

RESEARCH ARTICLE

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A Study of the Impact and Restitutive Efforts of Cervical Cancer Screening during the COVID-19 Pandemic in a Regional Cancer Centre in Eastern India

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Abstract

Aim: To evaluate the feasibility and efficacy of switching to a self-sampling based screening as compared to ongoing provider-collection based screening using HPV DNA test and assess the compliance of HPV positive women for further treatment during the COVID 19 pandemic. **Method:** The study participants were women aged 30-60 years from rural and semi-urban communities around Kolkata, who underwent screening followed by HPV testing by Hybrid Capture II test. In the pre pandemic era, the women who attended the health centres where trained health workers that collected cervical samples. Following lockdown, the health workers distributed the self-sampling device to the women during home visits and counselled them to collect their samples by themselves. Thereafter the self collected screened positive women were brought to the hospital for further treatment instead of community clinics. **Results:** From April 2018 to March 2020, 12,718 women underwent screening using either HPV DNA test or visual inspection with acetic acid. HPV samples were either provider collected (62.7%) or self-collected (37.2%). The HPV positivity and CIN2+ detection rate were 5.4% and 2%. From April 2020 to February 2022, 10,792 women underwent screening using self-sampling only. The HPV positivity rate and CIN2+ detection rate were found to be 5.1% and 1.9% . **Conclusion:** Cervical cancer screening by HPV self-sampling advocates participation of more women especially in rural areas, while accelerating progress towards elimination of cervical cancer.

Keywords: COVID-19 pandemic- cervical cancer screening- human papilloma virus- self -sampling, hybrid capture II

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Introduction

High risk human papilloma virus (hrHPV) testing from self-collected vaginal samples for cervical cancer screening is gaining popularity over the past two decades. Over these years several studies have shown that test accuracy parameters of self-collected and provider-collected HPV test are comparable. Self-collection is well-accepted among women and is effective in increasing cervical cancer screening uptake (Arbyn et al., 2018; Poli et al., 2020).

According to the WHO screening guidelines published in 2021, the primary screening tool of choice is high risk human papilloma virus (hrHPV) testing. Participants screened positive by this modality may be managed following the screen and treat approach. As an alternative, a triage test can be performed after the positive primary screening test that would determine the requirement for further treatment (WHO, 2021). Hence, for implementing

a successful screening strategy in the community, the priority should be given to a convenient and cost effective method of sample collection for hrHPV testing.

On the evening of the 24th of March 2020, the government of India ordered a nationwide lockdown followed by a series of restrictions and relaxations undertaken to tackle the infection and spread of the SARS-CoV-2 virus. This had a drastic effect upon the accessibility and attendance of patients at the hospital out-patient and outreach medical camps, hence affecting cervical cancer screening activities in the community. The ongoing pandemic exposed the frailties of the world wide healthcare system and resulted in non-emergency health services being scaled down or even withheld in certain situations. While significantly impacting the delivery of preventive health services such as cervical cancer screening, the pandemic on the other hand catalysed remarkable innovations and adaptations in the health-system. Cervical cancer screening programmes

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in LMICs (Low- and middle -income countries) have adopted contextually appropriate measures to maintain high screening coverage and high compliance to follow up and treatment of screen positive women by adopting more pragmatic management protocols and creating safe clinic spaces.

Our present study, conducted at Chittaranjan National Cancer Institute (CNCI), Kolkata, India aimed to evaluate the feasibility, acceptability, and efficacy of switching to self-sampling based screening compared to ongoing provider-collection based screening using a validated HPV DNA detection test among a socioeconomically disadvantaged, unscreened population during the COVID-19 pandemic.

Materials and Methods

This study encompasses an already existing community-based demonstration project, that was launched in May 2017 under the Ministry of Health and Family Welfare to screen women residing in various districts of West Bengal, located within a 50-100 km radius of CNCI. Residents of these places did not have access to any form of community based cervical cancer screening. The primary implementing agency is CNCI that is working with stakeholders in government as well as non-governmental voluntary organizations (NGOs). The core working team consisted of four female health workers, one laboratory technician and one specialist clinician.

In pre-covid times weekly screening camps were set up at primary health centres and the screen-positive women were offered colposcopy services in the same community-based clinics. From April 2020 onwards, during the COVID 19 pandemic there was a change in the strategy and 'door to door' awareness was provided by the health workers. The motivated participants after giving consent performed self vaginal sample collection in the comfort of their homes, while maintaining COVID safety protocols. Following the lockdown, the screen positive women were recalled at our hospital in batches for colposcopy by transportation provided by the Institute itself. Colposcopy, punch biopsies and treatment were then given in the hospital by the same clinician who had accompanied the team to the community.

In the pre-covid times, there were mainly provider collected sampling, however during the pandemic there was a complete shift to self-sampling. The participant collected samples were then placed in a labelled tube containing transport medium which was handed over to the health workers who sent it to the laboratory for testing in vaccine carriers with ice packs on the same day. The laboratory would process the samples over seven hours and the result of up to eighty eight samples could be generated in a day. The results of the test were communicated to the participants and in case of a positive test result, the participant would be instructed to follow-up for clinical assessments and treatment. The Hybrid capture 2TM (HC2) (QIAGEN INC, Gaithersberg, USA) technology was utilised for detecting human papilloma virus. The methodologies implemented during pre-COVID

and post-COVID times have been summarised in Table 1.

Results

As depicted in Table 2, the demography of the participants was such that around a third of the participants had no formal education. Most of the participants were housewives who were impacted maximum by the 'door to door' awareness and screening activities. The monthly family income, profession of head of family, and education of head of family indicated that the majority of the screened women belonged to lower middle and upper lower socioeconomic class as per the modified Kuppuswamy scale.

Screening test results

All the participants were screened for high risk HPV by hybrid capture test. Table 3 is depicting the gradual shift in the primary screening methodology from VIA, provider or self-collected vaginal sampling to presently 100% self-sampling for hrHPV testing. Further the adaptations made in the screening strategies have resulted in the maintenance of screened number of individuals while maintaining covid protocols through the pandemic. The HPV positivity rate before (5.4%) and after (5.1%) the pandemic was quite similar to our previous studies (Basu et al., 2015; Mittal et al., 2016).

In the pre-covid times colposcopy was performed in the community clinics or the makeshift camps. Once the pandemic started all the HPV positive women were recalled in the hospital with hospital provided transport facilities for colposcopy and treatment. This was a great boon for the patients, as transport services were curtailed intermittently during the pandemic due to travel restrictions. Colposcopy compliance was very good among the HPV positive women which was around 87% (482/554). The CIN 2 detection rate before and after the pandemic remained almost the same (2 and 1.9%).

Almost all screen positive women including the cases of CIN2/3 completed their treatment and were sent back home on the same day. Despite the pandemic, the treatment rates were good as the positive women were brought to the hospital amidst travel restrictions. Hence there was no drop in the number of colposcopies or treatment of these HPV positive women. The patients detected with invasive cancers or early stage cancers were referred for radiotherapy or prepared for surgery respectively. Around 5% patients were non-compliant and refused to undergo any treatment

Figure 1 illustrates the month-wise cervical cancer screening number distribution between April 2018 and March 2021. The 'x' axis illustrates the timeline in months and the 'y' axis shows the number of women undergoing screening in each month. Several waves of covid infection between 2020 and 2021 affected screening numbers that led to restitutive intensified screening in June and November, 2020 in between two infection peaks.

In Figure 2 the 'x' axis illustrates monthly trimesters, the left sided 'y' axis illustrates the screened positive participants attending colposcopy in the form of line graphs, and the right sided 'y' axis illustrates the median

Table 1. Comparison of the Methodology for Cervical Cancer Screening during Pre-COVID and Post-COVID Times.

	Methodology pre-COVID (April 2018-March 2020)	Methodology post-COVID (April 2020-February 2022)
Awareness creation	Awareness in large groups: (with local NGOs): Women sensitized regarding cervical cancer screening by pamphlet distribution/ group counselling in camp setting	Awareness by trained community health workers/ NGO volunteers 'door-to-door'
Primary screening	Pre-sensitized women attended screening at rural clinics: HPV testing (Mostly provider collected) or visual inspection with acetic acid.	HPV Screening by door-to-door self-collection of vaginal swabs of pre-sensitized women.
Recall after screening results	Recall screen positive women at community clinics for colposcopy	Recall screen positive women at CNCI for colposcopy in batches (after the lockdown was over)
Triage	Colposcopy at community clinics. Cervical biopsy taken and treatment was based on eligibility	Colposcopy at CNCI followed by immediate treatment of screen positive women
Treatment	Treatment : Thermal ablation (if criteria fulfilled) at community clinics LLETZ (Large loop excision of the transformation zone)- recalled at CNCI	Treatment :Thermal ablation (if criteria fulfilled) and LLETZ - both at CNCI

number of days from screening to colposcopy in the form of bar graph from 2019-2021. The volatile nature of the COVID 19 infection spread resulted in interventions that helped to cope with the screening and treatment activities.

Discussion

The COVID pandemic may be nearing a close, however there are going to be future waves of infection possibly at different time points throughout the world, that can be attributed to different subvariants or variants of Omicron (Thomas, 2022). Community based cervical cancer screening practices while maintaining preventive measures for COVID- 19 transmission had certainly been a challenge, especially when health resources were directed towards COVID vaccination, diagnosis and treatment. The dedicated medical and health worker team belonging to the preventive oncology department of our Institute provided uninterrupted services and did not have any change in its responsibilities during that period, unlike other departments of our Institute where the rationing of health resources and services had taken place.

The line graph in Figure 1 shows the decline

in screening numbers in March 2020, that can be attributed to the nationwide lockdown in addition to the conventional reduction in participation during the peak summer months as visible in the pre COVID years. The nationwide lockdown had paralysed all non-emergency services. However, this brought changes in our screening strategies, resulting in 'door to door' awareness and self vaginal sampling that catalysed screening efforts to bring pre-COVID levels of participation in the community. The screened participation numbers were comparable to the previous years, lasting through and achieving a peak even through the beginning of the first wave of COVID infection in September 2020. The steeper rise in COVID infection rates during the more graver second wave resulted in screening numbers dipping to the lowest levels in May 2021. After a month however there was a resumption of accelerated screening and this remained steady even through the third wave in January 2022.

Screening high number of women in their third decade of life will have a higher impact in the arrest of the pre-cancer disease process as is visible in the age group of the screened participants of this study. HPV positivity was found to be highest among the married participants

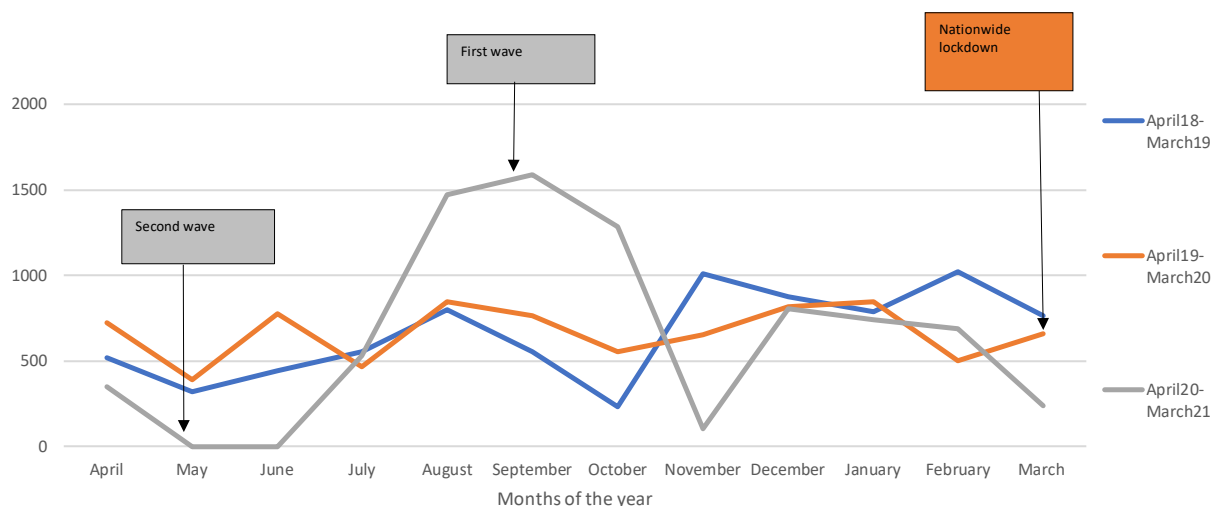


Figure 1. Cervical Cancer Screening Participation Month-Wise in pre and Post Covid Time Period

Table 2. The Demographic and Social Characteristics of the Participants Screened during the Pre-COVID and Post-COVID Times

Demographic & social characteristics		April 2018-March 2020		April 2020- February 2022	
		HPV Positive	HPV Negative	HPV Positive	HPV Negative
		599	10370	482	10310
Age group	30 - 34	155	2500	149	3162
	35- 39	135	2223	97	2097
	40 -44	133			1611
	45 – 49	65	1636	75	1486
	50 - 54	59	1149	48	962
	55 - 60	52	858	51	992
Menopausal status	Yes	72	1671	123	2119
	No	324	6737	359	8191
Marital status	Unmarried	1	7	0	6
	Married	558	9872	446	9882
	Separated	18	7	35	410
	Widowed	22	484	1	12
Age at marriage	< 18	316	4656	247	4826
	>18	282	5713	235	5484
Age at 1st childbirth	<18	114	2016	104	1831
	>18	476	8165	371	8366
Type of housing	Nulligravida	9	189	7	113
	Thatched	59	1287	88	1896
	Tiled	322	5185	286	8366
	Concrete	218	3898	108	113
Monthly income	< 5000	346	6015	277	5906
	5000-9999	210	3449	185	3781
	10,000-19,999	31	670	15	486
	>20000	12	236	5	137
Religion	Hindu	500	8215	446	9621
	Muslim	96	2148	35	689
	Christian	3	7	1	0
Education	Nil	164	2644	92	2067
	Primary	231	3858	166	3484
	Middle	91	1609	145	2860
	High school	88	1713	60	1555
	College	25	546	19	344
Occupation	Housewife	485	8733	451	9854
	Manual labour	88	1052	15	207
	Agriculture	2	5	2	17
	Service	19	515	9	181
	Business	4	48	1	11
	Professional	1	15	4	39

both in pre-COVID and post-COVID times. Among the hrHPV positive women, during both times, almost half of the participants had an early age of marriage less than 18 years age, and the age of first child birth was after 18 years in most of the participants indicating early marriage as an important risk factor.

The fall in the follow up of the participants during the months of April to June can be attributed to the peak summer months in the pre- COVID year of 2019 to 2020 which recovered gradually in the same year. The bar graph in Figure 2. shows a delay in the duration of follow up

(in days) of screen positive women attending colposcopy during the second quarter of 2019 that was mainly due to shortage of trained colposcopists. In the period following the nationwide lockdown, the hospital provided transport to screen positive participants from the community setting to the hospital for colposcopy and treatment. This improved the follow up numbers in general through the pandemic, keeping pace with the accelerated screening practices during the time that followed. These numbers however, picked up by the time of the third wave to levels that were comparable to the other years. The median days

Table 3. The Distribution of the Screening Tools, Positivity Rate and Compliance to Treatment before and after the Pandemic

	PRE-COVID	POST COVID
Total Screening	APRIL 2018-MARCH 2020 Women screened -12718	APRIL 2020-FEBRUARY 2022 (Lockdown from April- May 2020- No screening, Screening resumed from June 2020) Women screened- 10792
Screening Tests	IA -1749 women (13.7%) HPV testing- 10969 (86.24%) Provider collected- 6879 (62.7%) Self- collected- 4090 (37.2%)	Self-sampling method for HPV testing- 10,792 (100%)
Screening Tests Positivity	High risk HPV positive - 599/10969 (5.4%)	High risk HPV positive - 554 /10792 (5.1%)
Colposcopy	435/599 (72.6%)	482/554 (87%)
Treatment Compliance	Treatment done- 304/435 (70%) Thermal ablation – 235 LLETZ - 65	Treatment done- 414/482 (86%) Thermal ablation – 326 LLETZ - 85
CIN2+ DETECTION	2%	1.90%

to follow up then became comparable to the pre-COVID levels of less than a month through 2021, keeping in line with WHO recommendation of providing treatment within 6 months.

The necessity for dedicated screening activities in an environment of COVID infection, prevention and control resulted in several innovations in screening methodologies. Our model of using health workers for 'door to door' awareness, participant self vaginal sampling at home and transportation of screened positive individuals for follow up has worked very well and is replicable at other low and middle-income countries (LMIC). Extent of decline in cancer screening numbers can be interpreted from meta-analysis studies of upto 10% in cervical cancer screening during the pandemic and other

studies (Mayo et al., 2021; Fedewa et al., 2022; Miller et al., 2019). Global scaling down of cancer screening during the pandemic has been detrimental to the cause of cervical cancer elimination. In India community health workers (CHWs) play a crucial role in the health care system especially in maternal and child health care, and thus are the first contact person between the community and health services, hence they are regarded as the grassroots workers in health organisation pyramid (Kiranmayee et al., 2018).

Community-based screening for cervical cancer and task sharing to community CHWs have been suggested as a potential way to increase screening coverage in LMICs. The roles of CHWs in cervical cancer screening in LMICs have largely to date focused on education, outreach, and awareness programmes (O'Donovan et al., 2019). In this

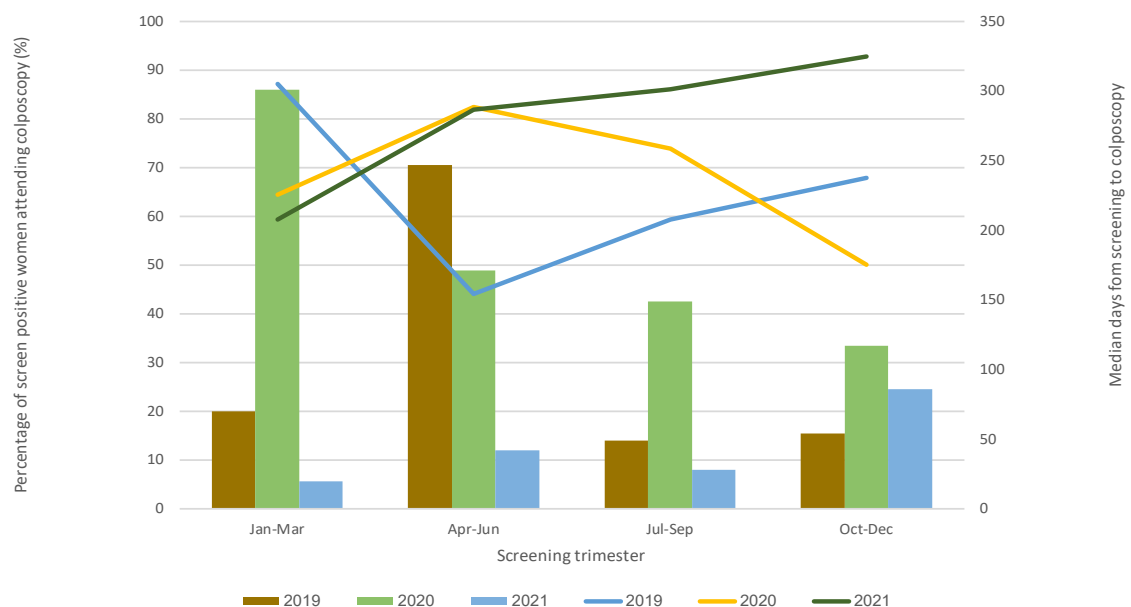


Figure 2. Impact of COVID Pandemic on the HPV Positive Participant's Follow up and Time Interval for Colposcopy.

regard, 'door to door' awareness, screening by vaginal self-sampling and referral for colposcopy and treatment, while keeping COVID safety protocols is the way forward.

In conclusion, COVID-19 pandemic has warranted several shift in priorities, collaborations in public and private institutions, residential emergency centres, remote monitoring by obtaining health care-mobile applications, wide spread availability of PCR testing devices, video consultations, provisions for home based care and technological advances in the field of artificial intelligence. Cervical cancer screening by HPV self-sampling advocates participation of more women especially in rural areas, while accelerating progress towards elimination of cervical cancer.

Abbreviations

HPV - Human Papilloma Virus, VIA – Visual Inspection with acetic acid, CIN2 + - Cervical Intraepithelial Lesion , hrHPV – High risk human papilloma virus , HC2 – Hybrid capture 2, LLETZ- Large loop excision of the transformation zone, VIA-Visual inspection with acetic acid, LMICs- Low- and middle-income countries, CHWs- community health workers

Author Contribution Statement

All authors contributed, reviewed, and edited the manuscript.

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Ethical Declaration

Compliance with ethical standards and has been approved by the Institutional Ethics Committee, Chittaranjan National Cancer Institute

Conflict of interest

The authors declare no conflict of interest associated with this publication.

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