



ASSESSMENT OF KNOWLEDGE ON PREVENTIVE STRATEGIES FOR TROPICAL DISEASES AMONG SECONDARY SCHOOL BIOLOGY STUDENTS IN ISI-UZO LOCAL GOVERNMENT AREA OF ENUGU STATE

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Abstract

This study assessed knowledge of preventive strategies for tropical diseases among secondary school Biology students in Isi-Uzo Local Government Area, Enugu State, Nigeria. Despite sustained public health efforts, diseases such as malaria, schistosomiasis, onchocerciasis, and soil-transmitted helminth infections remain endemic, highlighting the need for effective school-based health education. A descriptive cross-sectional design was employed, involving 150 SS2 Biology students selected from three public secondary schools through random sampling. Data were collected using a structured questionnaire covering demographics, knowledge of preventive measures, misconceptions, perceptions, and sources of health information. Descriptive statistics (mean and standard deviation) were applied, with a criterion mean of 2.50. Findings indicated moderate awareness of general preventive practices, including environmental sanitation, personal hygiene, and safe water use. However, notable deficiencies were observed in knowledge of disease-specific interventions, particularly the use of insecticide-treated nets and awareness of prophylactic or vaccine-based measures where applicable. Misconceptions persisted, such as attributing tropical diseases to “bad air,” assuming prevention is unnecessary in the absence of symptoms, and overreliance on traditional remedies. Information sources included schools, families, social media, and traditional practitioners, with varying credibility. Despite these gaps, students demonstrated positive attitudes toward adopting preventive behaviors and engaging in health-promotion activities. The study concludes that although baseline knowledge exists, targeted, evidence-based educational interventions are required. It recommends strengthening curriculum content, promoting experiential learning, enhancing teacher capacity, and fostering collaboration between the education and health sectors to improve disease prevention outcomes.

Keywords: Tropical Disease Prevention, Knowledge Assessment, Preventive Health Strategies, Secondary School Students, Isi-Uzo LGA

1. Introduction

Tropical diseases constitute a substantial proportion of the global burden of infectious diseases, disproportionately affecting populations in low- and middle-income countries where structural determinants such as poverty, inadequate sanitation, and limited access to safe water persist. The World Health Organization identifies a group of conditions collectively referred to as neglected tropical diseases (NTDs), which are endemic in over 140 countries and affect more than 1.4 billion people worldwide, including over 500 million children (Feng et al., 2025). These diseases, including lymphatic filariasis, schistosomiasis, onchocerciasis, soil-transmitted helminthiasis, and trachoma, are closely linked to environmental and socio-economic vulnerabilities and continue to impose significant morbidity, mortality, and economic burdens, thereby reinforcing the cycle of poverty and disease (Feng et al., 2025).

Nigeria bears one of the heaviest burdens of NTDs globally, with at least thirteen endemic conditions and an estimated 120 million individuals at risk of infection (Peter et al., 2012). Common endemic diseases include onchocerciasis, lymphatic filariasis, schistosomiasis, trachoma, soil-transmitted helminthiasis, and leprosy (Peter et al., 2012). The co-endemicity of multiple NTDs, alongside intense malaria transmission, exacerbates health inequities across regions, particularly in rural and underserved communities (Branda, et al., 2025). In Enugu State, malaria prevalence remains among the highest reported nationally, while NTDs such as schistosomiasis and onchocerciasis persist despite sustained control efforts (Branda, et al., 2025). Evidence indicates that onchocerciasis prevalence in some rural communities' ranges between 32% and 51%, even with ongoing mass drug administration programs, while schistosomiasis remains endemic in areas proximate to freshwater bodies (Ekpo et al., 2022). These trends underscore persistent gaps in environmental management, vector control, and community awareness.

Preventive strategies for tropical diseases are multifaceted and include vector control interventions such as insecticide-treated nets and indoor residual spraying, improvements in water, sanitation, and hygiene (WASH), mass drug administration, and health education. Among these, health education has been widely recognized as a cost-effective and sustainable intervention for improving knowledge and promoting behavioral change. Empirical studies demonstrate that structured school-based health education programs can significantly enhance students' understanding of disease transmission and prevention. For instance, an experimental study in rural Nigeria reported over 60% improvement in students' knowledge following targeted health education interventions (Mushtaq et al., 2024), while other studies have shown that although baseline awareness of diseases such as malaria may be relatively high, misconceptions about prevention persist and require targeted educational approaches (Wakai et al., 2025). More recent quasi-experimental evidence further indicates substantial gains in knowledge following intervention programs, although practical implementation is often constrained by limited resources.

Secondary school biology students represent a strategically important yet insufficiently studied population in this context. Although the biology curriculum in Nigeria includes topics on human diseases and epidemiology, there is limited empirical evidence regarding the extent to which students acquire accurate and actionable knowledge of tropical disease prevention (Josiah & Oguoko, 2025). Existing studies in Enugu State and other parts of Nigeria have largely focused on teachers or specific disease awareness campaigns, often revealing gaps in knowledge and the persistence of misconceptions (Wakai et al., 2025). This raises concerns about the effectiveness of knowledge transmission within the classroom and the potential for misinformation to influence students' understanding and practices.

Isi-Uzo Local Government Area (LGA) of Enugu State presents a particularly relevant context for this investigation due to its predominantly rural setting, agrarian economy, and limited access to healthcare infrastructure. Available reports indicate sustained transmission of malaria and endemic NTDs, including schistosomiasis and soil-transmitted helminth infections, despite ongoing intervention programs (Nnamonu et al., 2019, Nnamonu et al., 2020a, Nnamonu et al., 2020b). However, there is a paucity of empirical data on the knowledge and perceptions of secondary school students in this area regarding disease prevention. This gap is critical, given that adolescents are at increased risk of exposure due to their mobility and outdoor activities and can serve as important agents of health information dissemination within their households and communities (Nzenwa et al., 2025).

Despite the demonstrated effectiveness of health education in improving knowledge and preventive behaviors, its impact on secondary school biology students in rural LGAs such as Isi-Uzo remains inadequately explored. Existing research in Enugu State has predominantly targeted teachers and community members, leaving a significant gap in understanding students' baseline knowledge and misconceptions (Okeibunor et al, 2010). Without such evidence, it is difficult to design targeted interventions that address specific knowledge deficits and promote effective disease prevention practices.

This study therefore seeks to assess the knowledge of preventive strategies for tropical diseases among secondary school biology students in Isi-Uzo LGA, Enugu State. Specifically, it aims to determine students' level of knowledge, identify prevailing misconceptions, provide evidence-based recommendations for strengthening biology curriculum and health education programs, and examine the relationship between knowledge and students' readiness to adopt preventive practices. The study is confined to SS2 biology students in public secondary schools and focuses on common tropical diseases such as malaria, schistosomiasis, onchocerciasis, and soil-transmitted helminthiasis.

The significance of this study lies in its potential to inform multiple stakeholders. For students, the findings will highlight knowledge gaps and support the development of targeted

educational interventions that promote accurate understanding and adoption of preventive behaviors. For teachers and school administrators, the results will provide empirical evidence to guide instructional improvements and resource allocation. At the policy level, the study offers insights for curriculum development and the integration of context-specific health education into school programs. Public health practitioners and community health workers can utilize the findings to design more effective outreach strategies and school–community partnerships, while policymakers and development partners may leverage the evidence to support investments in health education, WASH infrastructure, and capacity building. Ultimately, by strengthening knowledge and preventive practices among adolescents, the study contributes to broader efforts aimed at reducing the burden of tropical diseases in rural Nigerian communities.

Methodology

Research Design

This study adopted a descriptive, school-based cross-sectional survey design to assess students' knowledge of preventive strategies for tropical diseases at a single point in time. Cross-sectional designs are widely utilized in knowledge, attitudes, and practices (KAP) studies due to their suitability for generating population-level estimates without inferring causality (Fithriyyah et al, 2024). This approach enabled the systematic evaluation of students' knowledge and related variables within the natural school setting.

Study Location

The study was conducted in Isi-Uzo Local Government Area (LGA) of Enugu State, Nigeria. The area is predominantly semi-rural, with environmental and socio-economic conditions that facilitate the transmission of tropical diseases such as malaria and schistosomiasis. The selection of this setting ensured ecological validity and contextual relevance of the findings to endemic rural communities (Nnamonu et al., 2020b).

Population of the Study

The target population comprised all Senior Secondary School II (SS2) Biology students enrolled in public secondary schools in Isi-Uzo LGA during the 2024/2025 academic session. According to records from the Post-Primary School Management Board, Enugu East Educational Zone, there are 13 public secondary schools with an estimated population of 1,050 SS2 Biology students (PPSMB, 2024).

Sample and Sampling Techniques

A multistage sampling technique was employed to ensure representativeness. In the first stage, five public secondary schools were purposively selected from the major communities of Eha-Amufu, Ikem, Neke, Mbu, and Umu-Alor. In the second stage, simple random sampling was used to select 20 SS2 Biology students from each school, yielding a total

sample size of 100 students. This approach minimized selection bias while ensuring adequate coverage across the study area (Creswell & Creswell, 2018).

Instrument for Data Collection

Data were collected using a structured, self-administered questionnaire divided into four sections. Section A captured demographic characteristics. Section B assessed knowledge of tropical diseases and their preventive strategies using multiple-choice and dichotomous items. Section C included Likert-scale items measuring attitudes and beliefs, while Section D assessed self-reported preventive practices. The instrument was designed in alignment with standard KAP survey frameworks (Adeogun et al., 2025).

Instrument Validity

Content and face validity were established. Content validity was ensured through expert review by specialists in public health, tropical diseases, and biology education, who assessed item relevance, clarity, and alignment with study objectives. Face validity was further evaluated through pilot testing among a small group of students with similar characteristics to the target population, leading to necessary revisions for clarity and cultural appropriateness.

Instrument Reliability

Reliability of the instrument was determined using Cronbach's alpha coefficient based on pilot data obtained from 30–40 students in a neighboring LGA. An alpha value of 0.70 or higher was considered acceptable for internal consistency. Items with low item-total correlations were revised or removed to enhance the reliability of the instrument.

Method of Data Collection

Ethical approval was obtained from relevant educational authorities, and informed consent was secured from participants and, where necessary, their guardians. Permission was also obtained from school administrators. The questionnaire was administered during scheduled biology classes under the supervision of trained research assistants. Respondents were given approximately 20 minutes to complete the instrument, and completed questionnaires were reviewed on-site to ensure completeness and accuracy.

Method of Data Analysis

Data were coded and entered into Microsoft Excel for analysis. Descriptive statistics, including mean and standard deviation, were used to summarize responses. A four-point Likert scale (Strongly Disagree = 1, Disagree = 2, Agree = 3, Strongly Agree = 4) was applied. A criterion mean of 2.50 was used as the decision threshold, with mean scores ≥ 2.50 indicating agreement and scores < 2.50 indicating disagreement. This analytical approach is consistent with established practices in educational and behavioral research.

Results

The results are presented in accordance with the study objectives and research questions, using descriptive statistics (mean and standard deviation) based on a criterion mean of 2.50 for decision-making.

Table 1: Mean and Standard Deviation of Students' Knowledge of Preventive Strategies for Tropical Diseases (n = 100)

S/N	Items	Mean	SD	Decision
1	Knowledge that tropical diseases are common in tropical regions	3.20	0.80	Accepted
2	Awareness of insecticide-treated nets for malaria prevention	2.22	0.98	Rejected
3	Knowledge of safe drinking water as a preventive measure	2.56	0.95	Accepted
4	Understanding of eliminating stagnant water to prevent mosquitoes	2.76	0.96	Accepted
5	Awareness of vaccines/preventive medications for tropical diseases	1.89	1.12	Rejected

Findings on students' level of knowledge of preventive strategies for tropical diseases indicate a mixed pattern of awareness. Students demonstrated adequate knowledge in selected areas, particularly in recognizing that tropical diseases are more prevalent in tropical climates ($M = 3.20$, $SD = 0.80$), understanding the importance of safe drinking water in reducing disease risk ($M = 2.56$, $SD = 0.95$), and acknowledging the role of eliminating stagnant water in preventing mosquito-borne diseases ($M = 2.76$, $SD = 0.96$). However, significant knowledge gaps were identified. Awareness of the role of insecticide-treated nets in malaria prevention was low ($M = 2.22$, $SD = 0.98$), and knowledge of the availability of vaccinations or preventive medications for certain tropical diseases was particularly poor ($M = 1.89$, $SD = 1.12$). The relatively higher standard deviation for the latter suggests considerable variability and uncertainty among respondents.

Table 2: Mean and Standard Deviation of Students' Misconceptions about Tropical Disease Prevention (n = 100)

S/N	Items	Mean	SD	Decision
6	Belief that diseases are caused by "bad air" or "evil spirits"	3.20	0.62	Accepted
7	Belief that prevention is unnecessary without symptoms	3.25	0.98	Accepted
8	Belief that only adults contract tropical diseases	2.64	0.96	Accepted
9	Doubt about effectiveness of taught preventive strategies	2.88	0.91	Accepted
10	Belief that local herbs alone are sufficient for prevention	3.01	0.99	Accepted

With respect to misconceptions and gaps in understanding, the findings reveal a high prevalence of erroneous beliefs among students. All items assessing misconceptions were

accepted, indicating widespread misunderstanding. Notably, students endorsed the belief that tropical diseases are caused by “bad air” or “evil spirits” ($M = 3.20$, $SD = 0.62$), that preventive measures are unnecessary in the absence of symptoms ($M = 3.25$, $SD = 0.98$), and that only adults are susceptible to such diseases ($M = 2.64$, $SD = 0.96$). Additionally, respondents expressed doubts about the real-world effectiveness of preventive strategies taught in biology ($M = 2.88$, $SD = 0.91$) and showed a tendency to rely on local herbs as sufficient preventive measures ($M = 3.01$, $SD = 0.99$). The relatively low variability in some responses suggests that these misconceptions are deeply entrenched.

Table 3: Mean and Standard Deviation of Students’ Perceptions on Curriculum Improvement (n = 100)

S/N Items	Mean	SD	Decision
11 Curriculum sufficiently covers preventive strategies	2.96	1.07	Accepted
12 Need for additional lessons on disease prevention	2.89	0.79	Accepted
13 Inclusion of practical activities in teaching	3.34	1.00	Accepted
14 School collaboration with local health authorities	1.66	0.88	Rejected
15 Need for teacher training and instructional resources	3.02	1.10	Accepted

Regarding recommendations for strengthening the biology curriculum and health education programmes, the results indicate strong student support for improvements. Most respondents agreed that the current curriculum addresses preventive strategies to some extent ($M = 2.96$, $SD = 1.07$), but also expressed the need for additional instructional content ($M = 2.89$, $SD = 0.79$). There was particularly strong support for incorporating practical and experiential learning activities, such as hygiene campaigns and demonstrations of preventive tools ($M = 3.34$, $SD = 1.00$). Furthermore, students emphasized the need for enhanced teacher training and provision of instructional resources ($M = 3.02$, $SD = 1.10$). However, there was low agreement on the importance of school collaboration with local health authorities ($M = 1.66$, $SD = 0.88$), suggesting limited awareness of the role of institutional partnerships in public health promotion.

Table 4: Mean and Standard Deviation of Students’ Readiness to Apply Preventive Strategies (n = 100)

S/N Items	Mean	SD	Decision
16 Willingness to use insecticide-treated nets	2.92	0.92	Accepted
17 Intention to ensure safe drinking water at home	3.03	0.78	Accepted
18 Willingness to educate others on disease prevention	2.61	0.82	Accepted
19 Willingness to participate in health campaigns	2.81	1.07	Accepted

S/N	Items	Mean	SD	Decision
20	Confidence in applying preventive strategies	3.01	0.97	Accepted

In terms of the relationship between knowledge and readiness to apply preventive strategies, the findings indicate a generally positive disposition among students. All items assessing readiness were accepted, reflecting willingness to adopt preventive practices. Respondents expressed readiness to use insecticide-treated nets ($M = 2.92$, $SD = 0.92$), ensure safe drinking water at home ($M = 3.03$, $SD = 0.78$), and educate peers and family members on disease prevention ($M = 2.61$, $SD = 0.82$). They also indicated willingness to participate in health campaigns ($M = 2.81$, $SD = 1.07$) and confidence in applying preventive strategies in real-life contexts ($M = 3.01$, $SD = 0.97$). Although the overall trend reflects positive behavioral intentions, the observed variability suggests differences in levels of confidence and motivation among students.

Discussion

The findings of this study provide important insights into the knowledge, misconceptions, and behavioral intentions of secondary school biology students regarding the prevention of tropical diseases in Isi-Uzo LGA. The results indicate that although students demonstrate some level of awareness, particularly in relation to environmental and hygiene-based preventive strategies, their knowledge remains uneven and incomplete. Specifically, the relatively high mean scores for items relating to the association of tropical diseases with climatic conditions, the role of safe drinking water, and the elimination of stagnant water suggest that students possess a foundational understanding of environmental risk factors. This pattern is consistent with previous studies indicating that adolescents in endemic regions often recognize the importance of sanitation and environmental management in disease prevention (Udonwa et al., 2010). However, the significantly lower awareness of insecticide-treated nets (ITNs) and preventive medications highlights critical deficiencies in knowledge of established biomedical interventions. Such gaps corroborate earlier findings that, despite widespread distribution campaigns, utilization and understanding of ITNs remain suboptimal among school-aged populations in Nigeria (Alao et al., 2025). The observed variability in responses further suggests that exposure to health information is uneven, likely influenced by socio-economic status, prior health education, and access to public health campaigns.

The findings on misconceptions are particularly concerning, as they reveal deeply entrenched erroneous beliefs about the causes and prevention of tropical diseases. The acceptance of all misconception-related items indicates that a substantial proportion of students' attribute disease causation to non-scientific factors such as "bad air" or spiritual forces, believe that preventive measures are unnecessary in the absence of symptoms, and assume that tropical diseases primarily affect adults. These results are consistent with evidence from sub-Saharan

Africa demonstrating the persistence of culturally rooted misconceptions about disease etiology and prevention (Farea et al., 2022). Such beliefs can significantly undermine the adoption of effective preventive strategies, as individuals may prioritize traditional or non-evidence-based practices over scientifically validated interventions. The finding that many students consider local herbal remedies sufficient for prevention further reinforces this concern and aligns with previous studies reporting reliance on traditional medicine in place of orthodox healthcare approaches (Morenikeji, 2009). The relatively low variability in some responses suggests that these misconceptions are widely shared and may be reinforced by prevailing cultural narratives and limited corrective health education.

Students' responses regarding curriculum improvement and health education interventions provide valuable insights into perceived gaps within the educational system. The general agreement that additional lessons, practical activities, and enhanced teacher capacity are needed suggests that current curriculum delivery may be insufficiently comprehensive or inadequately implemented. This aligns with a growing body of evidence supporting the effectiveness of school-based health education interventions in improving knowledge and promoting preventive behaviors (Harackiewicz et al., 2018). The strong endorsement of experiential learning approaches, such as demonstrations and community-based activities, underscores the importance of moving beyond theoretical instruction to more applied and participatory methods. However, the low level of agreement regarding collaboration with local health authorities suggests limited awareness of the role of multi-sectoral partnerships in disease prevention. This may reflect insufficient exposure to integrated health promotion initiatives or a lack of engagement between schools and community health systems. Variations in responses further indicate that students' perceptions of curriculum adequacy and educational needs may be influenced by contextual factors, including school resources and prior learning experiences.

Despite the identified knowledge gaps and misconceptions, the findings reveal a generally positive disposition among students toward the adoption of preventive behaviors. The majority of respondents expressed willingness to use ITNs, ensure safe drinking water, educate others, and participate in health campaigns, as well as confidence in applying preventive strategies in their daily lives. This aligns with previous studies indicating that adolescents often demonstrate favorable attitudes toward disease prevention when adequately informed. Evidence from intervention studies also suggests that improvements in knowledge are frequently associated with increased behavioral intentions, particularly in school-based contexts (Harackiewicz & Priniski, 2017). Nonetheless, the moderate variability observed in responses, especially regarding participation in community health initiatives, suggests that willingness may not always translate into actual practice. Structural barriers such as limited access to preventive tools, economic constraints, and inadequate community infrastructure

have been identified as key factors limiting the translation of knowledge into action (Alao et al., 2025).

Overall, the findings present a nuanced picture of partial knowledge, persistent misconceptions, and promising behavioral intentions among secondary school biology students in Isi-Uzo LGA. While students demonstrate an understanding of general environmental preventive measures, significant gaps remain in their awareness of standard biomedical interventions, and culturally influenced misconceptions continue to shape their perceptions. Importantly, the students' expressed readiness to adopt preventive practices and their recognition of the need for improved health education suggest considerable potential for intervention. Strengthening the biology curriculum through the integration of comprehensive, evidence-based, and contextually relevant health education particularly with an emphasis on practical and experiential learning could play a critical role in addressing these gaps. In addition, targeted efforts to correct misconceptions through culturally sensitive communication, enhanced teacher training, and increased collaboration between schools and health authorities are essential. Such interventions should be complemented by improved access to preventive tools and supportive environmental conditions to ensure that knowledge and willingness are effectively translated into sustained preventive behaviors.

Conclusion

This study demonstrates that secondary school biology students in Isi-Uzo Local Government Area possess a foundational but uneven understanding of preventive strategies for tropical diseases. While awareness of general environmental and hygiene-related measures is relatively adequate, significant gaps persist in knowledge of key biomedical interventions, particularly the use of insecticide-treated nets and preventive medications. Moreover, the prevalence of deeply rooted misconceptions regarding disease causation and prevention highlights critical deficiencies in both conceptual understanding and the effectiveness of existing health education approaches.

Despite these limitations, the findings reveal a strong willingness among students to adopt and promote preventive practices, indicating substantial potential for behavior change if appropriate educational interventions are implemented. This suggests that knowledge deficits, rather than attitudinal barriers, constitute the primary constraint to effective disease prevention in this population. Consequently, strengthening school-based health education through curriculum enhancement, integration of experiential learning strategies, and improved teacher capacity is imperative.

Furthermore, addressing culturally influenced misconceptions through context-sensitive and evidence-based communication is essential to ensure accurate knowledge translation. These efforts should be complemented by improved access to preventive tools and strengthened

collaboration between the education and health sectors to create enabling environments for sustained behavioral change. Overall, targeted and contextually relevant educational interventions have the potential to significantly enhance students' knowledge and practices, thereby contributing to the broader goal of reducing the burden of tropical diseases in rural Nigerian communities.

Recommendation

Education policymakers should prioritize the integration of comprehensive, evidence-based tropical disease prevention content into the secondary school biology curriculum. Emphasis should be placed on practical and experiential learning approaches, including demonstrations of insecticide-treated nets, safe water handling, and hygiene practices. To ensure effective delivery, sustained professional development programs must be provided to equip teachers with the necessary knowledge, instructional strategies, and resources. Strengthening teacher capacity in this manner will help reduce prevalent misconceptions and enhance students' understanding of scientifically validated preventive measures.

In addition, collaboration between schools and local health authorities should be institutionalized to support community-based health interventions. Such partnerships can facilitate access to preventive tools, including vaccines and insecticide-treated nets, and promote coordinated health campaigns that reinforce classroom knowledge with real-world practices. By combining curriculum-based education with practical, community-oriented initiatives, students' readiness to adopt preventive behaviors can be strengthened, contributing to sustained improvements in tropical disease prevention within their households and communities.

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