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Impact of COVID-19 pandemic on cervical cancer screening in Bangladesh: A registry-based study

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Abstract:

Cervical cancer screening coverage among women in Bangladesh has remained insufficient to meet the screening needs required for cervical cancer elimination. Therefore, it is of interest to evaluate the cervical cancer screening coverage among Bangladesh women aged ≥ 30 years during 2012–2022. Coverage increased from 1.53% (2012) to 52.16% (2018), declined from 44.54% (2019) to 40.07% (2020) and rebounded to 95.08% by 2022. Despite screening 3.7 million women, an estimated backlog of 13.7 million remained from the previous target population. Based on the 2022 census, 13,715,782 women require screening by 2030, requiring approximately 1.7 million women to be screened annually. Thus, data shows that program resilience and the need for strategic planning to achieve the WHO cervical cancer elimination target.

Keywords: COVID-19 pandemic, cervical cancer screening, screening disruption, screening strategy

Background:

According to GLOBOCAN 2022, cervical cancer is the fourth most common cancer among women worldwide, with approximately 660,000 new cases and 350,000 deaths annually, the majority occurring in low- and middle-income countries (LMICs) [1]. Persistent infection with high-risk human papillomavirus (HPV) is the primary cause of cervical cancer, making early detection through organized screening essential for reducing morbidity and mortality [2]. Screening methods include the conventional Pap smear, liquid-based cytology, HPV DNA testing and visual inspection with acetic acid (VIA). Among these, VIA is particularly suitable for resource-limited settings because it is inexpensive, provides immediate results and can be performed by trained non-physician health workers, enabling prompt treatment of screen-positive women [3]. Despite the availability of effective screening methods, barriers such as limited healthcare access, inadequate insurance coverage, socio-economic constraints and poor awareness continue to reduce screening uptake worldwide [4]. In Bangladesh, cervical cancer is one of the leading cancers among women, with approximately 9,640 new cases reported in 2022 [5]. To address this burden, the Government of Bangladesh established the National Cervical and Breast Cancer Screening Programme (NCBCSP), providing free VIA screening for women aged 30–60 years. The programme transitioned from paper-based reporting to the electronic District Health Information System 2 (DHIS2) in 2013, improving nationwide monitoring and data management [6]. The COVID-19 pandemic substantially disrupted preventive healthcare services globally after the World Health Organization declared COVID-19 a pandemic on 11 March 2020 [7]. Lockdowns, movement

restrictions and the reallocation of healthcare resources resulted in reduced participation in cervical cancer screening programs across many countries. Although several nations temporarily suspended screening services, Bangladesh was among the few LMICs that continued its national screening programme throughout the pandemic, albeit with varying service utilization [8]. Evaluating the resilience of Bangladesh's screening programme is essential for identifying service gaps and planning future interventions. Therefore, this study assessed national cervical cancer screening trends during the pre-pandemic, pandemic and post-pandemic periods to determine the impact of COVID-19 on screening coverage and to estimate the screening efforts required to achieve the World Health Organization target of 70% coverage by 2030 [9]. Therefore, it is of interest to report the impact of the COVID-19 pandemic on Bangladesh's national cervical cancer screening programme by evaluating screening coverage during the pre-pandemic, pandemic and post-pandemic periods and estimating the screening efforts required to achieve the World Health Organization's 2030 elimination target.

Methodology:

This retrospective registry-based study was conducted using national cervical cancer screening data in Bangladesh from 2012 to 2022. All women aged 30 years and above who were eligible for cervical cancer screening during this period were included. Data were extracted from the national cervical cancer registry, DHIS2 (District Health Information Software 2) to analyze trends in screening coverage across pre-COVID (2019), during COVID (2020–2021) and post-COVID (2022) periods.

Annual coverage requirement (2012–2030; 18 years):

$$\text{Coverage per year} = \frac{22,030,703}{18} = 856,750 \text{ (Year 2012-2030)}$$

A = Annual screening coverage = 856,750

B = Already screened

C = Annual Backlog

D = Backlog + women to be screened for current year → D = A + C

$$100\% \text{ coverage is} = 22,030,703$$

$$1\% \text{ coverage is} = \frac{22,030,703}{100}$$

$$70\% \text{ coverage is} = \frac{22,030,703 \times 70}{100} = 15,421,492$$

Inclusion criteria:

- [1] Women aged 30 years and above.
- [2] Women registered in the national cervical cancer screening program between 2012 and 2022.
- [3] Women with complete screening records in the national registry.

Exclusion criteria:

- [1] Individual-level patient records or data.
- [2] Screening data from years outside the 2012–2022 study period.
- [3] Screening tests performed for diagnostic purposes in women with symptoms rather than routine population-based screening.
- [4] Screening data included the annual number of women screened and corresponding coverage percentages. Screening coverage was compared across pre-COVID (2019), during COVID (2020–2021) and post-COVID (2022)

periods. Descriptive statistics, including mean and standard deviation (SD), were calculated for annual screening coverage and comparative analyses were performed to assess differences between periods. P-values were determined to evaluate statistical significance. Additionally, 2022 registry data were used to estimate the total target population, number of women screened, remaining backlog and annual screening targets required to achieve WHO's 70% coverage goal by 2030. All analyses were performed using SPSS version 25.0, providing insights into trends, pandemic-related disruptions and post-pandemic recovery patterns in the national cervical cancer screening program.

Results:

The registry data from Bangladesh show clear trends in cervical cancer screening coverage over 2012–2022. Screening increased steadily from 13,137 women (1.53%) in 2012 to 446,910 (52.16%) in 2018, reflecting program expansion before the pandemic. In 2019, 394,666 women (46.07%) were screened (pre-COVID), followed by a slight decline during the pandemic in 2020 to 381,563 (44.54%). Screening rebounded sharply in 2021 to 681,457 (79.54%) and 814,612 (95.08%) in 2022 (**Table 1, 2 and Figure 1, 2**). Comparisons across pre-COVID, during COVID and post-COVID periods were statistically significant ($p < 0.0001$) (**Table 3, Figure 3**). Of the original target population of 22,030,703 women, 3,675,007 had been screened by 2022, leaving 11,746,485 unscreened. The 2022 census increased the target population to 24,000,000, adding 1,969,297 women to the screening pool, resulting in an effective backlog of 13,715,782. To meet WHO's 70% coverage target by 2030, approximately 1,714,473 women need to be screened annually (**Tables 4, 5**).

Table 1: Distribution of the Target population by annual screening coverage for cervical cancer by the year 2012–2022

Facility	Year	Total VIA+ve	Total VIA-ve	Total Screening	Achieved (%)	Remaining Screening for Current Year	Target Screening for Next Year
						A-B=C	D (C+A)
Bangladesh	2012	625	12,512	13,137	1.53	843,613	1,700,362
	2013	3,990	58,870	62,860	7.34	793,890	1,650,639
	2014	11,053	133,600	144,653	16.88	712,097	1,511,287
	2015	12,717	189,495	202,212	23.6	654,538	1,511,287
	2016	10,445	223,287	233,732	27.28	623,018	1,479,767
	2017	13,162	286,043	299,205	34.92	557,545	1,414,294
	2018	84,112	362,798	446,910	52.16	409,840	1,266,589
	2019	14,612	380,054	394,666	46.07	462,084	1,318,833
	2020	11,387	370,176	381,563	44.54	475,187	1,331,936
	2021	14,794	666,663	681,457	79.54	175,293	1,032,042
	2022	19,848	794,764	814,612	95.08	42,138	898,887
	Total	196,745	3,478,262	3,675,007	23.83	11,746,485	

Note: Total target population = 22,030,703

70% coverage = 15,421,492

Table 2: Annual cervical cancer screening in Bangladesh (2012–2022)

Year	Screened Population	Coverage (%)
2012	13,137	1.53%
2013	62,860	7.34%
2014	144,653	16.88%
2015	202,212	23.60%
2016	233,732	27.28%
2017	299,205	34.92%

2018	446,910	52.16%
2019 (Pre-COVID)	394,666	46.07%
2020 (During COVID)	381,563	44.54%
2021 (During COVID)	681,457	79.54%
2022 (Post-COVID)	814,612	95.08%

Table 3: Cervical cancer screening coverage in Bangladesh by COVID-19 Periods (2019–2022)

Period	Year	Screened Population	Coverage (%)	p-value (vs. Pre-COVID 2019)
Pre-COVID	2019	394,666	46.07	Reference
During COVID	2020	381,563	44.54	<0.0001
During COVID	2021	681,457	79.54	<0.0001
Post-COVID	2022	814,612	95.08	<0.0001

Table 4: Distribution of the population to be screened from 2023 to 2030 to fulfill the WHO target

Parameter	Total Backlog (2012-2022)
Screening of target population (2012–2022): 22,030,703	11,746,485 (A)
According to census updated 2022 target: 24,000,000	1,969,297 (B)
Additional women (24,000,000-22,030,703)	
Total Backlog 2022	13,715,782 (A+B)

Note: From 2012 to 2022, the total target population was 22,030,703 women, among whom 3,675,007 were screened. Therefore, 11,746,485 women remained unscreened. According to the 2022 census, the updated target population increased to 24,000,000 women from the previous 22,030,703, indicating that an additional 1,969,297 women should be included under the screening coverage.

Table 5: cervical cancer screening target and backlog in Bangladesh (2022–2030)

Parameter	Number of Women
Target Population According to Census (2022) (A)	24,000,000
Screened (Cumulative, 2012-2022) (B)	3,675,007
Remaining Backlog (According to Table 4)	13,715,782

Note: According to census 2012 is 22,030,703 and census 2022, the target population was 24,000,000 women. The remaining screening to be done is 11,746,485 and the previous remaining portion of the target population is 1,969,297. Together, this totals 13,715,782 women. This backlog of 13,715,782 represents those who still need to be screened by 2030 to achieve WHO's 70% coverage target, including both the shortfall from the original target population and additional unscreened women due to population growth between 2012 and 2022.

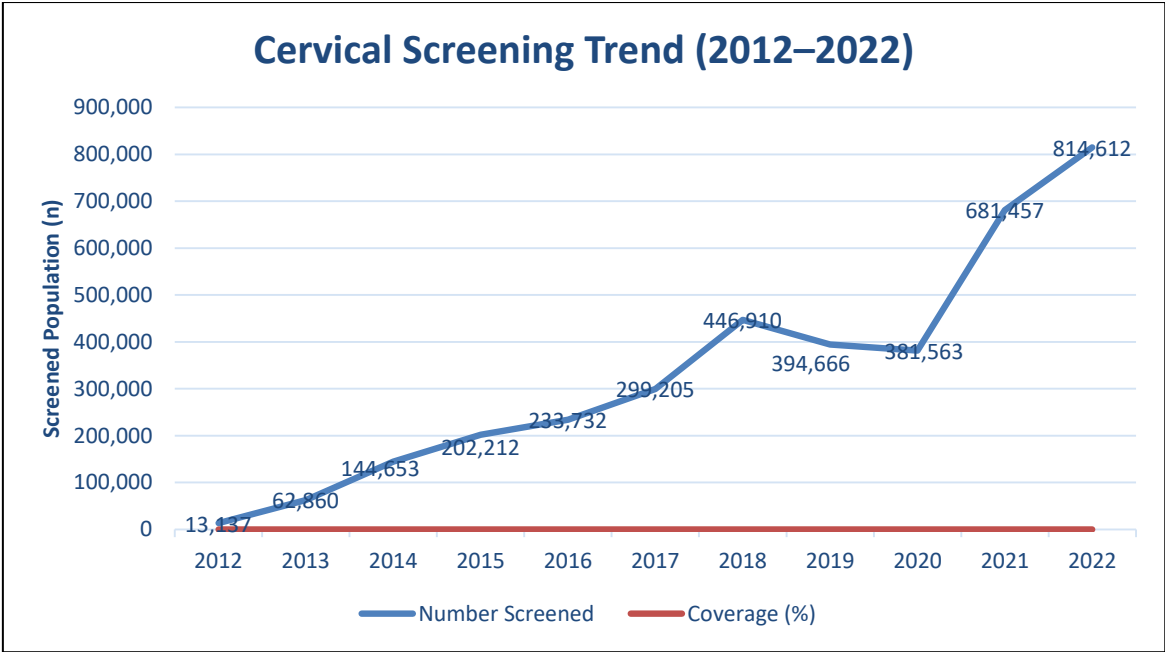


Figure 1: Annual cervical cancer screening coverage in Bangladesh (2012–2022)

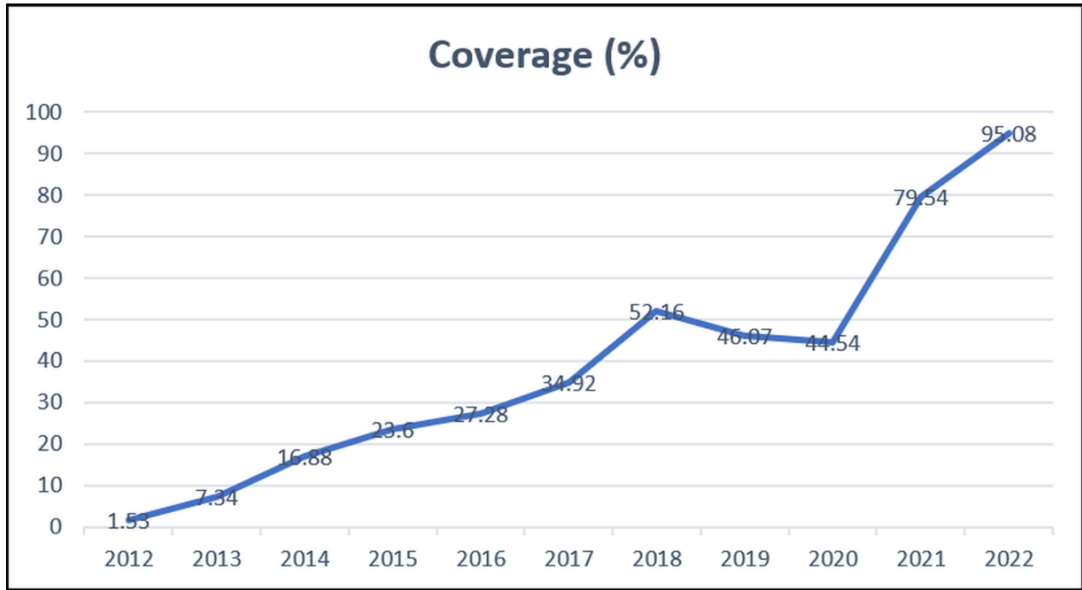


Figure 2: Annual cervical cancer screening coverage (%) in Bangladesh (2012–2022)

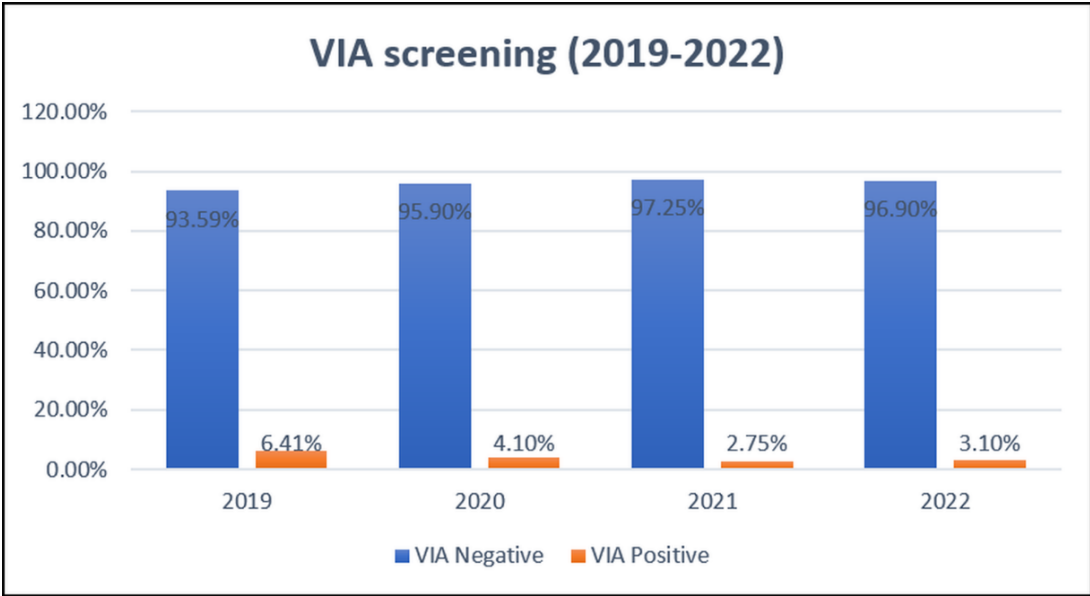


Figure 3: Distribution of VIA screening outcomes in Bangladesh (2019–2022)

Discussion:

The present study shows that Bangladesh's national cervical cancer screening programme experienced only a modest decline during the COVID-19 pandemic, followed by a rapid recovery. Screening coverage increased steadily before the pandemic, decreased from 46.07% in 2019 to 44.54% in 2020 and rebounded to 79.54% in 2021 and 95.08% in 2022 ($p < 0.0001$), indicating strong programme resilience despite disruptions to routine healthcare services. These findings are consistent with Lucas *et al.* [10], who reported a 14.1% decline in cervical cancer screening during 2020 due to pandemic-related restrictions. However, unlike many countries where screening services

remained substantially below pre-pandemic levels, Bangladesh showed a rapid recovery. Similarly, Casas *et al.* [11] reported that targeted resource mobilization and adaptive health system strategies facilitated the restoration of cervical cancer screening in low- and middle-income countries. Luckett *et al.* [12] also observed that Bangladesh successfully utilized strengthened health infrastructure and COVID-19 investments to sustain essential cancer screening services. Compared with European countries, Bangladesh achieved considerably higher screening coverage after the pandemic. Saveliev *et al.* [13] reported participation rates below 20% in several European settings, while Aguiar-Ibáñez *et al.* [14] highlighted persistent

inequalities in screening uptake among vulnerable populations despite well-established healthcare systems. These findings suggest that Bangladesh's nationwide VIA-based programme, decentralized service delivery and electronic DHIS2 reporting system contributed to its successful recovery. The declining proportion of VIA-positive women, from 6.41% in 2019 to 3.10% in 2022, together with increasing VIA-negative results, is consistent with the National Cervical and Breast Cancer Surveillance System of Bangladesh [15]. Similar trends have been attributed to broader screening coverage, earlier detection and improved quality assurance within national screening programmes. Despite this progress, substantial challenges remain. Based on national census estimates, approximately 13.7 million eligible women remain unscreened, requiring nearly 1.7 million women to be screened annually to achieve the WHO target of 70% coverage by 2030 [16, 17]. Elmes *et al.* [18] similarly emphasized that sustained investment, efficient resource allocation and strengthened community outreach are essential for maintaining programme gains and addressing the remaining screening backlog. Collectively, these findings indicate that while Bangladesh successfully recovered from the pandemic-related disruption, continued programme strengthening is necessary to achieve cervical cancer elimination targets.

Conclusion:

Fluctuations in screening coverage and the persistent screening backlog may hinder timely detection and progress toward cervical cancer elimination. Targeted catch-up strategies and sustained screening services are needed to reach women who missed screening, particularly during the COVID-19 pandemic. Addressing knowledge gaps, social taboos and misconceptions

is essential to improve screening uptake and achieve the WHO cervical cancer elimination target by 2030.

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