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What are the Reasons behind the Inconsistent Use of Insecticide Treated Bed Nets in South-Eastern Nigeria? A Qualitative Study

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Abstract: *Insecticide-treated bed nets (ITNs) have been shown to effectively protect against malaria when used appropriately. Armed with this information donation have been made and structures to ensure easy access to ITNs have been put in place across Nigeria. Nonetheless, data shows that the ITNs are not being used reliably. This paper seeks to share findings from a qualitative study designed to unpack the reasons why Nigerians from the southeastern region of the country chose not to use ITNs consistently despite having one. In total 7 Focus Group Discussion (FGDs) were conducted with participants purposively selected. About 37 participants were selected for the In-Depth Interviews (IDI). An inductive methodology was employed during the analysis. Reasons for inconsistent use of ITNs were identified at the personal and external levels. At the personal level, perceived risk of the disease, ITNs, perceived usefulness of the ITN, knowledge, acceptance, perception of older ITNs, and ITN use based on climatic seasons were identified as impediments to bed net use. At the external level, house structure and arrangement, insufficient amount of ITNs per home, and non-use due to spousal influence were reported as main barriers to consistent ITN use. Although most participants did not lack knowledge about malaria and ITNs use, inconsistent use of the ITN still occurred. This underpins the fact that people's attitude to consistent ITN use may be driven by their perceived lack of fear for the disease as a result of day-to-day experience with the disease. To address this challenge, there is a need to*

combine a behavior change intervention with other interventions where appropriate in a bid to deal with the drivers of inconsistent ITN use and the persistent malaria challenge as a whole. As the reasons for inconsistent use of the ITN traverses both the personal and external levels, there is also a need for a multi-level intervention that not only targets beliefs and skills to motivate ITN use in the at-risk population but also decision-makers in the communities where people live to implement measures that mitigate identified external factors that hinder ITN use.

Keywords: insecticide-treated bed nets, malaria, perception, inconsistent use.

INTRODUCTION

Malaria remains a major public health challenge in Tropical Africa. In 2018, the World Health Organization (WHO) reported an estimated 228 million cases of malaria globally, with 93 percent of the cases in the African region. Although pregnant women and children under age five have been categorized as the most vulnerable group to this disease, all age groups remain at risk of severe illness and death because of malaria. To tackle this challenge, a wide range of studies on the transmission, prevention, and control of malaria have been carried out. One key finding that characterized these studies has been the effectiveness of Insecticide Treated bed Nets (ITNs). This effectiveness has been affirmed by over 70 trials and more than 20 descriptive studies and summarized in several studies and scientific reports [1–6].

In Nigeria, malaria remains a key cause of hospital admissions, morbidity, and mortality. Nigeria alone accounted for 25 percent of all malaria cases globally [7]. The burden of disease is high among pregnant women and children under age five [8, 9]. Indeed, malaria results in about 33 percent of all childhood deaths in Nigeria [10]. In recent times, there have been reports of a rise in malaria incidence in the southeastern states of Nigeria [11]. In Enugu, a southeastern state, the malaria prevalence has been reported to be over 61.4 percent (ibid). The persistent prevalence, morbidity, and mortality from malaria have been reported by several studies to be a function of social and environmental factors [12–15]. Within this context, weak levels of access, ownership, and use of ITNs have also been implicated in the malaria challenge [16–18].

To tackle this challenge, the WHO, through the rollback malaria program and global fund to fight AIDS, tuberculosis, and malaria, has injected billions into the fight against malaria [19–22]. These funds have contributed to scaling up and increasing awareness and access to preventive and curative interventions for malaria. Specifically, emphasis was placed on increasing the proportion of pregnant women and children sleeping under an ITN to 60 percent by 2005 [23, 24]. Findings from surveys done in 2017, however, showed that 44 percent of children under age five and 49 percent of pregnant women utilize the ITN [25]. In addition, a study by Galvin et al., [15] reported that despite a rise in awareness about the ITN, from 7 to 60 percent in southeastern Nigeria, use of the ITN remained low. These findings indicate that access and awareness of preventive tools and

curative measures alone may not be sufficient to bring about the desired change of behavior [26–28]. Thus, there may be a need to go deeper to unearth the individual and environmental factors contributing to the inconsistent use of ITNs.

Theoretical Approach

A theoretical approach that may prove handy to unpack the complexities within the ITN use challenge is the socio-ecological approach to health promotion posited by Bartholomew-Eldredge et al., [29] and Fiske et al., [30]. The socio-ecological approach views health outcomes as a function of a system of factors occurring at personal and external levels. The personal level refers to individual-level factors. Within the context of this study, personal-level factors would be individual-level factors that influence ITN use either negatively or positively. Personal factors are typically beliefs and perceptions that drive people's motivation to use ITNs, while external factors are those that might facilitate or hinder the translation of this motivation (intention) into action. External-level factors also comprise environmental factors such as interpersonal, organizational, community, and societal factors that influence ITN use. It is worth noting that external factors also influence ITN use positively or negatively.

Interventions, such as ITN use, are events within this system; however, factors within the system can influence people's behaviors and this can result in the strengthening or weakening of outcomes of the intervention (ITN use). Therefore, the socio-ecological approach would show us the contribution of each factor to health outcomes at both the personal and external levels and the interrelationships between the factors and their role in ITN use.

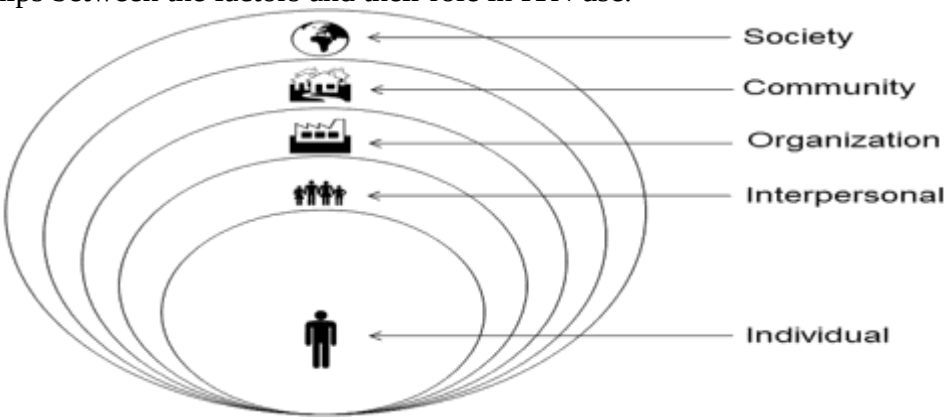

Fig. 1:The socio-ecological approach [29]

This article reports a qualitative study that aims to explore and identify the needs and barriers to ITN use with an emphasis on socio-psychological factors. Although a few studies of this nature have been done in other locations, the issue remains a critical challenge in this study site. Therefore, timely updates highlighting context and location-specific socio-epidemiological factors

serving as barriers to ITN use, next to personal factors, need to be identified for the effective implementation of ITNs to occur.

METHODS

Study Population

Situated in the southeastern part of Nigeria, Enugu state has a population of about four million people. Public health care is provided through health centers, state hospitals, private hospitals, and federal hospitals. Malaria remains a leading cause of under-five-year-old mortality and maternal mortality. This study was focused on the Nike area of Enugu state. This area includes the popular Nike Lake and has been experiencing a population explosion with its speedy development. Along with these positive initiatives are an ever-increasing number of malaria incidences. Emphasis in this study was given to the rural areas, which are markedly more affected by malaria incidences and mortality without ignoring the urban areas. The main language in the study area is Igbo; however, different dialects of Igbo are used in different communities in the Nike area.

Procedure (Sampling and method of data collection)

For this qualitative research, In-Depth Interviews (IDIs) and Focus Group Discussion (FGDs) were used. In total seven FGDs were conducted with 10 participants purposively selected. Purposive sampling was used to collect diverse perspectives from the communities. To this end, FGD interviewees included pregnant women, mothers of children under age five (to cover the vulnerable population), religious leaders, male heads of households, community leaders, and health workers. FGDs lasted between 50 to 105 minutes. An interviewer's guide, prepared in English, was translated into Igbo and pre-tested. A household survey team comprising Ph.D. students with experience in conducting interviews was trained by the lead researcher to assist during the FDG's. Thirty-seven people participated anonymously in the IDI for about one hour. The number of in-depth interviews ended after the point of saturation was reached. All were adults comprising males and females. The interviewees were drawn from Abakpa, Trans-Ekulu, Emene, Iji-Nike, Neke-Uno, Aguowa-Nike, and Ugbo-odogwu communities (all in Nike), and Enugu-east local government area of Enugu state, Nigeria. The interviewer explained the purpose of the research to the community leaders in each locality and the funding source was also revealed. All interviewees gave informed consent to participate. All collected data were checked to validate reliability and completeness. IDI and FGDs were audio recorded, transcribed verbatim, and then translated into the English language where necessary.

All interview data were independently coded by two researchers using an inductive methodology [31, 32]. Coding was conducted over three cycles with coders meeting to compare and agree on emerging themes. These emerging themes were further explored in subsequent interviews and reconstructed as appropriate. Quotes from the interviews are presented to substantiate the results.

RESULTS

The findings made from this study are reported loosely using the socio-ecological approach as a guide. Findings are broadly classified into two key categories, namely the personal and external levels.

Reasons for inconsistent use of ITNs at the personal level

Risk perception of malaria

Responses from participants showed that malaria is considered a common disease among most participants and, thus, the use of ITNs was not considered very important. One respondent explained that malaria is a normal sickness for them, and they do not see the need to go to the hospital or use the ITN for it. If the disease is considered common (or normal), then it is clear that the participants do not perceive malaria as a high health risk. Linked to the perception of non-risk of malaria is a general but widespread weak motivation toward ITN use. One participant explained that most nights she forgets to use the ITN because she has more important things on her mind. Another participant reported that she always forgets to use the ITN until she hears the mosquitoes; however, if she is too tired, she just ignores setting up the ITN. Surprisingly, this weak motivation was also a common response among health workers who participated in the (FGD) research. Indeed, a health worker who participated in the study noted that sometimes setting up the ITN and removing the ITN may not be very important since malaria can be treated. Further probing to rank the level of risk perceived by respondents between malaria with other diseases like HIV/AIDS showed that participants alike felt that diseases like HIV/AIDS present more risk, despite the frequency of malaria cases. Upon further probing to find out if participants were aware that a large number of people die from malaria, most participants thought that the deaths were due to other causes and not malaria. One of the participants explained that: the health system is weak and so most causes of death linked to malaria may be due to other reasons; however, he surmised that: doctors just say it's malaria if the person died before treatment for malaria was completed.

Risk perception of ITN use

Generally, participants disclosed that they felt the ITN was harmful, indicating a perception of risk. This perception of risk was linked to the ITNs' toxicity and biological reactions they experienced when they use the ITN. Most participants associated the risk perceived with the chemicals used to treat the ITN. One participant specifically indicated that he perceived the ITN was harmful to him and his family. His perception was a result of discussions with his friends who noted that unwanted reactions, such as itching, occur with ITN use. Another participant believed that the concentration of chemicals on the ITN plays a role in harmful reactions. His assertions

were based on his reactions to the ITN and the reactions of his family and friends. He, however, noted that he had no scientific evidence to back his opinion that the chemical concentration was too much but insisted that it could be a risk for people to make use of the ITN. Some participants indicated that they had heard about harmful reactions to the ITN while others reported having experienced harmful reactions because of the toxicity of the chemicals used to make the ITNs. Examples of reactions to ITNs reported by respondents include itching, boils, burning feeling on the skin, breathing difficulty, feeling of discomfort, and catarrh.

Perceived usefulness of the ITN

Most participants believed that ITNs were effective; however, pockets of respondents thought that the use of ITNs alone could not entirely prevent malaria. A participant explained that despite his wife and him using the ITNs regularly, she comes down with malaria regularly and he rarely gets sick. He attributed this to his genotype, saying that those with the "AA" genotype (like his wife) regularly have malaria and those with the "AS" genotype (like himself) hardly ever have malaria. Another participant re-echoed his point but attributed it to regularly sitting outside his home where the ITN cannot be used. He surmised that although the ITN may be effective at night, the mosquito can still bite during the evening when sitting outside or in the sitting room without the ITN. On the other hand, some other respondents believed that the ITNs they purchased from the open markets were fake and simply did not have any effect on mosquitoes. They claimed mosquitoes still found their way through the nets and were biting them. As a result, they had no confidence in ITN use generally. Despite these findings, many respondents across all the communities still asserted that they found the ITNs effective.

Perception of ITN use based on climatic seasons

Findings from the respondents revealed a perception that different seasons—dry and wet—play a role in ITN use. Specifically, participants noted that using the ITN was more important during the seasons when there were more mosquitoes. Some participants noted that the mosquito population increased during the hotter dry season so they tried to use their ITN. However, the already hot temperature sometimes serves as a barrier to ITN use because the ITN makes the sleeping space hotter, hence, a preference for alternative prevention methods. In another study site, a participant noted that there were more mosquitoes during the rainy season and summarized that their proximity to the river may have contributed to this challenge. In most cases, the participants reported ITN-induced heat-based discomfort as a reason for not using the ITN. Many of them indicated their willingness to use the nets during the cooler rainy season but not in the hotter dry season.

Attachment to the older ITNs

An unexpected but important finding was the observation that respondents opted to keep using older ITNs that were not retreated instead of getting or using a newer one. Their responses showed an attachment to the older and probably ineffective ITNs despite the availability of newer and more

potent ITNs. In one interview, a participant said that: *I have two ITNs, but I have only used one, I am keeping the second one because the first one does not have any problem. I wash it regularly, so it is not dirty.* Invariably, although this participant has a new ITN, she does not see any problem with the old ITN so she will keep using the old one until it gets bad. When asked how long she had used the ITN, she said she had used it for over five years. In the same light, another participant responded that: *I got a new ITN from a mass distribution campaign, but I still use the old one. Why should I stop using it? It is still good enough for now*. Upon further probing, he reported that: *I wash the ITN every three weeks, this is the only time I don't use the ITN.* So, although there was consistent use of the ITN in both reports, the effectiveness of the ITN, given the fact that it was long overdue for retreatment makes the consistent use weak.

Knowledge and acceptance of the ITN

Within the study area, many respondents had a mixed knowledge of the cause of malaria and, in some cases, the appropriate symptoms. The mosquito etiology of malaria was quite well acknowledged across the board by respondents; however, many respondents who knew the mosquito etiology of malaria still associated the disease with other factors such as stress, poor hygiene, exposure to the sun, excessive oil, and poor-quality water. Thus, while malaria information campaigns may have been effective in disseminating appropriate information, it appears as though respondents have mixed the correct ideas with information from other traditional sources. Because the respondents have mixed knowledge about the etiology of the disease malaria, they are likely to have a mixed attitude toward its prevention. This may explain the evident acceptance of the ITN with a further but unexpected emphasis on the need for more traditional methods of prevention and, in some cases, treatment. Therefore, while they accept that the ITN is effective, they still see the need to avoid too much oil, avoid working in the sun, and the need for more rest to deal with stress from farming activities. Invariably, the ITN is broadly accepted but the mixed knowledge results in mixed ITN use outcomes because malaria prevention is approached from different routes and is not just seen as a function of mosquito bite prevention through ITN use.

Reasons for inconsistent use of ITNs at the external level

House structure and arrangement

Several participants linked their failure to use the ITN to the structure of their homes. Some respondents associated non-use of the ITN with structural issues such as the ceiling type, ceiling distance, roof type, and wall type. For instance, the following participant noted that: the way our house is, it is difficult to hang the net. We don't have this type of roof (zinc), we have the local type (raffia) and there is no ceiling board to hang the net. Another participant from an urban study site indicated that: the problem for me is that the ceiling in my house is too far away from the bed, before I can hang the net, we will need to call a carpenter. Other structural issues reported by participants include the number of rooms and sleeping spaces. A participant indicated that: 'we don't use it because our house is self-contained (just an open space, no rooms), so it's difficult to

set, I mean who will use it and who will not? And there is nowhere to hang it because everything is in one place.' Overall findings showed that the structure of homes in both the rural and urban areas constituted barriers to ITN use.

Lack and insufficient amount of ITNs per home

Another reported reason for the non-use of the ITN was the lack of access to the nets. Across respondent groups in urban and rural areas, and across age boundaries, the response: I do not have one ("one" here refers to the ITN) was a common response. Within the framework of weak access, responses received from participants indicated that the in-house shortage of ITNs was a challenge. This means that while some homes did not have access to any ITNs, others had ITNs, but the numbers were insufficient for the number of residents in the house. For instance, one male participant replied that: We have the ITN, but it is not enough for everybody in the house, so my wife and the children use it, I do not usually fall sick. This response was similar to the response of one of the female participants, who responded that: The ITNs are not sufficient for my entire family, so I set it up for the children. I also use it when I sleep in their bed. Yet another respondent with a similar response said: Of course, the ITN is not enough but we do a first come, first serve policy for ITN usage in my house.

Non-use/non-renewal of ineffective ITNs due to access and finance

More regular findings were non-use due to financial challenges and access to ITN in some specific communities. In almost all FGDs, participants noted that finances contributed to the non-use of ITNs or non-renewal of ITNs owned. One participant noted that she has been using the same ITN for over 10 years. This may be a function of the finding that respondents were either not aware of the need to retreat the ITN or were unable to retreat the ITN because the retreatment kit was not readily available. Another respondent reported that she was waiting until another free distribution campaign was carried out to get new ITNs as her children were grown. On the other hand, some communities (as a whole) did not have any free ITN campaign and so many people in the communities do not have ITNs while those that have the ITN bought or obtained it by some other means. The reported sources of the ITN were government distributions, personal purchases, distributions during political campaigns, non-governmental organizations distributions, and hospital and medical personnel distributions.

Self-diagnosis, prevention, and treatment conundrum

In a bid to effectively understand the weak and inconsistent use of ITNs, it was important to identify respondents' preferred methods of treatment. Appropriately, patients feeling ill are expected to see a doctor who refers them for tests; after which they are given a prescription to obtain the treatment drugs. This was not the response trend garnered from almost all the respondents. Responses to the steps taken when feeling unwell ranged from going for tests without consulting a doctor to just going to the pharmacy/chemist for consultation. Some others just demand the treatment drugs for malaria at the pharmacy/chemist based on previous knowledge.

Further probing of respondents revealed that this mode of operation is embraced because it is the prevailing norm within society. For example, a respondent said: That is the way we do things here, we just go to the pharmacy and tell them we have malaria, and they give us the drugs. Another respondent noted that it is easier and less expensive. According to the respondent: why should I go to a doctor, and all, to get a prescription for what I already know? On the other hand, some respondents indicated a preference for local/traditional treatments, as they believed that these were more effective. This finding shows that in some cases people do not even go as far as seeing the doctors and may not be interested in campaigns on prevention methods because they have self-prescribed methods of dealing with the disease. With these self-prescribed methods in place, they may not see the need to use the ITN. This further explains why some respondents felt that just treating the disease was more important than trying to prevent it. If the affected population self-diagnoses with so much ease, then they are likely to prefer treatment of the disease and so would not use the ITN.

Non-use due to spousal pressure

A rare finding from a few rural participants was non-use due to spousal pressure after marriage. A participant reported that: After we got married, my husband said that he does not like the use of the ITN. He said that other methods of malaria prevention can be used but not ITNs use because he finds it confining and uncomfortable. More importantly, she explained that in line with traditional norms, which confer decision-making rights to the male head of household, she needs to obey. Further probing indicated that she was an active user of ITNs before marriage. She noted that she had accepted his decision to "keep her home."

Consistent ITN use

Diverse factors contributed to consistent ITN use at the household level. These factors include perceived risk, access and availability of the ITN, social support, and reported side effects. In most cases of reported consistent use of ITNs, participants were noted to have reported an understanding of the risk involved with the inconsistent or non-use of the ITN. Even in cases where household members made light of the disease; the use of the ITN consistently was considered an important way of healthy living among those who knew the importance of ITN use and those who had some unwanted experience with malaria. Very importantly, participants noted the importance of encouragement and reminders from family members for consistent ITN use.

DISCUSSION

This qualitative study shed light on several important factors that remain barriers to ITN use among respondents in the Nike area of Enugu state. These factors have resulted in continuous morbidity and mortality from a treatable and preventable disease, malaria, within the study population. It is clear from the literature and the results of this study that the challenge with consistent use of ITNs is more complex than has been assumed. While some findings relate broadly to factors affecting

accessibility to the ITN and installation of the ITN as barriers, more individual-specific factors, such as perceptions, which require more attention if the campaign for ITN is to be won, are also mentioned.

From this study, we observe that the structural and functional organization of the living space in homes can be a barrier to consistent ITN use. In addition, we saw that the form of the house and certain structural fittings may also be a challenge. This finding is not new as it was reported in studies by Toe et al., [33], Iwashita et al., [34], and Baume et al., [35]. These studies noted that the functional and routine use of ITNs is affected by the organization of the house. While the study by Toe et al., [33] further emphasized the importance of space management over just the form of the house, the study by Iwashita et al., [34] showed that sleeping arrangement was significantly associated with ITN use. The fact that the structural and functional arrangement, and management of the house, play a role in consistent ITN use, may be a reason to suggest the restructuring of houses to increase the number and organization of rooms to improve bed net use. However, this may not a very realistic given the cost implication and the socio-economic status of the people. Another possible option may be to improve the setup and tools for hanging the ITNs. In addition, the installation of wooden poles in homes without ceiling boards may be a way to hang the nets more effectively. It may also be helpful to further train users on hanging techniques and include a hanging manual in the ITNs distributed.

Another finding from the study was the insufficient number of ITNs per house. Within this context, the homes were reported to have an ITN, but not enough for all the occupants of the house. This finding was equally identified in studies by Sangare et al., [36] and Fuge et al., [37]. In the study by Sangare et al., [36] done in Uganda, the author noted that owning more than one ITN was slightly associated with always sleeping under an ITN during pregnancy. On the other hand, the study done by Fuge et al., [37] in Ethiopia noted that more than half of the mothers interviewed owned an ITN; however, they did not have enough ITNs in comparison with their family size. This aforementioned challenge in the study by Fuge et al., [37] resulted in over 52 percent of women not sleeping under an ITN the previous night. There may be a need to more intensively source intra-household data on ITN ownership and use dynamics in a bid to ensure homes have appropriate numbers of ITNs. Furthermore, sensitization about the importance and cost-benefits of ITN use may be needed at the rural level to strengthen willingness to pay for the ITN and motivation to use the ITN.

Linked to the above finding on insufficient numbers of ITNs per household is the low level of access to ITNs, which results in low levels of use. While many studies done across Africa [38–41] identified access to ITNs as a challenge within the continent, other studies, specifically in Nigeria [42, 43], emphasized the fact that it is also a local challenge. Recent studies by Aluko et al., [44], Adebayo et al., [45], and Mbonye et al. [46], showed that the low level of access remains a challenge. Diverse reasons have been offered for weak or no access to ITNs. In this study, finance was a chief reason for low or no access to ITNs. Additionally, weak distribution—such that some

communities have the ITN while others do not, distribution to friends and family, and distribution as a political tool—has been mentioned. This finding indicates a need to study government and key stakeholders in the distribution network to identify where the challenges lie in improving the supply chain for ITNs.

Unrelated to issues about weak or no access to ITNs is the role of socio-cultural norms that confer unequal gender-based power relations, which invariably play a role in ITN use. A respondent in this study noted the importance of spousal support in decision-making. While her spouse was not totally against malaria prevention, her response showed his opinion is a significant factor in her decision-making process. This concept can also be seen in studies by Quist et al., [47], Graves et al., [48], Tsuang et al., [49], and Haggenougen et al., [50]. Specifically, in the study by Quist et al., [47] done in Ghana, the authors showed that even though respondents have appropriate knowledge and understanding about malaria and the use of the ITN, socio-cultural norms that confer an unequal power relation between males and females by affirming headship to the man somewhat influences the decision of women to use the ITN. Indeed, the man is seen not just as the head of the home but also as the protector of the home and so his decision on all issues is final. While a lot of work is being done to ensure ITNs reach pregnant women and children under age five, the above findings suggest that there is still a need to go beyond distribution to identify and ensure that health practitioners and decision-makers consider socio-cultural norms and their attendant effects on in-house gender-based power relations when designing guidelines for malaria control programs.

At the individual level, a key finding that was made was how people's perception influences ITN use. Specifically, findings from respondents in this study show that malaria is perceived as a common disease. Invariably, it is unlikely that people would see the need to use the ITN if the disease is considered a common disease. This perception of the disease and its influence on ITN use was also reported in a recent study by Pulford et al., [31]. These authors conducted a study in Papua New Guinea and noted that despite a clearly accurate knowledge of the etiology of malaria, respondents still indicated an indifference toward the use of ITNs as a result of a lack of fear of the disease. Another possible reason driving the perception of malaria as being a common disease and the attendant indifference toward ITN use may be the regular occurrence of illness from the disease and the unregulated ease with which over-the-counter treatment drugs can be obtained by individuals without a doctor's prescription [51]. The earlier mentioned study indicated that the behavior (self-treatment) had become a habit and the ease of obtaining the drugs contributed to this habit. If people are convinced that when they come down with malaria they can easily walk into a pharmacy and get the necessary drugs without a doctor's prescription, then they are unlikely to be motivated to use the ITN.

On the other hand, some respondents expressed a perception of risk built on a fear of the toxicity of the ITN. This perception was manifest in different forms, with some perceiving the chemicals

on the ITN as risky while others simply linked reactions they had or were told about following the use of the ITN as a risk associated with ITN use. These perceptions of risk linked to ITN toxicity and reported reactions of ITN users have been reported extensively in the literature [52, 53, 42, 54–56]. For example, Taremwa et al., [54] reported that 1.5 percent of respondents (from a cohort of pregnant women) in a study done in Uganda, believed that the chemicals in the ITN cause cancer, and Mbonye et al., [56] reported that although most pregnant women in Mukono district, Uganda, generally knew the benefits of ITNs, very few of them used one. The low level of ITN use reported by over half of the respondents was linked to the view that ITNs are very harmful to adults, children, and pregnant women.

Addressing negative perceptions about health interventions has been a critical aspect of public health and behavior change models in social psychology. Pulford et al., [31] noted that perceptions can be a major barrier to protective health behavior and health promotion. Furthermore, theories such as the health belief model were developed to help explain some of these health-related beliefs that motivate protective behavior. The health belief model suggests that people's beliefs about health problems, perceived benefits of actions, perceived barriers to actions, and self-efficacy contribute to engagement or the lack of it in health-promoting behavior [57]. In addition, the protection motivation theory (reference) may help explain the ITN use challenge. This theory proposes that people protect themselves based on four factors: the perceived severity of a threatening event; the perceived probability of the occurrence, or vulnerability; the efficacy of the recommended preventive behavior; and the perceived self-efficacy. In other words, the motivation to protect one's self is driven by both the coping appraisal and the threat appraisal. Given the fact that respondents perceive malaria as common and invariably not serious, they are unlikely to engage in behaviors aimed at preventing malaria.

On the other hand, another theory that may help explain the role of perceived risk is the reasoned action approach, which succeeds the theory of planned behavior (Fishbein & Ajzen, 2010). This theory aims to explain the links between attitudes and behaviors, perceived social norms, and estimates of personal capabilities. Basically, it surmises that individuals will behave based on their pre-existing attitudes and behavioral intentions [58]. Thus, the expectations of an individual are likely to drive the performance of a behavior. In this case, because respondents have a pre-existing perception that ITNs present a risk to their health, they are unlikely to use them. Because these theories of health-protective behavior have long existed and have been used to explain and suggest solutions to challenges of this nature, these theories may prove useful to identify individuals who are unlikely to use the ITN and can be utilized to inform researchers about targets for future interventions to change the behavior [31]. Beyond the above, behavioral change education can be used to promote higher levels of ITN use [59, 60]. Specifically, the targeting of behavioral change programs, given the perceptions of the respondents, may be more effective at the target population's "teachable moment" (i.e., at a time of malaria morbidity). This pro-prevention behavior change information program can be carried out by health personnel during consultations.

This study was not without limitations. Given the fact that this study analyzed only qualitative data, its scope may be considered limited and confined to the area in which it was conducted. There is a need for further research in this area to identify barriers more clearly and design targeted interventions that can deliver effective results.

CONCLUSION

The findings of this paper may lead us to conclude that the barriers to ITN use remain diverse and varied. More importantly, the findings show us that the persistence of the malaria challenge goes beyond access and singular use of the ITN. Sustained use of the ITN which is more likely to deliver the expected results would require behavior change interventions. This would help to address the relatively weak motivation linked with ITN use. This step alone may not however solve all the challenges with ITN use. Therefore, there is a need to combine the behavior change intervention with other interventions where appropriate in a bid to deal with the drivers of the persistent malaria challenge.

Abbreviations
ITNs: Insecticide-treated bed nets; FGDs: Focus Group Discussion; IDI: In-Depth Interviews; WHO: World Health Organization.

Ethics approval and consent to participate
Ethical approval was an option from Maastricht University research line code ERCPN-188_10_02_2018 and from the Research Ethics Committee of the Ministry of Health in Enugu state (MH/MSD/REC 20/129).

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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