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Use of National Guidelines in the Treatment of Severe Malaria: A Retrospective Study of Severe Malaria Management in Under 5s in Benue State

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Abstract

This study explored healthcare providers' perceptions of the National Guidelines for Diagnosis and Treatment of Malaria (NGDTM) in Benue State, Nigeria, focusing on adherence barriers and facilitators. Employing a cross-sectional design, data was collected through a structured survey from a diverse sample of healthcare professionals. Findings revealed a nuanced landscape of attitudes towards NGDTM, with high awareness and positive attitudes but practical challenges hindering consistent adherence. Healthcare workers expressed uncertainty regarding guideline utilization and adherence, citing time constraints, inadequate training, and organizational culture as significant barriers. Despite these challenges, recommendations emerged to enhance guideline implementation and improve patient outcomes. These included prioritizing continuous training and education programs, addressing medication stockouts, and creating supportive work environments. Moving forward, interventions should focus on fostering positive attitudes towards guidelines, addressing systemic barriers, and promoting collaboration between public and private sectors to standardize practices across healthcare facilities. By addressing these challenges, stakeholders can optimize malaria management practices and ultimately improve health outcomes in Benue State.

Keywords*: Benue State, Guideline Adherence, Healthcare Providers, Nigeria, National Guidelines For Diagnosis and Treatment of Malaria.*

Introduction

Malaria, a major worldwide health issue, disproportionately affects vulnerable groups such as children under five [1-3]. The 2022 World Malaria Report reported consistent trends, with 619,000 fatalities and 247 million cases in 2021 [4, 5]. The WHO African Region remains the focal point of malaria, accounting for 95% of worldwide incidence and 96% of deaths in 2021 [5]. Nearly 80% of African malaria deaths were in children under the age of five [6], highlighting the devastating impact on this vulnerable demographic.

Malaria remains a serious public health hazard in Sub-Saharan Africa, killing over 500,000 people each year, the majority of whom are infants [7]. The region's year-round malaria transmission is aggravated by good weather and insufficient healthcare services [8-10]. Aside from mortality, malaria survivors have long-term repercussions that impede economic progress [11-13]. Mosquito nets and indoor spraying are two strategies that help to reduce transmission [14-16]. However, Sub-Saharan Africa's healthcare infrastructure falls behind, with only 2.3 health professionals per 1000 population [7], which contrasts sharply with other areas.

Nigeria's critical importance in understanding malaria is underlined by its different prevalence rates across areas. In the West, 8.70% of pregnant women tested positive for malaria, indicating a large burden [17]. The

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South East recorded rates ranging from 16.7% to 46.2%, with children under 5 accounting for 16.7% [18]. Kebbi State in the North had the greatest prevalence of malaria-positive children (77.7%), while the Federal Capital Territory had 29.6% in the 6-59-month age range [19]. Overall, Nigeria has a malaria prevalence of 31.9%, which contributes significantly to world mortality [20].

The problems mentioned highlight the need of malaria control guidelines at the national level. The authors argue that Nigeria's National Malaria Guidelines are critical for good case management [18]. These guidelines, based on global best practices and local data, guide healthcare practitioners through diagnosis, treatment, and prevention [21]. According to WHO, major parts of national recommendations for malaria include [21]:

1. Diagnosis: Detailed instructions on the proper use of molecular techniques, rapid diagnostic tests (RDTs), or microscopy to diagnose malaria.
2. Treatment: Recommendations for the selection of antimalarial medications, doses, and treatment plans for patients with both mild and severe malaria. Taking into consideration elements like medication resistance, this may involve recommendations for both first-line and alternative therapies.
3. Prevention: The use of indoor residual spraying (IRS), insecticide-treated bed nets (ITNs), and chemoprophylaxis for travellers or high-risk populations are some malaria control strategies.
4. Special Risks Populations: Particular recommendation for vulnerable groups, including non-immune travellers, pregnant women, small children, and those with comorbidities (such as HIV/AIDS, TB, etc.).
5. Epidemic Response: Guidelines for managing malaria outbreaks or epidemics, including surveillance, rapid response, and mass drug administration if necessary.
6. Healthcare Provider Training: Details on educating medical staff on how to use the rules in an efficient manner to guarantee consistent, high-quality service.
7. Monitoring and Evaluation: Protocols for monitoring and evaluating the application of recommendations, analysing the impact of interventions, and adjusting methods based on continuous surveillance and research.

The national guideline for malaria diagnosis and treatment attempts to standardise methods while improving patient outcomes. It's a valuable resource for Nigerian physicians, available both online and in healthcare facilities [18, 22, 23]. These guidelines emphasise the importance of case management in malaria control, offering clear guidance for proper diagnosis and treatment to limit the disease's impact on public health. Despite the potential benefits of such a guideline, there are concerns among stakeholders about their understanding, attitude, adherence, and behaviours in relation to its requirements. This comprises policymakers, health departments, and healthcare providers such as doctors, nurses, chemists, laboratory scientists, and medical technologists who work in malaria management.

Previous study in several Nigerian states has revealed worrying patterns of adherence, understanding, and attitudes towards national malaria recommendations [22, 18, 24, 23, 25]. Disparities in the availability and use of malaria rapid diagnostic tests (mRDT) between public and private health institutions in Ogun State highlight issues with resource allocation and adherence to standardized diagnostic methodologies [22]. Despite high knowledge, research in Ebonyi State showed that doctors do not comprehend or apply the 2015 National Guidelines for Diagnosis and Treatment of Malaria [23]. Similarly, investigations in Edo State have revealed variations in paediatric residents' prescribing patterns, indicating a disregard for national standards [18]. Primary

health care staff in Northern Nigeria, particularly Community Health Extension Workers (CHEWs), lack awareness of and adherence to the National Malaria Treatment Guidelines [25]. Physicians in Delta State hold varied views on the efficacy of antimalarial policy, which influences prescription patterns for malaria patients [24].

The Case of Benue

Several research have looked at malaria prevalence in Benue State, Nigeria, and the results show that rates vary by area. A study discovered that pregnant women in Makurdi had a high rate of anaemia (47.0%) and malaria infection (49.0%) [26]. Another study found a 55.7% frequency of Plasmodium falciparum parasitic infections in Gboko [27]. The author emphasised the hazard of asymptomatic malaria, which has a prevalence ranging from 24.9% to 40.1% in rural regions and 8.8% in cities [28]. However, one study found an overall frequency of 20.8%, with higher rates among female students and users of insecticide-treated nets [29].

Despite scant evidence on the application of national malaria guidelines in Benue State, a USAID mapping exercise identified considerable barriers to guideline adoption [30]. Most health facilities do not follow the National Guidelines for Diagnosis and Treatment of Malaria, with just 15.3% doing so, often due to a lack of training. Furthermore, a large number of facilities lack infection prevention procedures, compounding systemic issues. To address these issues, comprehensive initiatives that include guideline dissemination, targeted training, and thorough monitoring are required.

Based on the findings, efforts have been made to improve guideline implementation in Benue State. An engagement conference was held to increase the capacity of general hospitals, with work aids and standard operating procedures supplied. Monthly professional association meetings introduced the NMEP malaria e-toolkit and revised recommendations, with the goal of improving adherence among healthcare staff. However, significant gaps exist, demanding more interventions.

Conducting a comprehensive study on the use of national guidelines for severe malaria treatment in Benue State is crucial for providing accurate data and identifying challenges hindering guideline utilization. This research would inform evidence-based strategies to tackle these challenges and reduce the malaria burden. Effective solutions require disseminating recommendations, executing customized training, and building strong monitoring processes.

Statement of the Problem

Adherence to national recommendations is critical for effectively managing severe malaria in children under the age of five, particularly in regions with varying malaria incidence rates, such as Benue State in Nigeria [26, 27, 28, 31]. However, inadequate access to the National Guidelines for Diagnosis and Treatment of Malaria in healthcare facilities creates considerable obstacles [30]. The purpose of this study is to look into the hurdles to using guidelines and how to improve their accessibility, adoption, and implementation. The study aims to enhance malaria management practices by addressing these gaps with targeted interventions, training programmes, and strong monitoring methods [5, 30]. Finally, maintaining consistent and high-quality healthcare for this vulnerable population would necessitate collaborative efforts to overcome systemic problems and enhance guideline adherence in both government and commercial healthcare facilities in Benue State.

Consequently, this study aimed to assess the overall utilization of national guidelines for the treatment of severe malaria among children under five in Benue State, Nigeria. Additionally, it sought to identify factors

affecting the adoption and implementation of these national malaria guidelines within healthcare facilities in the region. Furthermore, the study intended to investigate the impact of healthcare provider knowledge and attitudes on adherence to these guidelines, with the ultimate goal of informing evidence-based strategies to enhance malaria management practices in Benue State.

Theoretical Framework

Health Belief Model

Hochbaum, Rosenstock, and Kegels developed the Health Belief Model (HBM) in the 1950s, and it is now a popular theoretical framework in health behaviour research [32–33]. This model proposes that people's decisions to engage in health-related behaviours are influenced by their views of the threat to their health and the importance they place on preventive [34]. The Health Belief Model is based on several principles, which provide insights into carers' and medical experts' opinions on treating severe malaria in children under the age of five.

1. Perceived Susceptibility refers to an individual's appraisal of their vulnerability to a specific health issue [32]. In the setting of severe malaria, healthcare experts and carers assess the risk of young children catching the disease and the severity of its consequences.
2. Perceived Severity reflects people's perceptions of the gravity of a health issue, which influences their decisions to adopt preventative or treatment measures [32]. When considering whether to follow national recommendations, healthcare providers and carers assess the severity of symptoms as well as the potential problems associated with severe malaria.
3. Perceived Benefits involve individuals weighing the advantages of adopting recommended health behaviours against perceived costs or barriers [32]. Healthcare professionals and caregivers assess the effectiveness of national guidelines in improving patient outcomes and preventing complications related to severe malaria.
4. Perceived Barriers encompass individuals' recognition of obstacles or costs associated with adopting health behaviors [32]. Barriers to adherence to national guidelines for severe malaria may include factors such as the accessibility of medications, availability of diagnostic tools, and deficiencies in healthcare infrastructure.
5. Self-Efficacy refers to an individual's belief in their ability to successfully perform a recommended health action [35]. In the context of severe malaria management, the self-efficacy of healthcare professionals and caregivers is influenced by factors such as the perceived complexity of adhering to national guidelines and their confidence in handling severe cases in young children.
6. Cues to Action are external events or triggers that prompt individuals to take preventive or treatment actions [36]. In the context of severe malaria, cues to action may include awareness campaigns, training programs, or the occurrence of severe cases in the community.

The Health Belief Model sheds light on a retrospective study of severe malaria management in children under the age of five in government and private hospitals in Benue State. The views of healthcare professionals and carers about the severity and vulnerability to severe malaria in young children have a major impact on adherence to national recommendations [37]. Furthermore, the model's emphasis on balancing perceived rewards and constraints is important for understanding the treatment adherence decision-making process.

Theory of Planned Behavior

1. The Theory of Planned Behavior (TPB), proposed by Icek Ajzen in the late 1980s, posits that behavioural intentions drive

individuals' behaviour [38]. The TPB suggests that substantial norms, perceived behavioural control, and attitudes toward the behaviour influence these intentions [38].

2. Attitude Toward Behavior reflects an individual's assessment of how well or poorly they perform a specific behaviour. Healthcare professionals and caregivers may form opinions about following national recommendations for managing severe malaria based on the guidelines' applicability, efficacy, and potential impact on patient outcomes.
3. Subjective Norms encompass perceptions of expectations or social pressure related to the behaviour. Expectations from coworkers, superiors, or society may influence adherence to national guidelines for managing severe malaria.
4. Perceived Behavioral Control refers to an individual's perception of the ease or difficulty of performing the behaviour. Factors such as resource availability, training opportunities, and infrastructure may influence perceived behavioural control in implementing severe malaria management guidelines.

The Theory of Planned Behaviour offers a thorough framework for investigating the intentions and behaviours of carers and healthcare professionals in managing severe malaria in Benue State's children under the age of five. This theoretical paradigm improves our understanding of the factors that influence adherence to national rules by delving into attitudes, subjective norms, and perceived behavioural control. The TPB explains the complex connections that determine compliance with national recommendations using insights from leading scholars in the field [39, 40].

Materials and Methods

The research design used a survey approach suggested by an author [41], which aligned with a positivist worldview [42]. Structured questionnaires are delivered to healthcare workers and carers to gather quantifiable data on severe malaria management in Benue State. This approach ensures systematic data collecting and statistical analysis, which improves understanding of adherence to national norms.

For cross-sectional research, such as the retrospective examination into severe malaria management in government and private facilities in Benue State, Cochran's formula, a widely used approach for predicting required sample sizes, was applied. Cochran's formula is expressed as:

where: n = the sample size, Z= the Z-score corresponding to the chosen confidence level, P = the assumed rate of occurrence as a proportion, and E = the desired margin of error. In the context of this study, considering a 95% confidence level (Z^2= 1.96), an assumed rate of adherence to guidelines at 50% (0.50 =P), and a reduced margin of error of 3% (0.03 =E^2), the sample size calculation using Cochran's formula becomes 1067.11. *n*=

$$\frac{Z^2 \times P \times (1 - P)}{e^2}$$

Therefore, Cochran's formula yields a calculated sample size (*n*) of approximately 1068. This approach, by Cochran's formula, is well-established in the literature on sample size determination for cross-sectional studies and ensures the study's statistical precision and reliability [43].

The study used a thorough sampling strategy that combined probability and non-probability techniques. Clustering, inspired by an author, arranged health facilities by location and type [44]. An author [45] advised systematic random sampling for cluster selection, but simple random sampling was used for individual facility selection [46]. Healthcare professionals were randomly picked from specified facilities to guarantee representation across all roles.

To address the research aims methodically, the study used a structured questionnaire with Likert scale items. It aims to provide nuanced insights into adherence variables by covering a wide range of topics, including NGDTM accessibility, utilization rates, preventive measures, training, and healthcare professional attitudes.

Cronbach's alpha was used to determine reliability, which is critical for measurement consistency [47]. Table 1 shows that utilization scales for NGDTM in severe malaria diagnosis, treatment, and prevention have strong internal consistency (α =.880, .971, .967). The training utilization scale indicated acceptable reliability (α =.726), whereas the adherence factors scale demonstrated moderate consistency (α =.713). The study's measures, with a total α of.832 over 66 items, demonstrated good internal consistency reliability in assessing NGDTM-related characteristics in healthcare facilities. Ethical concerns were crucial, with IRB permission obtained, informed consent gained from all participants, confidentially maintained, and precautions taken to reduce harm.

The data gathered from healthcare professionals was subjected to extensive statistical analysis. Descriptive statistics, such as frequencies, percentages, means, and standard deviations, were used to offer an overview of demographic features and survey responses. Inferential statistical tests, such as the chi-square test, were used to measure levels of adherence to the National Guidelines for Diagnosis and Treatment of Malaria (NGDTM), depending on the factors.

Table 1. Summary of the Findings of the Cronbach's Alpha Analyses

Scale	**Cronbach's Alpha**	**Number of Items**
Utilization rates of NGDTM in diagnosing severe malaria	0.880	8
Utilization rates of NGDTM in treatment protocols for severe malaria among children under 5	0.971	8
Application of NGDTM in preventive measures for the management of severe malaria among children under 5	0.967	8
Utilization rates of NGDTM in training healthcare providers	0.726	8
Factors influencing adherence to NGDTM by healthcare providers	0.713	12
Knowledge and attitudes of healthcare providers towards NGDTM	0.859	8
Total Score	0.832	51

Result

The data in Table 2 below shows a balanced gender distribution, with females slightly more at 51.7%. Most respondents are aged 40-50 (51.2%), and pharmacists are the largest professional group (31.7%). Semi-urban settings are common (46.2%), reflecting diverse work environments.

Table 2. Socio-Demographic Characteristics

Variable	Frequency	Percentage
Gender		
Male	434	48.3%
Female	464	51.7%
Age		
18-28	150	16.7%
29-39	177	19.7%
40-50	460	51.2%
Above 50 years	111	12.4%
Profession/Position		
Physician/Doctor	143	15.9%
Nurse	179	19.9%
Pharmacist	285	31.7%
Laboratory Technician	168	18.7%
Other (please specify)	123	13.7%
Location		
Rural	201	22.4%
Urban	282	31.4%
Semi-urban	415	46.2%
Type of Healthcare Facility		
Government-owned	203	22.6%
Private-owned	695	77.4%
Years of Experience		
Less than one year	172	19.2%
2-4 years	370	41.2%
5-8 years	239	26.6%
9 years and above	117	13.0%
Highest Level of Education		
Secondary School	12	1.3%
Health Diploma or Equivalents	292	32.5%
Bachelor's Degree	527	58.7%
Master's Degree	51	5.7%
Doctorate Degree	16	1.8%

Objective 1. The Overall Utilization of National Guidelines of Severe Malaria Among Children Under Five

Healthcare providers' perceptions of the National Guidelines for Diagnosis and Treatment of Malaria (NGDTM) reveal mixed sentiments as shown in Figure 1. Over half of respondents are uncertain or disagree about NGDTM's frequent use (48.3% to 47.1%) and primary role in diagnosis (46.9%). Positive perceptions, like NGDTM user-friendliness (45.8%) and diagnostic accuracy confidence (47.9%), are tempered by uncertainty or disagreement. Regarding adherence, around 39.6% to 38.0% express uncertainty or disagreement, and for treatment plan adherence, 26.8% are uncertain and 13.4% disagree.

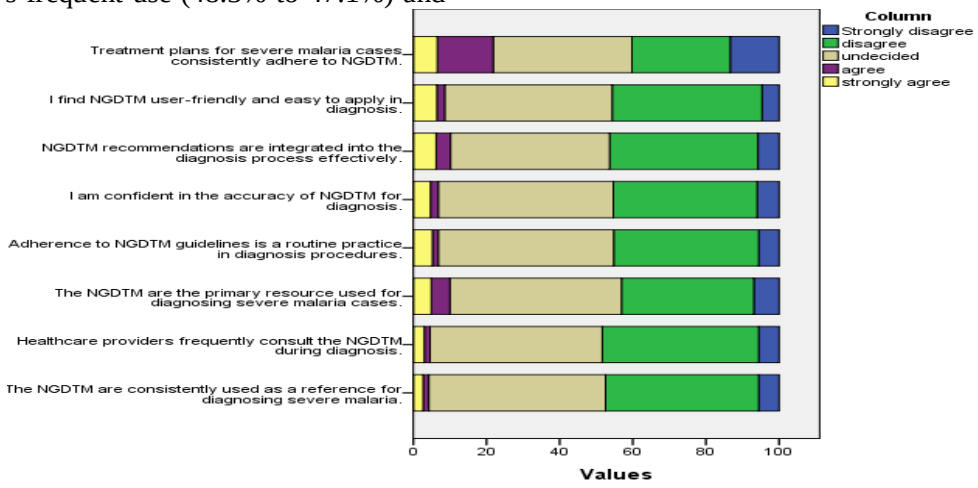

Figure 1. The Utilization Rates of the NGDTM in Diagnosing Severe Malaria Cases Among Children Under 5 in Healthcare Settings

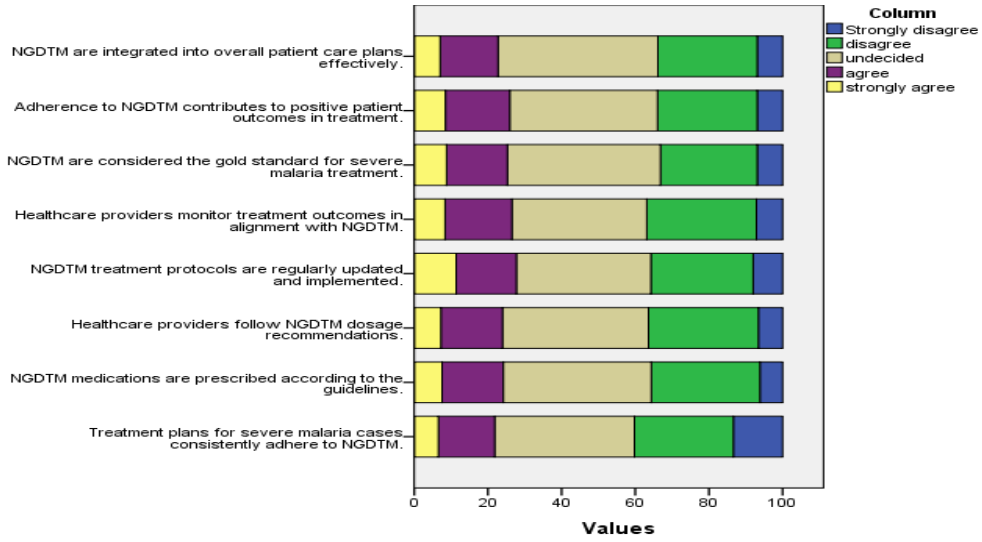

Figure 2. Rates of NGDTM Utilization in the Treatment Protocols for Severe Malaria Among Children Under 5 Within Healthcare Facilities

Figure 2 depicts healthcare providers' perceptions of adherence to the National Guidelines for Diagnosis and Treatment of Malaria (NGDTM). A significant portion (38.0%) is undecided about adherence to treatment plans, and 29.5% are unsure about consistent medication prescriptions. While 43.4% express confidence in NGDTM integration, uncertainty persists. Mixed opinions emerge regarding protocol updates,

with 36.5% agreeing and 27.7% disagreeing. Monitoring practices also vary, with 18.2% agreeing and 29.7% disagreeing.

Figure 3 highlights healthcare providers' application and adherence to NGDTM in preventive measures for severe malaria among under-5s. A significant portion reports frequent compliance, with 31.5% often and 28.2% always following NGDTM recommendations. Indoor residual spraying (IRS) and insecticide-treated bed net (ITN) distribution align well with guidelines, with 31.7% and 32.4% often implementing them, respectively. Chemoprophylaxis administration sees high adherence, with 37.1% often and 26.4% always implementing it.

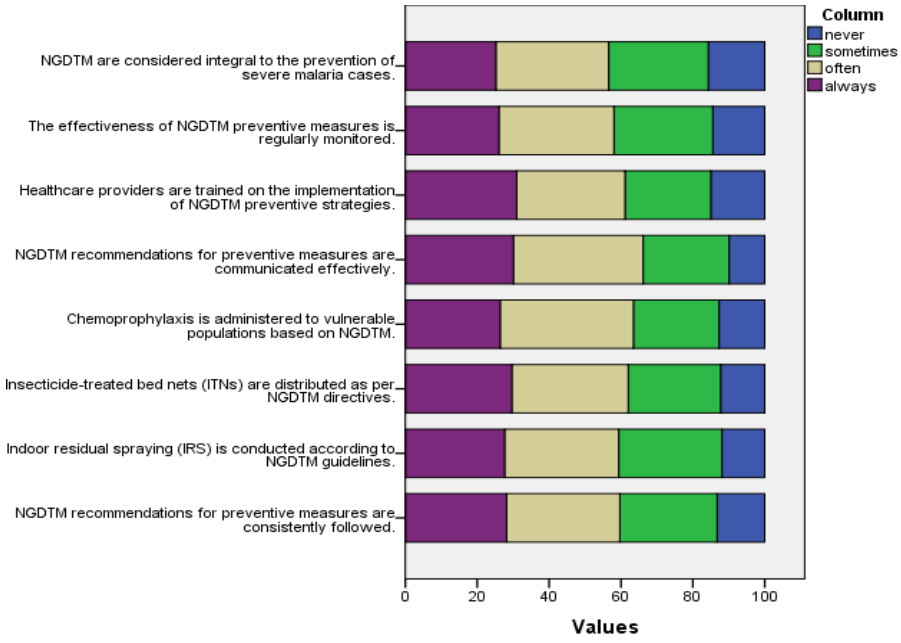

Figure 3. The Application of NGDTM in Preventive Measures in the Management of Severe Malaria Among Children Under 5

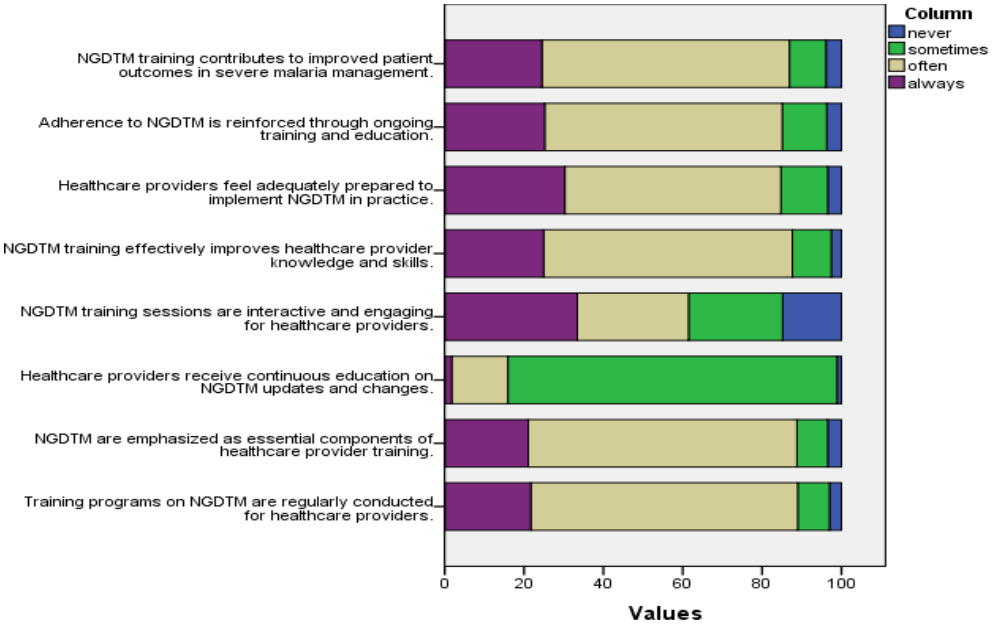

Figure 4. The Rates of NGDTM Utilization in Training Healthcare Providers in the Comprehensive Management of Severe Malaria Among Children Under 5

The data from Figure 4 indicates that a significant portion of healthcare providers frequently participate in NGDTM training sessions (67.3% often, 21.7% always) and recognize their importance (67.7% often, 21.0% always). While updates on NGDTM are less consistent (83.0% sometimes, 14.1% often), many find the sessions interactive (28.1% often, 33.4% always). Healthcare providers often benefit from the training (62.7% often, 24.9% always) and feel prepared to implement NGDTM (54.5% often, 30.3% always), contributing to improved patient outcomes (62.4% often, 24.5% always).

Objective 2: Factors Affecting the Adoption and Implementation of National Malaria Guidelines

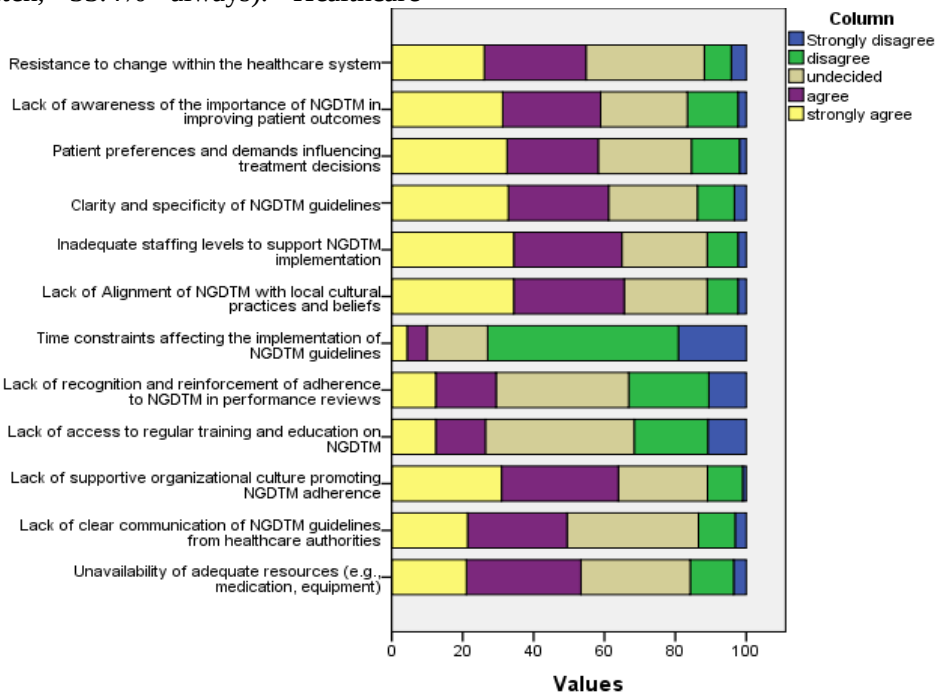

Figure 5. The Factors Influencing Adherence to NGDTM by Healthcare Providers

As shown in Figure 5, the survey data provides insights into various factors influencing healthcare workers' adherence to NGDTM guidelines. Overall, it appears that a significant proportion of respondents acknowledge several challenges that may impede adherence to NGDTM. Many respondents (53.8%) identify time constraints as a major barrier to implementing NGDTM guidelines, indicating that healthcare workers may struggle to allocate sufficient time for adhering to complex protocols amidst their busy schedules. Similarly, a substantial number of respondents (42.0%) highlight a lack of access to regular training and education on NGDTM, suggesting that ongoing professional development opportunities are crucial for maintaining adherence to evolving guidelines. Additionally, organizational factors play a significant role, with a majority of respondents (33.0%) citing the lack of supportive organizational culture promoting NGDTM adherence. This underscores the importance of fostering a workplace environment that prioritizes and reinforces adherence to established protocols.

Moreover, the alignment of NGDTM with local cultural practices and beliefs emerges as another key consideration, with a notable majority of respondents (34.4%) indicating that this alignment is essential for successful implementation. This finding highlights the importance of cultural sensitivity in healthcare practices, particularly in contexts where cultural factors may influence treatment decisions. Furthermore, clarity and specificity

of NGDTM guidelines are deemed crucial, with a majority of respondents (32.9%) emphasizing the need for clear and concise guidelines to facilitate adherence. This suggests that improvements in guideline clarity could enhance healthcare workers' ability to implement NGDTM effectively. Furthermore, a regression analysis was performed to ascertain the impact of respondents' (health workers') socio-demographics on the adoption and implementation of NGDTM.

As shown in Table 3, the overall model exhibited statistical significance ($F = 4.872$, $p < 0.001$), suggesting that at least one of the predictor variables significantly explains the variance in perceived adherence scores. However, the model's R-squared value is low ($R^{\wedge 2} = 0.037$), indicating that only about 3.7% of the variance in perceived adherence scores can be explained by the socio-demographic characteristics included in the model. Among the predictor variables, "Profession/Position" showed a statistically significant positive association with perceived adherence ($B = 1.454$, $p < 0.001$). This suggests that individuals with certain professions or positions such as physicians/doctors tend to have higher perceived adherence to malaria treatment protocols.

Additionally, "Type of Healthcare Facility" demonstrated a statistically significant positive association with perceived adherence ($B = 1.911$, $p = 0.036$), indicating that the type of healthcare facility influences adherence to malaria treatment protocols. Other socio-demographic characteristics such as gender, age, location, years of experience in healthcare, and highest level of education did not show statistically significant associations with perceived adherence to malaria treatment protocols.

Table 3. Regression Analysis on the Impact of Socio-Demographic Factors on Adherence to Ngdtm

Variable	Coefficient	Std. Error	t-value	p-value	95% CI Lower	95% CI Upper
Gender	0.339	0.805	0.421	0.674	-1.241	1.920
Age	0.600	0.455	1.318	0.188	-0.294	1.494
Profession/Position	1.454	0.304	4.784	0.000	0.858	2.050
Location	-0.674	0.493	-1.369	0.171	-1.642	0.293
Type of Healthcare Facility	1.911	0.909	2.101	0.036	0.126	3.696
Years of Experience	-0.284	0.419	-0.678	0.498	-1.107	0.538
Highest Level of Education	0.929	0.580	1.603	0.109	-0.209	2.067

Objective 3: The Impact of Healthcare Provider Knowledge and Attitudes on Adherence to National Malaria Guidelines

Knowledge and Attitude towards NGDTM

In Figure 6, 76.2% of healthcare workers are familiar with the National Guidelines for Diagnosis and Treatment of Malaria (NGDTM). 42.3% believe in NGDTM's effectiveness for better patient outcomes, and the same percentage express interest in learning more. Similarly, 42.3% feel confident in applying NGDTM principles, while an equal proportion supports initiatives for NGDTM adherence. Yet, opinions vary on NGDTM's impact on reducing morbidity and mortality and its integration into healthcare protocols.

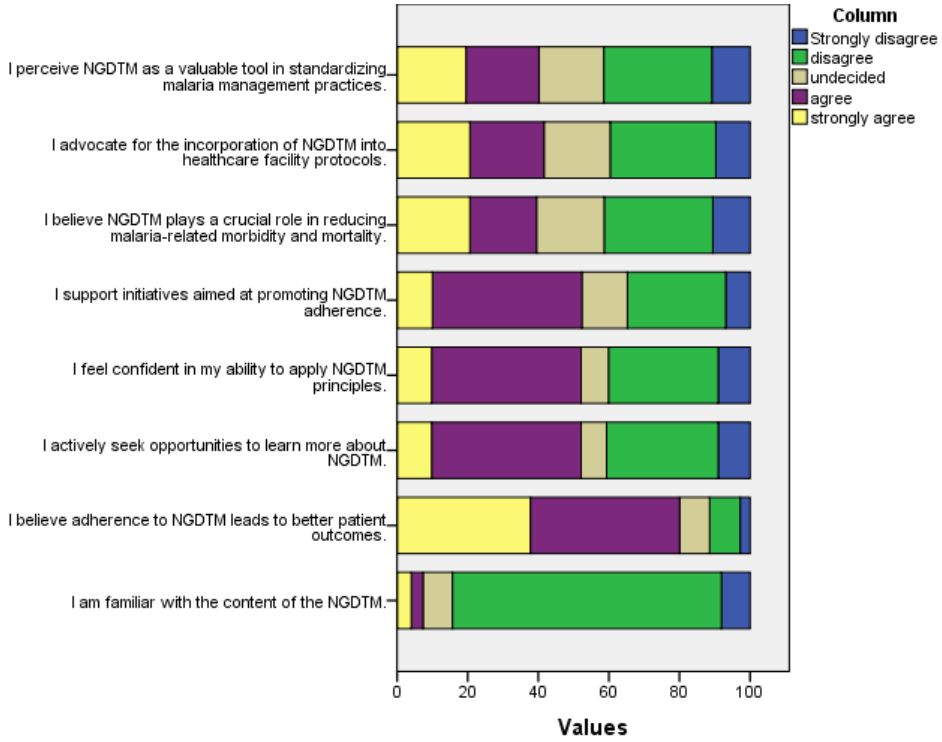

Figure 6. Knowledge and Attitude towards NGDTM

The regression analysis aimed to investigate the impact of positive knowledge and attitude towards the National Guidelines for Diagnosis and Treatment of Malaria (NGDTM) on adherence to malaria treatment protocols for children under 5. The results, as indicated in Table 4, indicated that the overall model was statistically significant (F = 17.181, p< 0.001), suggesting that at least one of the predictor variables contributes significantly to the variability in perceived adherence scores.

The R-squared value of the model was 0.134, indicating that approximately 13.4% of the variance in perceived adherence scores can be attributed to positive knowledge and attitude towards NGDTM. Among the predictor variables, several factors demonstrated statistically significant associations with perceived adherence to malaria treatment protocols:

Being familiar with the content of the NGDTM (p< 0.001), advocating for the incorporation of NGDTM into healthcare facility protocols (p< 0.001), and believing in the crucial role of NGDTM in reducing malaria-related morbidity and mortality (p< 0.001) were positively associated with perceived adherence. Conversely, feeling confident in one's ability to apply NGDTM principles showed a statistically significant negative association with perceived adherence (p = 0.036). Seeking opportunities to learn more about NGDTM (p = 0.060) and supporting initiatives aimed at promoting NGDTM adherence (p = 0.100) did not exhibit statistically significant associations with perceived adherence.

Table 4. Regression Analysis on The Impact of Knowledge and Attitude on Adherence to NGDTM

Variable	Coefficient	Std. Error	t-value	p-value	95% CI Lower	95% CI Upper
I am familiar with the content of the NGDTM	3.276	0.458	7.149	0.000	2.377	4.176

I believe adherence to NGDTM leads to better patient outcomes	0.420	0.364	1.153	0.249	-0.295	1.135
I actively seek opportunities to learn more about NGDTM	9.400	4.984	1.886	0.060	-0.381	19.181
I feel confident in my ability to apply NGDTM principles	-10.957	5.230	-2.095	0.036	-21.221	-0.693
I support initiatives aimed at promoting NGDTM adherence	1.830	1.110	1.649	0.100	-0.348	4.009
I believe NGDTM plays a crucial role in reducing malaria-related morbidity and mortality	-4.716	1.274	-3.701	0.000	-7.216	-2.215
I advocate for the incorporation of NGDTM into healthcare facility protocols	5.968	1.043	5.724	0.000	3.922	8.014
I perceive NGDTM as a valuable tool in standardizing malaria management practices	0.492	0.766	0.642	0.521	-1.011	1.995

Discussion of Findings

This section is concerned with a discussion of the findings of the study objectives within various extant contexts based on the objectives of the study.

Findings from Objective 1 showed the diverse perspectives held by healthcare providers regarding the utilization and adherence to the NGDTM. According to findings, healthcare providers' views on using guidelines for severe malaria in young children vary. While some are unsure about their frequent use and role in diagnosis, many express confidence in their accuracy. Adherence to treatment plans and preventive measures also shows mixed opinions, but training sessions are generally well-received and deemed beneficial for patient care. This finding resonates with previous literature that has highlighted the complexity of healthcare professionals' attitudes towards guidelines. A study found a concerning lack of knowledge among pediatric residents about national guidelines for managing malaria cases, indicating potential variations in awareness and acceptance of guidelines among different healthcare providers [18]. Similarly, another study observed variations in knowledge and practices between hospital and health centre workers, suggesting discrepancies in adherence levels [48].

Objective 2 delves into the barriers to adherence to NGDTM, identifying time constraints, lack of regular training, and organizational culture as significant hindrances. The study revealed that healthcare workers face challenges like time constraints and lack of training, hindering adherence to malaria treatment guidelines. Certain factors like profession and type of healthcare facility positively influence adherence. These findings align with prior research that has identified similar challenges in guideline implementation. A study highlighted the impact of inadequate training on healthcare workers' compliance with treatment guidelines, emphasizing the importance of ongoing education to maintain adherence [25]. Additionally, another study underscored the influence of organizational culture on adherence, emphasizing the need for supportive environments that prioritize guideline implementation [49].

Finally, findings (from objective 3) reveal widespread awareness of malaria management

guidelines among healthcare providers, reflecting a commitment to patient care [25, 18]. However, uncertainties and differing perspectives persist regarding NGDTM's efficacy and integration into institutional protocols [50-52]. Barriers such as inadequate training and disruptions in medicine supply hinder full implementation. These findings echo previous studies, highlighting challenges in translating knowledge into practice and ensuring consistent adherence to guidelines.

The study further found that knowing about and supporting malaria treatment guidelines positively influenced how healthcare workers followed treatment protocols for young children. However, feeling overly confident in applying the guidelines had a negative effect. This finding is consistent with previous literature that has emphasized the importance of healthcare providers' attitudes and perceptions towards guidelines. A study found that despite high awareness of guidelines, a low percentage of healthcare providers demonstrated good practice, suggesting that positive attitudes towards guidelines are crucial for adherence [23]. Conversely, confidence in applying guideline principles negatively impacted adherence, highlighting the nuanced nature of healthcare providers' beliefs and their impact on adherence.

Overall, these findings contribute to previous knowledge by providing a comprehensive understanding of the factors influencing adherence to NGDTM among healthcare providers. By identifying barriers and facilitators to adherence, this study offers valuable insights into strategies for improving guideline implementation and ultimately enhancing patient outcomes in malaria management. The implications of these findings underscore the importance of addressing systemic challenges such as inadequate training and organizational culture while fostering positive attitudes towards guidelines among healthcare providers. Moving forward, interventions aimed at promoting adherence to NGDTM should consider the multifaceted nature of barriers and facilitators identified in this study to ensure effective guideline implementation in clinical practice.

The findings on healthcare workers' perceptions of the National Guidelines for Diagnosis and Treatment of Malaria (NGDTM) resonate with the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB). High familiarity aligns with HBM's perceived severity and susceptibility, while positive attitudes reflect perceived benefits [32]. Barriers like inadequate training echo perceived barriers in the HBM [32], while supportive attitudes reflect self-efficacy and cues to action [35]. Similarly, TPB's positive attitudes influence adherence intentions, while perceived barriers hinder intentions [38]. Differences between public and private facilities suggest subjective norms' influence [32, 38].

Conclusion

The study highlights healthcare providers' awareness and positive attitudes towards the NGDTM in Benue State, Nigeria, particularly in managing severe malaria cases in children under five. Despite regular training and recognition of NGDTM's importance, practical barriers like medication stockouts and workload pressures hinder consistent guideline adherence. Given malaria's endemic nature and its severe impact on children, ensuring adherence is crucial for reducing morbidity and mortality. Addressing these challenges requires comprehensive strategies, including policy reforms, capacity building, and stakeholder engagement. Ongoing monitoring is vital to refine intervention strategies. Context-specific interventions are urgently needed to improve adherence and malaria management outcomes, especially among vulnerable populations like children under five. By tackling critical barriers and fostering a supportive healthcare environment, we can mitigate malaria's impact

and enhance child health in endemic regions like Benue State.

Limitation and Future Direction of Study

The study's insights into healthcare workers' knowledge and attitudes towards the National Guidelines for Diagnosis and Treatment of Malaria (NGDTM) are valuable, yet its reliance on self-reported data and cross-sectional design pose limitations. This approach may introduce response bias, potentially inflating familiarity and support for NGDTM, while hindering the establishment of causal relationships or tracking adherence changes over time. To enrich understanding and improve malaria management, avenues for further research include longitudinal studies to assess adherence changes over time and comparative studies to identify best practices and factors influencing adherence across different settings.

Moreover, intervention studies could evaluate the effectiveness of strategies such as training programs and organizational changes in enhancing adherence and treatment outcomes. Patient-centred research could offer insights into patients' perspectives, informing interventions focused on improving adherence and treatment outcomes. Additionally, policy and systems research could examine broader factors influencing guideline implementation and malaria management to inform policy and system-level interventions.

Recommendations

Based on the study's findings, recommendations to enhance adherence and improve outcomes include prioritizing continuous training and education programs to increase awareness and competency in managing malaria cases effectively. Addressing barriers such as inadequate training and disruptions in medicine supply is crucial, necessitating investment in infrastructure and resources to ensure consistent availability of medications and diagnostic tools, particularly in underserved areas.

Creating supportive work environments that promote guideline adherence through regular supervision and feedback mechanisms is essential. Encouraging collaboration between public and private sectors to standardize practices and ensure consistency in adherence across different healthcare facilities is also vital. Implementing ongoing monitoring and evaluation mechanisms to track progress and make data-driven decisions for continuous improvement is recommended to optimize malaria management practices and ultimately improve patient outcomes.

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Conflict of Interest

The authors declare no conflict of interest.

Author Contribution

Theresa Mayen A has conducted the literature collection, study design, and fieldwork, and written, reviewed and edited the manuscript.

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