

## ORIGINAL ARTICLE

# Impact of COVID-19 pandemic on the utilization of ART Centre Services of a teaching hospital

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### ARTICLE CYCLE

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### ABSTRACT

**Background-** COVID-19 pandemic has had a huge impact on the collateral health system. It made access to essential health services difficult. Such an essential service is a service provided to HIV patients. This study was planned to assess the effect of the current COVID-19 pandemic on Anti-Retroviral therapy (ART) center services. **Methods** -Pre-recorded epidemiological data from an ART center of a teaching hospital was used to answer the research question. Data was collected for retrieving 4 parameters i.e. number of registrations, number of HIV-positive patients kept on ART, number of deaths, and loss to follow up of the COVID-19 year and non-COVID-19 year then comparison was made between both. Data analysis was done with the help of SPSS. Independent t-test, one-way ANOVA test, and multiple comparison Tuckey's test were applied. **Results-** Statistically significant difference was noted in the total number of registrations, the number of patients kept on ART, death, and loss to follow-up in non- COVID-19 & COVID-19 years. After applying above mentioned statistical test the p-value came out to be <0.05. **Conclusion-**COVID-19 pandemic has adversely affected the auxiliary non-COVID-19 health services and health programs. The current study gives evidence that ART functioning is negatively affected by the COVID-19 pandemic.

### KEYWORDS

Pandemics; HIV Infections; impact of COVID-19 pandemic; Utilization of ART services,

### INTRODUCTION

The COVID-19 pandemic has created many challenges worldwide and has led to one of the largest societal crises of the century. Pandemics raise strenuous situations across all sectors of government and society and necessitate a whole-of-government response. Health will be predominantly impacted. Due to

the pandemic, we have deviated away from our existing health priorities as our whole strength is now working against COVID-19. The current Pandemic may affect the health outcome in many ways like as poor funding to the program, delayed planning and programming, poor drug supply, and reduced testing and diagnosis from the provider's side, from the beneficiary's side there may be

reduced treatment adherence. The United Nations emphasizes that health care is a right, even during the coronavirus pandemic but the best-known healthcare system (i.e., western pandemic European countries) was shattered during the COVID-19 pandemic. Health systems especially in low-to-middle-income countries may have fewer buffering resources and capacity against shocks from a pandemic. Assessment of disruption of non-COVID-19 services like maternal, neonatal, nutritional diseases, Non-Communicable Diseases (NCDs) including cancer, cardiovascular diseases, renal diseases, HIV AIDS and sexually transmitted infections, respiratory infections, tuberculosis, neglected tropical diseases and Malaria (1), is need of the hour. Sachdev D et al (2) found a higher incidence of COVID-19 in persons with HIV as compared to persons without HIV. Whatever we clinched in years should not fade away due to pandemics. The potential long-term impact of COVID-19 on the HIV program may be threatening. Assessment of the Impact of the pandemic on other essential health services is critical. A survey that follows modeling convened by the World Health Organisation (WHO) and UNAIDS in May forecasted that a six-month disruption in access to ARVs could lead to a doubling in AIDS-related deaths in sub-Saharan Africa in 2020 alone (3).

**Aim**-That's why the current article presents a review of the impact of COVID-19 on the functioning of an ART center in Uttar Pradesh.

**The objective** was to study the impact of COVID-19 pandemic on the functioning of ART centers by looking at important parameters of HIV AIDS like the total registration, the patient kept on ART, loss to follow and death.

## **MATERIAL & METHODS**

**Study type & design** – record-based retrospective study. **Study setting**- ART center attached with SN Medical College, Agra **Study duration**-January 2022 to June 2022(6 months). Sample size -Data from 3 years 2019, 2020 & 2021 were collected. **Inclusion criteria** -all enrollment during years 2019, 2020 & 2021 in ART records were included in the

study. **Exclusion criteria**- Enrollments with incomplete information were excluded.

**Ethical approval** (No. SNMC/IEC/2022/29 dated 22-04-2022) was obtained from the institutional ethical committee of a teaching hospital. The permission was taken from the principal of the teaching hospital and the nodal officer of the ART center. Confidentiality of data was maintained. The study was conducted according to the protocols and policies of the ethical review board. Relevant Data was then extracted from ART records. All information was recorded reliably. The current study was a **record-based retrospective study**. ART center was chosen by convenience sampling as it was attached to a teaching hospital. There is a standardized data record pattern at ART centers because of the standardized data format the reproducibility of data was not an issue.

All caution was exercised while using information from records. Monthly data of the pre-COVID-19 (year 2019) and COVID-19 period (the years 2020 & 2021) was recorded and compared. Considered parameters were total registration, number of HIV-positive patients initiated on ART, number of deaths among PLHIV (People Living with HIV AIDS), and loss to follow-up. Each mentioned parameter was recorded per month for a year in the absence of the COVID-19 pandemic (the year 2019) and with the presence of the COVID-19 pandemic (years 2020 & 2021) then a comparison was made between both.

Data analysis was done with the help of SPSS. Paired t-test was applied to see the difference between the ART center's parameters of different years. We have recorded 3 years of data 2019, 2020, and 2021. Data from 2019 was considered as pre-COVID-19 pandemic data and 2020 and 2021 were considered as COVID-19 pandemic data. The data from 2019 first was compared with 2020 and then 2019 data was compared with 2021 by applying an independent t-test. Then we applied a one-way ANOVA test to see the variance in the variables of different years (2019, 2020, and 2021). Then finally we applied a post hoc test for multiple comparisons.

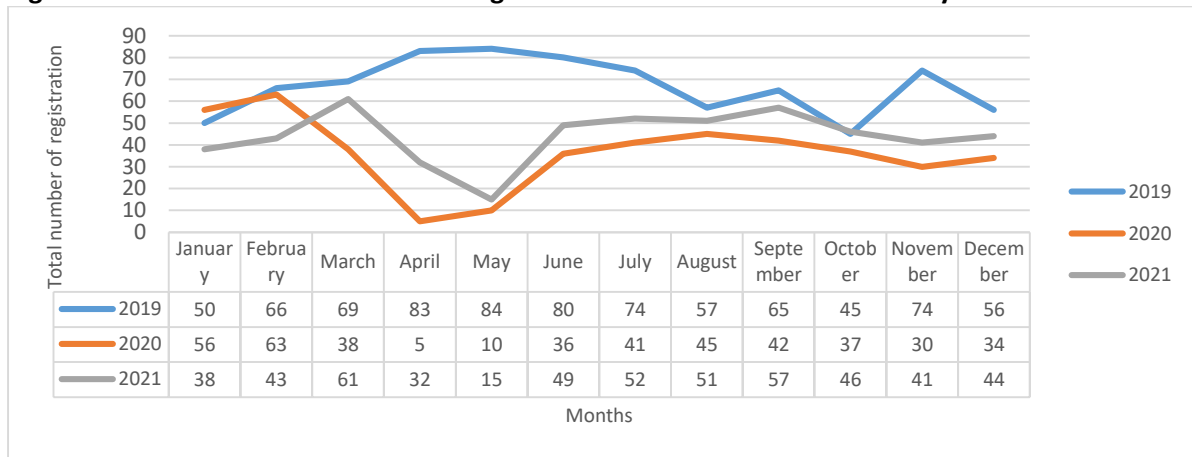
**RESULTS**

Figure 1 shows the total number of registrations was more in a year without COVID-19 pandemic (2019) as compared to years with COVID-19 pandemic (2020 & 2021). Figure 2 shows the total number of losses to follow-up was more in a year without COVID-19 pandemic (2019) as compared to years with COVID-19 pandemic (2020 & 2021).

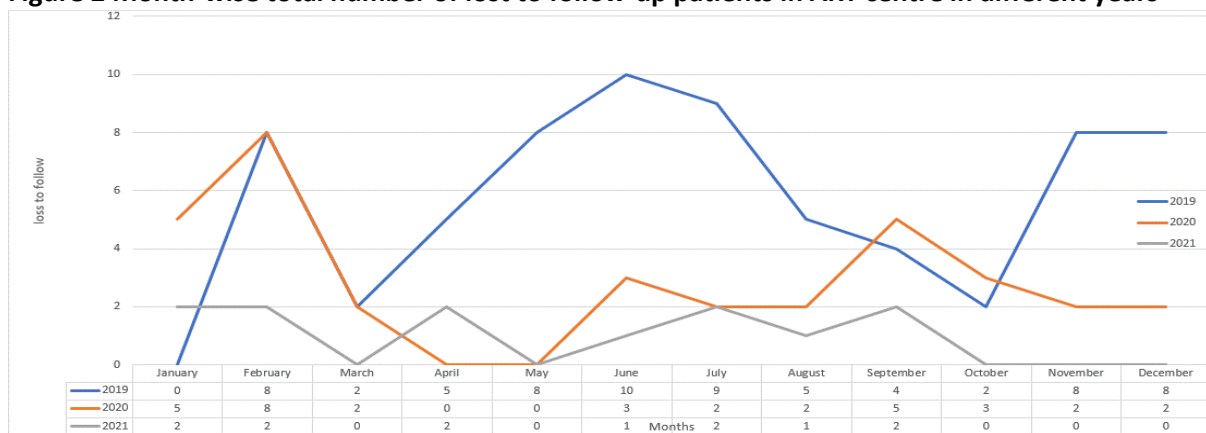
Figure 3 shows the total number of patients kept on ART was more in years without COVID-19 pandemic (2019) as compared to years with COVID-19 pandemic (2020 & 2021).

Figure 4 shows the total number of deaths was more in years without COVID-19 pandemic (2019) as compared to years with COVID-19 pandemic (2020 & 2021).

**Figure 1 Month-wise total number of registrations in ART centre in different years**



**Figure 2 Month-wise total number of lost to follow-up patients in ART centre in different years**



**Figure 3 Month-wise total number of patients kept on ART in ART center in different years**

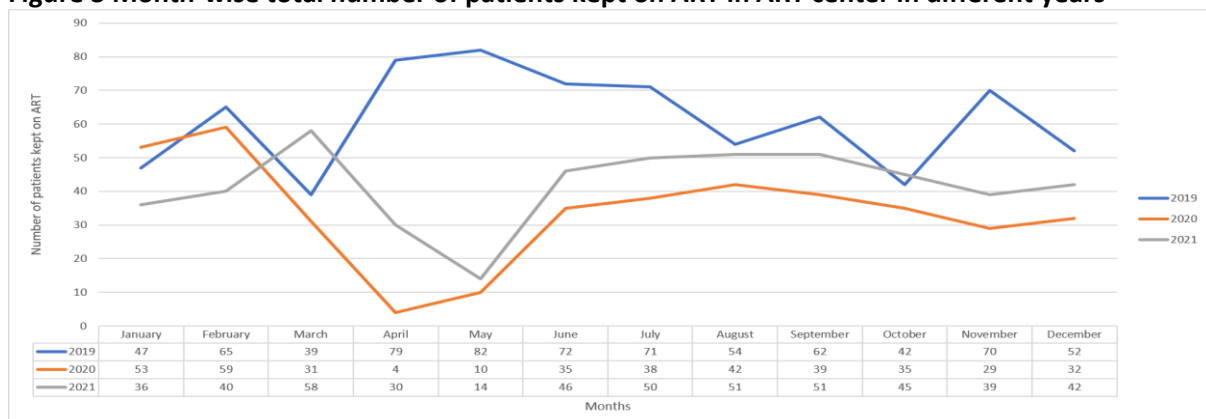


Figure 4 Month-wise total number of deaths in ART centres in different years

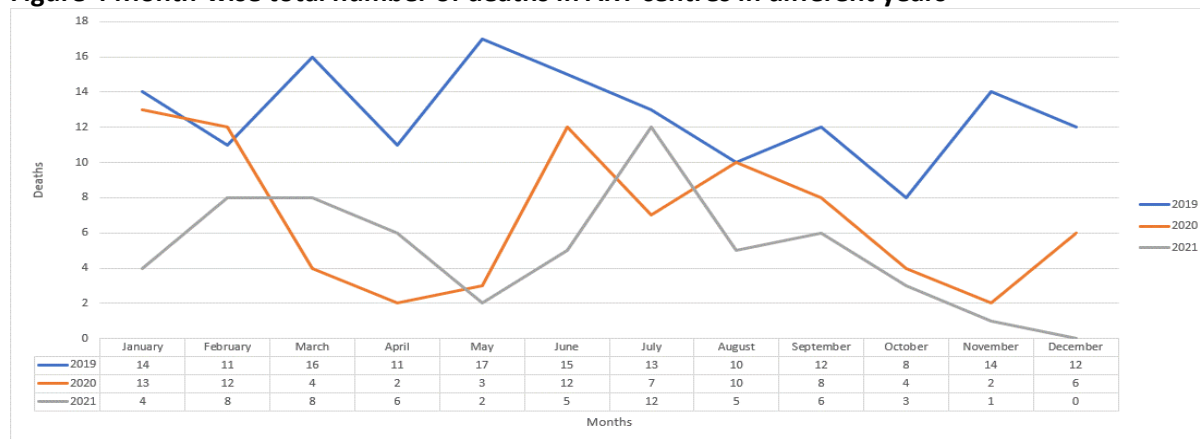


Table 1 Distribution of Various ART related statistics before during the COVID-19 period

Variables	Year	N	Mean	SD	t value	Pvalue
New Registration	2019	12	66.9167	12.84494	5.076	<0.001
	2020	12	36.4167	16.37880		
On ART	2019	12	66.9167	12.844	4.469	<0.001
	2021	12	44.0833	12.176		
	2019	12	61.25	14.31	4.504	<0.001
	2020	12	33.91	15.39		
Loss to follow up	2019	12	61.25	14.31	3.649	0.001
	2021	12	41.83	11.61		
	2019	12	5.75	3.22	2.57	0.017
	2020	12	2.83	2.49		
Death	2019	12	5.75	3.22	4.89	<0.001
	2021	12	1.00	0.95		
	2019	12	12.75	2.59	4.19	<0.001
	2020	12	6.91	4.055		
Started on ART	2019	12	12.75	2.59	6.324	<0.001
	2020	12	5	3.35		

Table 1 shows there was a statistically significant difference between the new registration of HIV patients, the number of HIV patients kept on ART, the Number of PLHIV losses to follow, and the number of deaths

among PLHIV in non-COVID-19 (2019) and COVID-19 period (2020 & 2021) as the application of independent t-test p-value for all the variable was found to be <0.05.

Table 2 Comparison of ART statistics during & before Covid 19 pandemic

		Sum of Squares	df	Mean Square	F	Sig.
New registration	Between Groups	6041.556	2	3020.778	15.584	<0.001
	Within Groups	6396.750	33	193.841		
	Total	12438.306	35			
Started on ART	Between Groups	4747.167	2	2373.583	12.345	<0.001

		Sum of Squares	df	Mean Square	F	Sig.
<b>Loss to follow up</b>	Within Groups	6344.833	33	192.268		
	Total	11092.000	35			
	Between Groups	137.722	2	68.861	12.630	<0.001
	Total	179.917	33	5.452		
<b>Death</b>	Within Groups	391.056	2	195.528	17.017	<0.001
	Total	317.639	35			
	Between Groups	379.167	33	11.490		
	Total	770.222	35			

Table 2 shows that there is a significant difference in the number of new registrations, the number of HIV-positive patients kept on ART, the number of PLHIV lost to follow and

the number of deaths among PLHIV in 3 years i.e., 2019,2020, and 2021. Further to check which years has a significant difference, we applied turkey's multiple comparison test.

**Table 3 The difference in the total number of registrations during & before Covid 19 pandemic**

Variables	(I) YearR	(J) YearR	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	upper Bound
<b>Total number of Registration</b>	2019	2020	30.50000*	5.68391	<0.001	16.5529	44.4471
		2021	22.83333*	5.68391	.001	8.8862	36.7805
	2020	2019	-30.50000*	5.68391	<0.001	-44.4471	-16.5529
		2021	-7.66667	5.68391	.379	-21.6138	6.2805
	2021	2019	-22.83333*	5.68391	.001	-36.7805	-8.8862
		2020	7.66667	5.68391	.379	-6.2805	21.6138
<b>Patients kept on ART</b>	2019	2020	27.33333*	5.66080	<0.001	13.4429	41.2238
		2021	19.41667*	5.66080	.005	5.5262	33.3071
	2020	2019	-27.33333*	5.66080	<0.001	-41.2238	-13.4429
		2021	-7.91667	5.66080	.353	-21.8071	5.9738
	2021	2019	-19.41667*	5.66080	.005	-33.3071	-5.5262
		2020	7.91667	5.66080	.353	-5.9738	21.8071
<b>Loss to follow up</b>	2019	2020	2.91667*	.95324	.012	.5776	5.2557
		2021	4.75000*	.95324	<0.001	2.4109	7.0891
	2020	2019	-2.91667*	.95324	.012	-5.2557	-5.776
		2021	1.83333	.95324	.148	-5.057	4.1724
	2021	2019	-4.75000*	.95324	<0.001	-7.0891	-2.4109
		2020	-1.83333	.95324	.148	-4.1724	.5057
<b>Death</b>	2019	2020	5.83333*	1.38383	.001	2.4377	9.2290
		2021	7.75000*	1.38383	<0.001	4.3544	11.1456
	2020	2019	-5.83333*	1.38383	.001	-9.2290	-2.4377
		2021	1.91667	1.38383	.360	-1.4790	5.3123
	2021	2019	-7.75000*	1.38383	<0.001	-11.1456	-4.3544
		2020	-1.91667	1.38383	.360	-5.3123	1.4790

Table 3 After applying multiple comparison tests, we found that for new registration there was a statistically significant difference between the year 2019 with 2020 and 2021 as

p<0.05 but there was no statistically significant difference found between the years 2020 and 2021 as p=0.379 >0.05. For ART initiation, there was a statistically significant difference

found between years 2019 with 2020 and 2021 as  $p < 0.05$ , but there was no statistically significant difference was found between the years 2020 and 2021 as  $p = 0.353 (> 0.05)$ . For loss to follow up there was a statistically significant difference in 2019 with 2020 and 2021  $p < 0.05$  but no statistical significance difference between 2020 and 2021 ( $0.148 > 0.05$ ). For death also there was a statistically significant difference between 2019 with 2020 and 2021 ( $p < 0.05$ ) but no statistically significant difference was found between 2020 & 2021 ( $0.36 > 0.05$ ).

## DISCUSSION

Significant differences were found in the total number of registrations in the ART center, the number of patients kept on ART, the total number of patients lost to follow, and the number of deaths in a COVID-19 year and non-COVID-19 year. All the above-mentioned parameters were found more in the year without COVID-19 pandemic. Total registrations were reduced in years with COVID-19 pandemic there may be many reasons behind this like lockdown, fear of corona, and many more. The total number of patients kept on ART was less in years with COVID-19 pandemic possible reasons behind this may be the less registration, and less drug stock. Loss to follow-up was also recorded less in the year with COVID-19 pandemic maybe because of less registration. Death due to HIV was recorded less in year with COVID-19 pandemic the cause of this may be under-reporting, less new registration and the cause of death might be overlapped by COVID-19 and other deaths.

Govender *et al* (4) in their review article presented a comprehensive analysis of data in relation to COVID-19 and its interaction with HIV- positive pregnancy and preeclampsia. They included COVID-19 positive HIV pregnant women while the current study was done on overall HIV patients. Chenneville T *et al* (5) by their study described the current and future impact of COVID-19 on people with HIV. They also narrated psychosocial implications, short-term, long term and biological impact of COVID-19 on HIV treatment. The current study

only assesses the impact of COVID-19 pandemic on the function of ART centre by looking at some selected parameters. Hogan AB *et al* (6) conducted a study on the impact of COVID-19 on HIV, TB, and malaria concluding that death due to HIV over 5 years could increase up to 10%. In contrast, present study concluded that during COVID-19 pandemic fewer deaths were reported and the current study is a record-based study. Boyd *et al* (7) found an increase in the number of patients living with HIV initiating ART with a 16% proportionate rise during the COVID-19 period. Opposite to current study that during COVID-19 pandemic number of patients kept on ART decreased. Similar to our finding Reductions in clinic volume were also noted by Lagat H *et al* (8). Snapshot (9) provides an indicative update on how lifesaving HIV, TB, and malaria programs and health service continuity have been impacted by COVID-19 across 32 low- and middle-income countries in 2020, and the extent of this disruption. Across all the facilities surveyed in this snapshot, HIV testing fell 41% in 2020. Roldan EQ (10) observed a raise of missed visits from 5 to 8% ( $p < 0.01$ ) very resembling the current study, a reduction in the number of new HIV diagnoses from 6.4 in 2019 to 2.5 per month in 2020 ( $p = 0.01$ ), a drop-in ART dispensation, and an increase of hospitalized HIV patients due to COVID-19. ART regimens including protease inhibitors (PIs) had a smaller average drop than ART not including PIs (16.6 vs 21.6%,  $p < 0.05$ ).

Prabhu S *et al* (11) surveyed current literature and found no evidence of the higher prevalence of COVID-19 among PLWH but equivocal data on increased mortality and worse clinical outcomes. Mellor M *et al* (12) In a meta-analysis of five studies, found that PLWH had a higher risk of COVID-19 mortality (hazard ratio 1.95, 95% confidence interval (CI): 1.62-2.34) compared with people without HIV. Dorward J *et al* (13) found by the Poisson regression model, taking into account long-term trends, the lockdown was associated with an estimated 47.6% decrease in HIV testing in April 2020 (incidence rate ratio (IRR) 0.524, 95% CI 0.446-0.615). ART initiations decreased from a median of 571 per week before lockdown (IQR 498-678), to 375 per week after

lockdown (331-399), with an estimated 46.2% decrease in the Poisson regression model in the first week of lockdown (March 30, 2020, to April 5, 2020; IRR 0.538, 0.459-0.630). In our study also there was a decline in the number of patients initiated on ART. Bhaskaran K et al (14) found that People living with HIV had a higher risk of COVID-19 death than those without HIV after adjusting for age and sex: hazard ratio (HR) 2.90 (95% CI 1.96–4.30;  $p < 0.0001$ ). Report (15) also concluded that people with HIV appear to have a slightly increased risk of dying from COVID-19. According to data 2 released from UNAIDS and WHO, new HIV infections fell by 39% between 2000 and 2019. HIV-related deaths fell by 51% over the same time period as we also found in the current study and some 15 million lives were saved through the use of antiretroviral therapy. Celestin K et al (16) found that the average number of HIV visits fell from 121.5 to 92.5 visits. Jewell LB et al (17) found that a 6-month interruption of supply of antiretroviral therapy (ART) drugs across 50% of the population of people living with HIV who are on treatment would be expected to lead to a 1.63 times (median across models; range 1.39–1.87) increase in HIV-related deaths over a 1-year period compared with no disruption. Adugna A et al (18) concluded that the mean difference was significant within HIV\_VCT, HIV\_PICT, and ART between the years 2019 before COVID-19 and 2020 during COVID-19 ( $p$ -value  $< 0.05$ ). HIV\_VCT, ART variability was substantial between the years 2019 and 2021 ( $p$ -value  $< 0.05$ ). Lee J a et al (19) concluded One hundred and twelve PLHIV (mean age:  $38.5 \pm 10.2$  years), 174 PAR (mean age:  $33.5 \pm 8.0$  years), and 9 prescribers participated in the survey;  $\geq 97\%$  of the PLHIV and PAR were male. A greater proportion of PAR than PLHIV reported a decrease in the frequency of hospital/clinical visits (59.2% vs. 17.0%) and HIV-related testing (50.6% vs. 6.3%) since COVID-19. Among PAR, not engaging or engaging less in high-risk behaviors was the most frequently cited reason (51.1%) for decreased frequency of HIV-related tests. A substantial proportion of PLHIV (12.5%) and PAR (50.0%) experienced interrupted use of ART and HIV preventive medications, respectively. A substantial proportion of PLHIV

(35.7%) and PAR (62.5%) were concerned about the long-term accessibility of HIV care, however,  $>90\%$  had not used any type of telehealth services during the pandemic. Kowalska JD et al (20) found out of 22 countries HIV clinics were operating normally in only six countries (31.6%). Similar to our finding the selected ART center's functioning is also affected

#### CONCLUSION

Current study concluded that there is a significant decline in the various parameters of selected ART center in COVID-19 period as compared to non-COVID-19 period which suggests that the COVID-19 pandemic has significantly affected the ART centre's functioning. We have to mitigate the impact of disruption produced by COVID-19 on ART services. We need supportive efforts to sustain the HIV response.

#### RECOMMENDATION

As the pandemic is over now we can give more emphasis on reviving essential services like ART center services. Preparedness is the key to dealing with situations like this in the future.

#### LIMITATIONS OF THE STUDY

This study was conducted in one ART center so the generalizability of the results of this study is questionable.

#### RELEVANCE OF THE STUDY

The study gives evidence of how a public health emergency of international concern can disrupt the essential health services

#### AUTHORS CONTRIBUTION

All authors have contributed equally.

#### FINANCIAL SUPPORT AND SPONSORSHIP

Nil

#### CONFLICT OF INTEREST

There are no conflicts of interest.

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## DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors haven't used any generative AI/AI assisted technologies in the writing process.

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