

Knowledge and Use of Insecticide-Treated Net Among Mothers with Children under Five Years at Atua, Ghana: A Community and Health Facility Based Study

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Abstract

Treated Nets (ITNs) have been identified as one of the most effective tools for malaria prevention. Yet only three percent (3%) of African children are currently sleeping under an ITN, and about twenty percent (20%) are sleeping under any kind of net. The study sought to access the knowledge and use of ITNs among mothers with children under-five as well as identify the approaches to promote and sustain the use of ITNs. This study was conducted at Atua in the Manya Krobo Municipality among mothers with children under five through in-depth interviews and a Focus Group of Discussion with community volunteers and members. The research identified three (3) significant issues/problems relating to the knowledge and use of Insecticide-Treated Nets among the mothers in the community. The findings show that ownership of ITNs among mothers with children under -five was high and this was due to the free ITN distribution of the product, whereas knowledge of its usage was low since most mothers were ignorant about ITN fixing or hanging, consistency in usage, retreatment of ITNs and have different perception and misconceptions about ITNs. Secondly, the finding identified factors such as age, type of household arrangements, low knowledge, finance, perception, beliefs, and misconception as causes for low usage of ITN. Thirdly, although sensitization on ITN use had taken place within the municipality, it had not been effective enough to promote and sustain the use of ITNs. This study ranked the following negative impact factors and concluded that low know-how, financial problems, household dynamics, negative perceptions, and misconceptions of ITNs, impact negatively on effective utilization of ITNs among mothers with children under five years. The study, therefore, recommends that the public-private partnership should be adapted to ensure accessibility, affordability, and sensitization on ITN's, their retreatment, and consistent usage. Also, there should be strategic education on behavior change to transform mothers' perceptions, beliefs, and attitudes on the use of ITN in the community.

Keywords: Acute Febrile Illness, Insecticide-Treated Nets ITNs, Plasmodium Parasites, In-depth Interviews, Focus Group Discussions, Roll Back Malaria, Thematic Analysis, Non-Governmental Organizations

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1. Introduction

Malaria is the world's most widespread infection and remains a major public health problem. For most years, it is the leading cause of morbidity and mortality in Africa, especially in pregnant women and young children and particularly in Tropical Africa where at least 90 percent of malaria deaths occur (United Nations Children's Fund (UNICEF), 2015). More than three-quarters of global malaria deaths occur in under-five children in sub-Saharan Africa (World Health Organization (WHO), 2018). In 2010, malaria was the principal cause of mortality (around 18 percent) among children under-five years in sub-Saharan Africa (WHO, 2015).

Malaria is an acute febrile illness caused by *Plasmodium* parasites, which are spread to people through the bites of infected female *Anopheles* mosquitoes. 5 parasite species cause malaria in humans, and 2 of these species – *P. falciparum* and *P. vivax* – pose the greatest threat. *P. falciparum* is the deadliest malaria parasite and the most prevalent on the African continent. *P. vivax* is the dominant malaria parasite in most countries outside of sub-Saharan Africa.

The first symptoms – fever, headache, and chills – usually appear 10–15 days after the infective mosquito bite and may be mild and difficult to recognize as malaria. Left untreated, *P. falciparum* malaria can progress to severe illness and death within 24 hours.

In 2020, nearly half of the world's population was at risk of malaria. Some population groups are at considerably higher risk of contracting malaria and developing the severe disease: infants, children under 5 years of age, pregnant women, and patients with HIV/AIDS, as well as people with low immunity moving to areas with intense malaria transmissions such as migrant workers, mobile populations and travelers (WHO, 2020).

In Ghana, it is estimated that 3 to 3.5 million cases of suspected malaria cases are reported each year in public health facilities, representing 30-40 percent of outpatient attendance and accounting for 22 percent of under-five mortality (MOH, 2019).

One of the most identified effective tools for malaria prevention is the use of Insecticide-Treated Nets (ITNs). Consistent use of ITNs reduces malaria transmission by up to 90 percent in general (Gimming, Vulule, LoTQ, Kamau, Kolczak, Philips-Howard, Mathenge, Terkuile, Nahlen, Hightower, and Hawley, 2013). and 44 percent of mortality in children under five (Lengeler, 2018). The evidence is that if more than 80 percent of households in an area sleep under ITNs, malaria transmission would be significantly reduced (Center for Disease Control (CDC), 2018).

As a result of the effectiveness of ITNs in malaria prevention, there have been increased international and national funds and programs that have boosted the deployment of ITNs. About half of African countries have waived taxes and tariffs on nets, netting material, and insecticides. Also, since 2012, African countries started scaling up the provision of ITNs free of charge or at highly subsidized costs for pregnant women and children under-five years in both rural and urban areas. Due to this, there has been a substantial increase in ITN coverage in African countries (UNICEF, 2015).

Development partners have also contributed by supplying ITNs for distribution at subsidized costs to pregnant women and children under five in Ghana. These ITNs which are distributed through a routine public health service have increased ownership of ITNs in the country (Ghana Demographic and Health Survey (GDHS), 2018). Fifty-four percent of households in Ghana own a mosquito net whether treated or untreated while 90 percent of households own more than one net. Spatially, rural households are more likely to own at least one or more nets compared to urban households. For instance, ITN ownership is highest in the Upper West Region (73 percent) and lowest in the Greater Accra Region (32 percent) (GDHS, 2016). This may be due to the fact that the free ITN distribution was started in Ghana in the Upper West Region which has malaria as the leading cause of death and the entire region is a malaria risk area. The region had the highest under-five mortality rate of 208 deaths per 1,000 live births in Ghana and malaria transmission is all year round although highest during the rainy season thus May to October (MOH, 2017).

Studies have however shown that the level of ITN ownership does not match its knowledge and usage. In Africa, the knowledge of ITN is low. A study among 246 health workers in South Western Nigeria showed that 93.5 percent were aware of ITN, but only 20.9 percent had knowledge of ITNs and 22.5 percent were using ITNs in their homes (Chiu, 2013). In Ghana, awareness of ITN is high, but there is inadequate knowledge on the use and management of ITNs. It has been recorded that misconception about ITNs affects the knowledge base of the population (GDHS, 2018).

Concerning use, ITNs have been used in WHO Global Malaria Programme since 1998. The goal for ITN uses targets 80 percent of people in Africa at risk of malaria to be using ITNs by 2016 (WHO, 2010). However, studies indicate that there is low use of ITNs particularly among children under five who are the most vulnerable. In Ghana, the GDHS 2018 reports that 41 percent of children under-five in all households slept under a mosquito net (treated or untreated) the night before the survey while 29 percent and 28 percent slept under an ever-treated net and an ITN respectively. The report also indicates that 54 percent of children under five slept under an ITN the night before the survey among households that owned at least one ITN.

There seems to be a gap between ownership, knowledge, and the use of ITNs. Whereas the target set by the government of Ghana is to ensure that children under-five years have access to and sleep under ITNs, the need for adequate knowledge and consistent use is imperative to achieve such a goal. It is upon this background that this study explores the knowledge and use of ITNs in Atua, Ghana.

Sleeping under ITNs protects from malaria-infected mosquitoes and has been associated with a significant reduction in malaria-related mortality and morbidity all over the world, especially in Africa (WHO, 2015). ITN constitutes one of the most effective malaria control tools to be developed and as such has been an important component of global and national malaria control policies since the mid-1990s (UNICEF, 2015). As a result, the government of Ghana has initiated a free distribution of ITNs to enable children under-five own and sleep under ITNs. Although this has increased ownership of ITNs, knowledge, and use of ITNs among mothers with children under five are still low (Anti-Malaria Drug Policy, 2019).

The incidence of malaria and its related sicknesses continues to be high among children under five in Ghana. For instance, in Atua in the Manya Krobo Municipality, there has been a consistent increase in malaria cases among children under-five despite the distribution of free ITNs for children under-five, pregnant women, and households under both the MOH and the Presidential Malaria Initiative (PMI) programs (Manya Krobo District Health Management Team (DHMT), 2016). Thus, there is a gap between ownership, knowledge, and the use of ITNs. Hence, this study is situated within this context to contribute to addressing the gap.

1.2 Research Objectives

The specific objectives are to:

1. analyze the knowledge of ITN among mothers with children under-five,
2. assess the use of ITN among the respondents, and
3. discuss effective approaches to promote and sustain the use of ITNs among the respondents.

1.3 Research questions

The aim of this study seeks to delve into the following questions.

1. How do mothers with children under-five perceive ITN?
2. What is the level of knowledge of ITN among respondents?
3. What is the extent of ITN use among respondents?
4. What factors encourage the use or non-use of ITN?
5. What factors can promote the use of ITN in the study area?

1.4 Scope of Study

Well-structured questionnaire for this study was administered to the Atua Government Hospital health care officers, community volunteers, and the target focus persons in Atua with the Manya Krobo Municipality. The study used community members as respondents in the questionnaire, In-dept-Interview, and Focused Group Discussions. It also involves health workers (physicians, physician assistants, nurses, community health nurses, enrolled nurses, midwives, as well as laboratory personnel of the Atua Government Hospital.

The findings of this study will contribute to the existing efforts to malaria prevention at Atua and its environs. It will serve as the basis to understand the gaps between knowledge and the use of ITNs. This is crucial to the development of appropriate behavior change communication campaign messages in the Municipal by the Health Directorate and all related agencies and departments as well as Non-Governmental Organizations (NGOs). The study will also serve as literature for academic work as well as unearth other areas for further research by students, research institutions, and organizations. The methodology used can also be adapted for similar research in similar contexts.

2. Material and Methods

2.1 Data Collection Technique

A qualitative research design was adopted for the study. The objective was to explore and understand the issues concerning the reality as experienced by the respondents. Qualitative techniques were employed in the sampling, instrumentation, data collection, analysis, and presentation of the findings.

A purposive sampling technique was used in the study. The objective was to identify particular or unique types of cases for in-depth investigations. The study participants were therefore selected through purposive sampling because of their position and relevance to the study on knowledge and use of insecticides, education, and sensitization programs. By this approach, the study was able to target people who possess some vital information required for the study. Hence, all respondents were selected based on their technical qualities and knowledge needed as well as their contributions to knowledge and use of insecticides among mothers with children under five years.

The research was a case study and exploratory in nature, hence a qualitative method that is most suitable for the exploratory and case study design was used. Qualitative study is the most appropriate technique for formulating, investigating the issues and producing data and information in the field. The study employed Focus Group Discussion (FGD) and the In-Depth Interview (IDI) in collecting the data.

The In-depth interview was conducted with 50 mothers with children under five years who came to the post-natal clinic at the Atua Government Hospital and the Focus group discussion was conducted with 20 health care professionals and other community volunteers. Community volunteers were male community members who were selected and trained by Ghana Health Service to help in the distribution, hanging, retreatment, and sensitization of community members on ITN.

Five (5) field assistants were trained to assist in the data collection. The in-depth interviews were conducted at the Atua Government hospital, in the homes and offices of respondents. The FGD was also conducted at the Atua Government Hospital. Each interview lasted for about 35 to 40 minutes and FGD lasted for an hour. After self-introduction, appreciation was shown to participants for acceptance of participation. The objectives of the study were read and explained to respondents to seek their consent. Assurance of anonymity and confidentiality were emphasized. Questions were asked according to the interview and FGD guidelines and recordings were done electronically with keynotes taken.

The data collected was with a well-structured questionnaire. Responses from the respondents were first transcribed. Narratives were used to substantiate and support issues that were discussed. The results will be presented in graphs and tables. The analysis was done and presented based on the objectives of the study and the themes in the instruments.

The descriptive analysis includes the use of statistical techniques, charts (line graphs), percentages, and averages to determine the empirical justification for utilizing the specified statistical technique for data analysis. It also included finding the mean, standard deviation, range of scores, skewness, and kurtosis of the continuous variables.

There are several assumptions common to all the techniques. These assumptions must be considered when

performing any of the analyses using the techniques. (Levels of Measurement, Independence of Observations, Normal Distribution, Homogeneity of Variance).

2.2 Focus Group Discussion (FGD)

To seek a collective understanding, perception, and experience of young people of the issues of handwashing practices, we used the Focus Group Discussion (FGD). FGD is a qualitative research method and data collection technique. It's essentially a "series of discussions to obtain perceptions on a defined area of interest" (Krueger and Casey, 2009: 2). Typically, this enables us to gather adequate information from the participants through discussions and probing of issues of interest. The process of informal discussions occurs in a group of no more than 12 individuals, with members who share some common characteristics (Franz, 2011) such as living in the same community and most of the school-going age. Mothers with children under 5 years here "have a direct experience of the topic", and, thus, are treated as key to the topic. These discussions are facilitated by a moderator, who introduces topics for discussion and helps the group to participate in a lively and natural discussion amongst themselves. (Asbury, 1995; Smithson, 2008).

The group's composition and the group discussion were carefully planned to create a non-intimidating environment so that participants felt free to talk openly and give honest opinions. The course of the discussion was usually planned and the moderator used a question guide as an outline to ensure that all topics of interest are covered (Acocella, 2012: 1127). FGD can be useful in providing insight into different opinions among different parties involved in the change process, thus enabling the process to be managed more smoothly.

2.3 In-Depth Interview (IDI)

The in-depth interview is another qualitative research method that enables us to conduct intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program or situation, etc. We, therefore, engaged key stakeholders in the hospital who in one way or the other have access to and work with the mothers.

In-depth interviews are useful when you want detailed information about a person's thoughts and behaviors or want to explore new issues in depth. The aim is to get different perspectives on the same topic and compare experiences on that particular subject/problem. Interviews are often used to provide context to other data (such as outcome data), offering a more complete picture of what happened in the program and why. It offers the opportunity to capture rich, descriptive data about how people think and behave, and unfold complex processes (Carolyn Boyce and Palena Neale, 2006). It is for these evidential reasons that we adopted the interview process to enable achieve depth in perceptions and experience sharing on the subject of knowledge and use of ITNs.

2.4 Thematic Data Analysis

Thematic analysis is a good approach to qualitative research where you're trying to find out something about people's views, opinions, knowledge, experiences, or values from a set of qualitative data. For example, interview transcripts, focus groups, social media profiles, or survey responses (Braun & Clarke, 2013). For this study, the types of qualitative data collected make the thematic analysis appropriate as it allows comparison of opinions, knowledge, and experiences while making sense of the rich set of data gathered from respondents.

The data collected were analysed thematically using the inductive approach of generating patterns from the data sets. An inductive approach was most appropriate as it allowed us to use the data to determine the themes and then compared them to existing knowledge. This thematic analysis enabled the qualitative data to extract and apply themes emerging from the interview transcripts.

The research closely examined the data to identify common themes – topics, ideas, and patterns of meaning that come up repeatedly. There were emerging themes that we focused on to examine the themes or patterns to make meaning of the data. This method emphasized both organization and rich description of the data set and theoretically informed interpretation of meaning. It means pinpointing, examining, and recording patterns (themes) within data. Themes are patterns across data sets that are important to the description of a phenomenon and are associated with a specific research question. The themes become the categories for analysis.

2.4.1 Process of Thematic Data Analysis

Adopting Braun and Clarke's (2013) approach, we adapted the steps of creating meaningful patterns for data analysis. These phases are familiarization with data, generating initial codes, searching for themes among codes, reviewing themes, defining and naming themes, and producing the final report.

The interview recordings were first and foremost transcribed into transcripts to enable the analysis of the data. These transcripts have stories to tell from each respondent which can be achieved by determining the similarities and differences in the stories told. So, we read the transcripts several times while engaging other materials and notes taken during the research to code key points emerging from each transcript. This enabled us to generate an initial list of items from the data set and note reoccurring patterns across the data. This provided a systematic way of organizing and gaining meaning for the coding process.

Some of the initial codes formed the themes and where a theme becomes too big, we generated sub-coding or subthemes to address the issues emerging from the data. We identified the relationships between codes and themes and between different levels of existing themes. Themes differ from codes in that themes are phrases or sentences that identify what the data means. They describe an outcome of coding for analytic reflection. Themes consist of ideas and descriptions within a culture that can be used to explain causal events, statements, and morals derived from the participants' stories (Braun & Clarke, 2013).

A set of themes were generated and later expanded or merged depending on what was more appropriate during the writing up of the findings. These allowed for analytical views and possible new patterns and issues in the data to be analyzed. Each of these themes was further analyzed to work out the scope and focus and determine the 'story' they are telling concerning the specific theme. The researchers wrote the final report making meaning of the key points or themes emerging from the data and useful contributions to answering the research questions. These themes became the topic and sub-topics reported in the finding's sections of the report.

3. Results and Discussion

3.1 Ownership of ITNs

Most of the respondents own an ITNs at home. They indicated that they had it when they attended antenatal and postnatal services at the Atua Government Hospital from 2018 to 2019. Others indicated they had theirs during the free house-to-house distribution by MOH in 2017 and 2018. Few others bought their ITNs from pharmacy shops.

Responses from the FGD also indicated that most, mothers with children under-five had ITNs before the free distribution in 2016 but noted not all people were around during the registration and distribution.

It can thus be said that these ITNs were distributed through routine public health activities. This is consistent with the study by Ghana Health Service (2018).

Most respondents had two ITNs at home while some others had one. Few others had three ITNs per household. Responses from the FGD revealed that most mothers had two ITNs because they received from both the hospital and the free household distribution. Others also bought their ITNs.

3.2 Knowledge and Perceptions of ITNs

Generally, all respondents have heard of ITNs before. While some indicated they had the information from the media, others said they heard it from health workers and community volunteers including friends and neighbors. Some respondents noted that radio and television had played an important role in informing the people in the community and its environs on ITNs and other health-related issues.

Mentioned as a source of information is a television advert that features a popular musician in Ghana. The message centers on how to prevent malaria with the use of ITNs.

Most respondents have heard and seen ITNs before but could not recall correctly messages on ITNs and do not know how to hang the ITNs. Most of the mothers do not know how to retreat the ITN after use. Most mothers lack knowledge of ITN and how to use it. Few of the respondents in the IDI could state correctly two importance of the use of ITNs. A respondent indicated "I know ITNs prevent mosquitoes from biting me when sleeping but cannot tell you any message on it."

The members of the FGD members said they had information about ITNs before being trained as community volunteers. The responses of the members of the FGD also noted that mothers in the community generally believe that ITN can prevent mosquito bites and therefore prevent malaria.

Regarding perception about ITNs, most of the respondents thought that ITNs constitute an effective form to prevent malaria, others said they perceived ITNs use as an effective measure in the prevention of malaria in both children under-five and adults. They stated that the chemical used to treat the nets were very strong and therefore drives mosquitoes away or kill those that come into contact with the ITNs. Respondents who had ITNs strongly believed that ITNs are effective in malaria prevention among the under-five compared to those who do not have ITNs in their homes. This finding is consistent with the study conducted by Onwejekwe, Akpala, Ghasi, Shu, and Okonkwo (2003).

Other respondents also had perceptions that were contrary to the above. They opined that they have never seen that ITNs kills mosquitoes physically as insecticide sprays do. They, therefore, doubted the ability of ITNs to kill mosquitoes on contact.

Others held different perceptions about the chemicals used in treating ITN. Some of the responses for the FGD indicated that some members of the community perceive the chemical as a family planning measure. A respondent indicated

People said the chemical is a type of family planning drug which the government is using to prevent pregnant women from becoming pregnant again after giving birth and that is why they are giving it for free to pregnant women (FGD).

3.3 Use of ITNs

Few of the respondents who owned ITNs were using them, especially for their children under five to sleep under them. It was further revealed from the FGD that ITNs use among children under five was not common in the community. Among the reasons given was that most children under five sleep with parents and older siblings on the same bed. Again, some of the children sleep on the floor or in congested rooms and this does not allow the hanging of ITNs. Some mothers indicated that they stopped letting their children sleep under the ITNs when they realized that there were no mosquitoes in the room. There were also witnesses where ITNs belonging to children under five were given to elder siblings to send to the boarding school. In such situations, the implications would be that children especially those under-fives would become vulnerable to mosquito bites.

Generally, all ITNs used by children under-five were either shared with mothers or older siblings but were not used all year round. Some respondents stated that they used their ITN only during the rainy season and temperatures were comparatively low. This is because the incidence of mosquitoes increases during the rainy season. Also, the season's lower temperatures reduce heat in the room in general and when sleeping under ITNs in particular. The community volunteers confirmed that mothers in the community use the ITNs consistently during the rainy season. A respondent noted, "During the raining season a lot of people bring their ITNs for treatments and others come wanting to have some (FGD)".

This finding is consistent with the study by Binka, et al, (2016) which showed that there are seasons that influence the use of ITN. It must however be emphasized that the seasonal use of ITN could increase the rate of malaria in the dry season. Thus, issues related to ITN use and malaria must intensify all year round, especially during the dry season.

3.4 Challenges to the use of ITNs

The respondents indicated several challenges associated with the use of ITNs. Firstly, it reduces the flowing of air in the room thereby making sleeping under ITN uncomfortable, especially for children under-five. According to them, the heat associated with the use of ITNs contributes to skin rashes in children and the discomfort of mothers. Others indicated that ITNs take up much space in their rooms, thus, increasing room congestion.

Respondents gave varied strategies they used to address some of these challenges. Some usually put on the fan to increase the flow of air in their rooms. Others put their children under the ITN but placed their heads outside the net to allow breathing of fresh air. A respondent noted, "the chemical in the net suffocates children, so a put his head outside the net since his head have less flesh that the misquote can bite".

Removal of the ITN every morning was another strategy to reduce congestion in the room.

While some of these practices put children at risk of mosquitoes', others such as the constant use of fans could have some health implications on the children.

Another challenge worthy to mention is related to the hanging of ITNs. Some of the respondents indicated that they do not know how to hang the ITNs, hence rely on their older sons to hang them. They explained that if the sons came home late or are not available, they do not use ITN. "It is only my elder son who knows how to hang the net and he always goes to play football and normally comes home late when the children are already asleep. Thus, anytime he comes home late, I don't put the Children under the ITN" (Respondent 6).

It is critical for mothers and ITN users to learn how to hang the ITN and remove it. This can go a long way to enhance the consistent use of ITN.

3.5 Promotion and sustainability of ITNs

Accessibility is a major factor that could promote and sustain the use of ITNs. Most respondents got their ITNs from the free distribution. Others also mentioned they bought their ITNs from pharmacies and drug stores. More than half of the respondents knew where they could obtain an ITN in the community.

The FGD demonstrated similar responses as the IDI and credited themselves and the health workers at the Atua government hospital for that sensitization. A respondent indicated "before we got ITNs from the government, some mothers said they had never used or even seen ITN before" (FGD).

Another volunteer mentioned that the demand for ITNs is high in the community yet they are not readily available after the free distribution. Some volunteers expressed doubt about the availability of ITNs in the open market as raised by one of their members.

Respondents indicated that ITNs in the community range from 35.00 Ghana cedis to 80.00 Ghana cedis each depending on the type and size of the net as well as where it's being sold. But there was a segment of respondents who did not know how much an ITN cost.

Lack of financial resources was frequently mentioned by both mothers and during the FGD as a barrier to obtaining an ITN and retreatment. The FGD revealed that people could not even afford the 5 Ghana cedi agreed by community leaders of Atua as the token for community volunteers who helped in the hanging of the free ITN distributed as well as for the treatment of ITNs. "You cannot go to buy an ITN or Insecticide when you do not have something to eat and to clothe children" (Respondent 2).

Even though all mothers knew that ITNs needed to retreat with an insecticide after a period of usage which was learned from health workers and by community volunteers, most of them could not mention the duration of retreatment. Some of the respondents who had already treated their ITNs mentioned they took them to the retreatment centers and NGO offices for retreatment. Others also said the free ITN distributed came with the insecticide and direction for retreatment which they followed. The most respondent said it cost them 5 Ghana cedis to buy the insecticide while others said it cost them 10 Ghana cedis to retreat at pharmacies and retail shops. Some also said it cost them 5 cedis for the treatment at the NGO's office while they were told it was supposed to be free. "Community volunteers complained the Ministry of Health does not bring the insecticide as promised and therefore retreatment cannot be done for free" (Respondents 4, 8, 11).

This statement was confirmed by FGD stating that the Ministry of Health does not supply insecticide for the free treatment as promised and therefore the insecticide they use is from another project which is not for free and even not regularly available.

All respondents indicated that community volunteers do not visit them at home to sensitize them on ITNs. They were around only in late 2015 to write our names and in early 2016 came to hang the nets in our rooms. They have not come back to see if what they have hung has fallen or if we have issues with its use (Respondent 11).

Most respondents said they had to go to community volunteers in their homes or visit them in their offices if they needed some support in connection with ITNs. This was not contrary to what was said during the FGD. It was mentioned that after the distribution of the ITNs, MOH was supposed to support community volunteers with logistics for a follow-up visit and sensitization exercises, but this did not materialize therefore preventing them from going on home visitations.

Most respondents suggested that to promote the availability of ITNs, the government should distribute ITNs to every individual of a household including children under-five for free. Few others were not in support of the statement when ITN is distributed for free people would not appreciate it and use it, therefore should be sold at a subsidised price instead. Generally, all respondents were in support of the government-bearing part or the full cost of ITN but were suggesting different strategies of distribution such as through pharmacies and drug stores.

Apart from the free distribution, respondents suggested sensitizing at both social gatherings and health facilities on ITN use and its effectiveness in the prevention of malaria as a strategy to promote and sustain ITN use in the community. Responses from the FGD also suggested religious leaders should join in the campaign on ITNs. Community volunteer indicated:

"Women listen to the advice of their children, so children in school should be educated on the use of ITNs for children under five and advised to pass the information to their parents" (FGD).

It was further indicated during the FGD that there had been increased attention to the media and therefore the media can be used through activities such as film shows, adverts, and talk shows with renowned presenters to promote the use of ITNs among mothers with children under-five. Few respondents said they would recommend the use of ITNs to others since it is the most effective way to prevent malaria among children under-five as well as ITNs are very economical since one does not have to buy them every day like mosquito coil and sprays. On the contrary, others said they would not recommend ITNs to others since they are not using them. When I sleep under ITN my eye starts to itch and becomes red, I would not recommend it to others so that when they use it and have problems, they would point a finger at me that am the cause (Respondent 2).

3.6 Validation of conceptual framework

The Steps to Behavior Change model was adopted for the study. The model comprises five steps to behavior change namely Knowledge, Approval, Intention, Practice, and Advocacy. The model which moves from the acquisition of knowledge through to advocacy where one changes behavior and advocates for others to adopt it also identified some factors that influence behavior change such as Physical stimuli, Rational stimuli, Skills, Knowledge, Social-Cultural factors, Demographic, that is age, sex, educational background, marital status, occupation, Previous experiences, and Attitudes.

The first step of the model which is knowledge involves mothers with children under-five to learning about the new behavior that is, the use of ITNs then recalling messages on ITNs, and understanding the meaning of the messages. Mothers with children under-five were expected to mention the importance of ITN use. The study shows that not all mothers know ITN and its use, hence, the inconsistency and non-use on the part of some of the respondents. The model assures that after knowledge the new behavior must be approved. From the study, some of the respondents have not approved of the use of ITN due to inadequate knowledge of some perceptions and misconceptions about the use of ITN. These affected their intentions and suggested the practice of the new behavior. Nevertheless, the few with some level of knowledge approved the consistent use of ITNs owing to their ability to prevent mosquito bites and malaria. These are gone beyond the intention step to the advocacy step.

3.7 Summarized findings emerged from key themes of Thermal analysis

- The youngest respondent was 20 years with the oldest at 53 years. Most respondents have attained at least primary education with few having tertiary. Also, most of the respondents are married, have a formal occupation, and had one child under five. All community volunteers had stayed in the community since their childhood and most of them have been volunteers with past community projects before the ITN distribution.
- Most mothers own ITNs in the community, and this was due to the free ITN distribution by the government to children under-five, pregnant women and through the two ITN per household distribution.
- Analysis of the knowledge of ITN among mothers with children under-five had shown that mothers with children under five have low knowledge of ITN. Although most mothers could name some types of ITNs and their importance, they were not able to recall correct messages on ITNs. Most messages said about the ITN were wrong and misconceptions and mothers did not know how to hang the ITNs, retreat them, as well as do not have knowledge about the insecticide used in the ITNs.
- It was also found that the knowledge mothers had on ITN was acquired mostly through the media and also through sensitizations by health workers.
- ITN protects children against malaria and mothers confessed that their children had spent a long time without falling sick since they started using ITNs. However, those who thought that ITNs are not effective argued that, they do sometimes suffer from malaria despite sleeping under ITNs and that mosquitoes can bite you when still outside.
- Also, findings from assessing the use of ITNs among mothers have shown from the study a low use of ITN. The study found that most mothers had reasons for not using ITNs for their children under five. The reason ranges from household arrangements to social-cultural practices, low knowledge as well as socio-demographic characteristics. In addition, perceptions of ITN use and knowledge of ITNs were identified by the study as some of the factors affecting the use of ITN.
- Despite the low use of ITNs, the study again found that there was inconsistency in the use of ITNs by those who use them for their children even though some mothers knew the implication of that. Reasons given for the inconsistent use were particularly related to the weather, difficulty in hanging ITNs, household arrangements as well as some negative perceptions about ITNs.
- In discussing effective approaches to promote and sustain the use of ITNs among mothers with children under-five, the study noted sensitization on ITN, accessibility, and affordability as approaches to promote and sustain the use of ITN among mothers. sensitization of misconceptions and perceptions about ITNs use through the media and other social and community gatherings were suggested would promote and sustain ITN use.
- The study found out that most mothers had their ITNs free but noted after the free distributions, ITN could only be found to buy in Atua at pharmacies and drug stores. This was identified cannot promote consistent ownership, usage, and sustainability of ITN use for mothers with children under five.
- The study again found out that ITNs are not affordable in the community. Most mothers mentioned financial difficulties as the reason for not using ITNs. It was mentioned in the study that most of those who had gotten free ITNs from the government could not pay for the token of one cedi for the volunteers.
- Finally, the study found out that few mothers were willing to recommend the use of ITNs to others.

4. Conclusion

The study has shown that there is high ownership of ITN among mothers with children under-five in Atua but the knowledge of mothers with children under five on ITN is low. The knowledge of mothers had been influenced by some factors such as perceptions, social, lack of sensitization, cultural practices, beliefs, and attitudes.

In the study community, there was low use of ITN among mothers with children under five. Although there was high ownership of ITNs among mothers, their uses did not match ownership. The study shows the following reasons for the low usage of ITN among mothers in the community. Household characteristics include household structure, number of people sleeping in the household, sleeping arrangements, disruption of sleeping arrangements, decision making, and supervision of children. Thus, the presence of an ITN in the household may not necessarily guarantee utilization.

Accessibility of ITN and retreatment insecticide in the community was found to be low due to irregular distributions as well as widespread and lack of enough sales outlets affected mothers' ability to obtain and retreat ITNs at their own pace. In addition, ITNs in Atua were found to be highly expensive for mothers. The price at which ITNs were being sold, the cost of retreatment, and even that token for the hung of free ITNs were

expensive to mothers that most of them could not afford.

To promote and sustain the use of ITNs, ITNs must be made available by the government in the community not only through irregular distribution but at common outlets like pharmacies, drug shops, and retail shops for free or subsidize prices where mothers can get them anytime, they needed it. Also, insecticides must be made available in the community by the government either for free or at subsidized prices to enable mothers to retreat their ITNs when necessary.

In addition to the availability and affordability of ITNs, mothers must be sensitized consistently particularly on misconceptions about ITN in other to promote and sustain their use.

4.2 Policy Implementation and Recommendations

Sensitization of mothers on the constant use of ITNs as well as retreatment must be done before the free distribution as well as during the distribution. At the same time, mothers need to be constantly reminded and assessed on their knowledge and ability to properly use ITNs by community health workers. Mothers should be thought how to hang the ITN through demonstrations in their homes as well as hanging it for them in their rooms as the strategy of the distribution adopted.

This would enable mothers to remove and hang ITNs back anytime they wish. Whilst in the study community ITNs had been distributed freely to children under-five and pregnant women and some members of the household, it is recommended that in the future free ITNs should be expanded to all individuals within all households to avoid grabbing ITNs of young ones.

The study further found out that after the mass ITNs distribution, ITNs and insecticides were not easily available in the open market in Atua despite the willingness of some mothers to purchase them. This, therefore, calls for a public-private partnership to ensure that ITNs are readily available in most places of the community.

Also, promises by the government in association with the distribution must be fulfilled in other to promote trust in issues said about the ITNs by community members and health workers as well as any agent engaged in the distribution.

Like any other new health intervention or change, acceptance always takes a longer phase since behavior change is a gradual process due to issues like cultural lag. Improving effective utilization of ITNs among mothers with children under-five should be a positive strategy to transform mothers' perceptions, beliefs, and attitudes about ITNs, it is very paramount to adopt a behavior change strategy. Such a strategy should be based on the fact that ITN use is an adaptive social behavior and needs improvement in the knowledge and understanding of ITN use by mothers.

With massive education of communities such beliefs, perceptions, and attitudes will be eliminated. However, such strategies should recognize and appreciate the fact that changing perceptions, beliefs, and attitudes is a gradual process as well as the use of ITN as a social adaptive behavior. This should be able to address the perceived negative effects of sleeping under the ITNs at the individual level as well as the community level factors that reinforce and sustain such misconceptions about ITNs.

Further, the behavior change strategy through behavior change campaigns at the community level should be used to provide a platform for both the health workers to learn about the perceptions of mothers to get to know them better and also to use that opportunity to educate the mother on how to properly use ITN and its importance in preventing malaria among children under five.

It has also been found that because of the free distribution of ITNs, concentration has been moved from the multiple measure intervention of malaria which includes outdoor spraying, use of DDT at potential breeding sites, and use of repellants to the concentration on only ITNs. It is recommended that this strategy should be reconsidered alongside the use of ITN among mothers with children under five to reduce the mosquito population.

Finally, it is recommended that ITN intervention must fulfill four basic functions that are to provide information, education, and communication, ensure procurement, distribution, and re-treatment of the ITNs, incorporated periodic monitoring, and evaluate and possess adequate financing.

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