


CANCER THERAPY AND PREVENTION

Cross-sectional survey of the impact of the COVID-19 pandemic on cancer screening programs in selected low- and middle-income countries: Study from the IARC COVID-19 impact study group

Patricia Villain | Andre L. Carvalho | Eric Lucas | Isabel Mosquera | Li Zhang | Richard Muwonge | Farida Selmouni | Catherine Sauvaget | Partha Basu  | for the IARC COVID-19 Impact Study Group†

International Agency for Research on Cancer,
Lyon, France

Correspondence

Partha Basu, International Agency for
Research on Cancer (IARC-WHO), 150 cours
Albert Thomas, 69372 Lyon Cedex 08, France.
Email: basup@iarc.fr

Abstract

We conducted a study to document the impact of COVID-19 pandemic on cancer screening continuum in selected low- and middle-income countries (LMICs). LMICs having an operational cancer control plan committed to screen eligible individuals were selected. Managers/supervisors of cancer screening programs were invited to participate in an online survey and subsequent in-depth interview. Managers/supervisors from 18 programs in 17 countries participated. Lockdown was imposed in all countries except Brazil. Screening was suspended for at least 30 days in 13 countries, while diagnostic-services for screen-positives were suspended in 9 countries. All countries except Cameroon, Bangladesh, India, Honduras and China managed to continue with cancer treatment throughout the outbreak. The participants rated service availability compared to pre-COVID days on a scale of 0 (no activities) to 100 (same as before). A rating of ≤ 50 was given for screening services by 61.1%, diagnostic services by 44.4% and treatment services by 22.2% participants. At least 70% participants strongly agreed that increased noncompliance of screen-positive individuals and staff being overloaded or overwhelmed with backlogs would deeply impact screening programs in the next 6 months at least. Although many of the LMICs were

Abbreviations: COVID-19, The Coronavirus Disease; GDP, gross domestic product; HPV, human papillomavirus; HDI, human development index; IARC, International Agency for Research on Cancer; LMICs, low- and middle-income countries; MoH, Ministry of Health; PPE, personal protective equipment; REDCap, Research Electronic Data Capture; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; VIA, visual inspection with acetic acid; WHO, World Health Organization.

† The IARC COVID-19 impact study group: Ashrafun Nessa (Department of Gynaecological Oncology, Bangabandhu Sheikh Mujib Medical University, Bangladesh); Tandin Dorji (Department of Medical Services, Ministry of Health, Bhutan); Arn Migowski (National Cancer Institute (INCA), Ministry of Health, Brazil); Paul Ndom (Comité National de Lutte contre le Cancer (CNLCA), Ministère de la Santé Publique, Cameroon); Yubei Huang (Department of Cancer Epidemiology and Biostatistics, Tianjin Medical University Cancer Institute and Hospital, China); Inocent Adoubi (Cancerologie CHU de Treichville, Plan cancer, Côte d'Ivoire); Jacqueline Figueroa (Unidad de Registro de Cáncer, Proyecto de Prevención de Cáncer Cervicouterino, Secretaría de Salud, Honduras); Kunal Oswal (Prevention, Early Detection Palliative Care Programme, Tata Trusts, Assam, India); Jerard M Selvam (State NCD Cell, NHM, Tamil Nadu, India); Reza Malekzadeh (Digestive Disease Research Institute, Tehran University of medical Sciences, the Islamic Republic of Iran); Arunah Chandran (Non-Communicable Disease Section, Disease Control Division, Ministry of Health, Malaysia); Youssef Chami (Fondation Lalla Salma Prévention et Traitement des Cancers, Morocco); Alicia Pomata Gunsett (Ministerio de Salud Pública y Bienestar Social, Capiata, Paraguay); Nicula Florian (Epidemiology and Biostatistics, Institute of Oncology "Prof. Dr. Ion Chiricuțu", Romania); Albert Tuyishime (Planning, M&E and Business Strategy, Rwanda Biomedical Centre, Rwanda); Suraj Perera (National Cancer Control Programme, Ministry of Health, Sri Lanka); Suleeporn Sangrajrang (National Cancer Institute Bangkok, Thailand); Sharon Kapambwe (Cancer Control Unit, Department of Health Promotion, Environment and Social Determinants, Ministry of Health, Zambia).

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deficient in following the “best practices” to minimize service disruptions, at least some of them made significant efforts to improve screening participation, treatment compliance and program organization. A well-coordinated effort is needed to reinstate screening services in the LMICs, starting with a situational analysis. Innovative strategies adopted by the programs to keep services on-track should be mutually shared.

KEYWORDS

cancer screening, COVID-19, low- and middle-income countries

1 | INTRODUCTION

The Coronavirus Disease (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection has claimed more than 1.4 million lives worldwide in less than a year.¹ The lockdowns and movement restrictions, slowing down of non-emergency services and diversion of fiscal and manpower resources will deeply impact entire continuum of cancer care.² The pandemic-induced health crisis will weaken health systems in most low- and middle-income countries (LMICs) that may shift priorities back to infectious disease control. This is likely to have a long-term impact on cancer prevention interventions, including cancer screening, which in turn will widen the existing disparities in oncology care.³ Economic consequence of the pandemic, with a 5.2% contraction in global gross domestic product (GDP) projected by the World Bank in 2020, is likely to derail resource-intensive public health programs like cancer screening in many limited resourced countries.⁴ Some of the LMICs have substantially invested in recent times to improve organization, reach and quality of cancer screening programs. The call for action toward elimination of cervical cancer issued by the World Health Organization (WHO) in 2018 stimulated many LMICs in the pre-COVID times to revise their national cancer control policies and commit resources to improve cervical cancer screening.⁵ The COVID-19 induced health crisis is a potential threat to these LMIC initiatives.

Present study conducted by the International Agency for Research on Cancer (IARC/WHO) aims to document possible impact of the COVID-19 outbreak on cancer screening programs in selected LMICs and also highlight the best practices that some of these countries might have adopted or planned to mitigate the disruptive consequences of the pandemic on cancer screening service.

2 | METHODS

Our research methodology includes conducting a questionnaire survey among the cancer screening program managers that preceded and informed an in-depth interview of each survey participant.

We prepared a list of 20 LMICs distributed across Africa, Central and South America, Asia and Europe fulfilling the following criteria:

1. The country should have a national cancer control plan operational in the year 2019.

What's new?

Reductions in non-emergency health services and diversion of resources during the coronavirus disease (COVID-19) pandemic have greatly affected all areas of health care, including cancer care. Here, the authors investigated the impact of the COVID-19 pandemic specifically on cancer screening in low- and middle-income countries. Nearly all countries investigated experienced suspensions in cancer screening lasting at least one month, owing to lockdown restrictions, changes in health priorities, and reduced patient visits. Upon reopening, cancer services generally operated at significantly reduced capacities, emphasizing a need for highly coordinated re-initiation efforts to ensure continuity of cancer care following lockdown.

2. The cancer control plan delineated a strategy to screen the population for at least one common cancer.

The source of abovementioned information was the seventh round of noncommunicable diseases country capacity survey, conducted by the WHO in 2019.⁶ The only country to be selected from Europe was Romania, which transitioned from upper-middle to a high income country in 2019.⁷

We invited the cancer screening program focal point from Ministry of Health (MoH) of each of the 20 identified countries to participate in our study. Their contact details were obtained from WHO regional offices and/or our national collaborators. We requested the focal point to designate an alternative person; in case he/she was not able to participate. The alternative person could be from MoH or an organization external to the Ministry but closely associated with screening program implementation and/or supervision. We sent reminder letters to the focal points not responding within 2 weeks. The screening program in India is administered by the individual states, and the state program focal point is responsible for implementation, data collection and monitoring. We directly approached the focal points of two states situated in different geographic locations (Assam in north-east and Tamil Nadu in South) of India.

The designated participant was invited to undertake an online questionnaire survey and participate in an in-depth interview

conducted within 6 weeks of submission of the completed survey. REDCap (Research Electronic Data Capture) electronic data capture tool hosted at IARC was used to collect and manage data.⁸ The questionnaire and interview guide were developed based on our discussions with some of the cancer screening program managers and review of recently published literature highlighting possible impact of the pandemic on cancer screening program. The questionnaire with close-ended questions was developed both in English and French (Supplement 1). It aimed to document, based on the participant's best knowledge and perceptions, the COVID-19 outbreak situation in the country, its impact on different services associated with cancer screening (invitation, screening test administration, diagnostic and treatment services), measures adopted to continue with such services and the participant's perception of impact of the outbreak on screening program in the ensuing 6 months. A preliminary version of the questionnaire in English was pretested internally and then piloted with cancer screening experts from Bangladesh, before being translated to French.

The interview, which was conducted using a semi-directive guide (Supplement 2) was mainly to collect further information on some of the responses provided in the survey and allow participants share their thoughts on possible impact of COVID-19 outbreak through open-ended questions. Depending on the evolving situation of the outbreak, the interviewee was allowed to modify some of his/her original responses in the survey. Every interview lasting about 1 hour was conducted in English or local vernacular (French, Spanish or Chinese), over prescheduled Zoom or WhatsApp calls by Patricia Villain, Isabel Mosquera or Li Zhang who were assisted by Partha Basu or Eric Lucas. Interviews were digitally recorded with permission. The summary of the interview was shared with the corresponding interviewee for final validation, before being included in the analysis. The final article was reviewed by all study participants.

We obtained additional descriptive data about the participating countries on: the human development index (HDI) from Human Development Data (1990-2018) of United Nations Development Programme; the cancer mortality rates from IARC GLOBOCAN; and the weekly average percentage change in COVID cases in the week of completing interview from WHO COVID-19 dashboard.^{1,9,10}

The survey data were analyzed in Stata 15.1 (StataCorp LP, TX) and presented as proportions. The summary of interview was used to validate responses to the questionnaire and interview by the corresponding participant and report some useful quotes.

3 | RESULTS

The study was conducted in 17 countries (85% [17/20] response rate). One country responded too late to be included and two could not participate due to the political unrest in their countries at the time our study was conducted. Among those participating, three belonged to low, seven to medium and another seven to high or very high HDI categories (Table 1). Age-standardized cancer mortality rates (in 2018) ranged from 51.0/100000 in Sri Lanka to 130.1/100000 in China.⁹

The survey questionnaire was filled out between 13 August and 22 September 2020 by 18 cancer screening program focal-points or supervisors from 17 countries. India had two participants, independently reporting for regional programs in the states of Assam and Tamil Nadu. Majority of the survey participants were from MoH, either acting as screening program(s) focal-point (9/18; 50%) or having a supervisory role (5/18; 27.8%) (Table 1). Rest of the participants (4/18; 22.2%) was from organizations external to the MoH (eg, voluntary organizations, academic institutions, independent coordinating agency). Participants from China and India reported status of regional programs, while others reported for national programs. Majority of the participants reported the status of breast (16/18; 88.9%) and/or cervical (16/18; 88.9%) cancer screening programs.

The first case of confirmed COVID-19 was detected in March 2020 in 11 (64.7%) countries, while the rest had the first case detected in January or February. Majority of the participants (16/18; 88.9%) reported to be using the WHO definition for confirmation of first COVID-19 case. The WHO Coronavirus Disease (COVID-19) Dashboard showed an upward trend in the weekly number of confirmed COVID-19 cases in Côte d'Ivoire, Rwanda, Honduras, India, Brazil and Zambia on the week of completion of interview (Table 1).

Nationwide lockdown was announced in 13 countries, while in Côte d'Ivoire, Zambia and the Islamic Republic of Iran lockdown was only regional (Table 2). Brazil was the only country not to have a lockdown till the date of interview. Administration of screening tests was suspended for at least 30 days in all countries except Côte d'Ivoire, Rwanda, Brazil and the Islamic Republic of Iran; while diagnostic services for screen-positive individuals was suspended in all except Côte d'Ivoire, Rwanda, Cameroon, Zambia, Brazil, Sri Lanka, the Islamic Republic of Iran and Malaysia (Table 2). Cancer treatment was suspended for at least 1 month in Cameroon, Bangladesh, India, Honduras and China. Zambia reported suspension of treatment of screen-detected cervical precancers. Except in Paraguay, China and Romania, the suspended services reopened with the withdrawal of lockdown. Availability of cancer screening (administration of screening tests), diagnosis and treatment services on the date of in-depth interview compared to pre-COVID days, rated by the program managers on a continuous scale of 0 (no activities) to 100 (activities normal and same as before), is shown in Table 2. A few participants changed the rating originally given at the survey during the interview. A rating of ≤ 50 was given for screening services availability by 11 out of 18 (61.1%) participants and for diagnostic services by 8 (44.4%) participants. The participants from Bangladesh, India (both regional programs) and Honduras (22.2%) suggested a rating of ≤ 50 for availability of treatment services. The reported impact of COVID-19 outbreak on availability of cancer screening, diagnostic and treatment services was generally more severe in countries with medium HDI compared to those with low or high HDI (Figure 1).

The in-depth interviews revealed a number of new strategies that the programs adopted to ensure continuity of services during the lockdown and beyond. These were primarily aimed at encouraging higher participation to screening, improving compliance to management of screen-positive individuals and ensuring access to cancer

TABLE 1 Human development index (HDI), cancer mortality rates, participants' profile, COVID-19 disease profile, the dates of completion of survey and in-depth interview by participating countries (grouped by HDI category and in ascending order of HDI values)

Country (region, when applicable)	HDI category (HDI value)	Cancer mortality rates ^a (/100 000)	Participant's role in cancer screening program	Screening programs that the participants reported on	Month of detection of first confirmed COVID-19 case	% change in weekly COVID-19 cases in the week of completing the interview	Date of completion of survey	Date of in-depth interview
Côte d'Ivoire	Low (0.474)	82.5	Program focal point	Breast, cervical	March 2020	+21.58%	01/09/2020	06/11/2020
Cameroon	Low (0.518)	75.3	Program supervision, within MoH	Breast, cervical, prostate	March 2020	-6.64%	01/09/2020	12/10/2020
Rwanda	Low (0.536)	104.8	Program supervision, outside MoH	Breast, cervical	March 2020	+9.30%	20/09/2020	05/11/2020
Bangladesh	Medium (0.579)	77.1	Program focal point	Breast, cervical	March 2020	-6.76%	13/08/2020	08/10/2020
Zambia	Medium (0.579)	90.5	Program focal point	Breast, cervical	March 2020	+32.08%	02/09/2020	14/10/2020
Bhutan	Medium (0.607)	76.6	Program focal point	Breast, cervical, gastric, oral	March 2020	-20%	19/09/2020	23/10/2020
India (Assam)	Medium (0.624)	61.4	Program focal point	Breast, cervical, oral	January 2020	+12.16%	05/09/2020	25/09/2020
India (Tamil Nadu)	Medium (0.625)	81.8	Program supervision, within MoH	Breast, cervical, oral	February 2020		31/08/2020	01/11/2020
Honduras	Medium (0.647)	86.9	Program supervision, within MoH	Cervical	March 2020	+38.71%	24/08/2020	22/09/2020
Morocco	Medium (0.693)	86.6	Program supervision, outside MoH	Breast, cervical	March 2020	-27.55%	01/09/2020	16/10/2020
Paraguay	High (0.738)	130.1	Program focal point	Breast, cervical, colorectal	March 2020	-5.01%	24/08/2020	14/09/2020
China (Tianjin)	High (0.738)	104.8	Program supervision, outside MoH	Breast, lung, gastric, liver	January 2020	-10.24%	07/09/2020	18/09/2020
Thailand	High (0.754)	104.8	Program focal point	Breast, cervical, colorectal	March 2020	-48.48%	22/09/2020	15/10/2020
Brazil	High (0.766)	91.3	Program focal point	Breast, cervical	March 2020	+12.51%	18/09/2020	22/10/2020
Sri Lanka	High (0.774)	51.0	Program supervision, within MoH	Breast, cervical, oral	January 2020	-4.82%	17/09/2020	13/10/2020
Iran (Islamic Republic of)	High (0.789)	74.5	Program focal point	Breast, cervical, colorectal	January 2020	-4.01%	18/08/2020	28/09/2020
Malaysia	Very high (0.802)	85.5	Program supervision, within MoH	Colorectal ^b	January 2020	-37.32%	17/09/2020	22/09/2020
Romania	Very high (0.802)	123.3	Program supervision, outside MoH	Breast, cervical	February 2020	-6.76%	16/08/2020	29/09/2020

^aAge standardized for world population.

^bThe participant reported primarily for colorectal cancer screening. During in-depth interview she informed that all cancer screening programs (breast, cervical, colorectal and oral) were equally affected in Malaysia (HDI, human development index; MoH, Ministry of Health).

TABLE 2 Information on lockdown and rating of availability of screening, diagnostic and cancer treatment services by the survey participants in the participating countries (grouped by HDI category and in ascending order of HDI value)

Country (region, when applicable) (HDI category)	If any lockdown was imposed, whether national or regional at first instance (period by month, year)	Status of administering screening tests		Status of diagnostic services for screen-positive individuals		Status of treatment services for cancer patients	
		Whether suspended anytime ^a	Rating of current services compared to pre-COVID time ^b	Whether suspended anytime ^a	Rating of current services compared to pre-COVID time ^b	Whether suspended anytime ^a	Rating of current services compared to pre-COVID time ^b
Côte d'Ivoire (low)	Yes, regional (June-August 2020)	No	65	No	68	No	65
Rwanda (low)	Yes, national (March-April 2020)	No	95	No	95	No	96
Cameroon (low)	Yes, national (April-July 2020)	Yes	50	No	75	Yes	75
Bangladesh (medium)	Yes, national (March-May 2020)	Yes	14	Yes	23	Yes	15
Zambia (medium)	Yes, regional (March-May 2020)	Yes	62	No	70	No	80
Bhutan (medium)	Yes, national (August-September 2020)	Yes	0	Yes	50	No	100
India (Assam) (medium)	Yes, national (March-June 2020)	Yes	15	Yes	20	Yes	30
India (Tamil Nadu) (medium)	Yes, national (March-June 2020)	Yes	50	Yes	50	Yes	50
Honduras (medium)	Yes, national (March-August 2020), then regional	Yes	20	Yes	20	Yes	20
Morocco (medium)	Yes, national (March-June 2020)	Yes	30	Yes	30	No	70
Paraguay (medium)	Yes, national (March-September 2020)	Yes	20	Yes	20	No	65
China (Tianjin) (high)	Yes, national (January-April 2020)	Yes	85	Yes	90	Yes	95
Thailand (high)	Yes, national (March-June 2020)	Yes	90	Yes	90	No	90
Brazil (high)	No	No	43	No	68	No	64
Sri Lanka (high)	Yes, national (March-June 2020)	Yes	85	No	100	No	100
Iran (Islamic Republic of) (high)	Yes, regional (February-April 2020)	No	50	No	64	No	83
Malaysia (high)	Yes, national (March-April 2020)	Yes	75	No	75	No	75

(Continues)

TABLE 2 (Continued)

Country (region, when applicable) (HDI category)	If any lockdown was imposed, whether national or regional at first instance (period by month, year)	Status of administering screening tests		Status of diagnostic services for screen-positive individuals		Status of treatment services for cancer patients	
		Whether suspended anytime ^a	Rating of current services compared to pre-COVID time ^b	Whether suspended anytime ^a	Rating of current services compared to pre-COVID time ^b	Whether suspended anytime ^a	Rating of current services compared to pre-COVID time ^b
Romania (very high)	Yes, national (April–May 2020)	Yes	8	Yes	8	No	97

Abbreviation: HDI, Human development index.

^aNo service provided for at least 1 month (could be during or beyond lockdown period).

^bRated on a sliding scale ranging between 0 (No activities) and 100 (same as pre-COVID time) on the date of survey and updated on the date of in-depth interview, if felt necessary.

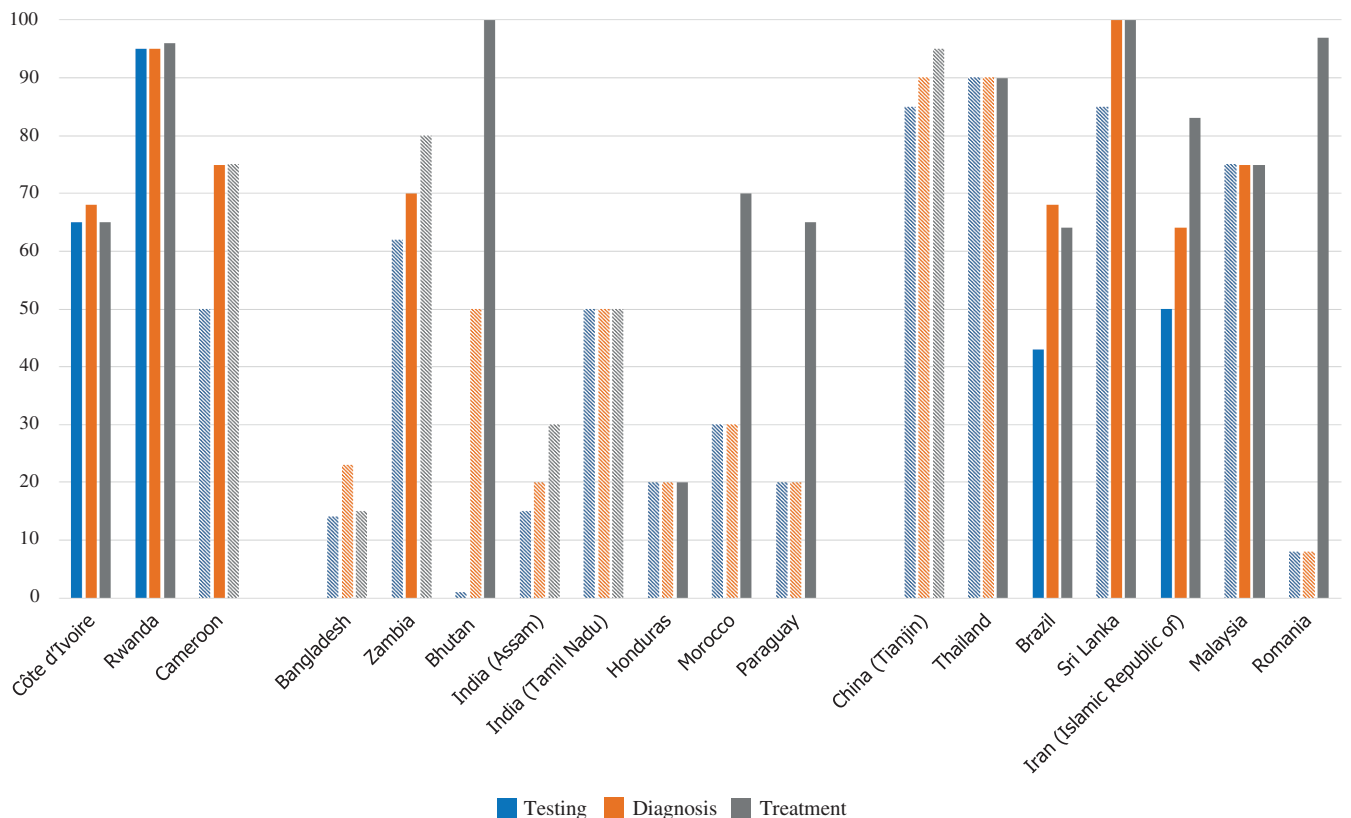


FIGURE 1 Rating of screening, diagnostic and cancer treatment services as on the date of in-depth interview compared to pre-COVID time by the participants from the countries (grouped by HDI category and in ascending order, from left to right, of HDI value) on a sliding scale ranging between 0 (no activities) and 100 (same as pre-COVID time). Total suspension of the service for at least 1 month during the outbreak (generally in lockdown) was represented in diagonal dashed lines [Color figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.com)]

treatment. These new strategies and practices adopted by the countries are listed in Table 3. A few noteworthy among these are improving community outreach through mobile clinics or expansion of screening facilities to primary care (Rwanda, Bangladesh, Zambia), introducing hotlines or mobile apps for cancer patients to seek hospital appointment and advice (Cameroon, Bhutan, India, Malaysia), delivering screening test results online (India, China), teleconsultation for the screen-positive individuals (India, Malaysia), using community health workers to distribute kits for fecal immunochemical test for

colorectal cancer screening during home visits (Malaysia), proactively recalling screen-positive individuals and ensuring their free transportation (Rwanda, Zambia) and engaging youth volunteers as navigators to reach oncology centers (India). Cancer drugs were transported from oncology institutions to primary care in Tamil Nadu, India. Brazil considered the postcrisis situation as an opportunity to minimize opportunistic screening and improving organization of services. “Putting cancer screening back on the agenda with primary-care being at the center” would be a priority for Zambia.

TABLE 3 New strategies adopted by the countries to ensure continuity of screening, diagnostic and treatment services during the lockdown and beyond and/or to improve overall program organization

Purpose	Description of new strategy	Countries where introduced during the lockdown ^a	Countries where introduced after the lockdown ^a
To improve screening coverage	Improve community outreach through mobile clinics; expand screening services to the rural primary health centers and anti-retroviral therapy (ART) clinics	Rwanda*	Bangladesh**, Zambia**
	Use campaigns to screen a large number of individuals in a day maintaining social distancing		Bangladesh**
	Online appointment system for cancer screening		China***, Sri Lanka***
	Using community health workers to distribute kits for colorectal cancer screening and educate the community		Malaysia
To ensure high compliance to further management of screen-positive individuals	Minimize the number of clinic visits (ie, switch to “screen and treat” approach from existing “screen colposcopy and treat” approach for cervical cancer screening)	Rwanda*	Bangladesh**
	Use magnifying device (compact colposcopes) to improve decision making for treatment		Bangladesh**
	Online delivery of test results, or set up a hotline to manage screen-positive cases		India**, China***
	Tele-consultation for the screen-positive individuals	Malaysia***	India**
	Transport services or reimbursement for the screen-positive individuals	Rwanda*	Zambia**
	Call the screen-positives or send short text messages on mobile phones	Rwanda*, Paraguay**	Zambia**
	Testing of already collected samples during lockdown to reduce backlogs	Honduras**	
To improve/ensure access to cancer treatment	Dedicated hotlines or mobile apps for cancer patients to seek hospital appointment and advice	Cameroon*, Bhutan**, Malaysia***	India**
	Free transport for cancer patients	Bhutan**	India**
	Keeping oncology center(s) open	Bhutan**, Paraguay**	India**
	Creating teams of youth volunteers to assist and guide patients to reach oncology centers		India**
	Ensuring the supply of oncology drugs through special procurement channels	Bhutan**, Sri Lanka***	India**
	Centralized call center at the major oncology centers and a patient database management system to manage mainly cancer patients access appointments, follow-up noncompliant patients		India**
To improve overall program organization	Take the opportunity to minimize opportunistic screening and move toward introducing population-based screening		Brazil***
	Postpone certain components of scaling up and focus on improved organization of existing cancer screening		Zambia**, Bhutan**
	Centralize management of the COVID-19 outbreak in order to free primary services to provide routine care	Iran (Islamic Republic of)***	

^aLow Human development index (HDI) country (*), medium HDI country (**), high or very high HDI country (***).

Staff associated with cancer screening, diagnostic or treatment services were reassigned to COVID-19 related duties in 14 out of 18 (77.8%) programs. The MoH issued official notifications to the health providers in 10 (55.6%) programs on whether screening activities should be continued or not. Specific communications to inform the general public about stoppage or reinitiation of screening services were issued by 11 (61.1%) programs.

All the programs reported following standard safety protocols at the workplace. Staff involved in cancer screening were trained on measures to mitigate the risk of transmission of SARS-CoV-2 in 83.3% (15/18) of the programs. Only two programs reported to have

trained their staff on how to continue with screening related services with adequate protection for both clients and providers.

Staff delivering cancer screening and related services were provided with personal protective equipment (PPE) in all the programs, although nine (50.0%) reported the supply to be irregular. Provision for hand sanitizers and masks for the screening participants was made by almost all programs, although supply was irregular in one third of them.

We listed the factors that could potentially impact cancer screening programs in the near future and asked the study participants to rate their agreement on a continuous scale of 0 to 100 (Table 4). The

TABLE 4 Degree of agreement of the study participants to a particular factor suggested to have major impact on services associated with cancer screening over next six months at least

Degree of agreement (range) ^a	Factors suggested to have major impact on services associated with cancer screening over next 6 months at least							
	Individuals will be reluctant to participate	Noncompliance of screen-positive individuals will increase	Number of staff available for screening related activities will be reduced	Providers will not prioritize screening	Service providers will be overloaded	Diagnostic and treatment services will be overwhelmed with backlogs	Planned expansion of program will be withheld due to competing priorities	Screening program will have less financial resources
	Number (%) of participants in the range of agreement for different factors							
75 to 100	6 (33.3%)	4 (22.2%)	3 (16.7%)	3 (16.7%)	6 (33.3%)	3 (16.7%)	5 (27.8%)	5 (27.8%)
50 to <75	5 (27.8%)	9 (50.0%)	6 (33.3%)	7 (38.9%)	9 (50.0%)	10 (55.6%)	6 (33.3%)	6 (33.3%)
25 to <50	3 (16.7%)	1 (5.6%)	4 (22.2%)	3 (16.7%)	0	4 (22.2%)	4 (22.2%)	1 (5.6%)
<25	4 (22.2%)	4 (22.2%)	4 (22.2%)	5 (27.8%)	3 (16.7%)	1 (5.6%)	3 (16.7%)	6 (33.3%)

^aThe study participants rated their agreement on a sliding scale ranging between 0 (do not agree at all) and 100 (completely agree).

factors eliciting a stronger agreement between participants (agreement score 50-100 for at least 70% of the responders) were increased noncompliance of screen-positive individuals (13/18 study participants, 72.2%), and service providers being overloaded (15/18, 83.3%) or overwhelmed with backlogs (13/18, 72.2%) (Table 4). A significant number of the participants (11/18 each; 61.1%) strongly agreed (agreement score 50-100) to the possibilities that planned expansion of screening program would be withheld or rejected due to competing priorities and less funding would be available to the screening programs due to financial reallocation. Bhutan gave an example of withholding planned introduction of human papillomavirus (HPV) detection test for cervical cancer screening.

Only five (27.8%) participants reported to have prepared a contingency plan or be in the process of drafting one to face a future worsened period of the outbreak. Cancer screening program in Thailand reported to have initiated an objective assessment of the impact of the pandemic (compared to the pre-COVID situation); nine among the others were planning to do so in near future.

4 | DISCUSSION

The COVID-19 pandemic, described by some as “the worst public health crisis in our generation,” has strained health systems to the extreme. Experts had already predicted a negative impact of the pandemic on cancer screening, and our study reported similar concerns expressed by program managers.¹¹ Almost all the countries included in our study reported suspension of cancer screening for at least a month due to restrictions associated with lockdown, shifting of health priorities to manage SARS-CoV-2 infections and reluctance among the public to visit health facilities. Screening, diagnostic and treatment services restarted at much reduced capacities after withdrawal of lockdown in most of the programs, as has been reported by countries outside our study.

A program from east Asia reported a 35% to 60% reduction in the monthly number of women participating in mammography screening

during March to May 2020, the peak time of the outbreak, compared to the observed numbers in the past 3 years.¹² Average number of screening mammograms in the Australian breast cancer screening programs drastically reduced to just over 1000 in the month of April 2020 compared to the expected average of over 70 000.¹³ A 62% to 96% decrease in lung, cervical, colorectal and breast cancer screening rates has been recently reported over seven states in the United States of America (USA).¹⁴ Even the average number of cancer surgeries being performed in a week in the USA reduced up to 88% during the peak period of the outbreak.¹⁵ Slowing down of cancer screening and deferring diagnostic and treatment services will lead to a surge in the number of cancer deaths, both in high and limited resourced countries.^{14,16}

Our study focused on LMICs spread across different continents and belonging to different categories of HDI. Primary reason for selecting these countries was that they were committed to improve quality and reach of cancer screening services before the outbreak struck. Ministry of Public Health of Cameroon initiated a pilot cervical cancer screening program in 2018 using low-cost HPV detection test in West Cameroon and was in the process of scaling up to other regions.¹⁷ Morocco adopted a strategic cancer control plan in 2010 and implemented breast cancer screening with clinical breast examination across all regions of the country.¹⁸ The program achieved more than 60% annual coverage of the target population within 5 years of initiation.¹⁹ Bangladesh has heavily invested in developing infrastructure, human resources and information system over the last 15 years to improve the quality of cervical cancer screening based on visual inspection with acetic acid (VIA) test.²⁰ The Zambian cervical cancer prevention program strategically leveraged existing antiretroviral therapy and reproductive health infrastructure to scale up VIA “screen and treat” services gradually up to national level.²¹ Emerging economies like Brazil, China and India with very heterogenous health care within the country have scaled up breast and cervical cancer screening in recent times with some efforts to improve program organization (strong political commitments, increased funding, more effective

health information system, etc.).²²⁻²⁴ Thailand switched to HPV test from existing cytology-based screening in 2020, after successful implementation of a pilot to demonstrate feasibility and cost-effectiveness.²⁵ Islamic Republic of Iran has also introduced HPV screening with a home-grown real-time PCR-based test in selected regions.²⁶ Honduras and Bhutan implemented and evaluated HPV screening in selected areas and Bhutan was planning to scale up nationally.^{27,28} Colorectal cancer screening program is being implemented as pilots in Morocco and Islamic Republic of Iran and is in the process of being scaled up in Thailand. These LMIC programs are likely to be much less resilient and less prepared to overcome such a major public health crisis, compared to the programs ongoing in the high-income countries. The program focal points participating in our study have expressed very valid concerns about several factors that would disrupt screening services further in the short term, at least.

The study participants were concerned that the uncertainties arising from the waxing and waning of the outbreak would have a lasting effect on reinitiation and normalization of cancer screening services. In general, patients with cancer symptoms face significant delays in accessing diagnostic and treatment services in the LMICs, resulting in late stage at presentation and significantly compromised post-treatment survival.^{29,30} The pandemic induced backlogs and slowing down of diagnostic and treatment services will further aggravate the situation with greater impact on the socioeconomically disadvantaged populations. The screening testing, diagnostic and treatment services in the medium HDI countries were worst affected, as per our study. The reported number of daily deaths from COVID-19 in countries belonging to low HDI category (Côte d'Ivoire, Rwanda and Cameroon) was extremely low (0-3 per day) at the time of implementation of our study, which possibly explains why these countries reported better situation compared to the medium HDI countries.¹

Our study revealed deficiencies in the programs in following some of the best practices recommended to continue with nonemergency services in the “new normal” situation. Regular and accurate public health messages from the MoH tailored toward general public as well as various levels of service providers on stoppage and initiation of services is key to maintain coordination. Many programs were not following this. Programs were deficient in providing training of staff on the specific measures to be adopted to minimize transmission risk during screening related interactions, ensuring regular and adequate supply of PPEs, masks and sanitizers and having a contingency plan to reduce backlogs.

Our study revealed a few silver linings in the midst of the disruptions as well. The strategies adopted by some of the programs to maintain services during the acute phase of the pandemic and its aftermath are not only innovative, but also can significantly improve the quality and reach of screening, if sustained over long term. Decentralization of services to primary care to improve access, having a system of navigation and providing transport support to the patients requiring diagnostic and treatment services are of great value irrespective of whether there is a health crisis or not, especially in the LMICs. Some of the programs have initiated remote consultation services, which need to be carefully monitored as advising patients without the ability to examine may lead to missed diagnosis.

Several factors may explain the wide variation in performance of the cancer screening services observed during the COVID-19 pandemic among the participating countries. Besides the variable severity of the disease in terms of number of cases and deaths, these factors included effective governance committed to maintain focus on cancer control services in the midst of the pandemic, timely and efficient planning to ensure continuity of all or some of the screening services and stakeholders' engagement. Innovative strategies adopted to bypass COVID-19 related barriers, either material such as the lack of transportation or psychological such as the fears of the population, also paid dividends. All these factors together might explain why countries like Rwanda, Zambia, Bhutan and Sri Lanka were performing better than others appertaining to the same HDI group. The managerial factors/decisions listed above, which sometimes might have been taken under financial constraints, reflect organization of the cancer screening services and the commitment of the policymakers, program leaders and service providers.

Our study has a few weaknesses. At least some of the self-reported outcomes in our study may have been affected by response bias, which is a tendency for participants to respond what was expected of them. Selection of countries has not followed a rigorous systematic selection process and the outcomes may not be considered as generalizable in the LMICs. We have been selective intentionally, as conducting a study like ours would not have been meaningful in the LMICs that do not have any screening program or have a low-quality program without any central coordination. Selection of LMICs with significant political and programmatic commitment to provide effective services and collecting information from the program focal persons or the supervisors themselves are the strengths of our study. The pandemic-induced disruptions are likely to hurt the screening programs in these countries the most and the impact is worth evaluating.

Restarting cancer screening activities as the crisis situation somewhat settles down will require a well-coordinated effort to reach out to the community more proactively, alleviate concerns of the apparently healthy individuals to return to routine health care and reorganize clinical services to minimize backlogs in services, especially cancer treatment. There is an urgent need for every screening program to perform a thorough situational analysis to quantify impact of the pandemic from health systems perspectives, focusing on governance, finance, workforce, infrastructure and services, information system and quality assurance process relevant to screening continuum. Policy interventions are necessary to mitigate further disruptions in nonemergency services through building public trust. The perception of the common public of their personal risk of severe illness from COVID-19 vs the risk of not seeking health-care advice if they have symptoms suggestive of cancer needs to be changed. “The patients with suspected cancer should realize that the benefit of their getting an early cancer diagnosis and initiating treatment without delay far outweigh the threats posed by COVID-19”—a quote from one of the program focal points in our study. Supporting health-care workers to tide over the increased work pressure and protecting them from getting infected will be key to improve health system capacity. Additional funding is necessary to build a resilient primary health system to improve people's access to much needed preventive health care. Reallocating at least an additional 1% of GDP of

public spending for primary care is within reach in all countries and should be seriously considered.³¹

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest.

DISCLAIMER

Where authors are identified as personnel of the International Agency for Research on Cancer/World Health Organization, the authors alone are responsible for the views expressed in this article and they do not necessarily represent the decisions, policy, or views of the International Agency for Research on Cancer/World Health Organization.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author.

ETHICS STATEMENT

Ethical approval for our study was obtained from the IARC Ethics Committee. In the email invitation sent to participants, an information sheet was attached describing the study objectives and methodology. The participant had to sign an informed consent electronically, before being able to initiate the survey. Also, at the beginning of the Zoom or WhatsApp calls, verbal consent from the participant was obtained before recording the interview. Only fully anonymized data were received, stored and handled at IARC in a central secure server. Data will be archived at IARC to allow retrieval for any scientific or regulatory external audits.

ORCID

Partha Basu  <https://orcid.org/0000-0003-0124-4050>

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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