



# Impact of COVID-19 Pandemic on Turn-Around-Time of HIV Viral Load Testing Services: A Case Study of a Selected Health Facility in the Northeast, Nigeria

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**Abstract:** The COVID-19 Pandemic has continued its devastating trend since its emergence and the negative impact is still being felt across the world. The pandemic has led to health service disruption and in some cases total collapse of services. In resource constrain settings, the situation is not different especially among PLHIV where declaration of lockdown and restriction of movement have affected ART provision and other essential HIV services. This study aimed at determining the effect of COVID-19 pandemic on HIV viral load (VL) testing services. The study adopted a case study approach with a sample size of 449 PLHIV client VL history collected retrospectively from laboratory records. Qualitative approached was also adopted with 3 key informants involved in viral load sample handling interviewed. The collected data was analyzed using STATA14 and NVIVO. The results revealed that, out of the total VL samples collected, 81% (n=363) of the collected samples were transported before the COVID-19 Pandemic and 19% (n=86) were transported during the pandemic. Furthermore, more than one-half of the client's samples, 89% (n=217) had their viral load suppressed within the period under study. The average HIV VL turn-around-time (TAT) of the study was 77 days, that is 71 days before COVID-19 and 83 days during COVID-19. The study concluded that HIV VL turnaround time increased during the COVID-19 pandemic with possible devastating effective on management of HIV patient disease.

**Keywords:** COVID-19 Pandemic, Viral Load, Turn-Around-Time, HIV

## 1. Introduction

The COVID-19 Pandemic has continued its devastating trend since its emergence and the negative impact is still being felt across the world. In resource constraints setting, the situation is not different especially among the section of the

population that have also been diagnosed with HIV [7]. There is now enough evidence to believe that COVID-19 Pandemic could lead to health service disruption, and this includes HIV testing services, which might result to more HIV related deaths and increase transmission [1, 11]. Some of the HIV services that could be affected include, HIV Testing, ART

provision, Viral Load (VL) testing, partner notification and even differential care for clients [15]. To enable states, combat the impact of COVID-19 Pandemic, several measures were deployed by government and the most intense among them was the declaration of total lockdown, restricting the movement of people except for essential workers. The restriction put in place also limited the normal movement of essential health workers and prevented patients' access to health facilities and services [8, 12].

HIV has remained a major health concern in Nigeria with a national prevalence rate of 1.4% and this is relatively high when compared with the total population of over 200 million people [2, 3]. The situation is further amplified in the conflict prone northeastern region where the study was conducted. The impact of the insurgent activities and resulting violence has devastated the lives of most people and has led to the disruption of essential health services across the region [5, 13]. With the negative impact of the pandemic on HIV Testing and ART services established by other studies [14, 15]. This study aimed to determine the effect of COVID-19 on HIV viral load testing services having in mind that viral suppression is one of the key indices for effective management of HIV disease [16]. The specific objectives were to determine the effect of COVID-19 Pandemic on the turnaround time (TAT) of VL results, assess the effect of the pandemic on viral suppression among HIV clients eligible for VL test and highlight some of the factors affecting viral load TAT during COVID-19 Pandemic. On April 18, 2020, the first case of COVID-19 was confirmed in Borno state and in response, national guidelines were instituted to prevent its spread [6, 8]. The state went further to declare 3 weeks total lockdown in human activities to prevent person-to-person transmission of COVID-19. This action led to the restriction of movement except for some essential workers who were responsible for providing health and other essential services [6].

## 2. Methodology

### 2.1. Study Design

The case study was conducted using routinely received viral load [VL] test results in Umaru Shehu Ultra-Modern Hospital (USUMH), Maiduguri Borno State. The study adopted both qualitative and quantitative methods, aimed at triangulation of both outcomes.

### 2.2. Study Population/Areas

The study was conducted in Umaru Shehu Ultramodern hospital, a comprehensive ART site in Maiduguri, Borno state, Northeastern, Nigeria within a 7-month period between December 2019 to June 2020. Data was collected to consider VL records of clients before and during the COVID-19 Pandemic.

### 2.3. Sample Size

A total sample size of 449 PLHIV clients VL records were extracted for quantitative analysis within the period in review.

Three (3) key personnel involved in viral load sample collection, transportation, and laboratory analysis were interviewed. The category of these staff is namely, Viral Load Champion (VLC), Sample Transportation Personnel (3PL Agent) and PCR Laboratory Scientist, who were randomly selected for Key Informant Interview.

### 2.4. Data Collection Method

Data collections was done retrospectively using kobo collect mobile app. Clients Viral Load records were extracted from laboratory data capturing records such as VL sample collection register, VL sample transportation register and VL monitoring register. Dataset considered for each collection included client code, gender, age, date of sample collection, date of sample transported to PCR Lab, Date the results were received at health facility and Viral Load result. Clients viral load records used for the study were those that had their VL result available within the period of the study. Qualitative data was collected by interviewing facility based viral load champion (VLC), VL transport agent (3PL) and PCR laboratory personnel using a Key Informant Interview (KII) guide.

### 2.5. Method of Data Analysis

STATA 14 and NVIVO software were both used in analyzing the quantitative and qualitative data obtained for the study. Simple percentages on key variables alongside logistic regression were employed to determine the impact of COVID-19 on viral load TAT in the selected facility. Statistical tests were two-sided and P-value < 5% was considered statistically significant. In addition, related themes, patterns, and structure were coded and analyze during the analysis of qualitative data.

## 3. Result

### 3.1. Result of Quantitative Approach

The result considered data extracted from 449 patients accessing HIV services in the selected facility who received viral load testing services within the period of the study.

The table 1 below revealed the demographic and clinical variables of the clients in the selected facility. From the table, 70.4% of the total clients were male, whereas the remaining few proportion (29.6%) were female. In terms of age group, about 31% of the total clients falls within the age group of 35-44 years with mean and standard deviation of 34.7 and 16.9 respectively. From the clinical variables, more than one-half of the client's, 89% have their viral load suppressed within the period under study while the remaining 11% have unsuppressed viral load. During the period of the study, 81% of the sampled clients have their Viral Load sample collected before COVID-19 pandemic while the remaining 19% of the VL samples were collected during the pandemic. Equal numbers of viral load samples collected were also transported to the PCR Laboratory for analysis before and during pandemic.

The table also shows that 54% of all clients VL result were received from the PCR Laboratory was before the pandemic

while the remaining 46% of the result were received during the pandemic.

**Table 1.** Demographic/Clinical Profile of the Client.

Demographic variables	Categories	Frequency N=449	Percent (%)	
Sex	Male	316	70.4	
	Female	133	29.6	
Age Group Mean=37.17 SD=11.63	<15	16	3.56	
	15-24	42	9.35	
	25-34	138	30.73	
	35-44	149	33.18	
	45-54	69	15.37	
Clinical variables	55-64	35	7.8	
	VL Sample Collected	Before COVID-19	363	81
		During COVID-19	86	19
	VL Sample Transported	Before COVID-19	363	81
		During COVID-19	86	19
VL Result received at the health facility	Before COVID-19	131	54	
	During COVID-19	113	46	
Viral Load Result Status	Suppressed	217	89	
	Unsuppressed	27	11	

The result of data analysis further revealed that out of 449 VL samples collected and transported during the period of the study, 244 (54%) clients had their VL results returned to the health facility. Only 46% of the total results received came in during the pandemic, the rest were received before the start of the pandemic. From the table above, the average turn-around-time (TAT) during COVID-19 was 83 days as shown in table 2 below. This implies that the turn-around-time of HIV VL result increased by 12 days during the COVID-19 pandemic.

**Table 2.** HIV Average Viral Load Turn-around-Time [TAT].

Period of VL Test	Number of Days
Before COVID-19 Pandemic	71 days
During COVID-19 Pandemic	83 days

### 3.2. Result of KII Approach

#### 3.2.1. VL Sample Collection, Processing and Transportation

The result of the KII showed that the Pandemic did not affect the process of collecting, and processing of VL samples from the health facility as there was always enough staff to carry out these activities. However, there was a decline in the number of clients samples collected following initiation of total lockdown by the Borno State Government which made it difficult for patients to access the health facilities. The VLC (3PL agents) sited that sample transportation was also affected during the lockdown period, the frequency of pickup from the health facility decreased from twice a week to once a week. These results were confirmed by the PCR Laboratory staff who cited that “there was a decrease in the frequency of sample drop off and number of VL samples made available by the 3PL agents” for analysis.

#### 3.2.2. VL Turn Around Time (TAT) by Interviewee

The VLC during the interview cited that normally it takes an average of two weeks for results of clients VL samples sent to the PCR Lab to be returned back to the health facility (HF).

The VLC highlighted a “delay in results return which could have been due to the pandemic”. The VLC stated that “no result of VL sample taken during the pandemic were returned to the HF”. The delay in analysis of VL samples and subsequent result unavailability for transportation was confirmed by the PCR Laboratory staff who stated some of the negative impact the pandemic had on normal PCR Laboratory operations. These include limited number of staff in the PCR lab due to the need to maintain social distancing, priority of analysis was given to the COVID-19 samples which affected VL sample analysis, faulty laboratory equipment could not be repaired due to the cancelation of domestic flight movement and ban on interstate travelling for persons responsible for the repairs. Staff involved in VL analysis were equally involved in COVID-19 testing and analysis.

### 3.3. Impact of COVID-19 on Turn-Around-Time [TAT]

Binary logistics regression was used to determine the impact of COVID-19 on TAT. The dependent variable [Viral Load result which was categorize into two (2) i.e., Suppressed and Unsuppressed and were coded into 1 and 0 respectively]. In addition, the independent variables (Date VL sampled collected, Date VL sample transported, and Date VL result received at the health facility respectively. These variables were coded into 0 [Before COVID-19 Pandemic] and 1 [during COVID-19 Pandemic]. The result revealed that Turn Around Time was affected due to COVID-19 pandemic. However, the odds of having TAT increased in term of samples result returned during COVID-19 pandemic started (OR=0.110.22151, 95%CI=0.06-.066), result transported (OR=0.26, 95%CI=.11-.59) and days in which VL result was received at health facility (OR=.38, 95%CI=.19-.73) respectively. In term of result collected, the odd of having TAT affected during pandemic is 88% less than before pandemic. In term of VL transportation, the odd of having VL samples

affected during the pandemic is 74% less than it was before the pandemic. Finally, from the VL result received at the

Health Facility, the odd revealed a 62% decrease than it was before the pandemic.

**Table 3.** Binary Logistic Regression showing the Impact of COVID-19 Pandemic on Turn-around-Time [TAT].

Factors	Odd ratio	Std. Err.	z	p>/z/	95% CI	
					Lower	Upper
VL sample collected						
Before COVID-19	[1.000] RC					
During COVID-19	.11092	0.3316	-0.115	0.032	.0595287	.658250
VL sample Transported						
Before COVID-19	[1.000] RC					
During COVID-19	.2605364	.1102762	-3.18	0.001	.1136538	.5972456
VL result was Received at Health Facility						
Before COVID-19	[1.000] RC					
During COVID-19	.375	.1269381	-2.90	0.004	.1931515	.7280553

Note: Number of observations=235, Likelihood ratio chi-square=9.37, Degree of freedom=234, p-value=0.0022 \*\*\* RC=Reference category.

## 4. Discussion

After the adoption and deployment of the national guidelines to prevent the spread of COVID-19, there was an immediate impact on the delivery of HIV VL testing services as revealed in interviews conducted on the service providers along the service chain. This was further confirmed in the number samples collected before the pandemic which was 4 times higher than samples collected during the pandemic. According to the interviewees, this was as a result of decrease in clinic visit due to the movement restriction that was in effect during the COVID-19 Pandemic lockdown. The study also confirmed a decrease in the frequency of sample pickup from the health facility which decreased from at least twice a week to just once a week due to the impact of movement restriction during the pandemic.

The national guideline for HIV treatment recommends 1000 copies/ml or less VL count as a minimum viral suppression rate for patients treated for HIV [7, 9, 10]. According to viral load results received in the HF during the period of the study, eighty nine percent (89%) of patient were virally suppressed while the rest (11%) were unsuppressed. However, more results were received by the HF before the pandemic (54%) than during the pandemic.

The study discovered that there was no documented stipulated standard for TAT of HIV VL result by the health facility. However, this study confirmed that the average turnaround time (TAT) increased by 12 days from 71 days before the pandemic to 83 days during the pandemic. Some of the factors identified in the study to have contributed to this increase VL TAT were, declaration of total lockdown which limited the number of staff in the PCR lab, due to the need to maintain social distancing; priority of analysis was given to the COVID-19 samples which affected VL sample analysis; faulty laboratory equipment which could not be repaired due to the cancelation of domestic flight movement and ban on interstate travels which affected the logistics of laboratory consumables.

## 5. Conclusion

In conclusion, VL turnaround time increased during the COVID-19 pandemic which could have possible devastating effect on the management of HIV patient. Considering the fact that viral suppression rate is an important parameter for HIV patient management, COVID-19 had a detrimental effect on HIV viral load sample collection, transportation, and receipt of results back at the health facility.

## 6. Recommendation

The study recommends the decentralization and usability of electronic Lab information management system by granting web-based access to Labs, sending samples to PCR Labs to remotely log/register their samples at real time and printing out their results from their own end thereby eliminating the registration, printing, and transportation processes of result from the PCR Lab to the health facilities. In addition, there is need for adequate staffing to work at the PCR Lab and also incentivize extended working hours and off days.

Also, there is need to explore the use of other alternative PCR machines like the GeneXpert platforms in the state by calibrating them for COVID-19 test thereby decongesting/decentralizing molecular test at the PCR Lab. This will ease the challenges of service disruption for VL testing services experienced during the COVID-19 pandemic period.

Further recommendations include the creation of a more comprehensive emergency response team that comprises of well-trained public health staff that are available in all public health laboratories in all the states and the availability and mobilization of emergency fund during emergencies will ensure effective service delivery.

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