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Impacts of COVID-19 Pandemic on HIV/TB Diagnosis in Nigeria

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ABSTRACT

Background: In countries with a high HIV/TB burden like Nigeria, HIV/TB and emerging infectious diseases like coronavirus (COVID-19) epidemics are anticipated to overlap. The objective of this study is to determine the public health impact of the COVID-19 pandemic on HIV/TB diagnosis in Abuja, Nigeria. **Methodology:** This study was carried out in HIV/TB testing laboratories within the Federal Capital Territory. The study population comprised all the full-time laboratory professionals working in the selected laboratories. A structured questionnaire was used to collect data via G*oogle form* from September to December, 2020. Data collected were analyzed using IBM-SPSS version 25.0. **Results:** The study comprised 164 laboratory staff from seven TB and HIV diagnostic laboratories in Abuja. COVID-19 crisis has significantly contributed to job layoffs (68.2%) and financial challenges (69.8%) within the laboratories. The negative impact of COVID-19 on staff availability at work was rated 81/100. Availability of appropriate and timely provision of PPE was poorly rated (50.2%). Also, respondents rated regular diagnosis of HIV/TB during COVID-19 very poor (37.0%). The negative effects of the pandemic on the supply of consumables and commodities (78.4%) and the purchase of consumables and reagents (76.0%) were rated high (p>0.05). Other negative diagnostic impacts of COVID-19 include lack of proper collection of diagnostic materials (61.4%), delay in the receipt of specimens (64.0%), and long turnaround time for HIV/TB test results (63.2%). **Conclusion:** Measures should be taken to ensure proper and regular sample collections during pandemic rather than focusing on COVID-19 and neglecting other diseases.
Keywords: COVID-19, Tuberculosis, HIV, Laboratory, Scientist, Diagnosis

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INTRODUCTION

The proliferation of infectious diseases, and particularly infectious pandemics, has a dramatic effect on the general health, well-being, and quality of living in underdeveloped countries, such as Nigeria. One of the key public health problems of the 21st century is the "triple burden" of the burden of COVID-19, TB, and HIV.(1) The dissemination of COVID-19 among people living with HIV (PLWH) in high burden countries is something to be deeply worried about. It is important to consider HIV/TB and COVID-19 pandemics since the three diseases overlap.(2) This can explain the recent link between HIV/TB/COVID-19.(3) The information on the burden of COVID-19 on patients with TB and HIV is limited by many awareness gaps. The COVID-19 cases show that even the most well-resourced countries are often unable to handle the vast number of patients seeking admission and ventilation.(4)

The new findings from survey of global AIDS and tuberculosis initiatives shows the changing landscape of the clinical and laboratory services within the programs. For example, laboratory facilities for HIV/TB are experiencing serious strain, with about 20% suffering elevated or extremely high damage levels, with several sophisticated diagnostic techniques in place to carry out viral load checks for PLWH on antiretroviral therapy or to diagnose TB which are being used for COVID-19 research(5).There is a danger of losing track on the "UNAIDS 90-90-90 goals and the risk of reversing the improvements that have been made in increasing TB case recognition, unless laboratory capability is quickly expanded to enable COVID-19 testing together with viral load testing and diagnosis of tuberculosis."(6)

In the diagnosis of HIV and TB, research laboratories within the FCT play a vital role. Members of the health care staff, including medical laboratory staff, virologists, pharmacy managers, quality management officers, and data managers, are essential to the performance of our health care system. In light of the growing COVID-19 cases in the FCT, several FCT preventive labs are testing for COVID-19. For these laboratories, plans for crisis have never been put in place, especially for resource-constrained configurations, and this has affected the diagnosis of HIV and TB in these laboratories. This research aims to recognize problems in areas of human capital, HIV and TB laboratory diagnosis, stock control, sample management, equipment reliability, laboratory optimization, and outcome transmission in light of the COVID-19 outbreak.

Study area

This study was undertaken in HIV and TB testing laboratories within the Federal Capital Territory (FCT), also known as Abuja, Nigeria's administrative territory. The city of Abuja had a population of 776,298 at the 2006 census, making it one of Nigeria's ten most populated cities (ranked eighth as of 2006).(7) The study was conducted between September 2020 and December 2020.

Study population

The study population comprised all the full-time Lab professionals including Laboratory Scientists, Laboratory Technicians, Laboratory managers, Interns, QC officers, Data managers and Store managers working at the HIV and TB testing laboratories within the FCT. A study questionnaire survey was developed via the google docs survey tools and was conducted online via the *google form* to seven hospitals covering Garki, Wuse, Maitama, Mabushi and the Aso Rock all

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within the Federal Capital Territory, Nigeria.

Sampling method

This research was a cross-sectional study and was conducted at HIV and TB testing laboratories within the FCT. The list of HIV and TB testing laboratories within the FCT was obtained from the FCT Department of Public Health and this was narrowed to a list of facilities within Abuja Municipal Area Council (AMAC). A total of seven (7) facilities was selected from AMAC based on their capacity to provide both HIV and TB services. The selected facilities included private, government and tertiary hospitals and they are represented as A, B, C, D, E, F, G, and H.

Online survey was conducted using google form to elicit information about the impact and challenges in areas of human resources, HIV and TB laboratory diagnosis, supply management, sample management, equipment functionality, laboratory optimization and result delivery. An email and WhatsApp messages were sent requesting participation to laboratory professionals including Laboratory Scientists, Laboratory Technicians, Laboratory managers, Interns, QC officers, Data managers, Store managers, Laboratory administrative staff and Laboratory Receptionist working at the testing laboratories. "A purposive technique of simultaneous data collection and analysis was implemented until time saturation was reached based on the pre-set final date of attempting the survey."(8)

Sample size

The survey questionnaire was administered via Email and WhatsApp platforms to seven hospitals within the FCT. A total of 164 laboratory personnel responded to the questionnaire.

Ethical issues

Ethical approval for the study was collected from the office of the Health and Human Services, Federal Capital Territory Authority (FCTA) with approval number FHREC 2020/01/96/24-09-20. Following the collection of ethical approval, research proposals and copies of the ethical document were submitted to the ethical committees of the seven hospital facilities selected for the study. Approval of the research committees of the seven facilities was also obtained before the study started. Consent for participation was included in the first part of the online survey. Only respondents who volunteered took part in the study and they were informed of their freedom to withdraw from the study at any point when answering the questions. They could also decide not to answer any of the questions. As part of the survey, personal knowledge such as email IDs that may have contributed to workers identity was not obtained to ensure secrecy. Also, all data were held in an electronic format that was password safe. The email or WhatsApp message circulated, discussed the survey priorities and the reassurance about preserving the anonymity of responses.

Statistical analysis

Data collected during the study was done using the *google docs* survey tool. It was then exported into a CSV format for data cleaning. IBM-SPSS version 25.0 was used for data analysis in conjunction with Microsoft Excel version 2019. ANOVA test of means was done setting P values below 0.05 as significant.

RESULTS

Socio-demographic characteristics of the study respondents

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The study comprised 164 laboratory staff from seven TB and HIV diagnostic laboratories in Abuja. They were 80 (48.8%) males and 84 (51.2%) females; 46.3% were within the age group 31- 40 years. All had higher education, mostly Christians (78.0%) and almost half (49.4%) were married. The majority of the respondents were scientists (51.8%), followed by Technicians/interns (38.4%) and others (administrative staff and Data managers) constituted 9.8% of all respondents as shown in Table 1.

Table 1:Socio-demographics profiles of the study respondents

Variable	Options	Number (n = 164)	Percent
Sex	Male	80	48.8
	Female	84	51.2
Age category	21 – 30	56	34.1
	31 – 40	76	46.3
	41 -50	32	19.5
Religion	Islam	36	22.0
	Christianity	128	78.0
Marital status	Currently married	81	49.4
	Never married	64	39.0
	Separated	19	11.6
Current designation	Scientists	85	51.8
	Technician/Intern	63	38.4
	Others	16	9.8
Year of experience	0 – 1	48	29.3
	2 – 5	67	40.9
	>5	49	29.9

Impacts of COVID-19 on the human resource processes in the last six months

Respondents were asked to rate on a scale 1-100, the impacts of COVID-19 on laboratory human resources in the last six months. Table 2 shows that the COVID-19 crisis has significantly contributed to job layoffs within the laboratories as professionals rated its impact 68.2% (range 47.6 – 71.2%). The laboratories are also facing financial challenges with an overall rate of 69.8% (range 66.8 – 73.6%), and their outputs have been negatively affected negatively 74.2%, highest among Technicians/inters (76.6%). The number of Technicians or interns coming to work during COVID-19 has significantly been affected (85.8%) than the scientists (78.2%) and administrative (78.8%) staff (p<0.05) with overall negative impact of 81.0%. However, laboratory staff are adequately trained on safety and preventive measures of COVID-19 with a rating score of 79.8% and the facilities have adequate infection prevention control policies with an overall score of 73.6%.

Table 2: Impacts of COVID-19 on the human resource processes in the last six months

Impacts (%)	Scientists (n=85)	Technician/ Intern (n = 63)	Others (n=16)	Total (n=164)	P-value
Has the COVID-19 crisis affected the number of job layoffs within the laboratory?	66.4	71.2	47.6	68.2	0.505
Is the laboratory facing financial challenges during the COVID-19?	66.8	73.6	70.0	69.8	0.184
Is the COVID-19 having any negative impact on your work output?	73.0	76.6	71.2	74.2	0.44
Has COVID-19 affected the number of staff coming to work?	78.2	85.8	78.8	81.0	0.022*
Has COVID-19 affected the number of staff required to undertake the work?	80.0	84.8	76.2	81.4	0.091
Are staff adequately trained on safety and preventive measures of COVID-19?	78.8	82.0	77.6	79.8	0.499
Do you think the lack of social insurance policy for health care workers is an obstacle to effective service delivery especially in this period of the pandemic?	83.6	87.6	90.0	85.8	0.161
Is the facility infection prevention control policy adequate?	76.6	74.6	75.0	73.6	0.763

* Significant at $p<0.05$

Impact of COVID-19 on diagnostic processes within the last six months

The findings of this study revealed the extent to which COVID-19 has affected HIV and TB diagnosis as shown in Table 3. The laboratories have been unable to continue with HIV/TB diagnosis in the last six months before this study (37.0%). In a score of 100, laboratory scientists scored the negative impacts of COVID-19 on weekly visits highest (75.8%) while the overall score was 74.8%. , The number of weekly tests done has been drastically affected with an overall negative impact of 69.8%. However, the overall scores on the timing of sample collection (59.6%), sample rejection and acceptance (59.8%), and regularity of quality control (59.0%) were moderately affected across all cadre (p>0.05). Other negative diagnostic impacts of COVID-19 include lack of proper collection of diagnostic materials (61.4%), delay in the receipt of specimens or isolates (64.0%), and turnaround time for HIV/TB diagnosis in the laboratory (63.2%).

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Table 3: Impact of COVID-19 on diagnostic processes within the last six months

Impacts (%)	Scientists (n=85)	Technician/Intern (n = 63)	Others (n=16)	Total (n=164)	P-value
Is the laboratory able to continue with HIV/TB diagnosis even with the COVID-19 pandemic?	38.6	35.0	37.6	37.0	0.138
Has the number of weekly visits been affected by COVID-19 compared to pre-COVID-19?	75.8	74.2	72.6	74.8	0.81
Has the COVID-19 affected the diagnosis of HIV/TB in the laboratory?	58.8	59.0	65.4	59.6	0.612
Has COVID-19 affected the number of tests done weekly?	71.6	68.8	65.0	69.8	0.486
Has the pandemic had any impact on the timing of sample collection?	60.4	59.6	53.8	59.6	0.487
Are you experiencing a lack of proper collection of diagnostic materials due to the pandemic?	63.6	59.6	57.6	61.4	0.399
Does the laboratory experience delay in the receipt of specimens or isolates due to the pandemic?	63.8	66.6	55.0	64.0	0.148
Has COVID-19 affected the turnaround time for HIV/TB diagnosis in the laboratory?	66.2	66.0	71.2	66.6	0.727
Is the pandemic having any impact on the date and time report for HIV/TB diagnosis are released?	65.2	62.2	57.6	63.2	0.468
How has COVID-19 impacted sample rejection and acceptance?	61.2	58.4	58.6	59.8	0.763
Has the pandemic affected the regularity of quality control is performed in the laboratory?	58.6	59.0	61.2	59.0	0.922

Impact of COVID-19 pandemic on supply chain system, equipment functionalities and the use of personal protective equipment (PPE) in the diagnosis of HIV and TB

Table 4 shows that the diagnostic laboratories did not have adequate, appropriate, and timely provision of PPE as the respondents equally rated it 50.2% (p>0.05). Overall scores also showed that the staff who had direct contact with patients were not provided with adequate PPE (43.6%) and the professionals were not being supplied with adequate PPE for their safety as they discharge their responsibilities (54.4%). Likewise, all staff categories rated training on PPE very low (40.8%) (p>0.05). The negative effects of the pandemic on the supply of consumables and commodities (78.4%) and the purchase of consumables and reagents (76.0%) were scored high (p>0.05). Other factors that COVID-19 negatively affected include inspection of consumables and reagents upon receipt (61.4%), the safe and secure transport of specimens/samples to the laboratory 63.0%, maintenance activities of equipment (60.4%), and daily monitoring and recording of temperatures for temperature-dependent equipment (61.2%), p>0.05.

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Table 4: Impact of COVID-19 pandemic on supply chain system, equipment functionalities and the use of PPE in the diagnosis of HIV and TB

Impacts (%)	Scientists (n=85)	Technician/Intern (n = 63)	Others (n=16)	Total (n=164)	P-value
Are there adequate, appropriate and timely provision of PPE?	48.8	52.4	48.8	50.2	0.672
Are all staff who have direct contact with all patients provided with Personal Protective Equipment (PPE)?	43.6	44.2	41.2	43.6	0.869
Do you feel that the PPE available to you is adequate to protect you when managing patients?	55.2	51.4	61.2	54.4	0.315
Have you received formal training in the use of the recommended PPE?	41.8	39.0	41.2	40.8	0.698
Has COVID-19 affected the supply of consumables and commodities?	76.8	80.6	78.8	78.4	0.501
Has COVID-19 affected the days the responsible staff for consumable and reagent management (inventory, order, etc.) is present at work?	72.2	70.0	65.0	70.6	0.352
Has COVID-19 affected the purchase of consumables and reagents?	75.2	77.8	72.6	76.0	0.51
Has COVID-19 affected the inspection of consumables and reagents upon receipt?	60.8	62.6	60.0	61.4	0.839
Are waste management procedures implemented effectively?	38.4	36.8	45.4	38.4	0.157
Has COVID-19 affected the safe and secure transport of specimens/samples to the laboratory?	65.8	61.0	56.2	63.0	0.236
Since the beginning of the pandemic, have the laboratory receive specimens or isolates from other clinical laboratories?	48.4	51.2	66.2	51.2	0.012*
Since the beginning of the pandemic, have the laboratory refer specimens or isolates to other laboratories?	51.0	44.8	55.0	49.0	0.092
Has COVID-19 impacted the equipment functionality in the laboratory?	60.8	60.4	51.2	59.6	0.267
Has COVID-19 affected the maintenance activities of equipment?	60.0	62.0	56.2	60.4	0.654
Has COVID-19 impacted the daily monitoring and recording of temperatures for temperature-dependent equipment?	60.8	62.2	60.0	61.2	0.908
Is the equipment maintained in a safe working environment?	37.6	34.6	36.0	36.4	0.372

DISCUSSION

Although the respondents of this study agreed that they have been adequately trained in safety and preventive measures. Besides, their facilities have adequate infection prevention control policies. Yet, the findings of this study revealed that COVID-19 has adversely affected human resources and processes in diagnostic laboratories in Abuja. This reflected in the submission of the majority of the respondents that the pandemic has resulted in job layoffs within their laboratories.

They also agreed that the laboratory outputs have significantly declined during this period because of the reduction in the number of working days. A comparative study in Nigeria also documented a similar finding that more than 65% of the health workers reported a lack of enthusiasm to go to work during the pandemic (9) though unlike this study, the majority of the respondents in their study expressed their lack of confidence or inadequacy in their workplace safety measure against COVID-19.

Most laboratories have been unable to continue with HIV/TB diagnosis in the last six months and this has drastically reduced the number of weekly visits. Besides, the COVID-19 crisis has caused a lack of proper collection of laboratory materials, delay in the receipt of specimens or isolates, and turnaround time for HIV/TB diagnosis in the laboratories. However, the timing of sample collection, sample rejection and acceptance, and regularity quality control were moderately affected across all cadre and this might be due to fewer weekly visits and delay in the receipt of specimens. Since fewer samples are available, sample collection, rejection, and acceptance might not be seriously affected.

This study also revealed that the COVID-19 crisis has adversely affected health supply chain system. This showed in the inadequate and untimely supply of PPEs, even for staff who usually have direct contact with patients or likely COVID-19 infected patients. Besides, the respondents reported that they were not adequately trained on PPEs. Apart from the PPEs, the study respondents also reported an inadequate supply of consumables and laboratory reagents. They also reported its effect on the safe and secure transport of specimens/samples to and fro-laboratories. Apart from the aforementioned, maintenance activities of equipment and the daily monitoring and recording of

temperatures for temperature-dependent equipment were also reportedly affected by the COVID-19 crisis. Previous studies have also reported inadequate protective equipment and materials due to scarcity which has consequently resulted in poor efficiencies and outputs.(1,2,10–13)

This study found a significant disruption in HIV/TB diagnosis in Nigeria during this pandemic. The fear that TB and HIV cases might shoot up as a result of disruptions in diseases diagnosis during this COVID-19 crisis has been expressed in several studies, even with a projection of possible incident rates. For example, the current biweekly survey of the Global Fund revealed that about 20% of HIV/TB diagnostic laboratories are currently facing disruption and considered this a significant challenge because laboratory staff are being allocated to COVID-19 diagnosis (14). The report further showed that HIV, TB, and malaria are the most affected diseases; almost 75% of countries are experiencing HIV services interruptions; 75% are experiencing TB services disruption and over 50% for malaria. Also, the rate of killing of HIV, TB, and malaria combined has to be estimated similar to the rate at which COVID-19 kill people and this number is expected to rise more than deaths from COVID-19 due to "lockdowns, resources diverted to the new virus, and interruptions to lifesaving services", especially in the most affected countries.(14)

A study conducted in Imperial College London projected an increase in deaths from HIV as 10%, TB as 20%, and Malaria as 36% in the next five years due to COVID-19, compared to "if there were no COVID-19 epidemic."(1) It has also been projected that if antiretroviral therapy is disrupted for six months as a result of this pandemic, there could be "an additional 500,000 deaths from HIV/TB related illnesses in sub-Saharan Africa."(15,16) This is a clarion call for all stakeholders in

Nigeria to rise in support of diagnostic facilities and processes in Nigeria.

Limitation

This study was conducted in Abuja and was limited to laboratory professionals. Further studies are needed to compare regional impacts of COVID-19 on diagnosis of TB/HIV. However, the findings of this study are good representatives of the country since it was conducted in the countries Federal Capital Territory.

CONCLUSION

This study was conducted to determine the public health impact of COVID-19 pandemic on HIV/TB diagnosis in Abuja, Nigeria. The findings of the study showed that the facility staff were highly aware of COVID-19 and its symptoms. The participants showed good attitudes towards COVID-19 infection and accepted that they were at high risk of COVID-19 infection. The respondents agreed that they have been adequately trained in safety and preventive measures. They also stated that their facilities have adequate infection prevention control policies. Yet, COVID-19 has negatively affected human resources and processes in their diagnostic laboratories which have resulted in job layoffs and reduced outputs. Most laboratories have been unable to continue with HIV/TB diagnosis and the number of weekly patient visits has significantly reduced. Besides, the COVID-19 crisis has caused a lack of proper collection of laboratory materials, delay in the receipt of specimens or isolates, and turnaround time for HIV/TB diagnosis in the laboratories. This study also revealed that the COVID-19 crisis has adversely affected health supply chain system. This showed in the inadequate and untimely supply of PPEs. Besides, no adequate training was given to the laboratory professionals on PPEs.

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