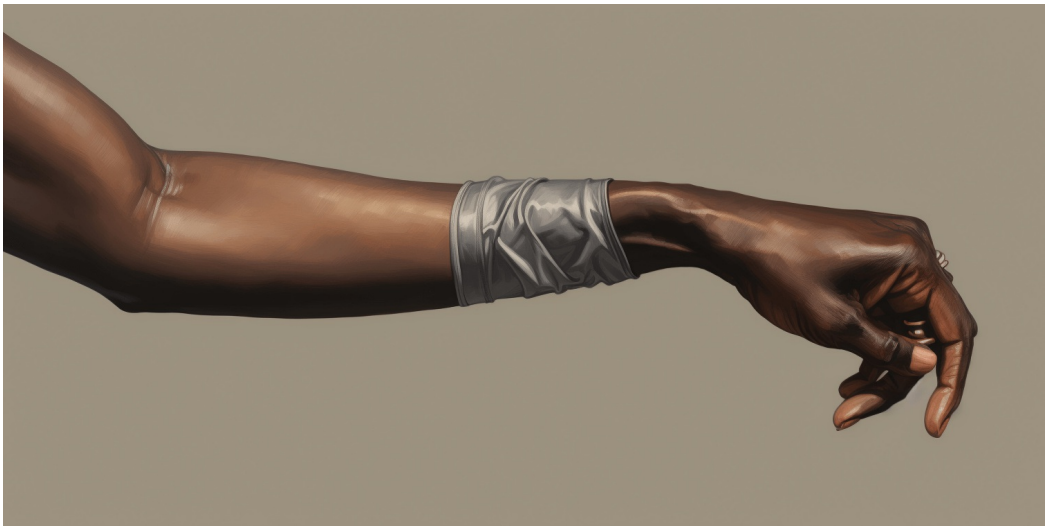

Prevalence of Buruli Ulcer Among Residents in Jasikan Municipality: A Cross-Sectional Study

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Abstract

Buruli ulcer is one of the neglected tropical diseases in the world. The mode of transmission and source reservoirs of Mycobacterium ulcerans are still largely unknown. The first probable case of Buruli ulcer in Ghana was reported in the Greater Accra Region in 1971. The prevalence of the disease in the Jasikan Municipality is unknown.

General Aim: The study was conducted to assess the prevalence of Buruli ulcer among residents in Jasikan Municipality.

Methods: The study employed a descriptive cross-sectional study design. A simple random sampling method was used to select respondents. A sample of 56 cases of Buruli ulcer was identified from the population. A pre-tested semi-structured questionnaire was administered. Data collected were entered into EpiData Manager version 4.0.2.101 and exported to Stata version 14.1 for analysis at a significance level of $p<0.05$ at a 95% confidence interval.

Results: The prevalence of the disease was determined to be 8.0 per 10,000 population.

Conclusions: Buruli ulcer was found to be high among the population.

Recommendation: The surveillance officers should provide health education to improve residents' awareness of Buruli ulcer in the study setting.

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Introduction

In Ghana, the first probable case of Buruli ulcer was recorded in the Greater Accra region in 1971 in a child who lived with his parents near the Densu River (Bayley, 1971). Following that case, in 1989, about ninety-six cases were reported in the Ashanti Region from the Afram Plains in the Asante Akim North District (Van der Werf et al., 1989). Between the period of 1993 and 1998, there were a number of Buruli ulcer cases recorded, up to three hundred cases in the Amansie West District of the Ashanti Region (Amofah et al., 2002). These were among residents who lived near the Oda and Offin rivers. This suggested that the people could have contracted the disease from the rivers at the time.

Additionally, in 1999, a nationwide survey was conducted in search of Buruli ulcer cases in Ghana. The survey identified six thousand cases of the disease and, based on the findings, concluded for the first time in Ghana that all ten administrative regions of the country had cases of Buruli ulcer. Between 2000 and 2003, about two thousand eight hundred Buruli ulcer cases were recorded in Ghana. The number of suspected Buruli ulcer cases recorded using the case-based forms has shown an increasing trend over the past years in Ghana (Yeboah-Manu et al., 2018).

According to the Global Health Observatory Data Repository report in Ghana, the number of reported Buruli ulcer cases in 2015, 2016, and 2017 were two hundred and seventy-five, three hundred and seventy-one, and five hundred and thirty-eight respectively (WHO, 2018). Available data also confirmed that two, one, sixteen, and twenty-nine Buruli ulcer cases were reported in 2015, 2016, 2017, and 2018 respectively in the Volta Region of Ghana. Of these suspected cases, one, eleven, and fourteen were laboratory confirmed for 2016, 2017, and 2018 respectively (DHIMS 2, 2019).

In the Jasikan Municipality in the Oti region, based on the DHIMS 2 (2022), in 2018 about 56 Buruli ulcer cases were reported in the region, all of which were recorded in the Jasikan Municipality. In 2019, it was revealed that one case was recorded in the Jasikan Municipality. In 2020, 40 Buruli ulcer cases were reported in the Oti region, with 21 cases from the Jasikan Municipality. In 2021, 24 Buruli ulcer cases were recorded in the Oti Region, with 8 cases in Jasikan. In all these instances, limited studies were conducted to determine the prevalence of Buruli ulcer among the population in the study setting. There appears to be a variance in the record of the Buruli ulcer cases with no clear pattern in the Jasikan

Municipality. Hence, this study was conducted to determine the prevalence of Buruli ulcer among residents in the Municipality.

Method

Study Site

The study was conducted in the Jasikan Municipality. The Jasikan Municipality is one of the municipalities in the Oti Region, with its administrative capital at Jasikan. The Municipality is located in the southern part of the Oti Region. Established in 1989, the Municipality is one of the oldest in the then Volta Region. It is bordered by the Kpando and Hohoe Municipality to the south, and further bordered to the north by the Krachi East and Kadjebi district.

In the 2020 population census, about 49.2% of the population were males and the rest were females. The majority of the population live in rural areas, constituting about 72.4%. The Municipality has a sex ratio of 91.9. Over the years, the majority of the population has been youthful, with an age dependency at 80.2%. The municipality has a total fertility rate (TFR) of 3.5, and the general fertility rate is 104.5 per 1000 women of fertile age. There are health centres in the Municipality providing healthcare to the people in their catchment areas and beyond. The services provided include clinical care, reproductive health, and child health services. Complicated cases are referred to the Jasikan Municipality hospital for management. The health centres are geographically located to provide easy access to health services for the people. The Jasikan Municipality hospital provides both antenatal and postnatal care services to the population. The Jasikan Municipality consists of high and lowland areas. The two main seasons are the wet and dry seasons. The major wet season lasts from April to July, and the minor one from September to November.

The Municipality lies in the wet semi-equatorial climatic zone. Annual rainfall is between 1,016mm-1,210mm. There is a 4-5 month dry season between November and April. The pattern of the rainy season has become highly unpredictable. The previously well-defined two peaks of rainfall have almost merged. Temperatures are high throughout the year and range from 26ºC in the coolest months to about 32ºC in the hottest months. The terrain in the Municipality is generally undulating. The low-lying areas, some of which are swampy, average 456.4 meters above sea level, and are used for rice cultivation.

The main cash crops are cocoa, maize, cassava, rice, yam, and various vegetables, notable amongst them being '*nkontomire*', tomatoes, pepper, and okra. There are infrastructures and amenities such as Government and Private Schools (nursery, primary, Junior high, secondary, and tertiary), Post office, Churches, Mosques, Health directorate, Municipal assembly, markets, shops, and offices. The most common house type is the compound house, followed by separate house, semi-detached house, huts/buildings (same compound), and flat/apartment. Higher proportions of dwelling units occupied by male-headed households are separate houses and semi-detached houses than the proportions of female-headed households in these types of dwelling units. The Jasikan Municipality was chosen for the study because of the rising cases of Buruli ulcer among the population.

Research Study

The study employed a descriptive cross-sectional study design, which was carried out from June to December 2022. A census method was conducted to establish the prevalence of Buruli ulcer disease in the study setting in the form of a case search.

Study Population

The study participants were residents living in the Jasikan Municipality. The study included residents of Jasikan Municipality who had stayed for at least one year before the study, residents with nodules, plaques, or any lesions, and confirmed Buruli ulcer patients. The study excluded residents with wounds who were seriously ill and required medical care, and those who were out of town.

Sample Size Determination

A sample size of 56 respondents was sampled from the study population. The sample size was determined using the method described by Kelsey et al. (1996).

Sampling Methods

The study employed a census approach as a sampling technique to collect data from the residents in the study to determine the prevalence of Buruli ulcer among the population. A case search was done in all the communities at Jasikan Municipality to identify cases. All cases who met the inclusion criteria were included in the study.

Data Collection Procedure

The data were collected using a pre-tested semi-structured interviewer-administered questionnaire. This questionnaire was administered to respondents at the study setting. Laminated pictures of various stages of Buruli ulcer were used to look for the cases in the communities within the Jasikan Municipality. In the communities, persons with similar stages of Buruli ulcer as shown on the laminated pictures were considered as cases and administered the questionnaire.

Community entry was carried out in Jasikan Municipality. In every community, the research team met the opinion leaders for a briefing before asking permission to enter the community for the case search. Where necessary, Churches and Mosques were visited to search for cases. The team also identified prayer camps which were located in obscured places to search for cases if they were transported there for spiritual treatment or cure. Data collectors were trained for two days. On the second day, pre-testing of the questionnaire was done in Kadjebi. After the pretest, all the necessary corrections were made before the final print out of the questionnaire for fieldwork.

During the data collection at the communities, the purpose of the study was explained to the respondents before the interview and the administration of the questionnaire. Questionnaire administration was face-to-face and lasted for about

forty-five minutes with each respondent. Once a case was identified, it was matched with a control in the same community. During the data collection, all suspected cases of Buruli ulcer that had not yet been identified were referred to the Jasikan Municipality Hospital for wound biopsy. The biopsy was then sent to the Noguchi Memorial Institute for Medical Research (NMIMR) for confirmation by the Jasikan Municipality Health Directorate.

Reliability and Validity of the Questionnaire

The development of the questionnaire was reviewed by the study supervisors and a statistician before the administration of the questionnaire in the field. The study ensured the reliability of the questionnaire by carrying out a pilot study at Kadjebi using ten respondents. The pilot test provided information on the trends of challenges that respondents were more likely to face in the field in terms of actual data collection. The pilot test ensured that all necessary corrections were made before the actual data collection in the field. Since the study setting was in a different district, all the respondents used for the pilot tests were different from those used for the actual work.

Statistical Analysis

The data collected were entered into Epi-Data Version 3.1 and exported into Stata version 15.1 for analysis. Statistical significance was considered at a level of 5%.

Ethical Considerations

Written approval for the study was obtained from the University of Health and Allied Sciences (UHAS) Research Ethics Committee (REC) (UHAS-REC A.11 [103] 2l-22) before the commencement of the study in the Jasikan Municipality. Written informed consent from parents/guardians and assent from children were also obtained. Permission was sought from the Jasikan Municipality Health Directorate. Participation in the study was voluntary, and respondents had the right to withdraw from the study without any penalty imposed on them. All information collected about the respondents during the study was treated confidentially.

Results

Table 1 shows the demographic characteristics of the study participants. The study sampled 56 participants, the majority of whom were females.

Table 1. Demographic data of respondents

Variable	Frequency	Percent (%)
Age (years)		
0-20	3	5.0
21-40	12	21.0
41-60	22	39.0
61+	19	35.0
Sex		
Male	26	46.0
Female	30	54.0
Occupational status		
Petty trading	13	24.0
Farming	23	41.0
Salaried worker	3	5.0
Unemployed	12	21.0
Students	5	9.0
Marital status		
Single	10	18.0
Married	32	57.0
Separated	14	25.0
Educational status		
No education	15	27.0
Primary	17	30.0
JHS	17	30.0
SHS	4	8.0
Tertiary	3	5.0

Prevalence of Buruli Ulcer Among the Residents

From Table 2, in terms of oedema, the majority of the cases, representing 89%, reported a sore on the skin with an ulcer. The study also found that the majority of the cases had a single lesion, and 95% of respondents had their site of lesions located on the lower limbs. From the findings, it was found that 59% of respondents said their illness evolved rapidly within four weeks.

Table 2. Epidemiological and clinical guidance of Buruli ulcer in cases

Variable	Frequency	Percent
Edema		
Plaque (firm skin)	1	2.0
Nodule (a small swelling on the skin)	5	9.0
Ulcer (a sore on the skin)	50	89.0
Number of lesions		
Single	45	80.0
Multiple	11	20.0
Site of lesions		
Heel and sole	1	2.0
Lower limbs	53	95.0
Upper limbs	2	3.0
Evolution of lesion		
Slowly under 4 weeks	23	41.0
Rapidly under 4 weeks	33	59.0
Duration of lesion		
Less than 3 months	9	16.0
Between 3-6 months	9	16.0
More than 6 months	38	68.0

From Table 3, it was found that the majority of the respondents, representing 64%, were new cases. A new case is a patient with no previous history or treatment for Buruli ulcer. A recurrent case is a patient who had treatment for Buruli ulcer and is presenting with another lesion(s) at the same site or at a different site within one year from the previous treatment. From the findings, it was found that 41% of the respondents indicated that the outcome of the sample was positive.

Table 3. Disease condition among cases

Variable	Frequency	Percent
Categories of cases		
New	36	64.0
Recurrent	20	36.0
Samples taken		
Yes	32	57.0
No	24	43.0
PCR outcomes of samples		
Pending	19	59.0
Positive	13	41.0
Disease limits movement		
Yes	15	27.0
No	41	73.0
Disease causes disability		
Yes	46	82.0
No	10	18.0

Calculation of Buruli ulcer prevalence

The period prevalence = 56/73,263 x 10,000

= 0.000764 per 10,000 population

= 8.0 per 10,000 population

Discussion

The study determined the prevalence of Buruli ulcer among residents at the time of the study. Based on the findings, it was found that all of the cases had lesions on their bodies. This finding from the study agrees with the study carried out by Amofah et al. (2002), where it was found that, in selected regions across Ghana, Buruli ulcer patients had lesions at various stages on their bodies. The similarity in terms of the findings of the study and that of Amofah et al. could be linked to the simple reason that these participants were sampled from Ghana and could have potential biological characteristics.

Additionally, the study found that the majority of the respondents had ulcers. This finding from the study agrees with Ahorlu et al. (2013), where it was found that all participants sampled at the time had ulcers on their sores. The similarity in terms of the findings could be due to the simple reason that these participants were sampled from the same geographic region. Initially, the Jasikan Municipality was part of the then Volta region and was later separated to form the Oti region. It is possible that the participants could have been exposed to the same risk factors which exhibited the same manifestation on patients confirmed as having Buruli ulcer disease.

The study also found that the majority of the cases had their lesions on the limbs. This finding from the study concurs with the report of the WHO (2022) which revealed that, in Buruli ulcer patients, the lesions are often on the extremities, with more on the lower than the upper extremities. It was shown that the prevalence of Buruli ulcer was determined among the residents. The determined prevalence was slightly higher than the prevalence determined by the Jasikan Municipality Health Directorate at the time of the study. This difference in terms of the results could be attributed to the reason that the study found new cases of Buruli ulcer patients in the study setting. Therefore, the use of case search could lead to the identification of more suspected cases of Buruli ulcer.

Strengths and Limitations

The study used a quantitative approach to conduct the study. This provided the opportunity to determine the prevalence of Buruli ulcer among residents in the study setting. The use of a quantitative approach could help in the possible generation of a hypothesis for a more detailed study with a larger number of study participants in the study setting. The findings would serve as baseline data in the study setting. The study lacked the social constructions of residents on Buruli ulcer.

Conclusion

The prevalence of the disease among the population was higher than what was found in the Health Directorate data. Public health workers in the municipality could use these findings to provide health education to residents in the communities and raise awareness about Buruli ulcer.

Declarations and Statements

Abbreviations

GHS: Ghana Health Service

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Authors' contributions

- Atubiga Alobit Baba conceptualised the research protocol, participated in the design of the research protocols, analysis of data, and drafting of the manuscript.
- Dr. Michael Adjabeng participated in drafting the manuscript, provided direction, supervised, and reviewed the

manuscript.

- Prof. John Owusu Gyapong read and approved the final manuscript.

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Availability of data

The dataset is available upon request from the corresponding author.

Competing interests

The authors declare no conflict of interest.

Consent for publication

Not applicable.

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