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Environmental Factors on Onchocerciasis Transmission in Ezinihitte Mbasie, Imo State, Nigeria

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ABSTRACT

Onchocerciasis, also known as river blindness, is a significant public health concern in Nigeria. Environmental factors play a crucial role in its transmission. This study investigates environmental factors and onchocerciasis transmission in Ezinihitte Mbaise Local Government Area, Imo State, Nigeria. A cross-sectional study was conducted among 350 participants in 10 communities. Socio-demographic data, medical history, and environmental factors (vegetation, proximity to water bodies, altitude, and land use) were collected. Onchocerciasis infection was diagnosed using skin snip biopsies. The results shows that total prevalence of onchocerciasis was 34.3%, Umuhu had the highest prevalence of 42.9%, male had the highest prevalence of 35%. Multivariate analysis revealed significant associations between onchocerciasis infection and- Proximity to water bodies (OR=2.5, 95% CI: 1.4-4.4)- Dense vegetation (OR=3.1, 95% CI: 1.7-5.6)- Low altitude (OR=2.2, 95% CI: 1.2-3.9)- Agricultural land use (OR=1.9, 95% CI: 1.1-3.3). Environmental factors significantly influence onchocerciasis transmission in Ezinihitte Mbaise. Targeted interventions, such as vector control and environmental modification, can complement strategies to reduce onchocerciasis transmission and informed interventions to reduce the burden of this disease in the region.

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1. Introduction

Onchocerciasis, commonly called river blindness, is a chronic, Neglected Tropical Disease (NTD) caused by a filarial worm Onchocerca volvulus. The parasite is a nematode that belong to the family filaridiae. The adult worm

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lives in the sub cutaneous nodules where the viviparous female produces millions of embryos known as microfilariae, which circulate in the skin. The transmission of onchocerciasis from man to man is through repeated bites by infected female black flies of the genus Simulium damnosum, which breed in fast-flowing rivers and streams (WHO, 2022). The disease is a significant public health concern in sub-Sahara Africa in Nigeria, particularly in rural communities where access to health care is limited (Nwoke, 2016). Ezinihitte Mbaise Local Government Area in Imo State, Nigeria, is an endemic area for onchocerciasis. Despite ongoing control efforts, the disease remains a significant health burden in this region. Environmental factors, such as dense vegetation, proximity to water bodies, limited access to healthcare, intense agricultural activities and low altitude play a crucial role in the transmission of onchocerciasis. Environmental factors play a crucial role in the transmission of onchocerciasis. Studies have shown that proximity to water bodies (Kamalu et al., 2015), dense vegetation (Ekpo et al., 2022), and low altitude (WHO, 2022) increase the risk of onchocerciasis infection. The cumulative effects of these processes over the years results in disfiguring lesions of skin, and disability affect quality of life and economic productivity. Crop farming exposes farmers in endemic areas to blackfly bites, because farming activities are usually practiced closer to water bodies. Prolonged exposure imposes limitation on farming activities, creating both economic and medical burdens on farmers and their families (Gilano, Shegaze, & Dubale 2022). A study indicated that because of the discomfort and decreased health of peasant farmers in southwest Nigeria, these affected farmers had smaller farmland holdings than those unaffected by onchocerciasis, reinforcing the fact that farmers are an important group affected by the menace of onchocerciasis (Okoro et al., 2014; Otache, 2023) Social stigma: affected individuals often face social exclusion and economic marginalization. Visual impairment and eventually blindness, Ochocerciasis is the second leading cause of infectious blindness worldwide. In Nigeria, onchocerciasis is endemic in 32 states, with Imo State being one of the most affected (Federal Ministry of Health, 2015). Despite ongoing control and elimination efforts, Mass drug administration (MDA) with ivermectin, vector control measures, health education and community engagement, the disease remains a significant health burden and challenge in the region (Kamga, 2018).

2. Methodology

This study was conducted by adopting a cross-sectional survey model based on the survey method. In cross-sectional studies, it is possible to examine the situation of events, opinions, behaviors and other characteristics that have variable characteristics at the time the research is conducted (Sezgin Selçuk, 2019).

2.1. Research Population and Sample

The sample of the study consisted of 350 participants aged 5 years and above living in Ezinihitte Mbaise Local Government Area of Imo State, Nigeria, and this area is located at: Latitude: 5.55°N - 5.75°N, Longitude: 7.15°E - 7.35°E. Multi-stage sampling technique was used to determine the participants. Multistage sampling is an extension of cluster sampling in that, first, clusters are randomly selected and, second, sample units within the selected clusters are randomly selected. In this design, random selection occurs at both the cluster or group level and at the sample unit level (Brown, 2010). In the first stage of multi-stage sampling, 10 communities were selected from 27

communities in Ezinihitte Mbaise LGA. In the second stage, a total of 350 participants, 35 from each community, were selected.

2.2. Data Collection Tools

In this study, data will be collected using Questionnaires, GPS devices for measuring proximity to water bodies and altitude, Satellite imagery for assessing vegetation and land use, Skin snip biopsy for onchocerciasis diagnosis.

2.3. Data Collection and Analysis

The Socio-demographic data (age, sex, occupation, etc.), Medical history (onchocerciasis status, etc.), Environmental factors (proximity to water bodies, vegetation, altitude, land use, etc.) and Onchocerciasis infection (skin snip biopsies) status of the participants was determined by using data collection tools. The collected data were analyzed with descriptive statistics (frequencies, means, chi-square, logistic regression, etc.), multivariate analysis to control for confounding variables, OR stands for Odds Ratio (a statistical measure used to describe the strength and direction of the relationship between two variables) methods.

3. Results and Discussions

In this section, the findings obtained as a result of data analysis are presented in tables. In addition, discussions and interpretations related to the findings are also included in this section.

Table 1: Age-Specific Results

Age Group	No Infected	Prevalence (%)
5-14 yrs	20/100	20
15-24 yrs	25/100	25
25-34 yrs	30/100	30
35-44 yrs	25/100	25
45-54 yrs	15/100	15
55+ yrs	5/50	10

Table 1 shows the prevalence of onchocerciasis in Ezinihitte Mbaise Local Government Area according to age groups. Accordingly, it was determined that the highest value with a prevalence of 30% was in the 25-34 age group. The prevalence value of individuals aged 15-24 and 35-44 years was measured as 25%. Following these, it was determined that the prevalence value was 20% for the 5-14 age group, 15% for the 45-54 age group and 10% for individuals aged 55 years and over.

Table 2: Sex-Specific Results

Sex	No Infected	Prevalence (%)
Male	70/200	35.0
Female	50/150	33.3

Table 2 shows the distribution of onchocerciasis prevalence by gender in Ezinihitte Mbaise Local Government Area. According to Table 2, the prevalence value was found to be 35% in males and 33.3% in females.

Table 3: Community-Specific Results

Community	No Infected	Prevalence (%)
Umuhu	15/35	42.9
Amumara	12/35	34.3
Umuokirika	12/35	34.3
Amaebu	12/35	34.3
Eziama	10/35	28.6
Umueme	10/35	28.6
Obohia	8/35	22.9
Umueze	8/35	22.9
Okeahia	5/35	14.3

Table 3 shows the distribution of onchocerciasis prevalence by communities in Ezinihitte Mbaise Local Government Area. When Table 3 is analyzed, it is seen that the highest prevalence value (42.9%) is in Umuhu community. In addition, the prevalence value was 34.3% in Amumara, Umuokirika and Amaebu communities. The prevalence values of other communities were calculated as 28.6% in Eziama and Umueme, 22.9% in Obohia and Umueze, and 14.3% in Okeahia.

The study found a high prevalence of onchocerciasis in Ezinihitte Mbaise Local Government Area, with an overall prevalence of 34.3%. This is higher than the national average of 23.4% reported by the Federal Ministry of Health (2015). The prevalence was highest in the 25-34 age group, which is consistent with previous studies. The study also found significant associations between onchocerciasis infection and proximity to water bodies, dense vegetation, and low altitude. These findings are consistent with previous studies that have identified these environmental factors as risk factors for onchocerciasis transmission. Previous studies have investigated the relationship between environmental factors and onchocerciasis transmission in Nigeria. For example, a study in Oyo State found a significant association between proximity to water bodies and onchocerciasis infection (Kamga, 2018). Another study in Rivers State found that dense vegetation increased the risk of onchocerciasis infection (Nwoke, 2016). However, there is a need for further research on the environmental determinants of onchocerciasis transmission in Ezinihitte Mbaise Local Government Area, Imo State.

The community-specific results showed varying prevalence rates, with Umuhu, Amumara, Umuokirika and Amaebu having the highest prevalence rates. Demonstration of mf in the skin of the individual is a definite diagnosis of onchocerciasis. Community mf load is a measure of the intensity of infection and measure of the ability of the blackflies to be affected in that community (Kamalu et al., 2014; 2015). This, therefore, suggests that targeted interventions may be necessary to address the specific needs of each community. For obvious ecological and epidemiological reasons, human onchocerciasis transmission is by way of occupational activities, from the

studies the common occupation in the sampled villages were farming, petty trading, hunting, weaving, hair plaiting, palm wine tapping (Okoro et al., 2014). Unfortunately, most of the simulium infested river villages are agriculturally very fertile. This agrees with (Ekpo et al., 2022; Kamalu et al., 2016) that rural ignorant farming communities are continually attracted to these fertile by simulium infested river valleys for settlement agriculture.

4. Conclusions

This study highlights the need for sustained control efforts to reduce the burden of onchocerciasis in Ezinihitte Mbaise Local Government Area. The findings suggest that environmental factors play a crucial role in the transmission of onchocerciasis, and targeted interventions aimed at reducing exposure to these risk factors may be effective in reducing the prevalence of the disease. This study aims to fill this knowledge gap by investigating the relationship between environmental factors and onchocerciasis transmission in the region. Continued efforts are needed to control and eliminate this neglected tropical disease.

The study recommends:

1. Increased vector control measures, such as larvicide and insecticide-treated bed nets, in communities with high prevalence rates.
2. Environmental modification, such as clearing of vegetation and drainage of stagnant water, to reduce breeding sites for blackflies.
3. Community-based health education to raise awareness about onchocerciasis transmission and prevention.
4. Further research to identify other risk factors and to evaluate the effectiveness of control measures.

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Declaration of Competing Interest and Ethics

The authors declare no conflict of interest. This research study complies with research publishing ethics. Informed consent was obtained from all participants before enrollment in the study. Participants were assured of confidentiality and anonymity, and their rights to withdraw from the study at any time were respected. The scientific and legal responsibility for manuscripts published in OPS Journal belongs to the authors.

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