and well-being for all, regardless of age. In the era of the SDG, the primary indicator used to track progress on the HIV/AIDS response is the HIV incidence rate per 1000 people who are uninfected. (2)

Currently, the free antiretroviral therapy (ART) program monitors patients on ART through clinical and immunological assessments every six months using a CD4 count and utilizes a "Targeted Viral Load" approach to identify treatment failure. However, various studies have revealed the inadequate predictive value of immunological criteria and have shown that delayed detection of treatment failure leads to the accumulation of drug-resistant mutations in HIV (4). While monitoring, the patients are asked to report to follow-up after a minimum period of three

months to monitor the clinical and immunological response to ART. On follow-up, the cases are categorised as a clinical failure and immunological failure as per WHO guidelines.CD4 cell count typically increases by >50 cells/μL at four to eight weeks and an additional 50 to 100 cells/μL/year thereafter. (3)

The 90-90-90 project which was launched by the Joint United Nations Programme on HIV/AIDS (UNAIDS) with the aim of achieving the following targets by the year 2020:

(i) identifying 90% of all people living with HIV (PLHIV),

(ii) initiating antiretroviral therapy (ART) for 90% of all PLHIV who know their status, and (iii) maintaining viral suppression for 90% of all PLHIV receiving ART.

To achieve these goals, concerted efforts are required to diagnose PLHIV, initiate ART, and provide ongoing care for those already receiving treatment. Innovative models of care delivery and patient monitoring, which include advanced diagnostic tools, can provide opportunities to further accelerate progress towards achieving high levels of HIV viral load suppression.(5,4)

The Xpert® HIV-1 Viral Load, produced by Cepheid Innovations Pvt. Ltd. in the USA, is a nucleic acid amplification test (CBNAAT) that is cartridge-based and fully automated. This rapid and simple assay requires minimal infrastructure and can perform specimen preparation, nucleic acid extraction and amplification, detection of the target sequence using real-time reverse transcriptase PCR (RT-PCR), and is routinely used to detect M. tuberculosis DNA, resistance to rifampicin, and other pathogens, including HIV, MRSA, Norovirus, HBV, and HPV. It is capable of quantifying all HIV-1 Group M, N and O subtypes and has a high sensitivity of 40 to 10,000,000 copies/ml (1.6–7 log10 copies/ml), delivering results in 90 minutes. This shortened turnaround time facilitates prompt clinical management in adult and paediatric samples. Kulkarni et al., Swathirajan et al., and Nash et al. have all reported that Xpert® HIV-1 Viral Load assay demonstrated comparable results to conventional real-time RT-PCR in India.(6)

HIV viral load testing is important part of HIV care and management and it should be prioritised .In India there is an estimation of more than 800000 tests needed annually whereas only about 7000 is done this 90% of the gap can be identified and addressed by minimising it.The turnaround time for the viral load done on Abbott platform currently in India is of 14 days.Many studies have found the concordance between genexpert and viral load testing by Abbott platfrom with high sensitivity(97%) and high specificity(97%). The existing testing facility of CBNAAT can be adapted for HIV VL testing along with the DBS samples which can be useful for both the programs and people living with HIV.

4.Problem statement-

Viral load testing is still an essential part of determining whether antiretroviral medication (ART) is working and providing the best possible patient outcomes, even if ART is now accessible to people living with HIV (PLHIV). In settings with low resources, such as ART centres in India, the expensive and sophisticated laboratory infrastructure and equipment needed for the current gold standard for HIV viral load testing may not be available. People living with HIV (PLH) may receive inadequate or delayed therapy as a result, increasing their risk of transmission and resulting in poor treatment outcomes. It is necessary to evaluate the viability of employing dried blood spots (DBS) and the Genexpert platform as an alternate approach for HIV viral load testing among PLH visiting ART facilities in India.

This study aims to evaluate the accuracy, cost-effectiveness, and acceptability of using Genexpert and DBS for HIV viral load testing in order to improve access to timely and accurate HIV treatment for PLH in resource-limited settings.

5.Objectives of the practicum-

To support the following necessary preparatory activities for the implementation of the study-

i. To gain an understanding of the process of selecting study sites and develop a strategy for selecting appropriate sites for the research study.

ii. To develop effective data collection and study tools that will be used to gather and analyze data for the research study.

6. Methodology of the study

6.1. Study design and duration-

It is an implementation study using mixed method, will be conducted prospectively at two ART cenetrs in two states of India for 18 months.

6.2. Intervention-

6.2.1.Two models for the intervention will be planned on the mentioned strategies.

Model 1-

CBNAAT platform based viral load testing and validation of gold standard Abbottm2000 platform: A compar ative analysis.

This model design focuses on the existing CBNAAT centres for viral load testing in absence of the viral load testing center in the same city or town where the ART centre is located. From the selected ART center the whole blood sample of the patient who has given the informed consent will be collected. The collected sample will be sent to the available CBNAAT laboratory for the viral load testing. The additional plasma aliquotes will be sent to the NACO-accredited reference laboratory for the testing of viral load sample on the standard assay.One DBS will be collected and stored for the future studies at ICMR-NARI.

Model 2 – DBS based viral load testing on Genexpert CBNAAT and Abbott m2000 platform: A feasibility study.

In this model, the ARTC where there is the absence of both CBNAAT and VLTC in the same city or town was chosen. From the sample collected from the eligible PLH and who has given informed consent two DBS will be prepared. These two DBS cards will be couriered to ICMR-NARI, Pune. The viral load testing will be done on the collected and stored samples by using the gold standard Abbott m2000 platform.

6.2.2.Selection of the study states

One or two states can be selected for the study.After reviewing the number of viral load testing centers , the states were categorized into 3 categories.

Category 1: States having more than four viral load testing centers

Category 2: States having at least one to three viral load testing centers.

Category 3: States without any viral load testing center.

The number of PLHIV, presence of CBNAAT facility in the same state and the number of viral load testing center in the state were analysed to select the state for the implementation of the study. The state of Rajasthan with 22 ART centers and only three(category 2) viral load testing centers was selected for the model 1 implementation.

The state of Odisha have the largest number of PLHIV on ART can be selected for the implementation of model 2 , as there is no viral load testing facility (category 3) in the state.

Section B: Role of Intern in research study

7. The tasks assigned

As a intern at the organization, was offered with the following tasks,

1. Review of literature on the VL testing using Abbott and Genexpert platforms
2. Strategizing the site selection for the study
    - Finalizing the ART centre in the state of Rajasthan

- Finalizing the ART centre in the state of Odisha

3. Developing the data collection and study tools.
    - Preparing the tool for collecting the clinical information of the participants.
    - Preparing the tool for collecting the laboratory information of the participants.

Section B: Role of Intern in research study

7.1. Review of literature

a) Identifying relevant databases: Identified relevant databases to search for literature related to viral load testing using GeneXpert and other platforms. Some examples include PubMed, Medline, Embase, and Cochrane Library.

b) Developing of the search terms: Next, developed a list of search terms related to viral load testing and GeneXpert. Some examples of search terms included "viral load testing," "PCR testing," "GeneXpert," "HIV/AIDS," "tuberculosis," and "viral load monitoring."

c) Conduct the search: Using the identified databases and search terms, conducted a comprehensive search for literature related to viral load testing using GeneXpert as well as the Abbot platform. Specifically, searched for both published and unpublished literature, including conference proceedings and abstracts.

d) Screen the literature: Once the literature was identified, screened the literature to determine its relevance to the topic. This involved the reading of the title and abstract of each article to determine whether it is relevant to the research question.

e) Extract data: Extracted the data from the relevant articles after the screening. This included the information about the study design, population n, methods, and results.

f) Analyze the data: Finally, analyze the extracted data to determine the feasibility of viral load testing using GeneXpert. This involved synthesizing the findings from the literature to identify patterns, strengths, and limitations of the existing studies.

7.2. Strategizing the site selection for the study

The criteria for selecting the ART centre for model 1 and model 2 is as described below:

Table 1: Selection criteria for ART centers among two selected states

ART center for model 1	ART center for model 2
• Non-availability of VLTC in same premise of the centre. • Availability of CBNAAT testing facility nearby or in the same premises of ART centre. • Feasible to transport plasma sample to NACO accreditated VL testing laboratory.	• Non-availability of VLTC in same city or town • The plasma sample is sent to NACO accredited lab for routine VL testing. • Non-avaialbility of CBNAAT centre in same city or town. or • Availability of CBNAAT facility with high testing burden(more than 3000 CBNAAT tests per year)

7.2.1. Selection of ART center for Model 1-

The marking of the present ART centres and present VLTC was done on the map of Rajasthan. The list of the ART centres in Rajasthan was obtained and all the present ART centres in each district of Rajasthan were marked with dots on the map according to that list. One dot represented one ART centre in the district.

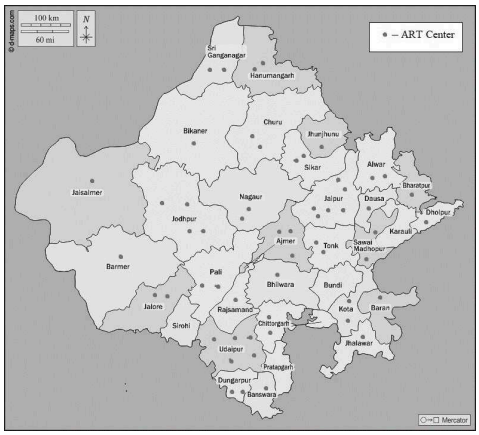

Figure 1:Anti-retro viral treatment (ART) centres in Rajasthan

Once the plotting of the ART centers was done , the list of the viral load testing centres in the state was obtained from the Rajasthan SACS. All three VLTC were marked on the map using the '#' sign along with the ART centres. One '#' sign represents one viral load testing center.

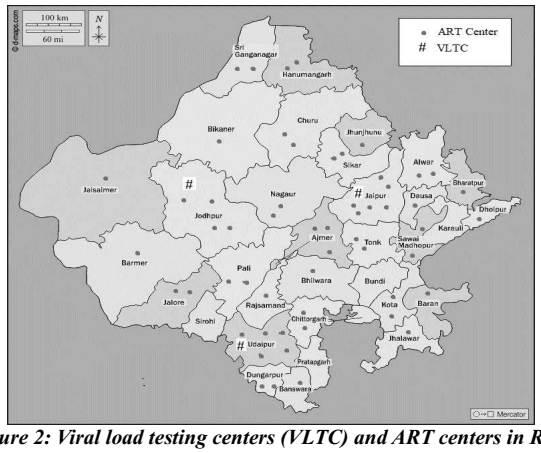

Figure 2: Viral load testing centers (VLTC) and ART centers in Rajasthan

The number of PLH registered from 35 ART centers was received from Rajashtan SACS.The table was formatted along with these ART centers and their linked viral load testing centers.

From the list below , according to the criteria –

The VLTC should not be available in the same premise of the ART center.

Henec,if the viral load testing center is situated in the same premise of ART center, the respective ART center is excluded from the study. The excluded ARTCs are shaded with red color in the table below.

Table 2.1: ART centers and linked VL testing centers in Rajasthan

Sr No	District	Name of ART center	Linked viral load tesing lab
1	Ajmer	JLN Hospital	SMS medical college, Jaipur
2	Alwar	Govt Dist Hospital	SMS medical college, Jaipur
3	Banswara	MG hospital	RNT Medical College, Udaipur
4	Barmer	Govt hospital	Dr S N Medical College, Jodhpur
5	Bharatpur	RBM govt hospital	SMS medical college, Jaipur
6	Bhilwara	MG hospital	RNT Medical College, Udaipur
7	Bikaner	PBM Hospital	Dr S N Medical College, Jodhpur
8	Chittorgarh	Sanwaliaji Govt Dist Hospital,	RNT Medical College, Udaipur
9	Churu	DB Govt Dist Hospital	SMS medical college, Jaipur
10	Dholpur	Dholpur District Hospital	SMS medical college, Jaipur
11	Dungarpur	ARTC, Sagwara, Dungarpur, Rajasthan	RNT Medical College, Udaipur
12	Dungarpur	Hardev Joshi Govt Dist Hospital	RNT Medical College, Udaipur
13	Hanumangarh	MGM Govt Dist Hospital	SMS medical college, Jaipur
14	Jaipur	Jaipur National Institute University	SMS medical college, Jaipur
15	Jaipur	Mahatma Gandhi Medical College,Jaipur	SMS medical college, Jaipur
16	Jaipur	NIMS ,Jaipur	SMS medical college, Jaipur
17	Jaipur	SMS Hospital, Jaipur	SMS medical college, Jaipur
18	Jalore	Govt Dist Hospital	Dr S N Medical College, Jodhpur
19	Jhalawar	SRG and Jhalawar Medical College	SMS medical college, Jaipur
20	Jhunjhunu	Govt Dist Hospital	SMS medical college, Jaipur
21	Jodhpur	K N chest hospital , Jodhpur	Dr S N Medical College, Jodhpur
22	Karauli	ARTC Karauli	SMS medical college, Jaipur
23	Kota	New Medical College Hospital	RNT Medical College, Udaipur
24	Nagaur	Govt Dist Hospital	Dr S N Medical College, Jodhpur
25	Pali	Bangad Hospital,	Dr S N Medical College, Jodhpur
26	Rajsamand	AIIMSRC, Rajsamand	RNT Medical College, Udaipur

27	Rajsamand	R K Hospital, Rajsamand	RNT Medical College, Udaipur
28	Sikar	S K Hospital	SMS medical college, Jaipur
29	Sirohi	Govt Dist Hospital	RNT Medical College, Udaipur
30	Sri Ganga Nagar	Civil Hospital , Suratgarh Road	Dr S N Medical College, Jodhpur
31	Tonk	ARTC, Tonk, Rajasthan	SMS medical college, Jaipur
32	Udaipur	AIIMS, Udaipur	RNT Medical College, Udaipur
33	Udaipur	GMCH, Udaipur	RNT Medical College, Udaipur
34	Udaipur	MB Hospital, Udaipur	RNT Medical College, Udaipur
35	Umarda	Pacific Institute of Medical Sciences, Umarda	RNT Medical College, Udaipur

Furthermore, the next criteria for the selection of ART center is-

We calculated the 75th percentile to establish the cutoff, for a high burden center which came back as 2170.

As, it should be a high-burden ART center with 2000 or more than 2000 registered PLH.

All the centers with 2000 or more registered PLH were selected, hence the ARTC with less than 2000 registered PLH were filtered out from the list.

By applying this criteria we obtained total seven ART centers listed below.

Table 2.2: ART centers with 2000 or more than 2000 PLH registered

Sr No	District	Name of ART center	Linked viral load tesing lab	Active Care-Dec-22
1	Ajmer	JLN Hospital	SMS medical college, Jaipur	4095
2	Bhilwara	MG hospital	RNT Medical College, Udaipur	2844
3	Pali	Bangad Hospital,	Dr S N Medical College, Jodhpur	2844
4	Sikar	S K Hospital	SMS medical college, Jaipur	2560
5	Kota	New Medical College Hospital	RNT Medical College, Udaipur	2444
6	Alwar	Govt Dist Hospital	SMS medical college, Jaipur	2170
7	Jalore	Govt Dist Hospital	Dr S N Medical College, Jodhpur	1979

To understand the feasibility of the transport of plasma samples from these ART centers to all VLTCs situated in Jaipur, Jodhpur, and Udaipur, the travel time by road was noted down.

Table 2.3: ART centers and time to reach the linked VLTC by road							
	ART centres		Viral load testing labs			Name of the linked VLTC	Active care
			Jodhpur	Jaipur	Udaipur		Till dec 2022
Sr.no.	District	Location of centre	Travel time-By road (Hour: Min)	Travel time-By road (Hour: Min)	Travel time-By road (Hour: Min)		
1	Ajmer	JLN Hospital	03:43	02:27	04:41	SMS Medical College, Jaipur	4095
2	Alwar	Govt Dist Hospital	08:41	02:52	09:00	SMS Medical College, Jaipur	2170
3	Bhilwara	MG hospital	04:46	04:09	02:34	RNT Medical College, Udaipur	2844
4	Jalore	Govt Dist Hospital	02:48	07:13	04:03	Dr S N Medical College, Jodhpur	1979
5	Kota	New Medical College Hospital	07:20	04:37	04:48	RNT Medical College, Udaipur	2444
6	Pali	Bangad Hospital,	01:06	05:15	03:52	Dr S N Medical College, Jodhpur	2844
7	Sikar	S K Hospital	05:45	02:12	07:56	SMS Medical College, Jaipur	2560

From the feasibility point of view, the transport of the plasma sample from the ART center of Kota to the linked VLTC required more than four hours from all the VLTCs in the state and hence was excluded from the study. Remaining six ART centers were shortlisted for the implementation of the study.

The total number of the CBNAAT testing done for the last year at the existing CBNAAT facility in the same premise or in the same district as ARTC were noted down. This list was prepared after the data was provided by the state TB officer.

Table 2.4: ART center and the VL testing , CBNAAT testing burden in the year of 2022								
Sr. no.	**District**	**Location of centre**	**Active care till dec 2022**	**Name of the linked VLTC**	**Travel time- By road (Hr: Min)**	**Total VL testing (From April to Dec 2022)**	**Name of the CBNAAT facility**	**Total CBNAAT testing (Till dec 2022)**
1	**Ajmer**	**JLN Hospital**	**4095**	**SMS Medical College, Jaipur**	**02:27**	**2917**	**IRL**	**4343**
2	Alwar	Govt Dist Hospital	2170	SMS Medical College, Jaipur	02:52	1778	DTC	7419
3	Bhilwara	MG hospital	2844	RNT Medical College, Udaipur	02:34	2293	DTC2	4833
4	Jalore	Govt Dist Hospital	1979	Dr S N Medical College, Jodhpur	02:48	1818	DTC	2386
5	Pali	Bangad Hospital,	2844	Dr S N Medical College, Jodhpur	01:06	1836	DTC2	2822
6	Sikar	S K Hospital	2560	SMS Medical College, Jaipur	02:12	2106	DTC	8411

IRL- Intermediate reference laboratories, DTC- District tuberculosis center

The data of ART center, case burden , feasibility of the transport of plasma sample to VLTC , availability of CBNAAT testing facility and the CBNAAT testing burden was reviewed altogether to select the one ART center where the study will be conducted. After all the consideration and the factors fulfilling the criteria, the ART center of **Ajmer – JLN hospital** was finalised for the implementation of the study.

7.2.2. Selection of ART center for Model 2-

For Model 2 of the study, the state with no HIV VLTC was considered, and the state of Odisha was confirmed for implementation.

This model 2 will adopt DBS sample for HIV VL testing in absence of both CBNAAT and VLTC in the same city or town where the ARTC is located. Under this model, DBS will be prepared from sample collected from eligible PLHIV and will be couriered to ICMR-NARI, Pune Viral load testing Apex laboratory.

As per protocol, Model 2 has to be implemented at one moderate to high burden ARTC.

For the selection of an ART center, the center with a moderate to the high burden of the PLH on HIV must be considered. To understand the burden of PLHIV currently on ART, the list was obtained from Odisha SACS.

Table 3.1. ART centers in Odisha with active cases

Sr No	Name of ART Center	Active Cases-Dec-22
1	DHH, Angul	1854
2	DHH, Balangir	1750
3	DHH, Balasore	1407
4	MKCG Medical College, Berhampur	5310
5	DHH, Bhadrak	720
6	Sub-Divisional Hospital, Bhanjanagar	1139
7	Capital Hospital, Bhubaneswar	2073
8	VSS Medical College, Burla	1701
9	SCB Medical College, Cuttack	3405
10	District Headquarters Hospital, Keonjhar	259
11	DHH, Koraput	348
12	DHH, Nabarangpur	786
13	FI-ART Centre, DHH, Nayagarh	351
14	DHH, Puri	537
15	FI-ART Centre, DHH, Rayagada	370
16	Rourkela Govt. Hospital, Rourkela	867

From these 16 ART centre, centres having more than 75th percentile of cases were considered as a high burden ART centres (cases > 1828). Therefore, the ARTC with more than 1828 present PLH on ART were considered as high burden ART centres and considered for sampling frame.

Table 3.2. ART centers in Odisha with active cases and CBNAAT test burden

Sr No	Name of high burden ART Center	Active Care-Dec-22	CBNAAT Test in last year
1	DHH, Angul	1854	1482
2	**MKCG Medical College, Berhampur**	**5310**	**4494**
3	Capital Hospital, Bhubaneswar	2073	4710
4	SCB Medical College, Cuttack	3405	7681

We assessed the availability of CBNAAT facilities along with CBNAAT test burden in the 4 shortlisted high burden ART centre as shown in table no 2.

Considering the maximum ART case load and second highest CBNAAT testing load, **MKCG Medical College, Berhampur** has finalised for implementation of model 2.

7.2.3. Other factors considered:

a) Availability of GeneXpert Machines: The second consideration was the availability of GeneXpert machines in the selected location. The GeneXpert platform is a specialized diagnostic tool that is used currently to detect drug-resistant TB levels in TB patients. It is important to select sites where the machines are readily available and accessible.

b) Infrastructure: The fourth consideration is the availability of suitable infrastructure, such as laboratory facilities, transport and storage facilities, and reliable power supply. These factors are important to ensure that the testing process is conducted smoothly and efficiently, and that the samples are properly handled and stored.

c) Regulatory Environment: The final consideration is the regulatory environment in the selected location. It is important to select sites where the regulatory environment is favourable for conducting research studies, and where there are no legal or regulatory barriers to conducting the study.

7.3. Developing the data collection and study tools

a) Following the research question: The first step in developing data collection and study tools is to clearly follow the research question. This guided me to the development of the data collection tools and ensure that the study is focused and targeted.

b) Identify the variables: After the research question was defined, the next step was to the identification of the variables that need to be measured in order to answer the research question. For example, in a study on the feasibility of viral load testing using GeneXpert, variables that may need to be measured could include the number of patients tested, the viral load levels detected, and the time taken to complete the testing process etc.

c) Develop data collection tools: Data collection tools were used to measure the defined variables. This could include questionnaires, surveys, or observation checklists. In the case of a study on viral load testing, data collection tools could include forms to record patient information, sample collection and processing, and the results of the GeneXpert tests.

While formatting the data collection tool, the clinical data sheet was prepared separately as well the laboratory data collection tool.

7.3.1.Preparing the tool for collecting the clinical information of the participants.

The NACO guidelines for treating patients with HIV were referred to prepare the data collection tool for collecting the clinical information.

As per the study protocol it was important to design the tool which will capture the demographic information , the clinical , personal and family history of the participants.The data collected through this tool will help the study to monitor the effectiveness of treatments, their adherence to the treatment ragimen etc.

Some of the key sections of this clinical data collection tool include:

a) Demographic information: This included details such as the patient's age, gender, occupation, and education.

b) Personal and family history: This section includes the details about patients typology, his habits as well as the family history such as the HIV status of partner , parents etc.

c) Clinical history: This section captures the patient's medical history, including details about their HIV diagnosis, past illnesses, and current symptoms.

d) Laboratory information: This section records the patient's previous CD4 count, viral load, and other important laboratory parameters that help healthcare providers to monitor the progression of the disease.

e) Treatment regimen: This section captures information about the medications prescribed to the patient, including the dosage and frequency of administration.

The Annexure I provides the detailed clinical data sheet form inclusive of all the necessary information needed to assess and analyze the study.

7.3.2. Preparing the tool for collecting the laboratory information of the viral load testing

The national guidelines for the HIV viral load testing has been referred to prepare the laboratory information sheet. The laboratory data sheet contains various sections that capture important information about the patient's laboratory test and its results.

Some of the key sections of the laboratory data sheet include:

a) Patient information: This includes details such as the patient's name, unique identification number etc.

b) Laboratory tests: This section records the laboratory tests performed on the patient, including the type of test, date of test, and the laboratory's name.

c) Specimen information: This part of the form records the information about the collected specimen , if its whole blood sample, dry blood spot with quantity of the specimen mentioned.Along with that the date and time of specimen collection, the temperature at which the specimen is stored is also included in this sheet.

d) Test results: This section records the results of the laboratory tests, including the units of measurement and the reference range.

Annexure II to IV contains a comprehensive laboratory data sheet that includes all the essential information required for the evaluation and analysis of the study.

8.Competency gained

8.1. Review of literature

a) Research skills: Conducted research on a specific topic including viral load testing, HIV viral load monitoring, Anti-retro viral treatment etc which involved searching for relevant literature, critically analyzing the information, and identifying knowledge gaps.

b) Critical thinking: Reviewing scientific literature has improved the critical thinking skills to evaluate the quality of the research, identify biases or inconsistencies, and assess the validity and reliability of the findings.

c) Communication: Synthesizing and summarizing complex information into a coherent and concise format that can be easily understood by others has helped to enhance effective communication skills, including clear writing and presentation skills.

d) Analytical skills: Analysing large amounts of data and synthesizing it into meaningful insights enhanced the strong analytical skills to identify patterns, trends, and relationships in the data.

e) Time management: It has increased my awareness about good time management skills to organize and prioritize tasks to meet deadlines.

f) Knowledge expansion: Reviewing literature has allowed me to expand my knowledge and understanding of all the HIV viral load testing. This has led to the development of new ideas and perspectives that has contributed to further research and development.

8.2. Strategising site selection for the study

a) Problem-solving: In the process of selecting a research site it has involved overcoming various obstacles and challenges, such as identifying suitable ART center which fulfilled the desired criteria, obtaining permissions and approvals, and managing logistics. Planning an effective strategy has built excellent problem-solving skills to identify solutions and overcome barriers.

b) Collaboration: Effective strategy planning for selecting a research site has included collaboration with various stakeholders, such as local authorities, the state TB officers, and the medical officers of the ART centers. This process has helped me to establish excellent communication and negotiation skills.

c) Project management: While planning the strategy for selecting a research site there was management of timelines, budgets, and resources effectively. As well as it was important to be aware about the methodology for the selection. This has helped to understand and improve project management skills, including prioritization, planning, and delegation.

d) Cross-cultural competency: Selecting a research site in a different cultural context requires an understanding of cultural differences, norms, and values. Keeping all these things in mind effective strategic planning needed to be inclusive of cross-cultural competency to navigate cultural barriers and establish productive relationships with local stakeholders.

8.3. Developing the data collection and study tools

a) Research skills: Developing data collection and study tools has developed a deep understanding of the research question, study design, and data analysis methods. The extensive research on the relevant literature and identification of suitable data collection tools that align with the research question has helped me to gain the efficient research skills.

b) Technical skills: Developing data collection and study tools enhanced my technical skills, such as proficiency in software tools used for data analysis, survey design, and data management. This included the selecting of appropriate data collection methods, such as interviews, questionnaires, or focus groups, and developing these tools using appropriate software.

c) Attention to detail: The accuracy of the data to be collected while Developing data collection and study tools requires an eye for detail, as even small mistakes or omissions in the tools can compromise. This has helped to put a careful attention to the wording of questions, survey flow, response options, and skip patterns.

d) Adaptability: Developing data collection and study tools has given the ability to adapt to changing circumstances, such as unforeseen logistical challenges or unexpected responses from the participants. This involved developing contingency plans and modifying the tools or study design as needed.

e) Ethical competency: Developing data collection and study tools requires consideration of ethical principles and guidelines, such as ensuring informed consent, respecting privacy and confidentiality, and minimizing harm to participants. This included developing tools sensitive to the participants' cultural and social context and minimizing any potential risks associated with participation in the study.

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Annexure I

Clinical data information sheet

1.Participants' information

- Study ID :
- Initials of the participant:
- Date of birth :
- Gender:
  - □ Male
  - o Female
- Date of registration:
- Name of the ARTC:
- Code of ARTC:
- City :
- Distance to the ART centre:
  - □ <10km
  - □ 10 to 30 km
  - □ >30 km
  - □ Unknown
- Time to reach the ART centre :
  - □ <30 min
  - □ 30 to 60 min
  - □ >60 min
  - □ Unknown

2.Personal history

- Typology (if any)-
  - □ Heterosexual
  - □ MSM
  - □ Truker
  - □ Migrant
  - □ Blood transfusion
  - □ Mother to child
  - □ Probable unsafe injection
  - □ Unknown
- Commercial sex worker

3. Family history

-Marital status

- □ Married
- □ Single
- □ Divorced/separated
- □ Widowed

- HIV status of the partner
  - □ Positive
  - □ Negative

- ☐ Unknown
- HIV history of partner (if died)
  - ☐ Positive
  - ☐ Negative
  - ☐ Unknown

4.Medical history

- Habit of –
  - ☐ Smoking
  - ☐ alcohol use
  - ☐ tobacco chewing
  - ☐ NA
- Other comorbidities
- Current medications other than ART

5.HIV diagnosis and ART initiation

- Date of confirmed +HIV test
- Place of HIV test
- Initial WHO staging.
- Height at ART initiation (m)
- Weight at ART initiation (kg)
- BMI at ART initiation (kg/m^2)
- Date of ART initiation
- Delay in ART initiation (months) if any
- Initial ART regimen
- Initial CD4 count

g) Initial viral load

6. ART summary -

Name	Date of start	Substitution, switch, or stop	Reason	Date of restart
1st line 1. Tenofovir (TDF) + Lamivudine (3TC) + Efavirenz (EFV) 2. Tenofovir (TDF) + Emtricitabine (FTC) + Efavirenz (EFV) 3. Zidovudine (AZT) +				

Lamivudine (3TC) + Efavirenz (EFV)				
2nd line 1. Tenofovir (TDF) + Lamivudine (3TC) + Boosted Atazanavir (ATV/r) 2. Tenofovir (TDF) + Emtricitabine (FTC) + Boosted Atazanavir (ATV/r) 3. Zidovudine (AZT) + Lamivudine (3TC) + Boosted Lopinavir (LPV/r)				
3rd line 1. Darunavir (DRV) + Ritonavir (RTV) + Raltegravir (RAL) 2. Darunavir (DRV) + Ritonavir (RTV) + Etravirine (ETV) 3. Darunavir (DRV) + Ritonavir (RTV) + Tenofovir (TDF) + Emtricitabine (FTC)				

- Adherence to ART in % -

- ☐ <50
- ☐ 50 to <80
- ☐ 80 to <85
- ☐ 85 to <90
- ☐ >90%

- Missed or delayed visits >7 days
  - ☐ Yes
  - ☐ No

5. Clinical assessment-

h) Number of OI reported from initiation

- Present clinical symptoms (Tick all that apply)
  - ☐ Unexplained weight loss
  - ☐ Swollen lymph nodes
  - ☐ Night sweats and fever
  - ☐ Unusual headaches, poor concentration or confusion
  - ☐ Fever with chills/rigor
  - ☐ Change in appetite
  - ☐ Skin rash
  - ☐ Sores/Ulcers
  - ☐ Painful swallowing
  - ☐ Chest pain, cough, or shortness of breath
  - ☐ Abdominal pain, vomiting or diarrhea
  - ☐ Numbness or tingling in hand or feet
  - ☐ Muscular weakness / abnormal movements
  - ☐ Partial loss of vision or visual field defects
- Past H/O TB details
  - Past TB infection and type of TB:
    - ☐ Pulmonary TB
    - ☐ Smear positive
    - ☐ Smear negative
    - ☐ Site(extrapulmonary TB)
  - TB registration district:
  - Treatment given
    - ☐ Category I
    - ☐ Category II
    - ☐ Other specify:
    - ☐ Non-DOTS
    - ☐ Rx for MDR
  - H/o of TB in family /close contacts:
  - 4 S screening:
    - ☐ current cough-
    - ☐ Fever-
    - ☐ Weight loss-
    - ☐ Night sweats-

- Treatment outcome:
  - ☐ Cured
  - ☐ Treatment completed.
  - ☐ Treatment failure
- Defaulted

6. Laboratory assessment-

- Date of previous HIV VL testing sample collected :
- Place of previous VL testing Lab :
- Date of previous HIV VL result:
- Previous VL test result:
- VL testing due date:
- Date of HIV VL prescription by medical officer:
- Need for VL testing :
  - ☐ Routine VL testing
  - ☐ Targeted VL testing
  - ☐ Repeat testing
  - ☐ Other specify:
- Other lab investigations prescribed to the patient:
  - ☐ Hb
  - ☐ TLC
  - ☐ DLC
  - ☐ Type of anemia
  - ☐ Serum creatinine
  - ☐ Blood sugar
  - ☐ CD 4 count/CD4%

Annexure II

Laboratory information sheet

Viral load register at ART center

Name of the ART center: **Date:**

ART center code:

Name of the ART center MO:

S.no.	Initials of the participant	Study ID of the participant	Date of the specimen collection	Time of specimen collection	Specimen storage temp.	Date of specimen dispatch to CBNAAT lab	Date of specimen dispatch to NACO lab	Time of specimen dispatch	Date of VL result received	VL Result	Remarks

Supervisor

Annexure III

Viral Load register at testing laboratory

(NACO accredited reference laboratory)

Name of the Viral load testing laboratory: **Date:**

Name of the laboratory in charge:

Name of the laboratory technician:

Lab number	Participants Initials	ARTC code	Study ID of the participant	Date and time of receiving the specimen	Was the sample accepted? (yes/no)	If rejected – Specify Reason	Specimen storage Temp.	Date of Testing	Result of Viral load count	Date of dispatching the results	Remarks

Supervisor

Annexure IV

Viral Load register at the testing laboratory

(CBNAAT laboratory)

Name of the Viral load testing laboratory: **Date:**

Name of the laboratory in charge:

Name of the laboratory technician:

Lab number	Participants Initials	Study ID of the participant	Date and time of receiving the specimen	Was the sample accepted? (yes/no)	If rejected – Specify Reason	Date of receiving the 2nd sample	Specimen storage Temp.	Date of Testing	Cartridge Identification Number	Result of Viral load count	Date of dispatching the results	Remarks

Supervisor