

## Prevalence of Lassa fever and Yellow fever during COVID-19 in 2020 in a tertiary health facility located in a rural south-south Nigeria

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### Abstract

**Introduction:** Lassa fever outbreaks has continuously occurred annually and currently declared endemic in Nigeria. Yellow fever remains a public health emergency since there is no definitive treatment but only symptomatic management. COVID-19 outbreak in 2020 became one of the deadliest pandemics the world has experienced in decades. Due to the synergistic epidemic of COVID-19 and other infectious diseases such as Lassa fever and Yellow fever, Nigeria faces a potential public health crisis.

**Objective:** To determine the prevalence of Lassa fever, COVID-19 and Yellow fever among all admitted patients in a tertiary health facility between January to December 2020.

**Methods:** Out of a total of 12,748 patients admitted in the health facility in 2020, all accessible case notes of those diagnosed of Lassa fever, COVID-19 and Yellow fever between January and December 2020 were retrieved and their socio-demographic variables were then recorded on a spreadsheet. Data were entered and analyzed using Statistical Package for Scientific Solution (SPSS version 23) using descriptive and inferential statistics.

**Results:** 614 had Lassa fever, 177 had COVID-19 and none had Yellow fever giving a prevalence rate of 3.26%, 1.39% and 0% respectively. The prevalence rate in the first, second, third and fourth quarter of the year for Lassa fever were 2.69%, 0.22% and 0.29% respectively while the prevalence rate in the first, second, third and fourth quarter for COVID -19 were 0%, 0.66% and 0.13% respectively. The prevalence of Lassa fever dropped drastically during the outbreak of COVID-19 from the 2<sup>nd</sup> quarter up to end of 3<sup>rd</sup> quarter of 2020 but started to rise again in the fourth quarter when cases of COVID-19 started declining.

**Conclusion:** The prevalence of Lassa fever was high in the first quarter of 2020 but decreased during the outbreak of COVID-19 when no Yellow fever cases were reported.

**Keywords:** COVID-19, Lassa fever, Patients, Prevalence, Yellow fever.

### Introduction

Lassa fever virus and yellow fever viruses belong to the Arenaviridae and Flaviviridae genera, respectively [1]. They also share similar zoological features and are often known as emerging tropical-viral diseases. Their negative impact on public health is partly due to their high virulence and human-to-human transmission (Lassa fever) and vector-to-human transmission (Yellow fever). The two viruses Lassa Fever and Yellow Fever also share common pathogenesis in terms of their primary cell targets being myeloid cells and in terms of the organs that are affected [1]. However, the type of immune responses that are induced by Lassa Fever and Yellow Fever infection

and their roles in protection or pathogenesis differ significantly. These differences may play a role in understanding disease, and the differences in disease epidemiological trends during the pandemic period. Comprehensive understanding of innate immunity to these zoonotic viruses may guide the development of effective medications that will boost human protective immune responses [2]. Lassa fever and yellow fever belong to the group of viral haemorrhagic fevers (VHFs) which causes severe haemorrhagic fever in humans.

The World Health Organization (WHO) declared the corona virus disease 2019 (COVID-19) infection a global pandemic on the month of March 2020. It has become one of the deadliest pandemics the world has

experienced in decades. SARS-CoV-2, a virus that causes COVID-19, was first detected in Wuhan, China, in December 2019 [2]. Nigeria faces a potential public health crisis due to the synergistic epidemic of COVID-19 and other infectious diseases such as yellow fever and Lassa fever infections. From early 2020, the morbidity and mortality rates of COVID-19 increased in Nigeria [3]. Simultaneously, Nigeria has recorded a high number of yellow fever and Lassa fever cases, with mosquitoes (*Aedes aegypti*) and rodents (multimammate rat) as vectors, respectively [3]. Infections with COVID-19, yellow fever and Lassa fever symptoms are challenging to differentiate particularly at the early stage due to similarities with their clinical signs.

Nigeria battles various communicable diseases annually, some of which are vaccine-preventable. Cases of Lassa fever have been rising rapidly over the past few years, with each year's outbreak surpassing the last, but with the outbreak of COVID-19 in 2020, it took a different dimension. Infecting over 100,000 people in Nigeria and killing over 1,300 since it began spreading about a year ago in Africa's most populous nation, the COVID-19 pandemic turned the clock back by years in the fight against other infectious diseases [4]. It has interrupted research, trials and other efforts to ease the public health burden. Nigeria, in 2020, had an unprecedented spate of deaths from some infectious diseases as more focus was channeled towards tackling coronavirus. Aside COVID-19, suspected cases of Yellow fever and Lassa fever claimed nearly 500 people across the country [4].

Additionally, co-infections with arboviruses or flaviviruses are not thoroughly studied in Nigeria. The country's resource-limited healthcare system faces the risk of becoming overwhelmed with multiple socio-economic crises. A limited number of virology labs and expert virologists make it difficult to respond timely to infectious disease outbreaks and to prevent infection spread. This will likely increase the morbidity and mortality due to Lassa fever, COVID-19 and Yellow fever.

The objective of this study was to determine the prevalence of COVID-19, Lassa fever and Yellow fever among patients admitted to a tertiary health facility in Edo State from January to December 2020.

## Methods

In this retrospective study, all case files of 12,748 admitted patients at Irrua Specialist Hospital, Irrua, Edo State from January to December 2020 were evaluated on a month by month basis. The case files for those with the diagnosis of Lassa fever, COVID-19 and Yellow fever were all retrieved. Excluded were those without definite diagnosis. Socio-demographic variables of these patients and the type of diagnosis were recorded on a spreadsheet. A total of 416 case files were retrieved of those with Lassa fever and 177

case files were retrieved for COVID-19 but none for Yellow fever.

Data were coded and entered into the Statistical Package for Scientific Solution (SPSS version 23) spreadsheet. After double check to ensure accuracy, the data were analysed using descriptive and inferential statistics. Prevalence of Lassa fever, COVID-19 and Yellow fever was gotten by dividing the total number of patients diagnosed with Lassa fever (416) and COVID-19 (177) by total population of all admitted patients (12,748) within the year 2020. The number of such cases for each quarter of the year was summed up and divided by the total population of patients admitted for the year (12748) to get the prevalence of Lassa fever, COVID-19 and yellow fever for the first, second, third and fourth quarter of the year 2020 respectively. Level of statistical confidence was set at 95% with a p-value of 0.05. T. National guideline for Lassa fever case management [5] defined probable case, suspected case and confirmed cases of Lassa fever. A suspected case is patient with fever for 3-21 days with a measured temperature of 38°C or more with one or more of the following: vomiting, diarrhea, sore throat, myalgia (muscle pain), generalized body weakness, abnormal bleeding, abdominal pain. A probable case is a suspected case who has one or more of the following: hearing loss, facial or neck swelling, seizure, restlessness, confusion, hypotension, oliguria, abnormal bleeding and any of the following supporting laboratory features: proteinuria and or microscopic hematuria, elevated urea  $\geq 45\text{mg/dl}$  or creatinine  $\geq 2\text{mg}$ , elevated transaminases, reduced platelets counts  $< 90,000$  cells/ $\text{ml}^3$

The permission to carry out this study was obtained from the Department of Community Health of Ambrose Alli University and Ethical approval was sort and obtained from the Irrua Specialist Teaching Hospital Research Ethics Committee. Data was securely stored in a folder and protected on password in a personal Computer for safety.

## Results

Most of the patients were in the age groups 21-30 (14.66%), 31-40 (20.91%), 41-50 (12.98%), 51-60 (12.98%) and 61-70 (12.26%) giving age group 21-70 a majority of 73.79%. There was no significant difference between the number of males and females 50.2 and 49.8 respectively. More of the patients (56.73%) were married and most of them were Christians (89.66%) and Esan (78.85%) by tribe (Table 1).

About half of the COVID-19 patients (49.15%) were more than 61 year of age and more were married (56.84%) than single (37.62%) (Table 2).

Total number of all patients admitted during the period of January to December 2020 was 12,748. The total number of cases of Lassa fever, COVID-19 and Yellow

fever in 2020 were 416, 177 and 0 respectively giving a prevalence rate of 3.26%, 1.39% and 0% respectively (Table 3).

**Table 1:** Socio-demographic characteristics of patients with Lassa fever

Variables	Frequency (n= 416)	Percent
<b>Age (years)</b>		
0-10	42	10.10
11-20	37	8.89
21-30	61	14.66
31-40	87	20.91
41-50	54	12.98
51-60	54	12.98
61-70	51	12.26
71-80	24	5.77
>80	6	1.44
<b>Sex</b>		
Male	209	50.24
Female	207	49.76
<b>Marital status</b>		
Single	157	37.74
Married	236	56.73
Widow	23	5.53
<b>Religion</b>		
Christianity	373	89.66
Islam	43	10.34
<b>Ethnicity</b>		
Esan	328	78.85
Igbo	46	11.06
Etsako	23	5.53
Yoruba	8	1.92
Hausa	7	1.68
Tiv	4	0.96

**Table 2:** Socio-demographic characteristics of patients with COVID-19

Variables	Frequency (n= 177)	Percent
<b>Age (years)</b>		
21-30	4	2.26
31-40	4	2.26
41-50	26	14.69
51-60	56	31.64
≥61	87	49.15
<b>Sex</b>		
Male	94	50.16
Female	83	49.84
<b>Marital status</b>		
Single	11	37.62
Married	154	56.84
Widow	12	5.54
<b>Religion</b>		
Christianity	147	83.05
Islam	30	16.95
<b>Ethnicity</b>		
Esan	74	41.81
Igbo	46	25.99
Etsako	41	23.16
Yoruba	11	6.21
Hausa	5	2.83

**Table 3:** Cases of Lassa fever, COVID-19 and yellow fever in 2020

Months*	Total cases of Lassa fever	Total cases of COVID-19	Total cases of Yellow fever	Total
January	120	0	0	120
February	163	0	0	163
March	60	0	0	60
April	12	9	0	21
May	11	21	0	32
June	5	54	0	59
July	2	71	0	73
August	0	2	0	2
September	6	3	0	9
October	10	2	0	12
November	11	3	0	14
December	16	12	0	28
Total	<b>416</b>	<b>177</b>	<b>0</b>	<b>593</b>

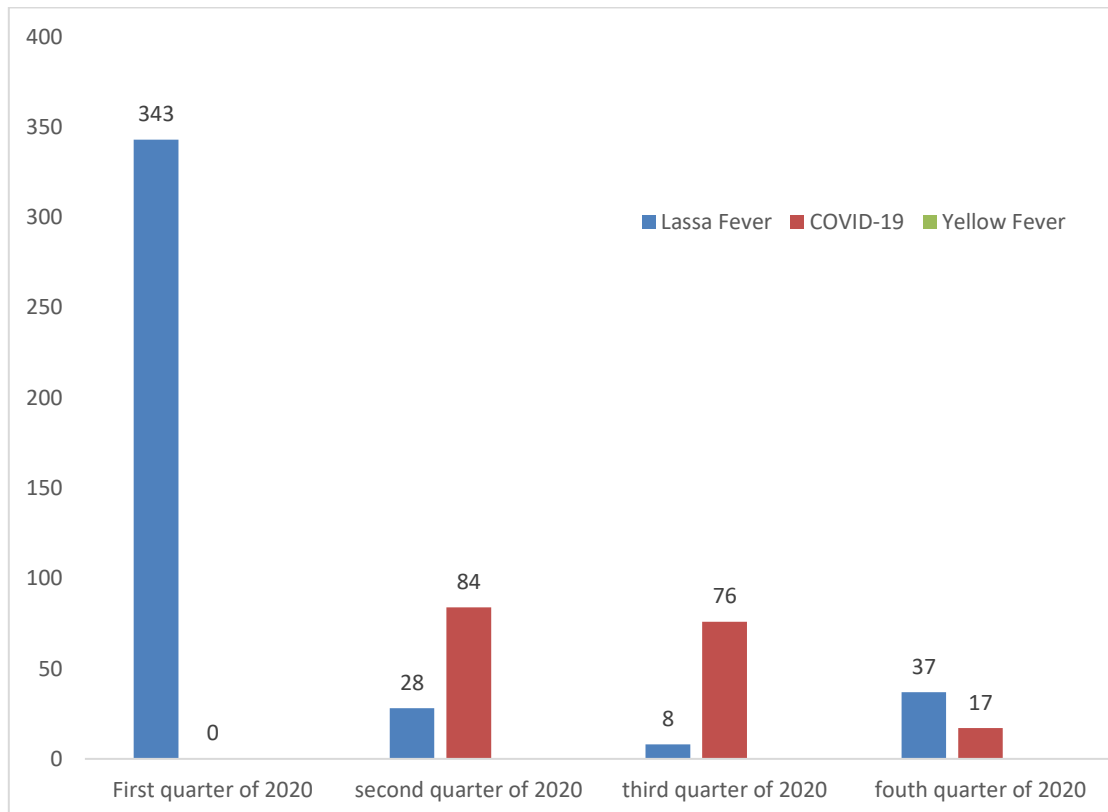
The number of cases of Lassa fever reduced during the outbreak of COVID-19 but started rising again when the prevalence of COVID-19 started declining as shown in first quarter with high cases of Lassa fever but reduced in second quarter and third quarter when COVID-19 cases were high but started to climb again when the cases of COVID-19 declined (Figure 1).

The prevalence of Lassa fever, Yellow fever and COVID-19 in the first, second, third and fourth quarter of 2020 were: 2.69%, 0%, 0%; 0.22%, 0.6%, 0%; 0.06%, 0.6%, 0% and 0.29%, 0.13%, 0% respectively. The prevalence of Lassa fever dropped drastically during the outbreak of COVID-19 but started to rise again in the fourth quarter when cases of COVID-19 started declining.

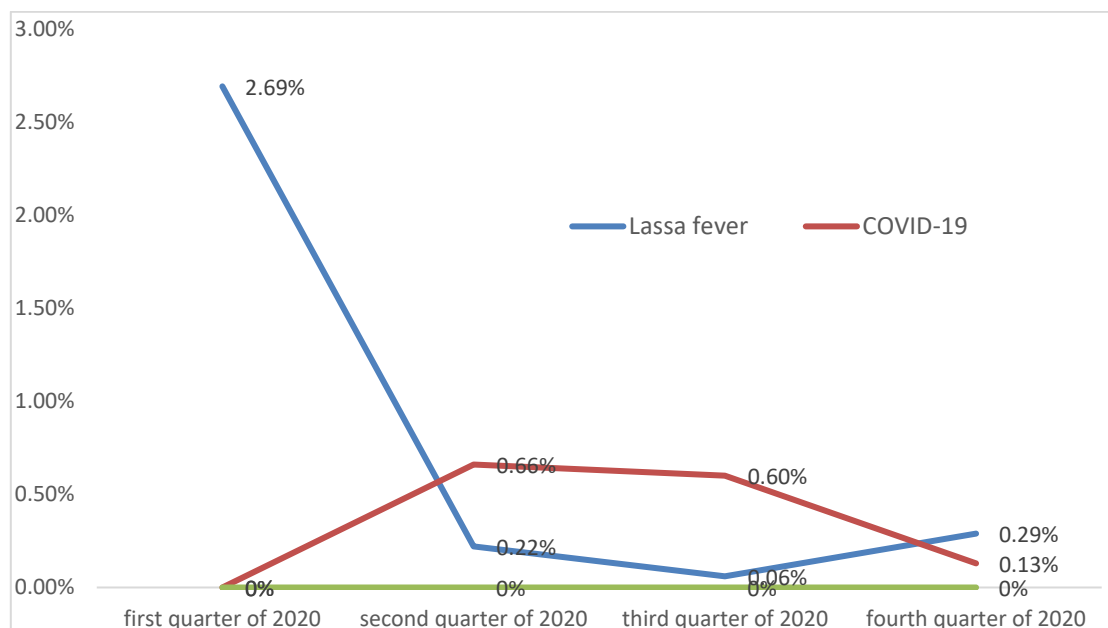
## Discussion

Findings from this study shows that the prevalence of Lassa fever, COVID-19 and yellow fever among the 12,748 admitted patients in the year 2020 were 3.26%, 1.39% and 0% respectively with more cases of Lassa fever occurring in the month of February. The prevalence of Lassa fever was high (2.69%) in the first quarter when compared to other periods of the year but this reduced drastically during the outbreak of COVID-19 from the second (0.22%) to the end of the third quarter (0.06%) of 2020. The prevalence of Lassa fever started to rise again (0.29%) when COVID-19 cases declined.

The finding of high prevalence of Lassa fever in the first quarter of 2020 is similar to a retrospective study carried out on the occurrence of Lassa fever infections and control efforts in Nigeria [3]. The study found that, of the total number of 17,777 suspected cases, 2959 cases were confirmed positive for Lassa fever by a laboratory test, while 781 deaths were recorded. Also, an annual distribution of Lassa Fever showed significant increase in number of cases in 2018, 2019 and 2020 with confirmed cases at 633 (18%), 833



**Figure 1:** No of cases of Lassa fever, COVID-19 and Yellow fever per quarter of 2020



**Figure 2:** Prevalence of Lassa fever, COVID-19 and Yellow fever per quarter of 2020

(16%) and 1189 (17%) respectively.[3] This is also in tandem with another study where it was stated that over 1189 confirmed cases and 244 fatalities of Lassa fever were reported in 2020 which was a considerable rise from previous year with fewer cases recorded in 2021.[6] A high prevalence of Lassa fever points to poor knowledge about Lassa fever and its prevention, poor housing conditions, activities like bush burning which causes displacement of rodents from bushes into households, poor hygiene or even traditional

practices of rodent consumption. More awareness needs to be created on methods to prevent this disease like keeping foodstuff in rodent-proof containers, using doors that locks properly without holes for passage of rats into homes, having rodent Traps in the house to reduce their number and keeping one's surroundings clean to prevent attractants. The cycle of poverty, ignorance and disease is evident among majority of victims of this disease of Lassa fever which is commoner among the poor with poor

hygiene and poor living conditions where homes are laced with rats and rat droppings.

More so, the finding of 1.39% as prevalence of COVID-19 is in tandem with a systematic review and meta-analysis carried out in 2021 which shows that the seroprevalence of COVID-19 in the general population varied from 0.37% to 22.1% with pooled estimate of 3.38%. On regional level, seroprevalence varied from 1.45% in South America to 5.27% in North America. [7] This is in contrast with a retrospective cohort study on prevalence and clinical characteristics of Coronavirus Disease 2019 seen at a Testing Centre in Lagos Nigeria. A total number of 481 clients were evaluated in that review. The prevalence of SARS-CoV-2 infection in the population was 14.6% which was quite high.[8] The high prevalence of COVID-19 in 2020 was a result of COVID-19 pandemic in which Nigeria was also affected in 2020 but the prevalence of SARS-CoV-2 in Nigeria was quite low when compared to the cases found in developed world.[9]

In addition, for yellow fever, of the 12748 patients admitted into the Hospital, there were no recorded cases of yellow fever. This indicated that none of the studied patients were positive for yellow fever virus in the year 2020. This is similar to the study on prevalence of yellow fever virus among Lassa fever PCR-NEGATIVE febrile patients in Nigeria. The results revealed that none of the studied samples were positive for the Yellow fever virus. The study concluded that there was no evidence of yellow fever transmission among the population in Owo, Nigeria. [10]. Contrary to a study which showed increase in circulation of yellow fever virus looking at a retrospective cross-sectional study to examine the resurgence of yellow fever cases and outbreaks from 2023-2020 in Oyo State, Nigeria. [11]

In addition, findings from this study showed that the number of cases of Lassa fever reduced during the outbreak of COVID-19 but started to rise again when the prevalence of COVID-19 started declining. A study carried out in 2020 collaborated this finding which stated that the possible determinants behind the decreased number of Lassa fever in Nigeria, which was likely due to synergistic impact of COVID-19 pandemic.[12] This is similar to another study which stated that Lassa fever coexisting with COVID-19 pandemic, cases of Lassa fever in African population have been reported to decrease.[13]The reason for the decrease of cases of Lassa fever during the outbreak of COVID-19 could be the result of the stringent infection prevention regulations including hand washing, distancing and personal protective equipment use such as face mask during the outbreak of COVID-19. This resulted in the prevention measures of many infectious diseases including yellow fever, Lassa fever and COVID-19.

## Conclusion

The prevalence of Lassa fever dropped significantly between the 2<sup>nd</sup> quarter and end of third quarter when the prevalence of COVID-19 was high but begin to rise again in the fourth quarter when the prevalence of COVID-19 started declining. The decline in the prevalence of Lassa fever during the outbreak of COVID-19 could be the result of the stringent measures put in place to reduce the transmission of COVID-19 which helped curtail all infectious diseases.

## List of abbreviations

COVID-19 – corona virus disease 2019

VHFs – viral haemorrhagic fevers.

## Declarations

### Ethical approval

None provided.

### Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Competing interests

No conflict of interest associated with this work.

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### Contribution of Authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

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