



Impact of COVID-19 Pandemic on HIV Testing Uptake Among Key Populations Enrolled in Targeted Intervention Program in Maharashtra, India

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Abstract

The COVID-19 pandemic posed unprecedented challenges to HIV services globally. We evaluated the impact of the COVID-19 pandemic on the uptake of HIV testing in the Targeted Intervention (TI) program in Maharashtra—a high HIV burden state in India. Annual HIV testing was sustained during the pandemic year (2020–2021), at levels similar to the pre-pandemic year (2019–2020), among Female Sex Workers (FSW), Men having Sex with Men (MSM), Transgender (TG), and Truckers; but not among Migrants and Intravenous Drug Users (IDU). There was an acute decline during the lockdown across all typologies. Sharp recovery was seen among FSW, MSM, and TG during the early months of the un-lockdown. The community-based screening (CBS) approach primarily contributed to this recovery. Among migrants and truckers, recovery was delayed. There was an overall reduction of 58% in annual HIV-positive registrations. The community-based networks, participatory structures, and processes of HIV programs played an essential role in reaching the community during the pandemic.

Keywords HIV testing · COVID-19 · Community-based screening for HIV · Targeted Intervention Program for HIV · India

Introduction

The pandemic of COVID-19 had an unprecedented impact on health services globally [1]. Many countries enforced strict lockdowns as a measure to combat the COVID-19 pandemic declared by World Health Organization (WHO) on March 11, 2020. In India, the government announced a strict lockdown across the country from March 24, 2020, to June 8, 2020, with very short notice. There were severe restrictions on gatherings, travel, etc. Other restrictive measures, such as using masks and sanitizers, physical distancing, curfews, creation of containment zones, etc., were enforced during the lockdown period. Depending on the local situation,

restrictions were relaxed in a phased manner during periods of un-lockdown. During the un-lockdown period, containment zones and restrictions on social gatherings continued. Limited staff was allowed at workplaces, public transport was allowed at half capacity, and night curfews were imposed. Government healthcare centers and hospitals were converted to COVID-19 care centers. All the health staff was reallocated to manage the COVID-19 pandemic. The access to health services for conditions other than COVID-19 decreased significantly [2–4]. Moreover, people avoided accessing health care in hospitals due to fear of contracting COVID-19 [5].

Globally, the pandemic affected important health programs, including Tuberculosis, HIV, Nutrition, Other Communicable and Non-Communicable diseases, etc. [6, 7]. There was a significant impact on the different components of HIV programs, including the uptake of HIV testing and Anti-retroviral Treatment (ART) [8–11]. It could have derailed the success gained by HIV programs [12]. The impact could be devastating for a country like India, which has one of the highest numbers of people living with HIV (PLHIV) in the world [13]. Lockdown, adopted as a measure to combat the pandemic, posed many challenges in the

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utilization of HIV services by the program's beneficiaries [14, 15].

The HIV epidemic in India is mainly concentrated among Key populations (KP) such as Female Sex Workers (FSW), Men having Sex with Men (MSM), Hijra/Transgender (TG), and Injecting Drug Users (IDU). Prevention activities such as outreach, awareness regarding HIV, HIV screening and testing, and supply of other commodities among these key populations are done through the Targeted Intervention (TI) program. The TI program focuses on reaching the at-risk population from urban areas. Community-based screening (CBS) of HIV, introduced in 2016–2017, is an important strategy adopted in the program. CBS includes approaches such as door-to-door/home-based testing and mobile outreach campaigns, and testing in workplaces, parks, bars, places of worship, and educational establishments [16].

There is limited understanding of how the COVID-19 pandemic affected HIV testing through TI programs in India. A clinic-based longitudinal assessment done in MSM and IDU populations from 15 cities in India reported a 25% reduction in utilization of HIV services in Apr–May 2020 compared to the pre-pandemic level [17]. Another qualitative study from Telangana and Maharashtra among FSW, MSM, and transgender women reported challenges in HIV, CD4, and Viral load testing due to lockdown restrictions and fear of contracting COVID-19 [18]. These were predominantly localized studies. A state or national-level understanding of this subject is limited. Given the heterogeneity of distribution of key populations across states and variability in the relaxations during un-lockdown, it is essential to look at the impact of the pandemic in different states of India. Maharashtra has been one of the worst affected states by COVID-19 [19] and HIV [20]. With this background, this study examined the impact of the COVID-19 pandemic on the uptake of HIV testing in the TI program in Maharashtra, among different typologies. The study also looked at the pattern of recovery of HIV testing uptake over time by type of testing (HIV testing through Integrated Counseling and Testing Centers (ICTCs) or CBS).

Methods

Study Setting

This evaluation study was carried out in the state of Maharashtra, which is one of the high HIV prevalence states in India, contributing to 17% of the national HIV burden [20]. TI program data from all the TI organizations operational across Maharashtra were obtained for the analysis.

About TI Program

TI program is implemented through Non-Governmental and Community-Based Organizations (CBO). The strength of these organizations is their linkages to the community. The CBO-level program staff includes peer educators and peer navigators employed from within the community and outreach workers (ORWs) for providing different community-level services. According to the mapping and size estimation of the high-risk population done in 2009–2011 [21], each TI organization is given a target to cover the population of a specific typology mapped in their working area. The number of operational TI organizations increased in 2019–2020, compared to 2018–2019, as the HIV program aimed at increasing its penetration. The target for 2020–2021 was set in March 2020—i.e., before the pandemic hit. It was at levels similar to the previous year. For most of the active TI organizations in Maharashtra, their respective annual targets have remained the same from 2018–2019 to 2020–2021.

Study Design

A mixed-methods study was conducted using the secondary data analysis of TI program data from Maharashtra and qualitative interviews with the officials and TI program staff.

Quantitative program data had aggregate information from 30 districts (excluding Mumbai) on HIV testing from April 2018 to March 2021. Primary qualitative data were collected through in-depth interviews (IDI) with officials and TI organization staff and focus group discussions (FGD) with peers and ORWs from the organizations, using IDI and FGD guides. The qualitative component aimed to understand how TI organizations strategized to adapt to the COVID-19 pandemic situation and assess challenges posed by the pandemic in reaching out to unreached populations.

Data Analysis

The month-wise data of indicators, such as total HIV testing, HIV testing through CBS and ICTC, and HIV positivity, were used for quantitative analysis. All the data obtained from the Maharashtra State AIDS Control Society (MSACS) were compiled in MS excel. Data were checked for missing values and accuracy. Queries regarding the data were shared and clarified with the help of the respective Program Officers of the Technical Support Unit (TSU), assisting in the program monitoring and technical areas. April 2020 to March 2021 was considered a 'COVID-19 year' or pandemic year, and one previous year (April 2019–March 2020) was considered a 'Pre-COVID-19' year to establish the reference period. A comparative analysis of the impact of the COVID-19 pandemic on the uptake of total HIV testing in the TI program in Maharashtra was done for each typology.

A monthly trend of HIV testing in each typology was also seen to understand the recovery pattern. Further analysis was done to understand the role of the testing approach, i.e., ICTC or CBS, in recovery. Data were analyzed in MS Excel and R statistical software using a descriptive comparison of trends in HIV testing over time.

Qualitative data were collected from 30 TI organizations across ten districts. Organizations catering to different typologies and representing regional diversities were selected to collect qualitative data to ensure the diversity and specificity of issues faced during the COVID-19 pandemic. All the interviews were assigned a unique study ID and then transcribed. The transcripts were scrutinized for errors and completeness. A primary code list was prepared, and the transcripts were coded using RQDA software for qualitative data analysis. A mix of inductive and deductive codes was derived. Codes were categorized into code categories, and emerging themes were identified and analyzed.

Ethics

The study was approved by the Prayas Institutional Ethics Committee for Research and the MSACS research review committee. The program shared de-identified aggregate program data, which were used for quantitative assessment in the study. Written informed consent was taken from all the officials, IDI, and FGD participants for voluntary participation and audio recording of the qualitative interviews.

Results

HIV Testing Uptake in the TI Program During the Pre-COVID-19 and COVID-19 Period

Annual HIV testing of 296,013, 387,853, and 351,980 individuals (cumulative numbers for all the typologies) was conducted during 2018–2019, 2019–2020, and 2020–2021 respectively (Fig. 1). A 9% reduction in testing was seen during the pandemic year, compared to the previous year, despite the same number of functional TI organizations. Figure 1 shows that for typologies like FSW, MSM, TG, and truckers, HIV testing uptake during the COVID-19 year was almost equivalent to pre-COVID-19. In fact, for MSM and TG populations, HIV testing uptake increased by 7 and 5%, respectively. There was a 44% decrease in HIV testing uptake among the IDU population. Among the migrant population, a 16% reduction in HIV testing was observed compared to the pre-COVID-19 year.

Patterns of HIV Testing Recovery in Different Typologies in the TI Program

Figure 2 shows monthly HIV testing during COVID-19 and pre-COVID-19 years. A sharp decline was observed in HIV testing among all the typologies during the initial lockdown period (Apr 2020–Jun 2020). Recovery in HIV testing was seen during the post-lockdown period (from July 2020 to Oct 2020) among FSW, MSM, and TG populations. In the Migrant and Trucker population, the recovery of HIV testing

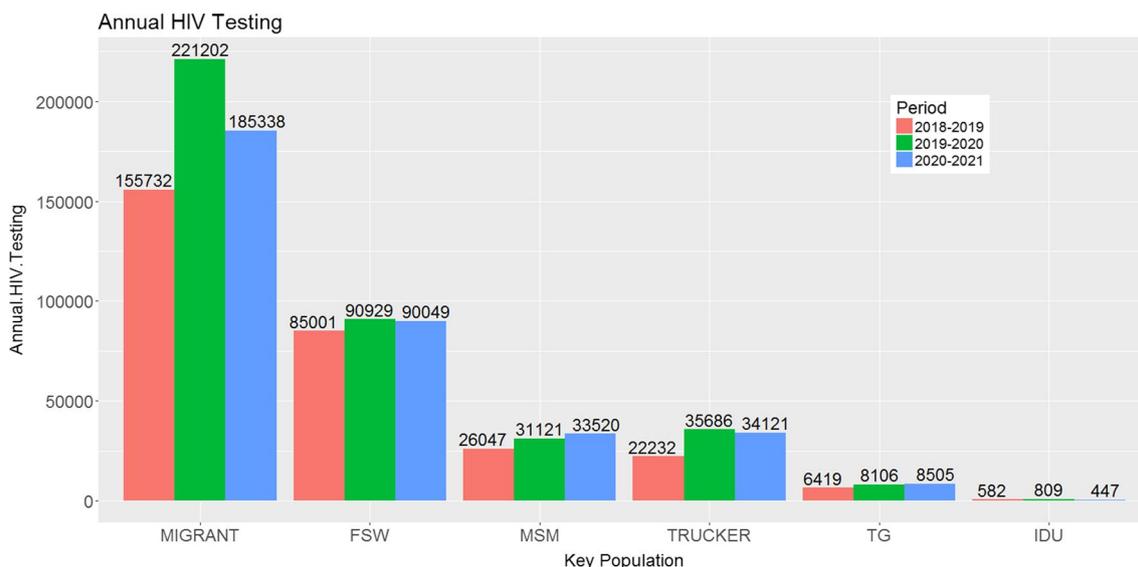


Fig. 1 Annual HIV testing in the Targated Intervention program during 2018–2019, 2019–2020, and 2020–2021 for different typologies. *FSW* female sex worker, *MSM* men having sex with men, *TG* transgender, *IDU* intravenous drug user

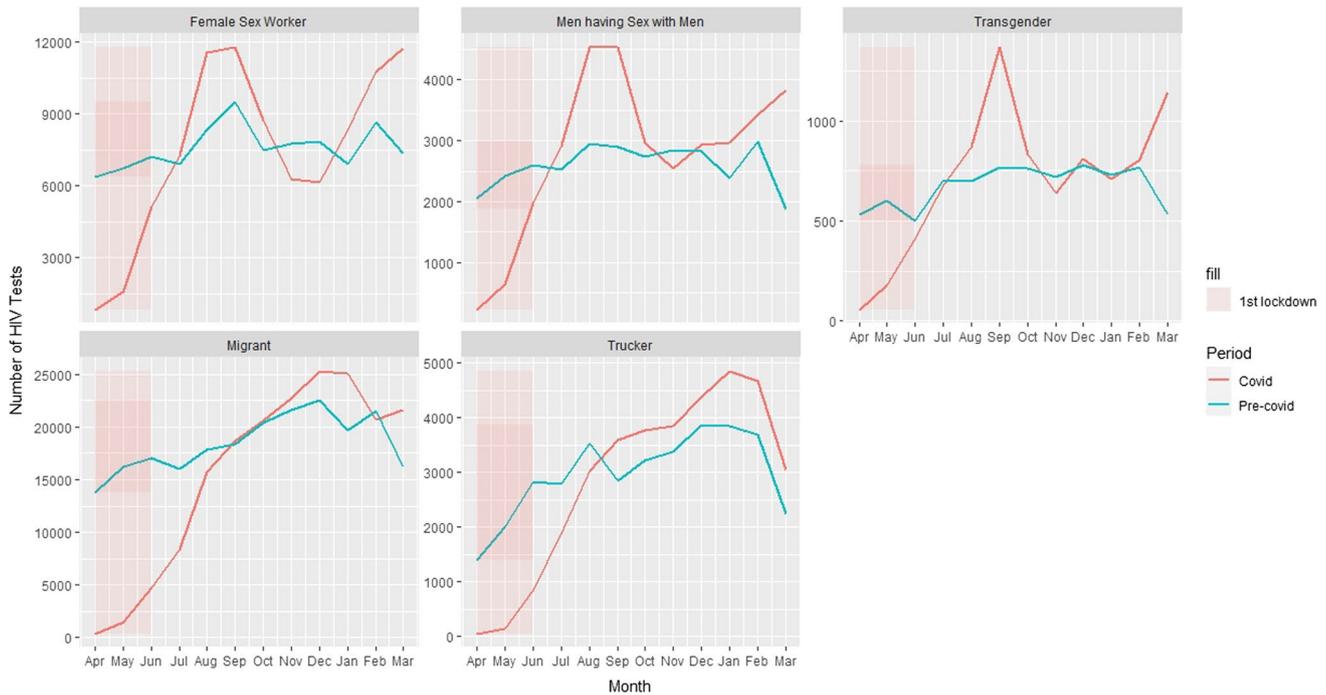


Fig. 2 Monthly HIV testing (total) in the Targeted Intervention program before and during the COVID-19 pandemic for different typologies

uptake happened much later post-Oct 2020 when everything regained normalcy.

Role of Different Testing Approaches in the Recovery of HIV Testing Uptake

HIV testing in the TI program is done mainly through ICTCs and CBS. During the initial strict lockdown, there was an acute drop in CBS and ICTC for all typologies (Fig. 3). After the relaxation of the pandemic-related restrictions, the TIs started outreach and providing HIV services. For FSW, MSM, and TG populations, there was a sharp rebound in CBS testing after the end of the strict lockdown. HIV testing through ICTCs during the post-lockdown period remained similar to pre-COVID-19 years among these populations. The CBS approach most compensated recovery of HIV testing in these typologies. For Migrants and Truckers, the CBS for HIV remained slightly higher during the COVID-19 year compared to the pre-COVID-19 year, and HIV testing through ICTCs was lower for quite a long period and increased after Nov 2020. For IDUs, all the HIV testing was done through CBS during the COVID-19 and pre-COVID-19 years.

The qualitative data analysis revealed the several challenges faced by people in accessing HIV testing at health care facilities during the un-lockdown phases. These included travel restrictions, conversion of health facilities into COVID-19 care centers, fear of contracting COVID-19,

etc. Therefore, the program strategized to focus more on CBS during the un-lockdown period.

"During the COVID-19 scenario, patients were finding it difficult to access the health facility. We took this opportunity... We had asked our staff to reach out to the client rather than the client accessing (the health services at health care centers). During COVID-19, where there was demand, they (TI organizations) did testing through CBS because it was a programmatic decision to go out and test the population." (Key Informant)

During the pre-COVID-19 period, CBS was done through HIV testing camps in places frequently visited by the community. However, COVID-19-related restrictions such as social distancing, containment zones, etc., posed difficulties. Therefore more focus was put on doorstep testing. Peers and ORWs played a proactive role in reaching out to people in their designated areas and coordination.

"We told ORWs to take meetings (with community members) at their sites. Previously if one or two meetings were taken (for a site), the number (of meetings) was increased to four. From here (TI NGO office), I used to give them (ORW) a due list (a list of community members whose HIV testing was due). In due list, we used to give them all the information about what is done and what is remaining (tests

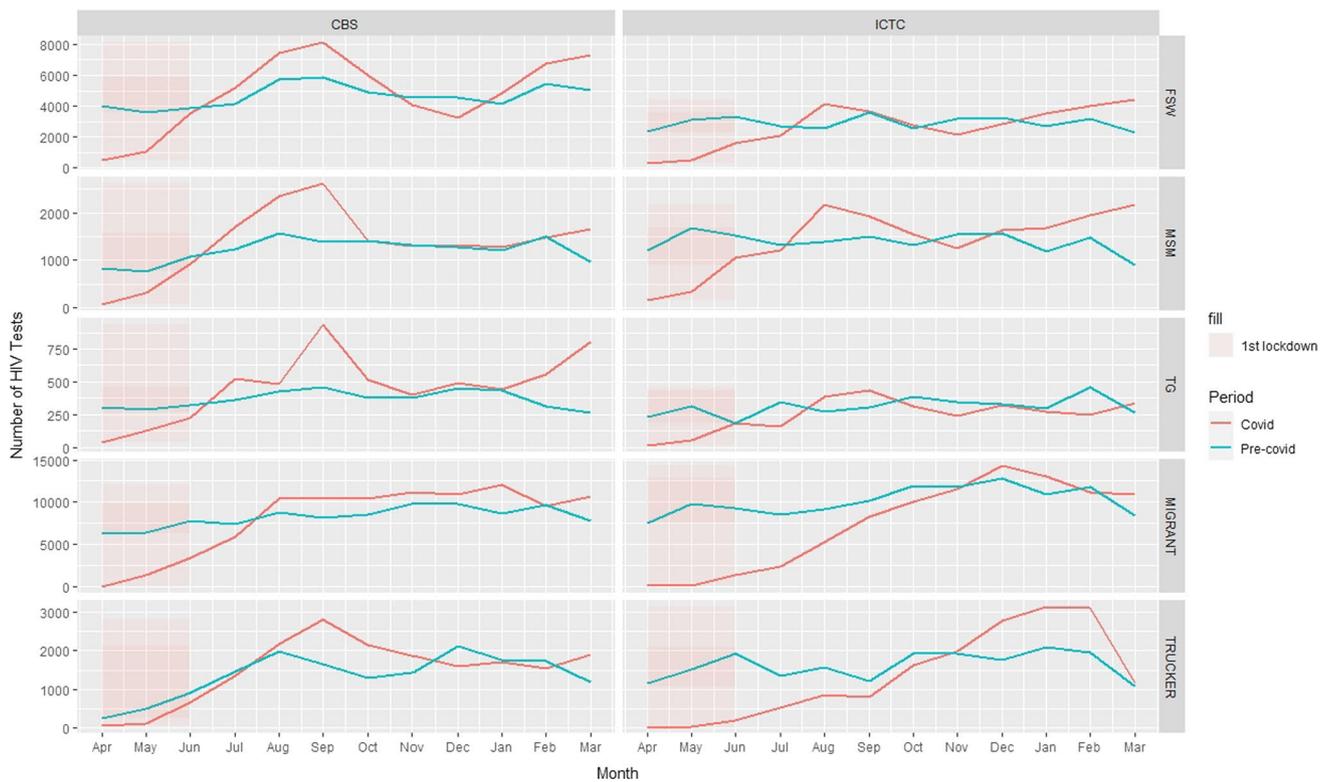


Fig. 3 Monthly HIV testing through CBS and ICTC during the pre-COVID-19 and COVID-19 years in the TI Program for different typologies. *ICTC testing registered under the TI program. FSW

female sex worker, MSM men having sex with men, TG transgender, CBS community-based screening, ICTC Integrated Counseling and Testing Center

and services) according to the doctor or according to report." (Program Manager, MSM, TI)

Comparison of the Number of HIV Positives and HIV Positivity During Pre-COVID-19 and COVID-19 Years

The absolute number of HIV-positive cases registered during the COVID-19 year significantly declined (478 vs. 822) compared to the pre-COVID-19 year among all the typologies. The reduction among migrants was highest (51%), followed by truckers (49%), FSW (27%), MSM (25%), and TG (22%), respectively. Among IDUs, no PLHIV was registered during the pandemic year, compared to 6 PLHIV in the pre-pandemic year.

There was also a decrease in the new registrations and HIV positivity among all the typologies during the COVID-19 year compared to the pre-COVID-19 year (Fig. 4). HIV positivity in 2018–2019 and 2019–2020 (pre-pandemic years) was 0.29% and 0.21%, respectively. During the pandemic year, it reduced further to 0.14%

Discussion

To our knowledge, this is the first study from India that analyses the state-level impact of the COVID-19 pandemic on HIV testing in the TI program throughout lockdown and later phases of opening up.

During the initial lockdown, HIV testing was significantly affected for all typologies. During the un-lockdown phases, rapid recovery was observed among FSW, MSM, and TG populations. Among Migrants and Truckers, the recovery was delayed and was seen only after transport and business regained normalcy. Despite the challenges posed by the pandemic, there was near-achievement of annual testing targets, except in migrants and IDUs. FSW, MSM, and TG programs could reach out, screen, and test their already registered community members as soon as opening up started in June 2020. The peer educators and ORWs working for these typologies were from the community and had close contact with community members. This enabled follow-up even during the pandemic. The decentralized implementation, driven mainly by outreach staff and peers, helped sustain testing amid pandemic-related

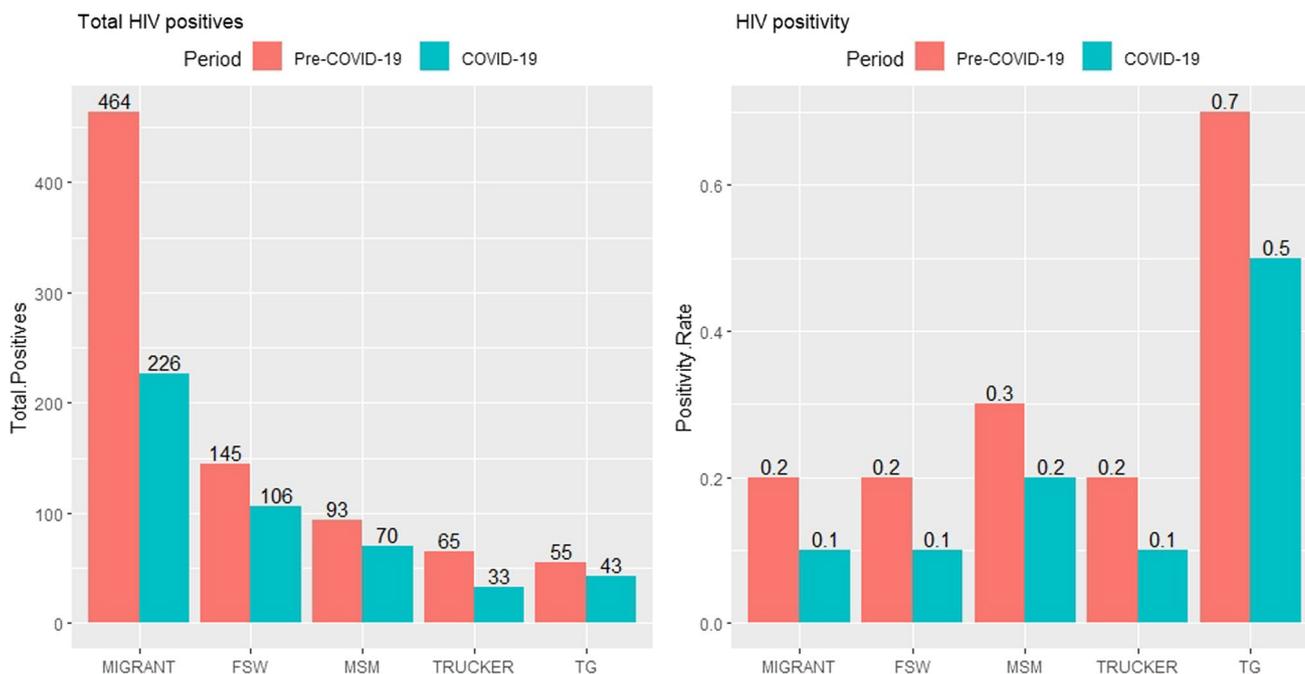


Fig. 4 Comparison of total PLHIV registered and HIV positivity before and during the COVID-19 pandemic in the Targated Intervention program for different typologies. *FSW* female sex worker, *MSM* men having sex with men, *TG* transgender

restrictions. A different pattern of recovery was seen among migrants. The population of migrants and truckers is not constant in an area. Many migrants returned to their native places during the pandemic, and truckers could not move for a long time due to travel restrictions. The recovery for these typologies was seen much later (post-Oct 2020), after the opening of inter-state boundaries for trade and commerce. The reduction in testing uptake in the IDU population during the pandemic year was mainly because of the closure of activities of one TI organization working for the IDU population.

During the un-lockdown phases, restrictions (such as the closure of public transport, ban on social gatherings, and night curfews) and reduced access to health care facilities (many were converted as COVID-19 care centers, health care providers were allocated COVID-19 duties) hampered the access to HIV services by key populations. Therefore, the program strategized to focus on CBS. During pre-pandemic years, CBS mainly operated through testing camps organized in community settings. In the initial un-lockdown period, it was difficult to conduct such camps. There were many challenges due to containment zones and social distancing etc. However, the flexible structure of CBS offered opportunities to adapt to the situation and sustain HIV testing by focusing on doorstep testing. The community-based networks established in HIV programs over the past years provided a strong foundation for new strategies to be quickly planned and implemented [22]. Our findings are consistent

with a study from Kenya that reports systematic peer outreach by community-based and HIV-self-testing helped fill gaps in clinic-based HIV testing during the pandemic [23]. Retrospective cohort analysis in 44 countries from different continents (Asia, Latin America, the Caribbean, Europe, and Africa) shows that HIV testing did not return to the pre-pandemic levels despite the use of various strategies such as HIV-self testing, prioritizing facility-based testing of symptomatic clients, pregnant women, and index testing [11].

The reduced number of PLHIV detected during the pandemic period remains a concern. It could be due to a decline in HIV testing and reduced HIV positivity during the pandemic. The reduced HIV positivity during the pandemic can be seen as an extension of previous trends of declining HIV prevalence in the state [20]. Decreased sexual activity was reported among the key population due to the lockdown and fear of COVID-19 transmission [18]. It may have been an additional factor, resulting in a decline in new cases. However, as things returned to normalcy, activities resumed. The qualitative interviews indicate that socio-economic compulsions arising out of the pandemic pushed key populations into risk-taking behaviors. Also, the restrictions on mobility increased difficulties in accessing preventive measures. Another possible reason for reducing PLHIV registrations could be poor outreach to new and vulnerable populations during the pandemic. In the past, experts in the field had flagged the issue of the TI program getting saturated in their outreach (not being able to reach out to never-tested, at-risk

people) [24]. It may have worsened during the pandemic year, as reflected by the lower number of new registrations. Analysis by sub-typology, demographic characteristics, and first-time testers will help understand the gaps in reaching out. However, this data could not be availed for the study. Difficulty in reaching out to new at-risk populations has been reported previously [24]. A study carried out among MSM and IDU in 15 cities in different states of India suggested that the COVID-19 pandemic may have led to delayed and missed HIV diagnoses and may contribute to increased HIV transmission [17].

Our study has several limitations. It is based on aggregate analysis. It provides typology-specific differences in the testing uptake during the pandemic. However, further disaggregated analysis was not possible due to the lack of data availability. These nuances will help identify the gaps and design targeted strategies to reach the unreached. Maintaining state-level information on individual attributes and adding indicators such as first-time testing will be crucial. The present analysis reflects the urban situation, as the TI program focuses on urban areas. It will be important to know the impact in rural areas as well.

Conclusions

This study has important insights for strengthening the existing program in the near and long term. CBS played a vital role in sustaining HIV testing among key populations during the COVID-19 pandemic. Adding indicators like first-time testers and sub-typology level data is needed to know whether CBS is beneficial to reach the hard-to-reach population.

The community-based networks, participatory structures, and processes built by HIV programs over many years played an essential role in reaching the community during the challenging situation due to the pandemic. It is crucial to increase community engagement in program activities and build their capacities to make them resilient to fight against such crises.

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Author Contributions All authors contributed to the study conception and design. Data collection was done by TD, PM and VJ. Data analysis was done by RP, TD, SD and PM. The first draft of the manuscript was

written by RP and TD and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data Availability Yes.

Code Availability Not applicable.

Declarations

Conflict of interest There is no potential conflict of interest.

Ethical Approval The study was approved by the Prayas Institutional Ethics Committee for Research and the Maharashtra State AIDS Control Society (MSACS) research review committee.

References

1. World Health Organization. Pulse survey on continuity of essential health services during the COVID-19 pandemic: interim report, 27 August 2020. [Internet]. 2020 [cited 2022 Jul 28] p. 21. Report No.: WHO/2019-nCoV/EHS_continuity/survey/2020.1. Available from: https://apps.who.int/iris/bitstream/handle/10665/334048/WHO-2019-nCoV-EHS_continuity-survey-2020.1-eng.pdf?sequence=1&isAllowed=y.
2. Hebbar PB, Sudha A, Dsouza V, Chilgod L, Amin A. Healthcare delivery in India amid the Covid-19 pandemic: challenges and opportunities. *Indian J Med Ethics*. 2020;5(3):1–4.
3. Raman R, Rajalakshmi R, Surya J, Ramakrishnan R, Sivaprasad S, Conroy D, et al. Impact on health and provision of healthcare services during the COVID-19 lockdown in India: a multicentre cross-sectional study. *BMJ Open*. 2021;11(1): e043590.
4. Khetrapal S, Bhatia R. Impact of COVID-19 pandemic on health system & sustainable development goal 3. *Indian J Med Res*. 2020;151(5):395–9.
5. Singh K, Kondal D, Mohan S, Jaganathan S, Deepa M, Venkateshmurthy NS, et al. Health, psychosocial, and economic impacts of the COVID-19 pandemic on people with chronic conditions in India: a mixed methods study. *BMC Public Health*. 2021;21(1):685.
6. The Global Fund. The impact of COVID-19 on HIV, TB and malaria services and systems for health: a snapshot from 502 health facilities across Africa and Asia [Internet]. The Global Fund; 2021 [cited 2022 Jul 21]. Available from: https://www.theglobalfund.org/media/10776/covid-19_2020-disruption-impact_report_en.pdf.
7. Gopalan HS, Misra A. COVID-19 pandemic and challenges for socio-economic issues, healthcare and National Health Programs in India. *Diabetes Metab Syndr*. 2020;14(5):757–9.
8. Moitra E, Tao J, Olsen J, Shearer RD, Wood BR, Busch AM, et al. Impact of the COVID-19 pandemic on HIV testing rates across four geographically diverse urban centres in the United States: an observational study. *Lancet Reg Health Am*. 2022;7: 100159.
9. Dorward J, Khubone T, Gate K, Ngobese H, Sookrajh Y, Mkhize S, et al. The impact of the COVID-19 lockdown on HIV care in 65 South African primary care clinics: an interrupted time series analysis. *Lancet HIV*. 2021;8(3):e158–65.
10. WHO. WHO: access to HIV medicines severely impacted by COVID-19 as AIDS response stalls [Internet]. 2020 [cited 2022 Jul 21]. Available from: <https://www.who.int/news/item>

- [06-07-2020-who-access-to-hiv-medicines-severely-impacted-by-covid-19-as-aids-response-stalls](#).
11. Rick F, Odoke W, van den Hombergh J, Benzaken AS, Avelino-Silva VI. Impact of coronavirus disease (COVID-19) on HIV testing and care provision across four continents. *HIV Med.* 2022;23(2):169–77.
 12. Hogan A et al. Potential impact of the COVID-19 pandemic on HIV, tuberculosis, and malaria in low-income and middle-income countries: a modelling study. *Lancet Glob Health.* 2020 [cited 2022 Jul 26]. Available from: [https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(20\)30288-6/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(20)30288-6/fulltext).
 13. UNAIDS. The gap report. UNAIDS; 2014. Report No.: ISBN 978-92-9253-062-4.
 14. Shah I, Delia Pereira NM. HIV services in times of COVID-19. *Indian J Med Res.* 2020;152(6):533–4.
 15. Parikh N, Chaudhuri A, Syam SB, Singh P, Pal P, Pillala P. Diseases and disparities: the impact of COVID-19 disruptions on sexual and reproductive health services among the HIV community in India. *Arch Sex Behav.* 2022;51(1):315–29.
 16. NACO. National HIV Counselling and Testing Services (HCTS) guidelines [Internet]. 2016 [cited 2019 May 2]. Available from: http://naco.gov.in/sites/default/files/National%20HIV%20Counselling%20&%20Testing%20Services%20Guideline,%20Dec%202016_0.pdf.
 17. McFall AM, Menezes NP, Srikrishnan AK, Solomon SS, Anand S, Baishya JJ, et al. Impact of the COVID-19 pandemic on HIV prevention and care services among key populations across 15 cities in India: a longitudinal assessment of clinic-based data. *J Int AIDS Soc.* 2022;25(7): e25960.
 18. Pollard R, Gopinath U, Reddy YA, Kumar BR, Mugundu P, Vasudev CK, et al. HIV service delivery in the time of COVID-19: focus group discussions with key populations in India. *J Int AIDS Soc.* 2021;24(Suppl 6): e25800.
 19. Joshi S, Unnithan P.S. Why Maharashtra, Kerala continue to record high Covid-19 cases [Internet]. *India Today.* [cited 2022 Nov 29]. Available from: <https://www.indiatoday.in/coronavirus-outbreak/story/why-maharashtra-kerala-continue-to-record-high-covid-19-cases-1817732-2021-06-21>.
 20. National AIDS Control Organization. Sankalak: status of national AIDS response (second edition, 2020) [Internet]. 2020. Available from: [http://naco.gov.in/sites/default/files/Sankalak%20Status%20of%20National%20AIDS%20Response,%20Second%20Edition%20\(2020\).pdf](http://naco.gov.in/sites/default/files/Sankalak%20Status%20of%20National%20AIDS%20Response,%20Second%20Edition%20(2020).pdf).
 21. National AIDS Control Organization. White paper on mapping and population size estimation of high-risk groups for HIV in India. [Internet]. 2019. Available from: <http://naco.gov.in/sites/default/files/White%20Paper%20on%20Mapping%20%26%20Estimation.pdf>.
 22. NACO. National stakeholder consultation towards identification of priority areas for capacity building of communities and community groups [Internet]. 2021 [cited 2022 May 5]. Available from: http://naco.gov.in/sites/default/files/Final_Report_of_National_Stakeholder%20Consultation.pdf.
 23. Odinga MM, Kuria S, Muindi O, Mwakazi P, Njraini M, Melon M, et al. HIV testing amid COVID-19: community efforts to reach men who have sex with men in three Kenyan counties. *Gates Open Res.* 2020;4:117.
 24. NACO. Revamped and revised elements of targeted intervention for HIV prevention and care continuum among core population [Internet]. 2019 [cited 2022 Jul 27]. Available from: http://naco.gov.in/sites/default/files/TI%20Strategy%20Document_25th%20July%202019_Lowres.pdf.

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