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Health-Seeking Behaviour of Buruli Ulcer Patients in Rural Areas with Water Bodies in Rivers State

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Abstract

Buruli ulcer (BU) remains a neglected tropical disease that disproportionately affects populations living in rural communities with frequent exposure to aquatic environments. Despite its debilitating physical, social, and economic consequences, evidence on the health-seeking behaviour of affected individuals remains limited in many endemic areas of Nigeria. This study assessed the health-seeking behaviour of Buruli ulcer patients in rural communities with water bodies in Rivers State, Nigeria, and identified factors associated with poor health-seeking behaviour. The study employed a community-based cross-sectional design among residents of selected rural Local Government Areas with water bodies. A multistage sampling technique was used to select 405 participants, and data were collected using a structured questionnaire adapted from World Health Organization (WHO) Buruli ulcer assessment tools and the WHO Quality of Life (WHOQOL-BREF) instrument. Data were analysed using descriptive statistics and modified Poisson regression, with adjusted prevalence ratios (APR) and 95% confidence intervals (CI) used to identify factors associated with poor health-seeking behaviour. The mean age of the respondents was 38.74 ± 17.20 years. Most respondents were currently unmarried (70.86%), had secondary education (47.04%), lived in households with seven or more members (54.07%), and resided in inland communities (62.47%). Overall, 96.6% of respondents demonstrated poor health-seeking behaviour, while only 3.4% exhibited good health-seeking behaviour. Respondents who were unsure of the distance to their water source were significantly more likely to have poor health-seeking behaviour compared with those living 100–500 m from their water source (APR = 1.16; 95% CI: 1.01–1.34; p = 0.04). Furthermore, respondents who practiced Christianity were significantly less likely to have Buruli ulcer than those practicing Islam (AOR = 0.21; 95% CI: 0.09–0.49; p < 0.001), while civil servants were less likely to have Buruli ulcer than students (AOR = 0.32; 95% CI: 0.10–1.00; p = 0.05). Conversely, respondents with fair knowledge were more likely to have Buruli ulcer than those with good knowledge (AOR = 4.04; 95% CI: 1.07–15.29; p < 0.05). Residence was significantly associated with poor health-seeking behaviour, as respondents living in riverside or swamp areas were less likely (APR = 0.88; 95% CI: 0.79–0.98, p = 0.02) to demonstrate poor health-seeking behaviour than those living inland. Respondents unsure about the distance to their water source were more likely (APR = 1.16; 95% CI: 1.01–1.34, p = 0.04) to have poor health-seeking behaviour than those living 100–500 m from their water source. Additionally, contact with saltwater bodies was associated with an increased likelihood of poor health-seeking behaviour (APR = 1.07; 95% CI: 1.00–1.14, p = 0.05). The study demonstrates that poor health-seeking behaviour remains widespread among Buruli ulcer patients in rural communities of Rivers State, with delayed presentation and reliance on non-formal treatment pathways contributing to the burden of the disease. Strengthening community awareness, improving access to affordable healthcare services, and addressing financial and geographical barriers to care are essential for promoting early diagnosis and treatment of Buruli ulcer in endemic communities.

Keywords: Buruli ulcer, Health-seeking behaviour, Nigeria, Rivers State, Rural communities, Water bodies.

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INTRODUCTION

Buruli ulcer (BU) is a neglected tropical disease caused by *Mycobacterium ulcerans*, an environmental mycobacterium that produces a potent toxin known as mycolactone (WHO., 2022). The disease primarily affects the skin and subcutaneous tissues and is characterized by progressive tissue destruction that may result in extensive ulcers, scarring, deformity, functional impairment, and disability. Buruli ulcer is generally painless in its early stages, which may contribute to delayed recognition and presentation for care. Although the disease is considered uncommon compared with other infectious diseases, it remains an important public health problem in affected communities because of its potential to cause prolonged illness, disability, and social consequences (Guarner, 2018; Yotsu et al., 2018; Yotsu et al., 2025).

Buruli ulcer has been reported in more than 30 countries, with the majority of documented cases occurring in West and Central Africa. The geographical distribution of the disease is not completely understood, partly because of underdiagnosis, inadequate surveillance, and limited access to diagnostic services in remote communities. A systematic review of available evidence identified BU occurrence in 32 countries and indicated that its actual geographical distribution may be wider than currently recognized (Simpson et al., 2019). Similarly, available epidemiological evidence suggests that the number of reported cases does not necessarily reflect the true burden of disease because affected populations are often located in rural and underserved areas where access to health services and disease surveillance is limited (Omansen et al., 2019; Röltgen et al, 2019; Yotsu et al., 2025).

Africa bears the greatest reported burden of Buruli ulcer, with cases concentrated particularly in countries such as Côte d'Ivoire, Ghana, Benin, and Cameroon (WHP, 2022). The disease also occurs in Nigeria, although available evidence suggests that its magnitude may be underestimated. In a pilot case study conducted in three rural districts of Nigeria, Ukwaja et al. (2016) demonstrated the occurrence of BU and highlighted the need for improved disease surveillance and case detection. The existence of BU in rural Nigerian communities is particularly important because limited awareness, geographical barriers, and restricted access to specialized services may hinder early diagnosis and treatment.

The ecological characteristics of affected communities are also relevant to the epidemiology of Buruli ulcer. *Mycobacterium ulcerans* is an environmental pathogen, and BU has repeatedly been associated with aquatic and wetland environments. Studies have reported associations between disease occurrence and rivers, wetlands, swamps, stagnant water, and other aquatic ecosystems, although the precise mechanism by which humans acquire infection remains incompletely understood (Zingue et al., 2018; Williamson et al., 2018). Environmental investigations have also demonstrated the persistence of *M. ulcerans* in water-associated environments, including village water sources used by communities affected by BU (Bratschi et al., 2017). These findings suggest that environmental conditions and patterns of human interaction with aquatic ecosystems may be relevant to the occurrence of the disease.

The relationship between Buruli ulcer and aquatic environments is particularly important for rural populations whose livelihoods involve frequent contact with rivers, wetlands, and other water bodies. Fishing, farming, transportation, domestic activities, and other livelihood practices may require repeated interaction with aquatic environments. Environmental and spatial studies have consequently examined the relationship between landscape characteristics, human activities, and BU occurrence (Campbell et al., 2015; Williamson et

al., 2018). However, although ecological associations are well documented, the exact mode of transmission of *M. ulcerans* to humans remains uncertain. Therefore, frequent contact with water bodies should be regarded as a potential environmental risk context rather than evidence of a confirmed direct transmission pathway (Yotsu et al., 2025).

The clinical consequences of Buruli ulcer can be considerable, particularly when diagnosis and treatment are delayed. Lesions may progress from relatively small nodules or plaques to extensive ulcers involving large areas of the limbs or other parts of the body. Severe disease may result in contractures, restricted movement, permanent scarring, deformity, and other forms of functional impairment. The management of advanced disease may require prolonged wound care, antibiotics, surgery, physiotherapy, and rehabilitation (Frimpong et al., 2016; Yotsu et al., 2018; Yotsu et al., 2025). The consequences therefore extend beyond the immediate clinical manifestations of infection and may affect the social and economic well-being of patients and their households.

Although effective antibiotic treatment is available, timely diagnosis remains a major challenge in Buruli ulcer control. The disease may initially present as a painless lesion, and individuals may not recognize the condition as requiring medical attention. Delays may also occur because of difficulties in obtaining laboratory confirmation and accessing appropriate healthcare services. In Nigeria, Meka et al. (2016) reported substantial delays between disease onset and diagnosis among patients with Buruli ulcer. Their findings indicated that prolonged diagnostic delays were associated with more advanced disease and longer periods of hospitalization, emphasizing the importance of early case detection and access to appropriate services. The need for early diagnosis remains relevant because treatment is more effective when disease is identified before extensive tissue damage occurs (Meka et al., 2016; Yotsu et al., 2025).

Health-seeking behaviour refers to the actions and decisions taken by individuals when they perceive symptoms or a health problem and attempt to obtain care. It includes recognition of symptoms, decisions about whether and when to seek treatment, choice of healthcare provider, and the types of treatment used before or instead of formal healthcare. Health-seeking behaviour is influenced by multiple factors, including knowledge and perceptions of illness, cultural beliefs, socioeconomic circumstances, geographical accessibility, healthcare costs, availability of services, and previous experiences with healthcare providers. These factors are particularly important in neglected tropical diseases, where symptoms may be misunderstood and formal healthcare services may be difficult to access.

In Buruli ulcer-endemic communities, perceptions of the disease may influence decisions about where and when to seek treatment. Community members may interpret skin lesions according to local understandings of illness and may use traditional, herbal, or spiritual forms of treatment before approaching a health facility. Evidence from Nigeria indicates that cultural beliefs, limited knowledge, financial constraints, and structural barriers may influence the management of neglected tropical skin diseases (Ukwaja et al., 2020). Such factors are important because the use of alternative treatment or delayed presentation at a health facility may postpone diagnosis and appropriate antibiotic treatment.

The economic burden associated with Buruli ulcer may further influence healthcare-seeking decisions. Treatment may involve direct costs such as transportation, medicines, wound-care materials, and other healthcare expenses, as well as indirect costs resulting from lost income and time spent seeking or receiving care. In Nigeria, Chukwu et al. (2017) demonstrated that Buruli ulcer can impose a substantial financial burden on affected patients and their

households. Financial difficulties may therefore act as an important barrier to timely healthcare utilization, particularly among rural households with limited economic resources.

Access to healthcare is another important consideration in the management of Buruli ulcer. Many affected communities are located in rural areas where specialized diagnostic and treatment services may be distant from patients' homes. Transportation difficulties, limited availability of trained healthcare workers, inadequate diagnostic capacity, and weak referral systems may delay access to appropriate care. In Nigeria, studies have identified challenges associated with the management of neglected tropical skin diseases, including inadequate awareness, limited diagnostic capacity, insufficient healthcare resources, and difficulties in linking affected individuals with appropriate services (Ukwaja et al., 2020). These challenges may be particularly pronounced in communities located far from urban health facilities.

The problem of delayed healthcare seeking is therefore not solely an individual behavioural issue. It reflects the interaction between individual perceptions, household circumstances, community beliefs, environmental conditions, and the organization and accessibility of health services. For Buruli ulcer, understanding these interacting factors is important because delays can allow lesions to progress and increase the likelihood of disability and prolonged treatment. Improving outcomes consequently requires not only effective clinical treatment but also strategies that promote early recognition, appropriate health-seeking behaviour, timely referral, and accessible services (Meka et al., 2016; Ukwaja et al., 2020; Yotsu et al., 2025).

Rivers State presents an important setting for investigating health-seeking behaviour associated with Buruli ulcer. The state is located in the Niger Delta region of southern Nigeria and is characterized by extensive networks of rivers, creeks, wetlands, mangrove areas, and swampy environments. The state comprises 23 Local Government Areas and has numerous rural communities whose livelihoods are linked to fishing, farming, transportation, and other water-related activities. These geographical and socioeconomic characteristics provide a relevant context for investigating diseases associated with aquatic environments.

The environmental characteristics of Rivers State are particularly relevant to Buruli ulcer because the disease has been associated with aquatic ecosystems in several endemic settings. However, the presence of rivers and wetlands alone does not establish transmission of *M. ulcerans*. Rather, the combination of aquatic environments and frequent human interaction with these environments provides an important context for investigating potential exposure and patterns of disease occurrence (Bratschi et al., 2017; Williamson et al., 2018; Yotsu et al., 2025). This distinction is important because the mechanisms responsible for transmission remain incompletely understood.

Despite evidence of Buruli ulcer in Nigeria, there remains limited information on health-seeking behaviour among affected individuals in rural communities of Rivers State. Previous Nigerian studies have documented the occurrence of BU, diagnostic delays, financial burdens, and barriers to the management of neglected tropical skin diseases (Ukwaja et al., 2016; Meka et al., 2016; Chukwu et al., 2017; Ukwaja et al., 2020). However, these studies were conducted mainly in other parts of southern Nigeria and may not fully capture the circumstances of rural communities in Rivers State. Differences in geographical accessibility, livelihood activities, transportation, cultural practices, interaction with water bodies, and availability of healthcare services may influence how affected individuals recognize symptoms and seek treatment.

Furthermore, evidence from other Buruli ulcer-endemic countries cannot necessarily be assumed to apply directly to rural communities in Rivers State. Studies from Ghana, Benin, Cameroon, and other endemic settings have demonstrated the importance of community knowledge, perceptions, socioeconomic circumstances, healthcare accessibility, and treatment practices in the management of BU (Aujoulat et al., 2023; Tabah et al., 2016; Yotsu et al., 2018). However, local evidence is required to determine which of these factors are most relevant within the Nigerian context and, specifically, within rural communities of Rivers State.

There is therefore a need for context-specific evidence on the pathways through which individuals with Buruli ulcer seek care in rural communities with water bodies in Rivers State. Understanding where patients first seek treatment, how long they wait before accessing formal healthcare, the types of treatment used before presentation, and the factors influencing their choice of healthcare providers can provide useful evidence for strengthening early case detection and referral. Such evidence may also support the design of community-based health education, improved referral mechanisms, and interventions aimed at reducing barriers to appropriate care.

Therefore, this study assessed the health-seeking behaviour of Buruli ulcer patients in rural communities with water bodies in Rivers State, Nigeria. Specifically, the study examined where patients first sought care, the timing of healthcare seeking, the types of treatment used before presentation at a health facility, and the factors influencing their healthcare-seeking decisions. The findings are expected to provide context-specific evidence to support early detection, timely referral, appropriate treatment, and improved access to Buruli ulcer care in rural communities.

MATERIALS AND METHODS

Study Setting And Data Source

This study was conducted in Rivers State, located in the South-South geopolitical zone of Nigeria. Rivers State was created on 27 May 1967 and is situated within the Niger Delta region. It is bounded by the Atlantic Ocean to the south, Imo, Abia, and Anambra States to the north, Akwa Ibom State to the east, and Bayelsa and Delta States to the west. The state capital, Port Harcourt, serves as a major economic and administrative centre and is widely recognized as the hub of Nigeria's oil and gas industry. Rivers State occupies a land area of approximately 10,575 km² and has an estimated population exceeding seven million people.

The state comprises 23 Local Government Areas (LGAs) and is inhabited by several ethnic groups, including the Ikwerre, Ogoni, Ibani, Opobo, Kalabari, Okrika, Ekpeye, and Ogba peoples. The economy of the state is driven largely by petroleum exploration, agriculture, fishing, trading, and other water-related occupations. These activities play a significant role in the livelihoods of rural residents, particularly those living in communities located near rivers, creeks, wetlands, and swampy environments.

Furthermore, Rivers State lies within the tropical humid rainforest zone and is characterized by high annual rainfall, extensive river networks, mangrove swamps, freshwater wetlands, and numerous water bodies. These ecological features create environmental conditions that may favour the persistence and transmission of *Mycobacterium ulcerans*, the causative organism of Buruli ulcer. Frequent human interaction with aquatic environments through

farming, fishing, water transportation, domestic water use, and other livelihood activities may increase exposure to potential sources of infection. Additionally, environmental alterations associated with oil exploration, dredging, excavation, and water pollution may contribute to ecological conditions that support the survival of the organism.

The study specifically focused on ten rural LGAs with significant water bodies and environmental characteristics considered relevant to Buruli ulcer transmission. These LGAs were Abua/Odual, Ahoada East, Ahoada West, Akuku-Toru, Andoni, Gokana, Khana, Ogba/Egbema/Ndoni, Omuma, and Opobo/Nkoro. These areas were selected because of their extensive interaction with rivers, creeks, wetlands, and other aquatic ecosystems, which have been identified in previous studies as important environmental settings associated with Buruli ulcer occurrence. Their ecological characteristics, combined with the dependence of residents on water-related occupations and activities, make them appropriate settings for investigating the burden of Buruli ulcer in Rivers State.

Figure 1: Map of Rivers State showing the 10 rural LGAs where the study was carried out.

Study Population

The study population comprised Buruli ulcer patients residing in the selected rural communities with water bodies in Rivers State. Participants were identified through community-based case finding and/or selected health facilities in the study areas. The study included individuals with clinical features consistent with Buruli ulcer who could provide information about their symptoms, previous treatment, healthcare utilization, and health-seeking experiences.

Participants were included if they were residents of selected rural communities with water bodies in Rivers State and had a clinically diagnosed or laboratory-confirmed Buruli ulcer, in accordance with the study protocol. Participants were also required to be able to provide reliable information about their health-seeking experiences. Only individuals who were willing to participate and provided informed consent were included. For participants below the legal age of consent, assent and parental or guardian consent were obtained where applicable.

Participants were excluded if they were unable to provide reliable information about their symptoms, treatment history, or healthcare-seeking behaviour. Individuals with another diagnosed chronic skin condition that could interfere with the assessment of Buruli ulcer or affect the interpretation of their health-seeking experiences were also excluded. Participants who refused to provide informed consent, or who were unable to provide consent because of their condition or other circumstances, were excluded from the study.

Sample Size Determination

The sample size for this study was determined using Cochran's formula for estimating sample size in large populations:

$$n = \frac{Z^2 \alpha P(1-P)}{d^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where:

where n represents the required sample size, Z is the standard normal deviate at a 95% confidence level (1.96), p is the estimated prevalence (0.5), and d is the margin of error set at 5% (0.05). Substituting these values

$$n = \frac{Z^2 x\, P(1-P)}{d^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

$$= \frac{1.96^2 x\, 0.5(1-0.5)}{0.05^2}\ ^2 = 384.16$$

To account for possible non-response and incomplete questionnaires, a 5% non-response rate was added:

$$n_f = \frac{n}{1-r} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

where

n_f = *adjusted sample size,*

n = *initial sample size (384.16),*

r = *non-response rate (5% = 0.05).*

Therefore, a minimum sample size of 405 respondents was used for the study.

Sampling Technique

A multistage sampling technique was employed to ensure adequate representation of residents from rural communities located around water bodies in Rivers State. In the first stage, ten rural Local Government Areas (LGAs) were selected from eligible LGAs with significant water bodies, namely Abua/Odual, Ahoada East, Ahoada West, Akuku-Toru, Andoni, Gokana, Khana, Ogba/Egbema/Ndoni, Omuma, and Opobo/Nkoro. In the second stage, three wards were randomly selected from each LGA. In the third stage, three communities were selected from each ward using simple random sampling. In the final stage, households within selected communities were sampled systematically by selecting every fifth household from community household listings. Eligible participants who met the study criteria and provided informed consent were recruited into the study.

Method of Data Collection

Data were collected using a structured interviewer-administered questionnaire adapted from the World Health Organization (WHO) Buruli Ulcer assessment tool and the WHO Quality of Life-BREF (WHOQOL-BREF) instrument. The questionnaire was designed to obtain information on the respondents' socio-demographic characteristics, Buruli ulcer status, knowledge and perceptions, environmental and water-related exposures, health-seeking behaviour, treatment received, clinical presentation, disability, and patient-reported outcomes. The questionnaire contained seven main sections. Section 1 assessed socio-demographic and household characteristics using 11 items (D1–D11), including age, sex, marital status, religion, educational level, occupation, household size, type of residence, distance to water source, community, and household income. Section 2 assessed Buruli ulcer status and prevalence using seven items (P1–P7), covering previous diagnosis, current suspicious skin lesions, household and community history of Buruli ulcer, onset of the most recent episode, laboratory sample collection, and outcome of the lesion. Section 3 assessed knowledge and perceptions using 16 items (K1–K16), including knowledge of the cause, transmission, treatment and prevention of Buruli ulcer, sources of information, perceived knowledge, stigma, and attitudes towards people with Buruli ulcer. Section 4 assessed environmental and potential risk factors using 13 items (R1–R13), including sources of water, frequency of contact with natural water bodies, water-related activities, footwear, history of skin injuries, insect bites, BCG vaccination, sanitation, and access to healthcare facilities.

Section 5 assessed care-seeking behaviour, treatment and quality of life using 16 items (C1–C16). Health-seeking behaviour was assessed mainly using C1–C7. C1 assessed the respondent's first action after noticing the lesion, with response options including doing nothing, self-care or home remedies, visiting a traditional healer, visiting a patent medicine vendor, attending a health centre or clinic, attending a hospital, or other actions. C2 assessed the time between noticing the lesion and the first healthcare visit, with response options of less than one week, 1–4 weeks, 1–3 months, and more than 3 months. C3 assessed the main reason for delaying or not seeking care, including cost, distance or transportation, not considering the lesion serious, preference for traditional care, fear or stigma, poor previous experience, and other reasons. C4 assessed the place where Buruli ulcer was diagnosed or treated, while C5 assessed the treatments received, including antibiotics, wound care or dressings, surgery, traditional remedies, and physiotherapy. C6 assessed the estimated out-of-pocket cost of Buruli ulcer care, while C7 assessed the type of support received. Items C8–C16 assessed pain or discomfort, limitations in movement and daily activities, emotional distress, effects on work or school, social participation, overall health, lesion status, scarring or contracture, and the need for assistive devices.

Section 6 assessed the clinical presentation of presumptive Buruli ulcer cases, including lesion type, number and site of lesions, duration or evolution of lesions, WHO category, case classification, laboratory sample collection and PCR results, movement limitation, and disability. Section 7 collected information required for estimating years of life lost (YLL) and years lived with disability (YLD) associated with Buruli ulcer.

The questionnaire was administered by trained research assistants who were familiar with the study communities. Before data collection, community entry was carried out through consultation with community leaders and relevant local health authorities. Eligible participants were interviewed after informed consent had been obtained. For participants below 18 years of age, parental or guardian consent and participant assent were obtained.

Completed questionnaires were checked daily for completeness and consistency before coding and data entry.

Instrument Validity and Reliability

The questionnaire was reviewed by experts in public health and infectious disease research to establish face and content validity. The instrument was pretested among residents of a community outside the study area who were not included in the main study. Feedback from the pretest was used to improve the clarity and understanding of the questions before the main data collection. The internal consistency of the instrument was assessed using Cronbach's alpha, which produced a reliability coefficient of 0.875, indicating good internal consistency.

Method of Data Analysis

Data were coded, cleaned and analysed using SPSS version 25 and Stata version 17. Descriptive statistics, including frequencies, percentages, means and standard deviations, were used to summarise respondents' socio-demographic characteristics, Buruli ulcer-related characteristics and health-seeking behaviour.

Health-seeking behaviour was assessed using the care-seeking items in Section 5, particularly C1–C7. These items examined the respondent's first response after noticing the lesion, time taken to seek healthcare, reasons for delay, place of diagnosis or treatment, treatment received, cost of care, and support received. The individual responses were coded according to the direction of health-seeking behaviour, with responses reflecting timely use of appropriate healthcare services assigned favourable scores and responses reflecting delayed care or reliance on non-formal sources of care assigned unfavourable scores. The individual scores were summed to obtain an overall health-seeking behaviour score, with higher scores indicating more favourable health-seeking behaviour.

For the classification of health-seeking behaviour into good and poor categories, the total score was compared with the predetermined cut-off point used in the study. Respondents whose total score was at or above the cut-off were classified as having good health-seeking behaviour, while those below the cut-off were classified as having poor health-seeking behaviour. Modified Poisson regression with robust standard errors was used to determine factors associated with health-seeking behaviour. The outcome variable was the binary classification of health-seeking behaviour (good versus poor). The analysis produced prevalence ratios (PRs) with corresponding 95% confidence intervals (CIs) and p-values. Variables considered relevant based on the study objectives and/or those meeting the specified criterion at the bivariate analysis were included in the multivariable model. Statistical significance was assessed at the 5% level. The general model was specified as:

$$\log(\mu i)=\beta_0+\beta_1X_1+\beta_2X_2+\cdots+\beta_kX_k \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4$$

where (μi) represents the expected outcome, β_0 is the intercept, $\beta 1 \ldots \beta_k$ are regression coefficients, and $X_1 \ldots X_k$ denote explanatory variables.

Crude prevalence ratios (CPR) and adjusted prevalence ratios (APR) were estimated as:

$$PR=e^{\beta} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 5$$

with corresponding 95% confidence intervals.

The precision of the estimates was assessed using 95% confidence intervals calculated as:

$$CI=\beta\hat{}\pm1.96\times SE(\beta\hat{})\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

where $\beta\hat{}$ is the estimated coefficient, and SE is the standard error.

Ethical Considerations

Ethical approval for this study was obtained from the relevant Research Ethics Committee of Rivers State University. Permission to conduct the study was obtained from appropriate community and health authorities. Written informed consent was obtained from all participants. Participation was voluntary, and confidentiality of all information provided was strictly maintained. The study was conducted in accordance with established ethical principles governing human subject research.

RESULTS

Table 1 presents the socio-demographic variables of the respondents in the study area. The data show that 31.85% of the respondents are aged 45 years and above, while 20.49% are aged 24 years and below. The mean age of the respondents was 38.74 ±17.2. Female respondents make up 53.33% of the sample, while males constitute 46.67%. Similarly, most of the respondents (70.86%) are currently unmarried, while 29.14% are currently married. Christianity is the religion of the majority (72.35%), followed by traditional religion (14.07%) and Islam (13.58%). However, nearly half of the respondents (47.04%) had secondary education, 24.38% had tertiary education, 15.02% had no formal education, and 13.55% had primary education. Furthermore, a larger proportion of respondents (27.09%) are unemployed, while 15.76% are civil servants. A total of 29.06% of the respondents report a monthly household income of less than ₦30,000, 29.80% earn between ₦30,000–₦69,999, 13.05% earn ₦70,000 or more, while 28.08% prefer not to disclose their income.

Moreover, most of the respondents (62.47%) reside in inland villages, 27.65% reside in riverside or swamp areas, and 9.88% reside in peri-urban areas. Improved water sources are used by 70.94% of respondents, while 29.06% rely on unimproved water sources. A majority (68.15%) use freshwater bodies, 27.65% use saltwater bodies, and 4.20% use other water sources. Additionally, contact with natural water in the past month shows that 31.36% of respondents have daily contact, 18.27% have weekly contact, another 18.27% have monthly contact, and 32.10% have rare or no contact. The distance to the water source is less than 100 meters for 60.25% of respondents, 100–500 meters for 23.21%, 501–1000 meters for 6.67%, more than 1000 meters for 3.95%, while 5.93% are not sure of the distance.

Table 1: Socio-Demographic Characteristics of Respondents

Variable	Frequency (n)	Percent (%)
Age Group (years)		
≤ 24	83	20.49
25-35	110	27.16
36-44	83	20.49
45 and above	129	31.85

Mean Age		38.74 ± 17.21
Sex		
Female	216	53.33
Male	189	46.67
Marital Status		
Currently Married	118	29.14
Currently Unmarried	287	70.86
Religion		
Islam	55	13.58
Christianity	293	72.35
Traditional	57	14.07
Education Level		
No Formal Education	60	15.02
Primary	55	13.55
Secondary	191	47.04
Tertiary	99	24.38
Occupational Status		
Students	45	11.08
Unemployed	109	27.09
Civil Servants	64	15.76
Trading	53	13.05
Fishing	35	8.62
Artisan	44	10.84
Farming	55	13.55
Household Size		
1–4 persons	127	31.36
5–6 persons	102	25.19
≥7 persons	176	43.46
Monthly Household Income		
< ₦30,000	117	29.06
₦30,000–₦69,999	121	29.80
≥₦70,000	53	13.05
Prefer not to say	114	28.08
Residence Type		
Inland Village	253	62.47

Peri-Urban	40	9.88
Riverside/Swamp	112	27.65
Primary Source of Water		
Unimproved water sources	118	29.06
Improved water sources	287	70.94
Water Source Characteristics		
Freshwater bodies	276	68.15
Saltwater bodies	112	27.65
Others	17	4.20
Frequency of Contact with Natural Water (Past Month)		
Daily	127	31.36
Weekly	74	18.27
Monthly	74	18.27
Rarely/Never	130	32.10
Distance to Water Source		
<100 meters	244	60.25
100–500 m	94	23.21
501–1000 m	27	6.67
>1000 m	16	3.95
Not sure	24	5.93

Figure 2 presents the distribution of outcomes of the most recent lesion among the respondents. The data show that 20% of the respondents had ongoing lesions, while 10.9% reported that their lesions healed without major problems. Lesions that healed with a scar were reported by 9.6% of the respondents. A smaller proportion of respondents reported contracture or deformity as the outcome of their lesions (3.5%), and only 1.5% of the respondents experienced amputation.

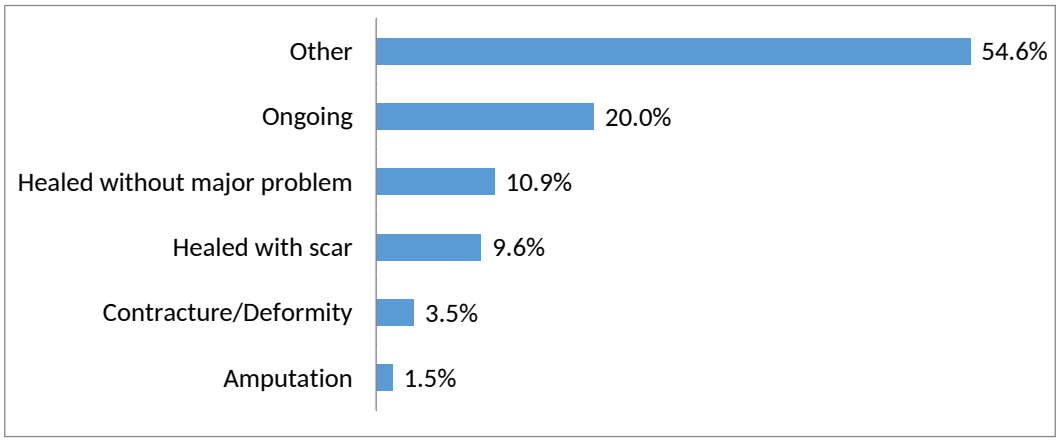

Figure 2: Distribution of Outcome of most recent lesion among the respondents

Table 2 shows the distribution of health-seeking behaviour of Buruli Ulcer patients. Most respondents (32.9%) first took other actions when a lesion was noticed, 31.3% did nothing, 24.6% applied self-care or home remedies, while few sought care at health centres (3.4%), patent medicine vendors (3.9%), or traditional healers (3.9%). Similarly, diagnosis and treatment were mostly at primary health centres (30.2%) and other unspecified facilities (39.7%), with smaller proportions attending general hospitals (10.1%), teaching hospitals (6.2%), private clinics (3.9%), or traditional/spiritual centres (10.1%). Treatments received included antibiotics (27.4%), wound care/dressings (23.5%), traditional remedies (10.6%), physiotherapy (3.4%), surgery (2.8%), and other treatments (32.4%).

Out-of-pocket costs for care exceeded ₦60,000 for 35.8% of respondents, ₦30,000 ₦59,999 for 17.3%, ₦0 ₦9,999 for 5.6%, ₦10,000 ₦29,999 for 2.8%, while 38.6% were unsure of the costs. Most respondents (84.4%) received no support, 14.0% received family or community support, and 1.1% accessed government programmes. Pain or discomfort was reported as not at all by 43.0%, a little by 25.7%, moderate by 7.3%, a lot by 19.0%, and extreme by 5.0%. Difficulty moving limbs or performing activities was not at all for 30.2%, a little 31.3%, moderate 9.5%, a lot 23.5%, and extreme 5.6%. Emotional distress was not at all for 31.8%, a little 12.3%, moderate 19.6%, a lot 25.1%, and extreme 11.2%. The impact on work, school, or income was not at all for 33.0%, a little 16.2%, moderate 12.8%, a lot 16.2%, and extreme 21.8%. Social participation was not at all limited for 29.6%, a little 10.1%, moderate 8.9%, a lot 14.0%, and extreme 37.4%.

Table 2: Distribution of Health-Seeking Behaviour among Buruli Ulcer Patients

Variable	Frequency (n)	Percent (%)
First action when lesion was noticed		
Did nothing	56	31.28
Health centre/clinic	6	3.35
Patent medicine vendor	7	3.91
Self-care / home remedy	44	24.58
Traditional healer	7	3.91
Other	59	32.96
Time from noticing lesion to first healthcare visit		
<1 week	74	41.34
1–4 weeks	41	22.91
1–3 months	18	10.06
>3 months	46	25.70
Main reason for delay in seeking care		
Cost	53	29.61
Distance/Transport	38	21.23
Did not think serious	11	6.15
Preference for traditional care	9	5.03

Fear/Stigma	1	0.56
Other	67	37.43
Place where BU was diagnosed/treated		
Primary Health Centre	54	30.17
General Hospital	18	10.06
Teaching Hospital	11	6.15
Private Clinic	7	3.91
Traditional/Spiritual	18	10.06
Others	71	39.66
Treatments received		
Antibiotics	49	27.37
Wound care/dressings	42	23.46
Traditional remedies	19	10.61
Physiotherapy	6	3.35
Surgery	5	2.79
Other	58	32.40
Out-of-pocket costs for BU care		
₦0–₦9,999	10	5.59
₦10,000–₦29,999	5	2.79
₦30,000–₦59,999	31	17.32
>₦60,000	64	35.75
Don’t know	69	38.55
Support received		
None	151	84.36
Family/Community	25	13.97
Government program	2	1.12
Pain or discomfort from lesion		
Not at all	77	43.02
A little	46	25.70
Moderate	13	7.26
A lot	34	18.99
Extreme	9	5.03
Difficulty moving limbs / doing activities		
Not at all	54	30.17
A little	56	31.28

Moderate	17	9.50
A lot	42	23.46
Extreme	10	5.59
Emotional distress (worry, sadness, shame)		
Not at all	57	31.84
A little	22	12.29
Moderate	35	19.55
A lot	45	25.14
Extreme	20	11.17
Impact on work/school or income		
Not at all	59	32.96
A little	29	16.20
Moderate	23	12.85
A lot	29	16.20
Extreme	39	21.79
Social participation limited		
Not at all	53	29.61
A little	18	10.06
Moderate	16	8.94
A lot	25	13.97
Extreme	67	37.43
Overall health today		
Poor	32	17.88
Fair	83	46.37
Good	50	27.93
Very good	14	7.82
Current status of lesion		
Improving	114	63.69
No change	55	30.73
Worsening	10	5.59
Visible scarring/contracture		
Yes	69	38.55
No	110	61.45
Need for assistive devices		
None	116	64.80

Walking aid	7	3.91
Other	56	31.28

The data in Figure 3 show the overall health-seeking behaviour level among respondents with Buruli Ulcer. A majority of the respondents (96.6%) exhibited poor health-seeking behaviour, while only a small proportion (3.4%) demonstrated good health-seeking behaviour.

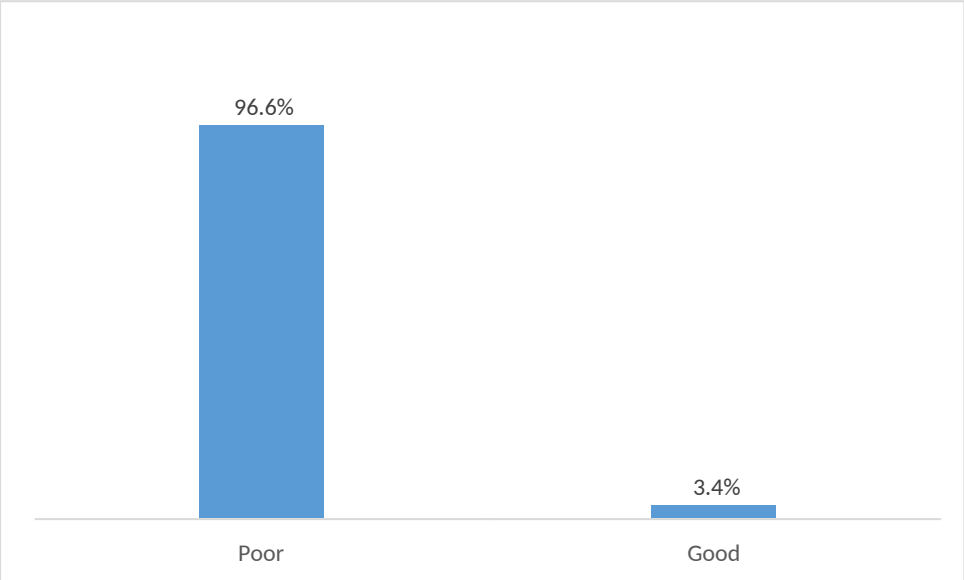

Figure 3: Health-Seeking Behaviour Level

The data as shown in Table 3 revealed that respondents aged 25–35 years were slightly less likely (APR = 0.96; 95% CI: 0.89–1.03, p = 0.27) to have poor health-seeking behaviour than those aged below 24 years. Similarly, males were slightly more likely (APR = 1.06; 95% CI: 0.99–1.13, p = 0.09) to exhibit poor health-seeking behaviour than females.

However, residence was significantly associated with poor health-seeking behaviour, as respondents living in riverside or swamp areas were less likely (APR = 0.88; 95% CI: 0.79–0.98, p = 0.02) to demonstrate poor health-seeking behaviour than those living inland. Respondents unsure about the distance to their water source were more likely (APR = 1.16; 95% CI: 1.01–1.34, p = 0.04) to have poor health-seeking behaviour than those living 100–500 m from their water source. Additionally, contact with saltwater bodies was associated with an increased likelihood of poor health-seeking behaviour (APR = 1.07; 95% CI: 1.00–1.14, p = 0.05) compared to contact with freshwater. Similarly, respondents who contacted water on a monthly basis were more likely (APR = 1.09; 95% CI: 1.00–1.19, p = 0.05) to exhibit poor health-seeking behaviour than those who contacted water daily.

Table 3: Factors Associated with Poor Health-Seeking Behaviour

Characteristics	CPR	95% CI	p-value	APR	95% CI	p-value
Age (years)						
<24 (Ref)	1.00	–	–	1.00	–	–
25–35	0.95	0.88–1.02	0.159	0.96	0.89–1.03	0.27

36–44	0.95	0.88–1.02	0.159	0.94	0.83–1.08	0.39
45+	0.97	0.93–1.01	0.158	0.99	0.89–1.11	0.90
Sex						
Female (Ref)	1.00	–	–	1.00	–	–
Male	1.02	0.96–1.07	0.543	1.06	0.99–1.13	0.09
Marital Status						
Currently Married (Ref)	1.00	–	–	–	–	–
Currently Unmarried	1.01	0.95–1.08	0.712	1.01	0.91–1.11	0.87
Religion						
Islam (Ref)	1.00	–	–	1.00	–	–
Christianity	1.00	0.94–1.06	0.951	1.10	0.98–1.24	0.10
Traditional	0.95	0.84–1.07	0.391	1.02	0.88–1.19	0.76
Education						
No formal (Ref)	1.00	–	–	1.00	–	–
Primary	1.00	0.86–1.16	1.000	1.00	0.84–1.18	0.98
Secondary	1.03	0.92–1.15	0.647	1.04	0.91–1.19	0.58
Tertiary	1.02	0.91–1.16	0.709	1.02	0.89–1.17	0.75
Occupational Status						
Students (Ref)	1.00	–	–	1.00	–	–
Unemployed	1.02	0.90–1.15	0.789	1.10	0.90–1.34	0.34
Civil Servants	1.06	0.95–1.18	0.319	1.11	0.94–1.30	0.21
Trading	1.06	0.95–1.18	0.319	1.11	0.91–1.35	0.30
Fishing	1.06	0.95–1.18	0.319	1.14	0.94–1.38	0.19
Artisan	1.06	0.95–1.18	0.319	1.15	0.91–1.46	0.25
Farming	0.97	0.83–1.13	0.675	0.99	0.79–1.24	0.94
Residence						
Inland (Ref)	1.00	–	–	1.00	–	–
Peri-Urban	1.01	0.99–1.03	0.319	0.98	0.91–1.06	0.70
Riverside/Swamp	0.92	0.84–1.00	0.052	0.88	0.79–0.98	0.02
Household Size						
1–4 (Ref)	1.00	–	–	1.00	–	–
5–6	0.99	0.91–1.08	0.832	1.01	0.92–1.12	0.81
≥7	1.04	0.96–1.12	0.319	1.02	0.93–1.11	0.73
Household Income						
< ₦30,000 (Ref)	1.00	–	–	1.00	–	–

₦30,000–₦69,999	0.96	0.89–1.03	0.267	0.97	0.88–1.07	0.532
≥₦70,000	1.02	0.98–1.05	0.319	1.00	0.94–1.06	0.954
Water Source						
Unimproved (Ref)	1.00	–	–	1.00	–	–
Improved	0.96	0.92–1.01	0.158	0.95	0.89–1.01	0.11
Water Type						
Freshwater (Ref)	1.00	–	–	1.00	–	–
Saltwater bodies	1.05	1.01–1.10	0.015	1.07	1.00–1.14	0.05
Others	1.05	1.01–1.10	0.015	1.02	0.90–1.16	0.75
Water Contact Frequency						
Daily (Ref)	1.00	–	–	1.00	–	–
Monthly	1.05	0.99–1.11	0.084	1.09	1.00–1.19	0.05
Rarely/Never	1.03	0.96–1.11	0.461	1.02	0.95–1.10	0.52
Weekly	0.97	0.86–1.10	0.668	0.98	0.89–1.07	0.65
Distance to Water Source						
100–500m (Ref)	1.00	–	–	1.00	–	–
501–1000 m	1.06	0.98–1.16	0.159	1.04	0.92–1.16	0.53
<100 m	1.03	0.94–1.13	0.551	1.00	0.88–1.12	0.96
>1000 m	1.06	0.98–1.16	0.159	1.05	0.91–1.22	0.50
Not sure	1.06	0.98–1.16	0.159	1.16	1.01–1.34	0.04

APR = Adjusted Prevalence Ratios.

Table 4 presents the factors associated with Buruli Ulcer occurrence. At the unadjusted level, respondents aged 25–35 years had lower odds of Buruli Ulcer than those aged below 24 years (UOR = 0.48; 95% CI: 0.27–0.88; p = 0.02); however, this association was no longer statistically significant after adjustment (AOR = 0.64; 95% CI: 0.29–1.40; p = 0.26).

Religion was significantly associated with Buruli Ulcer occurrence. Compared with respondents who practised Islam, those who practised Christianity had lower odds of Buruli Ulcer (AOR = 0.21; 95% CI: 0.09–0.49; p < 0.001), while those who practised traditional religion also had lower odds (AOR = 0.34; 95% CI: 0.12–0.94; p = 0.04). Respondents with secondary education had higher odds of Buruli Ulcer than those with no formal education (AOR = 2.32; 95% CI: 1.08–4.96; p = 0.03). Civil servants had lower odds of Buruli Ulcer than students, although the association was borderline (AOR = 0.32; 95% CI: 0.10–1.00; p = 0.05).

Among the environmental characteristics, residence type was not significantly associated with Buruli Ulcer occurrence after adjustment. Respondents living in peri-urban areas (AOR = 1.52; 95% CI: 0.58–4.00; p = 0.40) and riverside/swamp areas (AOR = 1.36; 95% CI: 0.75–2.47; p = 0.31) did not differ significantly from those living in inland areas. Use of an improved water source was associated with lower odds of Buruli Ulcer (AOR = 0.57; 95% CI: 0.32–1.03; p = 0.05). Respondents living 501–1000 metres from their water source had

significantly higher odds of Buruli Ulcer than those living 100–500 metres away (AOR = 4.00; 95% CI: 1.34–11.90; p = 0.01). Other categories of water type, frequency of water contact, and distance to water source were not statistically significant after adjustment.

Respondents with fair knowledge had higher odds of Buruli Ulcer than those with good knowledge (AOR = 4.04; 95% CI: 1.07–15.29; p = 0.04). Perception was not significantly associated with Buruli Ulcer occurrence (AOR = 1.14; 95% CI: 0.70–1.87; p = 0.60).

Table 4: Factors Associated with Buruli Ulcer Occurrence

Characteristics	UOR (95% CI)	p-value	AOR (95% CI)	p-value
Age (years)				
<24 (Ref.)	1.00	–	1.00	–
25–35	0.48 (0.27–0.88)	0.02	0.64 (0.29–1.40)	0.26
36–44	0.67 (0.36–1.25)	0.21	0.79 (0.31–2.00)	0.62
45+	0.98 (0.56–1.71)	0.95	1.35 (0.59–3.08)	0.48
Sex				
Female (Ref.)	1.00	–	1.00	–
Male	0.92 (0.62–1.37)	0.68	0.86 (0.53–1.40)	0.54
Marital Status				
Currently married (Ref.)	1.00	–	1.00	–
Currently unmarried	1.32 (0.85–2.06)	0.22	0.65 (0.34–1.26)	0.20
Religion				
Islam (Ref.)	1.00	–	1.00	–
Christianity	0.21 (0.11–0.39)	0.00***	0.21 (0.09–0.49)	0.00***
Traditional	0.34 (0.16–0.75)	0.01**	0.34 (0.12–0.94)	0.04*
Education				
No formal (Ref.)	1.00	–	1.00	–
Primary	0.98 (0.44–2.18)	0.96	0.82 (0.31–2.14)	0.68
Secondary	2.74 (1.47–5.09)	0.00**	2.32 (1.08–4.96)	0.03*
Tertiary	0.90 (0.44–1.81)	0.76	1.39 (0.59–3.29)	0.45
Occupational Status				
Students (Ref.)	1.00	–	1.00	–
Unemployed	1.10 (0.54–2.24)	0.80	1.56 (0.57–4.24)	0.38
Civil servants	0.50 (0.22–1.16)	0.11	0.32 (0.10–1.00)	0.05
Trading	1.17 (0.52–2.64)	0.71	1.60 (0.54–4.79)	0.40
Fishing	1.96 (0.80–4.80)	0.14	1.81 (0.54–6.04)	0.33
Artisan	0.85 (0.36–2.03)	0.72	1.05 (0.32–3.46)	0.94

Farming	2.13 (0.95–4.76)	0.07	1.95 (0.65–5.80)	0.23
Household Size				
1–4 (Ref.)	1.00	–	1.00	–
5–6	0.68 (0.38–1.22)	0.20	0.73 (0.34–1.53)	0.40
≥7	0.68 (0.41–1.14)	0.14	0.74 (0.39–1.40)	0.35
Household Income				
< ₦30,000 (Ref)	1.00	–	1.00	–
₦30,000–₦69,999	0.66 (0.39 1.10)	0.10	1.14 (0.52 2.22)	0.69
≥₦70,000	1.00 (0.52 1.90	0.99	1.88 (0.79 4.44)	0.15
Prefer not to say	0.40 (0.23 070)	0.001***	0.52 (0.26 1.08)	0.08
Residence				
Inland (Ref.)	1.00	–	1.00	–
Peri-Urban	1.58 (0.81–3.10)	0.18	1.52 (0.58–4.00)	0.40
Riverside/Swamp	1.52 (0.97–2.38)	0.07	1.36 (0.75–2.47)	0.31
Water Source				
Unimproved (Ref.)	1.00	–	1.00	–
Improved	0.38 (0.25–0.59)	0.00***	0.57 (0.32–1.03)	0.05*
Water Type				
Freshwater (Ref.)	1.00	–	1.00	–
Saltwater	0.94 (0.60–1.48)	0.79	0.75 (0.42–1.37)	0.36
Others	2.16 (0.80–5.83)	0.13	1.22 (0.29–5.05)	0.79
Water Contact Frequency				
Daily (Ref.)	1.00	–	1.00	–
Monthly	1.61 (0.90–2.87)	0.11	1.15 (0.53–2.47)	0.73
Rarely/Never	0.53 (0.32–0.88)	0.01*	0.67 (0.35–1.30)	0.24
Weekly	0.63 (0.35–1.14)	0.12	0.99 (0.46–2.13)	0.98
Distance to Water Source				
100–500m (Ref.)	1.00	–	1.00	–
501–1000m	3.29 (1.35–8.02)	0.01**	4.00 (1.34–11.90)	0.01*
<100m	1.46 (0.89–2.40)	0.13	1.20 (0.63–2.30)	0.58
>1000m	1.16 (0.39–3.49)	0.79	0.79 (0.19–3.30)	0.75
Not sure	0.28 (0.08–1.00)	0.05*	0.27 (0.06–1.20)	0.09
Knowledge				
Good (Ref.)	1.00	–	1.00	–

Fair	2.86 (1.04–7.89)	0.04*	4.04 (1.07–15.29)	0.04*
Perception				
Negative (Ref.)	1.00	–	1.00	–
Positive	1.14 (0.77–1.71)	0.51	1.14 (0.70–1.87)	0.60

- *p < 0.05, **p < 0.01, ***p < 0.001

DISCUSSION

This study examined the health-seeking behaviour of Buruli ulcer patients living in rural communities with water bodies in Rivers State. The findings indicate that appropriate healthcare utilisation was generally low, with many respondents demonstrating poor health-seeking behaviour. Several respondents delayed seeking care, initially relied on self-treatment or home remedies, or sought care from informal sources. This pattern is consistent with the challenges associated with Buruli ulcer, particularly in rural communities where awareness of the disease and recognition of its early manifestations may be limited. The early lesions of Buruli ulcer are often painless and may therefore be perceived as minor skin conditions that do not require immediate medical attention (Guarner, 2018; Yotsu et al., 2018). In Nigeria, delayed diagnosis has also been documented among people affected by Buruli ulcer, highlighting the difficulty of obtaining timely diagnosis and appropriate treatment (Meka et al., 2016).

The low use of formal healthcare services as the first response to a Buruli ulcer lesion is an important concern. Some respondents reported doing nothing after noticing a lesion, while others initially used home remedies or sought care from informal providers. This behaviour may partly reflect the clinical characteristics of Buruli ulcer. Early lesions are frequently painless and may develop gradually, reducing the perceived need for urgent treatment (Guarner, 2018; Yotsu et al., 2018). Consequently, individuals may wait until the lesion becomes larger, ulcerates, or begins to interfere with daily activities before seeking professional care. Delayed presentation is particularly important because prolonged disease can result in extensive tissue damage, scarring, contractures, functional limitations, and disability (Yotsu et al., 2018; Yotsu et al., 2025). Evidence from Nigeria has similarly shown substantial delays between the onset of symptoms and diagnosis among patients with Buruli ulcer (Meka et al., 2016). These findings suggest that improving early recognition of suspicious skin lesions should be an important component of Buruli ulcer control in rural communities.

The finding that some respondents relied on home remedies or informal sources of care is also consistent with evidence from Buruli ulcer-endemic settings. Healthcare decisions for neglected tropical skin diseases are influenced not only by the availability of biomedical services but also by community beliefs, previous experiences, perceived causes of illness, and the accessibility of alternative sources of care. In Nigeria, traditional healers and herbalists have been identified as important sources of care for people with neglected tropical skin diseases, while beliefs about supernatural causes of illness may also influence treatment choices (Ukwaja et al., 2020). Such practices may contribute to delays in reaching health facilities when individuals first attempt to manage lesions within the household or community. Community-based approaches that improve recognition of Buruli ulcer and

establish clear referral pathways may therefore help to reduce inappropriate delays in seeking biomedical care (Awah et al., 2018; Amoussouhoui et al., 2018).

Delay in seeking healthcare was another important finding of the study. Some respondents waited for several weeks or months before visiting a health facility. Cost and transportation difficulties were among the factors reported to contribute to these delays. This finding is particularly relevant to rural populations, where geographical access to healthcare may be limited and transport to health facilities may be difficult or expensive. The financial burden of Buruli ulcer can extend beyond the direct cost of medical treatment to include transportation, food, accommodation, wound-care materials, and other expenses associated with repeated healthcare visits (Chukwu et al., 2017). In Nigeria, the financial burden associated with Buruli ulcer care has been shown to affect patients and their households, demonstrating that the economic consequences of the disease can extend beyond the clinical management of the lesion (Chukwu et al., 2017). Similarly, broader structural and socioeconomic barriers have been identified as important obstacles to the integrated management of neglected tropical skin diseases in Nigeria (Ukwaja et al., 2020). These findings suggest that improving health-seeking behaviour cannot depend solely on increasing knowledge; reducing the economic and geographical barriers to care is also important.

The study also found limited support for patients during treatment, with many respondents reporting little or no support from family, community, or government sources. This is important because Buruli ulcer treatment may require repeated interaction with healthcare services, wound care, rehabilitation, and time away from work or other productive activities. Lack of social and practical support may therefore increase the burden experienced by affected individuals and make continued engagement with healthcare more difficult. Evidence from former Buruli ulcer patients has shown that patients have expressed needs extending beyond the treatment of the infection itself, including improved follow-up, rehabilitation, wound care, and psychosocial support (Velink et al., 2016). The burden associated with the disease may also extend to caregivers and family members, particularly when patients experience prolonged illness or functional limitations (Amoako et al., 2021). Strengthening family and community support, therefore, should form part of a broader patient-centred approach to Buruli ulcer management.

The findings further demonstrate that Buruli ulcer affects patients beyond the physical manifestations of the disease. Respondents reported effects on emotional well-being, social participation, work, schooling, and income. These findings are consistent with evidence that Buruli ulcer can produce substantial physical, psychological, social, and economic consequences for affected individuals. Lesions, scars, and disabilities may alter physical appearance and functioning, potentially affecting social interaction and participation in everyday activities (Velink et al., 2016; Woolley et al., 2016). The experience of pain may also become important as the disease progresses or when wounds require prolonged care (Woolley et al., 2016). In Nigeria, recent evidence has further demonstrated the relationship between Buruli ulcer, stigma, and reduced quality of life among affected persons (Esmai-Onyima et al., 2025). These consequences are particularly important in rural communities where livelihoods may depend heavily on physical labour and where reduced productivity can directly affect household income and welfare.

The effect on social participation deserves particular attention. Visible lesions, scars, and physical disabilities may cause embarrassment and contribute to stigma or social withdrawal. Former Buruli ulcer patients have described experiences and concerns that demonstrate that

the effects of the disease may continue even after clinical treatment, particularly when scarring, disability, or changes in appearance remain (Velink et al., 2016). The association between stigma and quality of life observed among people affected by Buruli ulcer in Nigeria further indicates that the consequences of the disease extend into social and psychological domains (Esmai-Onyima et al., 2025). Consequently, Buruli ulcer control should not focus exclusively on antimicrobial treatment but should also incorporate wound care, rehabilitation, psychosocial support, and measures to reduce stigma.

The analysis also showed that characteristics of the environment and place of residence were associated with health-seeking behaviour. Respondents living in riverside or swamp communities appeared to demonstrate better health-seeking behaviour than those living in inland communities. One possible explanation is that people residing closer to water bodies may have greater familiarity with Buruli ulcer as a result of previous cases within their communities or greater exposure to disease-related health education. Environmental and geographical characteristics are important in understanding Buruli ulcer because the disease has a well-documented association with aquatic and wetland environments, although the precise mode of transmission remains incompletely understood (Zingue et al., 2018; Yotsu et al., 2025). Studies have also demonstrated the presence or persistence of *Mycobacterium ulcerans* in environmental settings associated with affected communities (Bratschi et al., 2017; Aboagye et al., 2017). Greater familiarity with the disease within communities where Buruli ulcer is more commonly recognised may potentially contribute to earlier recognition and healthcare seeking. However, the observed difference may also reflect variations in access to health information, previous contact with health services, or community-level experiences that were not fully captured by this study.

Differences were also observed according to the type and frequency of contact with water and respondents' knowledge of the distance to their water source. These findings may reflect differences in daily activities, environmental exposure, perceptions of disease risk, and familiarity with the local environment. Previous studies have demonstrated that environmental characteristics, land use, proximity to water bodies, and human interaction with aquatic environments are relevant to the epidemiology of Buruli ulcer (Kenu et al., 2014; Campbell et al., 2015; Wu et al., 2015). Evidence from Cameroon has also suggested a relationship between environmental changes involving water systems and the emergence of Buruli ulcer in affected communities (Vandelannoote et al., 2020). However, environmental exposure does not necessarily translate directly into healthcare-seeking behaviour. The relationship observed in the present study may therefore reflect a combination of environmental familiarity, disease awareness, previous exposure to health services, and other community-level factors. Further qualitative and mixed-methods research would be useful for explaining how residents of water-associated communities perceive Buruli ulcer risk and decide when and where to seek care.

The study found that socio-demographic characteristics such as age, sex, education, occupation, marital status, and income were not clearly associated with health-seeking behaviour after other factors were taken into account. This suggests that poor health-seeking behaviour may cut across different demographic groups within the study population rather than being concentrated within a particular age, sex, educational, occupational, or socioeconomic category. This finding is important because it indicates that interventions based solely on targeting specific demographic groups may not adequately address the problem. Previous research in Nigeria has shown that barriers to the management of neglected tropical skin diseases are influenced by broader structural, financial, health-system,

and community-level factors rather than by individual characteristics alone (Ukwaja et al., 2020). Similarly, the challenges associated with Buruli ulcer diagnosis and treatment have been linked to delays in recognition, access to appropriate services, and the availability of effective care pathways (Meka et al., 2016; Ukwaja et al., 2020).

CONCLUSION

This study assessed the health-seeking behaviour of Buruli ulcer patients living in rural communities with water bodies in Rivers State, Nigeria. The findings showed that poor health-seeking behaviour was common among the respondents. Delayed presentation to health facilities, use of self-care and other informal treatment options, high treatment costs, and limited social or institutional support were common. The study also showed that Buruli ulcer affects patients' physical, emotional, social, and economic well-being.

After adjustment for other factors, residence in riverside or swamp communities was associated with lower odds of poor health-seeking behaviour. Saltwater contact, monthly water contact, and uncertainty about the distance to the water source also showed associations with poor health-seeking behaviour, although the findings for saltwater contact and monthly water contact were borderline and should be interpreted with caution. Age, sex, education, occupation, marital status, and income were not significantly associated with health-seeking behaviour after adjustment.

The findings suggest that poor health-seeking behaviour among Buruli ulcer patients is an important concern in the study area. Efforts to improve early healthcare seeking should focus on increasing community awareness of the early signs of Buruli ulcer, encouraging early presentation to health facilities, reducing financial and transportation barriers, and providing greater support to affected patients. Strengthening these areas may help promote earlier diagnosis and treatment and improve the overall care of people affected by Buruli ulcer.

Strengths and Limitations

This study provides useful information on the health-seeking behaviour of Buruli ulcer patients living in rural communities with water bodies in Rivers State, where information on the disease and healthcare use is limited. The study used primary data collected directly from affected individuals, which allowed the researchers to examine their healthcare-seeking practices, treatment experiences, and factors associated with health-seeking behaviour. The use of a multistage sampling approach across several rural communities also helped to include respondents from different communities.

However, the cross-sectional design means that the study cannot establish cause-and-effect relationships between the factors examined and health-seeking behaviour. The study also relied partly on information provided by respondents, which may have introduced recall bias, particularly when reporting treatment history, treatment costs, and the time between noticing symptoms and seeking care. Although several factors were included in the analysis, other factors such as cultural beliefs, quality of services at health facilities, previous health experiences, and community-level influences were not fully assessed. The findings should therefore be interpreted within the context of these limitations.

Practical Implications

The findings show the need to encourage people with suspected Buruli ulcer to seek care early. Health education should focus on helping community members recognize the early signs of the disease and understand the importance of reporting to a health facility without delay.

Financial and transportation barriers should also be addressed. Community-based support, referral systems, and public health programmes can help patients reach appropriate health facilities and continue their treatment. Health education and early case detection should receive particular attention in rural communities around water bodies.

Health workers and community health volunteers should also be supported to identify suspected cases early and link patients to appropriate care. These measures may help reduce delays in treatment and improve health outcomes among people affected by Buruli ulcer in Rivers State.

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Author Contributions

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- **Olatunde Raimi**: Formal Analysis, Methodology, Visualization, Writing – review & editing
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Conflicts of Interest

The authors have declared that no competing interests exist.

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