



ORIGINAL ARTICLE

A Four-year Retrospective Review of Buruli Ulcer Disease in Delta State, Nigeria.

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Keywords

Buruli Ulcer;

*Mycobacterium
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ABSTRACT

Background: Buruli Ulcer (BU) is a debilitating necrotic cutaneous infection, scattered across the universe, but has received less attention when compared with other infectious diseases. It is endemic in some Nigeria states including Delta State, but there is a dearth of published data on BU in Delta State. This knowledge gap necessitated this study, which aimed to ascertain the pattern, distribution and clinical characteristics of BU cases in Delta State, Nigeria.

Methods: This study is a four-year retrospective review from 2018 – 2021. A proforma was designed to retrieve all records of suspected and confirmed cases of BU in the Delta State BU registry from 2018 – 2021. Data obtained were entered and analysed using SPSS version 23.0.

Results: Among the 163 suspected BU cases retrieved from the register, 52 (32%) were confirmed positive using the Polymerase Chain Reaction (PCR) technique. The confirmed cases were distributed in 16 (64%) of the 25 Local Government Areas (LGAs) in the state. There was a marked decline in the number of cases from 2018 to 2020 and a slight increase in 2021. Nearly all confirmed cases (98.1%) presented as ulcers and were mainly located in the lower limbs (80.8%). The lesions were mostly the category III type (63.5%), while 90.4% of those affected had limitations of movement in the affected area.

Conclusion: BU is present in Delta State of Nigeria, with the majority of cases presenting to health facilities late. Thus, active surveillance activities by BU control agencies to enhance early case detection is recommended.

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INTRODUCTION

Buruli Ulcer (BU) is a neglected tropical disease caused by *Mycobacterium Ulcerans* affecting mostly the skin and soft tissues.^{1,2,3} In rare cases, it may involve the bone.^{4,5,6} BU usually progresses slowly, from several weeks as a painless nodule or papule, to a large plaque or oedema, into a painless ulcer with undermined edges of the affected skin.⁷ The lesions are often found on the limbs and are twice as common on the lower limbs than on the upper limbs. Although the case fatality of BU is low, the disease is associated with substantial damage of cutaneous tissues with complications ranging, from scarring, contractual deformities, and disabilities to amputations.^{1,4,8-9}

The World Health Organization (WHO) classified BU lesions into three categories according to severity.⁹⁻¹⁰ Category I lesions are single small nodules, papules, plaques and ulcers of <5cm in diameter. Category II lesions consist of multiple plaques, ulcers, or oedematous lesions or a single ulcer of 5–15cm diameter. Category III lesions are >15cm or disseminated lesions in the head, neck, face and bones.¹⁰⁻¹³ Categories II and III lesions are particularly prevalent in rural areas, where access to healthcare is limited, and awareness of the disease is low.¹²

BU affects all ages and sexes, but most cases of the disease occur in children between the ages of 4 – 15

years.^{10,14} It has been reported in over 34 countries worldwide between 1960–2016, mainly West Africa, Australia, Southeast Asia, Central and South America, and the Western Pacific.^{1,2,5,15-19} It is recognized as an emerging public health problem by the World Health Organization, leading to the establishment of a Global Buruli Ulcer Initiative by the World Health Organization in early 1998.^{15,20}

More than 53,000 BU cases have been reported worldwide by 20 countries from 2002 – 2016.^{16,19} The number of cases reported to the WHO worldwide annually has been decreasing steadily in countries known to be actively reporting BU; from 5954 cases in 2004 to 1864 cases in 2016 – a reduction of 69%.^{16,19,21} It has been reported that this predominantly reflects reductions in Africa, resulting in declines in most of the countries with high prevalence.^{18,21}

In Nigeria, the BU disease was first described in four patients from Benue State in 1967.²² Since then, till 2015, there have been scanty reports from different states in Southern Nigeria.²³ In 2015, the National Tuberculosis, Leprosy and Buruli Ulcer Control (NTLBUC) programme reported that BU is endemic in various states of Nigeria, especially those lying in the southern belt. Cases have been reported in over 8 states of Nigeria, viz. Adamawa, Benue, Anambra, Akwa Ibom, Cross River, Enugu, Ebonyi, Delta, Ogun and Oyo States.^{8,23-25} However, there is scarce literature regarding cases of BU in Delta State, Southern Nigeria. Thus, this study was carried out to review the pattern, distribution and clinical characteristics of BU cases in Delta State.

METHODOLOGY

Study Area: This study was carried out in Delta State of southern Nigeria. It is an area of tropical rainforest with predominantly mangrove swamps in the south and freshwater swamps in the north. It is generally at near or low altitudes to sea level. It extends over an area of 18,050 km² with a large part (60%) being landmass. It lies between 5°00' - 6°45'E and 5°00' - 6°30'N. It has 25 Local Governments Areas (LGAs) and an estimated population size of 5.6 million people as of 2016.²⁶⁻²⁷ Delta State is basically an oil and natural gas-producing state, with extensive agricultural and mining activities.²⁶⁻²⁷ Studies have suggested that wetlands, communities with increased farming activities close to rivers and swimming in rivers are drivers of BU transmission.²¹

Delta State offers professional healthcare services through 684 government-owned and registered private health facilities across the twenty-five LGAs.²⁸

The government-owned healthcare facilities include 445 Primary Health Care (PHC) centres, 64 secondary health facilities, and 2 tertiary centres. The Eku Tuberculosis, Leprosy, Buruli Ulcer Control Unit is the main hub for the diagnosis and treatment of BU in the state.

Study Design and Study Population: This study is a 4-year retrospective review of all records of suspected and confirmed cases in the Buruli Ulcer registry for the State from 2018 – 2021.

Research Instruments: A proforma was designed to collect information from the Buruli Ulcer registry. The following variables were accessible and extracted from the registry: age, sex, LGA, location of the lesion, category of the lesion, limitation of movement of the affected limb, Ziehl-Neelsen (ZN) stain of smear diagnosis results and Polymerase Chain Reaction (PCR) diagnosis result.

Data Analysis: Data obtained were entered and analysed using IBM SPSS version 23.0. Descriptive statistics (frequency and percentage) were used to present information on cases of Buruli Ulcer, clinical characteristics, and distribution of the disease in the state. The chi-square test was used to ascertain the association between age, sex and BU cases. $p < 0.05$ was considered statistically significant.

Ethical Clearance: Ethical clearance was obtained from the Health Research and Ethics Committee of Delta State University Teaching Hospital (DELSUTH) Oghara for the conduct of the study. Permission to obtain data from the Buruli Ulcer registry for Delta State was obtained from the BU focal person for Delta State.

RESULTS

Number of Cases of Buruli Ulcer in Delta State

A total of 163 suspected cases were reported and retrieved from the BU case registry for Delta State. Among the 163 suspected cases, 52 (32%) tested positive on PCR, while 111 (68%) tested negative. Seven (13.5%) of the suspected case samples were positive both on Ziehl-Neelsen stained and Polymerase Chain Reaction.

Figure 1 shows the trend of Buruli Ulcer cases for the period of the study. There was a sharp decrease in the number of Buruli Ulcer patients from 2018 to 2020. However, the number of cases increased slightly from 2020 to 2021.

Distribution of Buruli Ulcer Cases in Delta State

Table 1 shows that of the 52 confirmed cases of BU, 26 (50%) were male and female. There was no statistically significant association between sex and BU disease. The highest number of cases (n=15) was seen in the age group 15 – 19, while the least number of cases (7) was seen in the age group of 0 – 14 years. However, there was no statistically significant association between age and BU disease (Table 1).

Figure 2 shows the distribution of BU across the 25 Local Government Areas (LGA) of Delta State. BU has been detected in 16 LGAs across the 3 senatorial districts of Delta State. In Delta South, it was seen in, Patani, Burutu, Isoko North, Isoko South, and Warri South. In Delta North senatorial district, the disease was reported in Ukwuani, Ndokwa West and Oshimili North LGA. In Delta Central Senatorial District, the disease is prevalent Ughelli South, Ughelli North in Ethiope East, Ethiope West, Udu, Okpe, Sapele and Uvwie LGAs. The disease has been detected more in Ughelli North LGA, Patani, Ethiope East and Ughelli South LGA. Based on the senatorial districts, the disease is clustered more in Delta Central Senatorial District.

Clinical Characteristics of BU Disease in Delta State

Among the 52 positive cases, 51 (98.1%) lesions were presented as ulcerate lesions, while 1 (1.9%) presented as oedema. Most of the lesions, 18 (34.6%) were located in the right leg, and 17 (32.7%) were located in the left leg. WHO classification of BU was used to classify lesions documented in the registry. The majority of the lesions, 33 (63.5%), were Category III, 13 (25%) were Category II and 6 (11.5%) were Category I. About 47 (90.4%) had a limitation of movement in the affected area, while 5 (9.6%) had no limitation in the affected area.

DISCUSSION

Our study identified 52 confirmed cases of Buruli Ulcer within (2018 – 2021) a 4-year study period. This is higher than the 27 BU confirmed cases in Ogun State between (2009 – 2012) a 4-year study period.²⁹ There are various findings from several studies. For instance, reports that 127 Nigerians with confirmed cases of BU received treatment in the BU medical centre of Pobè, in Benin Republic from 2005 – 2013 (8 years review).³⁰ Also 157 confirmed cases following an active search for BU suspected cases were reported from 5 states (Ekiti, Lagos, Ondo, Osun and Ogun) in Southwest Nigeria.³¹ A study in Ogoja communities in Cross river state and Oguta LGA of Imo State reported 36 confirmed cases on PCR of the 42 clinical BU cases

and 71 confirmed cases of the 356 subjects studied respectively.^{25,32} It was also highlighted that in endemic communities of Nigeria, the number of BU cases is grossly underestimated, hence the need for continuous surveillance.²⁵

We found an equal distribution of the disease among males and females. Most previous research also found that the disease has no sex preference.^{16,31,33} Young people, the middle-aged and elderly, were more affected than children in our study. This was similar to the report of the study conducted in the 5 states in Southwest Nigeria and another study conducted in 4 states (Anambra, Cross River, Imo, Ogun) in South Nigeria.^{24,31} Other studies found more cases of the disease among children under 15 years of age.^{10,14,16,34.}

In this study, BU disease was confirmed in 16 LGAs across the three senatorial districts of Delta State. Most cases of the disease reported are clustered in Delta Central Senatorial district of Delta state, followed by Delta South senatorial district, and the least number of cases reported from Delta North Senatorial district. The reason for the density of cases in Delta Central and Delta South senatorial districts could be attributed to the fact that both senatorial districts are characterized by large water bodies, such as the Ethiope River, the Escravos River and Forcados River, and other tributaries of river Niger. Proximity to water bodies is well recognized to increase susceptibility to the disease, particularly in Africa as the disease is correlated to water bodies.^{1-2,35} The causative organism, *M. Ulcerans* is seen at the bottom of aquatic bodies or protected by biofilms.³⁶

The highest burden of BU disease was seen in 2018, which decreased in 2019 and 2020; however, a slight increase was observed in 2021. The sharp decrease in 2020 could be attributed to the limited number of surveillance activities that were carried out in 2020 due to the COVID-19 pandemic, which brought a temporary halt to surveillance activities, where all resources were deployed to tackle the pandemic as compared to surveillance activities carried out in 2018 and 2019, while the increase observed in the year 2021, could be attributed to increasing surveillance activities being carried out.

Almost all of the patients in the Delta State BU registry presented ulcerative lesions. This is quite high compared to the findings from a national study in Ghana, in which approximately half of the cases presented with ulcers.¹⁵ In the BU study conducted in the medical centre of Pobè, in the Benin Republic, and the study conducted in 4 states (Anambra, Cross River, Imo, Ogun) in southern Nigeria, approximately four-fifths of the Nigerians presented with ulcers.^{24,30}

More than three-quarters of BU patients had ulcerative lesions in the study conducted at Oguja and of the 82 patients studied in Benin Republic.^{13,25}

In this study, 67% of the patients had lesions located on the lower limbs. This finding is similar to the reports obtained in a national study in Ghana and five western states in Nigeria.^{13,15,31} In the study conducted at BU medical centre of Pobè and the study at Ogoja, more than half of BU lesions were located in the lower limbs.^{25,30} This pattern has been explained in the literature, that clothing protects the trunks against contact with *Mycobacterium Ulcerans*, hence BU's preponderance in exposed parts of the body.^{31,38-39}

As commonly reported, most individuals with BU lesions present in the advanced stages of the disease and diagnosis is often made late. Slightly above three-fifths of the BU lesions documented in the Delta State Buruli Ulcer registry were of category III. This finding is in line with the study conducted at BU medical centre of Pobè, in Benin Republic and the study conducted in 4 states (Anambra, Cross River, Imo, Ogun) of southern Nigeria.^{24,30} The study conducted among 82 patients in the Republic of Benin reported four-fifths of BU patients had category III lesions.¹³ In the Pobè study, about 96% of the 1227 cases had category III lesions.³⁴ Category III lesion is regarded as lesions > 15 cm in diameter or could be multiple in any part of the body.¹⁰⁻¹³ This finding shows that most cases of the disease are diagnosed late, signifying that there is a low rate of early diagnosis of BU in most cases of the disease.

This falls short of WHO recommendations that BU-endemic countries should institute community actions to reduce the proportion of ulcerative cases to < 60% and Category III cases to < 30%.³⁹ According to previous studies, reasons often advanced for the late presentation of BU cases observed among Nigerians include delay before consultation, limited access to health facilities, stigmatization and traditional beliefs, prompting them to seek treatment with traditional healers.^{13,16,30} Late diagnosis of BU reduces the chances of medical treatment without surgical excision and skin grafting. Early stages of BU can be treated with antibiotic medications such as streptomycin, amikacin and rifampicin.^{7,12,38}

Severe cases of BU can result in limitation of movement in the limb affected. In this study, almost all the cases had limitations of movement in the affected area, which could have been due to late presentation. In the Ogoja study, more than half of BU cases had limitations of movement in the affected limb.²⁵ In the study conducted among 82 cases in the Republic of Benin, more than one-quarter of BU patients had

movement limitations.¹³ This finding is also a pointer to the fact that most cases presented in the state are presented late either due to low surveillance activities or inaction on the aspects of the clients.

In this study, seven cases were confirmed positive by both Ziehl-Neelsen staining and Polymerase Chain Reaction. It was also reported in a study that out of three BU-confirmed cases following an active search, one was confirmed by both Ziehl-Neelsen staining and Polymerase Chain Reaction.¹⁸

CONCLUSION

Buruli Ulcer is present in Delta State of Nigeria, with the majority presenting to health facilities late. Thus, it is recommended that an active search of cases in the communities and future community surveys in the state be carried out periodically.

LIMITATION OF STUDY

The season of occurrence of BU couldn't be retrieved.

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CONFLICTS OF INTEREST

We declare that we have no known financial/competing interests or personal relationships that could have appeared to influence the work reported in this paper.

AUTHORS CONTRIBUTION: Ejiroghene Clitt Ucho, and OCHEI Oboratare, contributed to the concept paper, the proposal, the literature search, the design, data analysis, interpretation and writing of the subsequent drafts of the paper.

TABLES AND FIGURES

Table 1: Age and Sex Distribution of Buruli Ulcer in Delta State

Variable	Test Results on PCR		χ^2 ; p-value
	Positive n, (%)	Negative n, (%)	
Sex			
Male	26 (30.2)	60 (69.8)	0.234; 0.63
Female	26 (33.8)	51 (66.2)	
Age groups			
0 – 14	7 (41.2)	10 (58.8)	3.061; 0.54
15 – 29	15 (32.6)	31 (67.4)	
30 – 44	10 (28.3)	31 (71.7)	
45 – 59	11 (27.8)	27 (72.2)	
>60	9 (38.9)	12 (61.1)	

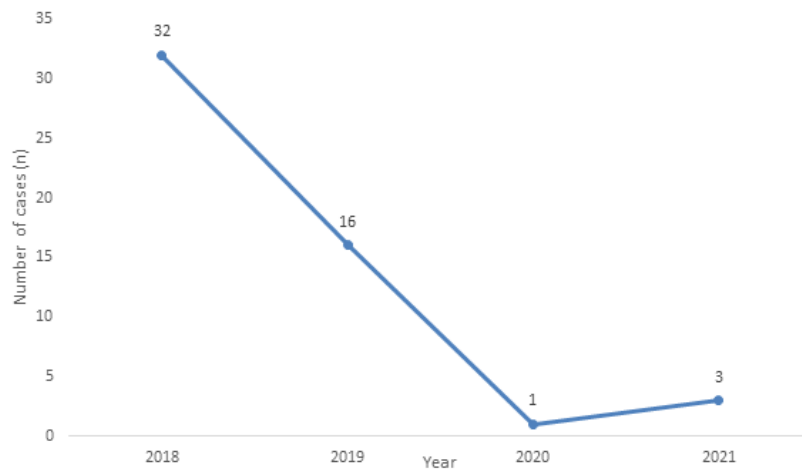


Figure 1: Number of Buruli ulcer patients with year

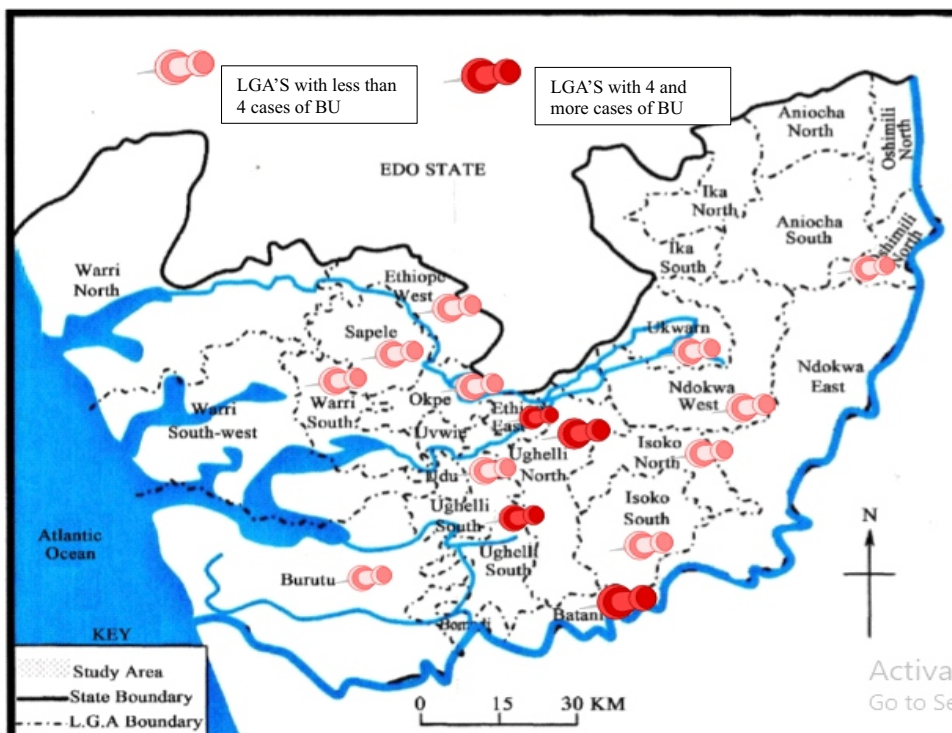


Figure 2: Distribution of BU cases across the LGAs of Delta State

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