Awareness and use of Malaria Prevention Measures among Child-Bearing aged Women in Jere Local Government Area, Borno State, Nigeria

Muhammad Sirajo AHMAD
Department of Physical and Health Education, University of Maiduguri
Nurudeen Ismaila ADAMU
Department of Physical and Health Education,
University of Maiduguri

Hamza Dan-Iya ABDULLAHI
Department of Physical and Health Education,
University of Maiduguri

Abstract: Malaria unquestionably is a drain on human resources and global finance. Thus necessitates immediate action to implement preventative measures in order to mitigate it threats. In this study, the researchers assessed the awareness of malaria prevention measures among child-bearing aged women in Jere LGA, Borno State of Nigeria. A survey research design was adopted together with a self-developed questionnaire selecting 350 women resident in Jere LGA who were aged 15years and above using a convenience sampling technique. Counts based on frequencies and percentages table were employed in data analysis. Findings depict that; there are various malaria prevention measures available in Jere LGA, child-bearing aged women in Jere LGA had satisfactorily good levels of awareness of various malaria prevention measures, child-bearing aged women in Jere LGA are utilizing various malaria prevention measures. Malaria prevention methods used in includes; cleaning of environment (98%), insecticides treated net (94%), anti-malarial drugs (90%), indoor mosquito spray (80%), mosquito repellent (70%) and remove water stagnation (52%). It is therefore recommended that: health personnel at the Primary Health Care should intensify regular enlightenment campaigns on the utilization of malaria prevention measures to ensure continual compliance and making it to become a habit; government should provide in abundance malaria prevention measures at every health center in the area of study and also, purchase price of these equipment's should be slashed and lastly child-bearing aged women should tidy up regularly their surrounding and develop a habit for used any other measures that prevent malaria, this will ensure safety from contracting malarial disease which is disastrous to health and comes along with economic burden.

Keywords: Awareness, Use, Malaria, Prevention measures

Background of the study:

Malaria continues to be among the most severe public health challenges in middle and low income counties, with elimination and control in endenkx areas a top priority. In the year 2015, it was estimated that two hundred and twelve (212) million people fall victims malarial disease while a number close to 500,000 deaths from malaria was reported worldwide, with 90 and 92% of the incidence and mortality recorded in Africa (WHO, 2016). According to a report published in 2015 by World Health Organization, India and fifteen (15) countries in Sub-Saharan Africa were responsible for eighty percent (80%) malaria burden globally. It also stated five countries alone recorded for half of all cases of malaria globally.

Nigeria is rank at the top spot with twenty-five (25%) of the cases, followed by DR Congo with 11% and Mozambique (5%), respectively. India and Uganda each had 4% of the total (WHO, 2015). In areas where Malaria is prevalent, children under the age of five are especially vulnerable to the infection. Of all Malaria death, 70% occurs in children within the age bracket (WHO Report, 2016). Since (2000), throughout the Sub-Saharan Africa, the Roll Back Malaria Programmed contributed positively toward interventions and treatment of Malaria disease effectively (Batt *et al.*, 2015)

The World Health Organization (WHO) has set new malaria reduction goals to be met by 2030, including a reduction of malaria mortality and incidence rates globally by 90% and its eradication in at least 35 affected countries. (WHO, 2015)

Malaria is a contagious disease caused by Plasmodium protozoan parasites that is mostly found in the tropics and subtropics. Malarial disease is caused by at least five parasite species, two of these are the most fatal: Plasmodium vivax and Plasmodium falciparum (WHO Report, 2016). P. malariae, P. ovale, and P. Knowles are the remaining parasite species of malaria.Almost all the malarial death and ninety percent (90%) of it cases worldwide is as the result of infection from life threatening malaria specie P. falciparum (WHO Report, 2016). It is more common in Sub-Saharan Africa and New Guinea. In South America and Asia, P. vivax is more common (Calderaro *et al.*, 2013). P. malariae is the least common of the species, but it can also be found in most endemic areas.

Malaria is indeed a major public health concern in Nigeria, with more cases and deaths than any other country on the planet. 97% of the populations of Nigeria are at risk of Malaria. The malaria-free highlands are home to the remaining 3% of the population. In Nigeria, an estimated 100 million malaria cases were recorded every year, with over 300,000 deaths. This is comparable with deaths in Nigeria from HIV/AIDS per year (215,000). Malaria is thought to be responsible for 11% of all maternal deaths. Malaria is responsible for 30percent of hospitalizations and 60percent of outpatient visits among children under the age of 5 in Nigeria. Malaria is most common in children aged 6 to 59 months in the South West, North Central, North East, and North West regions, with prevalence rates approaching 50%. Malaria is least common disease in children aged 6 to 59 months in the South East region, with a prevalence of 27.6%. According to World Health Organization report 25% of recorded Malaria cases worldwide arefrom Nigeria. (WHO, 2018)

Result from a study conducted among pregnant women in South-South, Uyo, Nigeria to determine awareness and practice level of malaria preventive strategies showed that in the antenatal clinical setting, the majority of the respondents had been treated for acute malaria. Malaria is highly

prevalent in Nigeria, and it is transmitted all year long, with peak during the rainy season. The majority of those polled were also aware that malaria has negative consequences during pregnancy. (Abasiattai, Etukumana & Umioyoho, 2009).

In terms of the use of malaria prevention measures, among child-bearing aged women in Jere Local Government of Borno State, it shows that some of them used treated mosquito nets, coil or spray, Because they were aware that malaria was transmitted through mosquito bites, the practice remained confined to the methods used in preventing contact with the vector, especially during the rainy season.

Medication, mosquito eradication, and bite prevention are all examples of malaria prevention measures. Malaria prevention and control have been developed and shown to have a significant impact on women of childbearing age's health. Malaria prevention and control has three (3) pronged approaches:

- Treated insecticide net
- Preventive treatment and
- Malaria illness case management

Kimbi *et al.*(2014) it is important to note that the use of malaria prevention measures is linked to people's level of knowledge and belief. From community to community and among individual households, perceptions of possible causes, modes of transmission, and decisions about preventive and control measures differ. This study will try as much as possible to close this gap.

According Nkuo-Akenji *et al.* (2005), adequate malaria knowledge among mothers of children under the age of five has a strong link to lower morbidity and mortality among children. However, there are still many misconceptions about malaria. As a result, local malaria knowledge and practices are critical for the implementation of culturally appropriate, long-term, and effective interventions. (Vijayakumar, 2009). Malaria cannot be controlled solely by the health sector; therefore, various interventions involving other health-related sectors should be pursued.

Malaria not only poses a serious health risk, but the recurring clinical consequences of disease in endemic areas during childhood and adulthood, as well as outbreaks in epidemic-prone areas, impose a burden on households, health services, and, ultimately, on community and national economic growth. The community's socioeconomic conditions have a direct impact on the malaria problem. Ignorance and poverty contribute to the source and spread of malaria, as well as impeding disease control strategies. (Wesse, 1972; Yadav, Tyagi, Ramanath 1999; Collins *et al.*, 1997).

Most childbearing age women are hesitant and recalcitrant when it comes to disease prevention through improved knowledge and awareness, which is the best way to keep disease at bay and stay healthy, as illness confusion and health-seeking behavior may interfere or enhance the effectiveness of prevention measures. Direct interaction with the community plays an important role in avoiding malaria problems, according to studies on awareness and utilization (Collins et al, 1997; Singh *et al.*, 1998)

Individual and community knowledge levels, perceptions, and practical behaviors must all be understood in order to ensure proper intervention measures. However, in the study area, thorough awareness and use of malaria prevention measures are not investigated.

Statement of the Problem:

Ideally, malaria as an endemic disease in Sub-Saharan African Countries, Nigeria in particular has become a disease of utmost concern and attention. This prompts the need to put adequately in place measures toward preventing it spread. Due to the advancement in technology which made the

availability of malaria preventive equipment's in abundance and easy access to information (knowing the level of impact of malaria fever disease), it is then expected that Child-bearing aged women in Jere Local Government Area put in place measures to prevent themselves adequately from contracting such diseases.

However, Despite the government's and partners' efforts, malaria remains a public health concern, a leading cause of morbidity and death, particularly among pregnant women, nursing mothers, and children under the age of five in Borno State's Jere Local Government Area. (Awine *et al.,* 2017), As a result, a thorough investigation into the level of awareness and use of malaria prevention measures among women of childbearing age in the Jere LGA of Borno State is required.

Objectives of the Study:

The following objectives will be determined by this study.

1. the availability of Malaria Prevention Measures among child-bearing aged women in Jere LGA, Borno State.
2. the Awareness of Malaria Prevention Measures among child-bearing aged women in Jere LGA, Borno State.
3. the use of malaria prevention measures adopted by child-bearing aged women in Jere LGA, Borno State

I. Literature Review

Concept of Malaria:

Malaria is a protozoa-borne parasitic disease transmitted by infective vectors. It can be found in tropical and countries closed to the tropic regions all over the world, including Africa, America, and Asia. Killings from Malaria diseases is reported to be between one and three hundred million people each year in Sub-Saharan Africa, of whom larger percent are children under the age of five. Malaria has a strong connection to poverty because it is the cause of poverty in 90% of cases and a major impediment to economic development.

Malaria is one of the most common infectious diseases of major public health concern. The protozoan parasite of the genus plasmodium is said to cause this disease. Malarial disease is caused by at least five parasite species, two of these are the most fatal: Plasmodium vivax and Plasmodium falciparum (WHO Report, 2016). P. malaria, P. ovale, and P. knowlesi are the remaining parasite species of malaria.Almost all the malarial death and ninety percent (90%) of it cases worldwide is as the result of infection from life threatening malaria specie P. falciparum (WHO Report, 2016). It is more common in Sub-Saharan Africa and New Guinea. In South America and Asia, P. vivax is more common (Calderaro *et al.*, 2013). P. malaria is the least common of the species, but it can also be found in most endemic areas.

Infections from malaria occur usually as a result of bites from infected female anopheles' mosquitoes. Anopheles mosquitoes alone has the capacity to transfer the disease to humans, and they must have been infected by feeding on an infected person's blood. When a mosquito bites an infected person, a small amount of blood is drawn, which contains the malaria parasite in its microscopic form. When the mosquito bites for its blood meal about a week later, these parasites mix with the mosquito saliva and are injected into the person's red blood cells, causing anaemia symptoms (light-headedness, shortness of breath, tachycardia, etc.) as well as other general symptoms like fever, chills, nausea, flu-like illness, and in severe cases, coma and death.

Malaria can be prevented by using mosquito nets and insect repellents, as well as mosquito control methods like spraying insecticides inside homes and draining

standing water where mosquitoes lay their eggs

Malaria vaccine development has met with limited success, and more unusual approaches such as gene modification of mosquitoes to make them durable to the parasite have also been considered.

Malaria is still the deadliest parasitic infection in humans today (Oshikoya, 2006). Currently, it is estimated that between 1-2 billion people live in malaria-prone areas, with up to 500 million people dying each year (Shulman & Dorman, 2003). According to several recent reports, 90 percent of those killed are from Africa, south of the Sahara, where the parasite plasmodium falciparium thrives in its most virulent form (Alnwick, 2001; Kuti, Orolabi & Makinda, 2006).Malaria, which is highly endemic in Nigeria, remains a major public health trouble and the major cause of hospitalization in all age groups, according to available evidence (Anumedu et al., 2006).

Symptoms:

Malaria symptoms can appear as soon as seven days after being bitten by an infected mosquito. Depending on the parasite you're infected with, the time between being infected and experiencing symptoms (incubation period) ranges from 7 to 18 days. However, symptoms can take up to a year to appear in some cases..

Malaria's first symptoms are flu-like and include: shivering chills that can range from mild to severe, Headaches, a high fever, and other symptoms sweating profusely, Nausea, vomiting, and diarrhoea Convulsions, Coma, Diarrhea, Abdominal pain, Anemia, Muscle pain, Convulsions, Coma, Diarrhea stools that are bloody, A temperature of 38°C or higher, I'm hot and shivering. I'm not feeling well in general.

These signs and symptoms are frequently mild, making it difficult to distinguish between malaria and other illnesses. Malaria symptoms can appear in 48-hour cycles in some cases. You may shiver at first during these cycles because you are cold. The temperature rises, along with severe sweating and exhaustion. Symptoms last anywhere from 6 to 12 hours on average. Plasmodium falciparum is the parasite that causes the most severe form of malaria. This type of infection can quickly progress to severe and life-threatening complications, such as breathing difficulties and organ failure, if not treated promptly.

Malaria prevention measures:

Vector control refers to a set of actions taken against a disease vector with the goal of limiting the vector's ability to spread the disease by securing areas known to be susceptible to transmission (Gueye et al., 2016). Receptivity to malaria is determined by local vector populations' vectorial capacity, which includes not only the presence of the vector but also its size of population, habit of biting humans, and longevity relative to the sporogony period (Gueye et al., 2016). The climatic condition, natural environment, and human and vector behaviour all have a significant impact on each of these variables. As a result, to achieve maximum effectiveness, vector control measures must match the local setting. The goal of vector control in an elimination phase is to reduce the vectorial complexity.

The following are the main vector control measures:

1. Insecticide-treated mosquito nets (ITNs)
2. Indoor residual spraying (IRS)
3. Larval source management (LSM)
4. Other prevention measures

1. Insecticide-Treated Mosquito Nets (ITNs):

ITNs include long-lasting insecticidal nets (LLINs), where the insecticide lasts for up to

3 years, and nets conventionally treated, where the insecticide is active for up to 12 months.

Because small children and pregnant women are the population most at risk, the WHO recommended that all health ministries and donor agencies increase ITN distribution. The universal coverage of ITN distribution has now been adopted by the majority of national malaria control programs, with periodic mass distribution campaigns. As a result, the widespread distribution and use of ITNs has been credited with 67–73 percent of the total 663 million malaria cases averted in SSA over the last 15 years (WHO, 2015). Evidence from cluster-randomized controlled trials (RCTs) that showed pooled relative reductions in child mortality of 18 percent (Lengeler, 2004; Matovu, Goodman, Wiseman, Mwengee, 2009) and parasite prevalence of 18 percent (Lengeler, 2004; Matovu, Goodman, Wiseman, Mwengee, 2009) has prompted a large expansion in the distribution of ITNs. Despite the massive scale-up of ITN distribution in SSA, there are still shortfalls and inequities (Noor, Kirui, Brooker, Snow, 2009) that jeopardize long-term elimination or control efforts. A recent study in SSA looked at equity trends in ITN ownership and found that in most settings, a substantial increase in ITN ownership favored the poorest households; this has been attributed to increased nationwide ITN distribution campaigns. Sierra Leone and Zimbabwe had the most progress in terms of equity (Taylor, Florey, Ye, 2017).Both in terms of ownership and utilization, there is still a large gap. In SSA, households at risk of the disease own between 34 and 98.4% of ITNs. Ownership of at least one ITN was associated with a consolidated relative reduction in mortality in under-five children of 23 percent and a pooled relative reduction in parasitemia prevalence in children of 24 percent, according to a multi-country analysis of observational data in SSA that looked at associations between ITN household ownership and child mortality and parasitemia prevalence (Lim et al., 2011).

Generally, ITN possession has been linked to factors such as proximity to distribution sites, cost, economic status, and method of distribution. According to a study in Northern Nigeria, the presence of a health care facility in the community, care provider education level, and accommodation have the greatest impact on possession among under-five children (Oresanya, Hoshen, Sofola, 2008). In areas far from distribution sites, ITN use is low. Cost is the main factor that prevents the poorest people from accessing and using ITNs in countries where they are partially subsidized and socially marketed (Ruhago, Mujinja, Norheim, 2011; Rosero-Bixby & Spatial, 2004).

To ensure adequate use of ITNs, several strategies must be modified. One strategy that can be used is to use effective behavioral changes communication to change people's minds about using bed nets. Families are encouraged to use their ITNs on a regular basis, care for them, get them repaired whenever they are damaged (Koenker et al., 2014).

2. Indoor Residual Spraying (IRS)

The Global Malaria Eradication Campaign's main strategy was indoor residual spraying, which resulted in malaria being eradicated in many countries and greatly reduced its burden in others (WHO, 2015). In 2015, the Internal Revenue Service (IRS) protected approximately 106 million people. (2016 World Malaria Report) It has primarily targeted low and/or seasonal transmission areas, and its recent expansion into high transmission areas has raised concerns about long-term viability (WHO, 2015).

The IRS has been used to eradicate malaria and control epidemics in several countries.

Several studies have demonstrated its efficacy. IRS, for example, reduced re-infection with malaria parasites detected by active surveillance in children following treatment in an RCT conducted in Tanzania looking at stable malaria cases (entomological inoculation rate (EIR) > 1) Protective efficacy (PE) was 54 percent in terms of preventing parasite re-infection. Malaria case incidence was marginally reduced in children aged 1 to 5 years (PE: 14%), but not in children older than 5 years (PE: 2%). (Pluess, Tanser, Lengeler, Sharp, 2010). IRS reduced the incidence rate of all malaria infections in two RCTs for unstable malaria (EIR 1); the PE was 31% in India and 88% in Pakistan. There was an increase in malaria cases after IRS was stopped in Northern Uganda, according to a community-based trial conducted in several districts and focusing on children under five. After spraying was stopped in June 2015, the incidence rate ratio in the under-five population increased from 0.77 in December 2014 (when spraying started) to 1.74 in June 2015. (Okullo etal., 2017). In another study, absolute malaria test positivity rate (TPR) values increased by 3.29 percent per month in Uganda after IRS was discontinued for 4–18 months (Raouf et al., 2017).When used on a large scale in high-transmission areas, IRS can be much more expensive because it requires multiple spray rounds to protect the population. Another issue with IRS is that it poses a greater risk to human health and the environment than other intervention methods. Despite their effectiveness in controlling mosquitoes, some insecticides, such as dichlorodiphenyltrichloroethane (DDT), are banned in some countries due to environmental concerns. Only under specific circumstances is it recommended by WHO for use. Insecticide resistance, like ITNs, is a major concern when it comes to IRS use. The main problem at hand is pyrethroid resistance.

3. Larval Source Management (LSM)

Larval source management (LSM) is the control of aquatic habitats that could serve as mosquito breeding grounds in order to prevent complete cycle of immature development. It is among the oldest techniques in the fight against malarial disease, but it is often overlooked and dismissed as a malaria control strategy in Africa (Fillinger and Lindsay, 2011). With the recent recognition that outdoor mosquito bites makes a significant contribution to malaria transmission (Koenker et al., 2014), LSM has received more attention, as it does provide the double benefits of reducing both house-entering and outdoor biting mosquitoes.

LSM can be further classified into:

i. Habitat modification: Landscaping, surface water runoff, land clearing, and filling are all examples of permanent changes to land and water. It's simple to do and can be done in remote areas with basic materials (Fillinger & Lindsay, 2011; Tusting et al., 2013).

ii. Habitat manipulation: Steps such as flushing, drain removal, shading, or exposing habitats tothe sun are frequently used, such as water level modification. It is more appropriate in resource-limited setups, similar to environment modification..

iii. Biological control: natural enemies are introduced into freshwater environments (e.g., predatory fish, invertebrates, parasites, or disease organisms.) Gambusia affinis is a predatory fish (Fillinger & Lindsay, 2011; Tusting et al., 2013). This method requires a lot of resources and better management from experts to make it work.

Larvicide: Mosquitoes are controlled by saturating water bodies with biological or chemical insecticides on a regular basis. It works best in areas with a small number of easily identifiable fixed habitats. Microbial larvicides have been shown to be effective

in reducing adult mosquito populations and controlling anopheline mosquito larvae. They have a safety advantage over chemical larvicides in that they do not harm other aquatic species

4. Other Prevention Measures

i. House improvement (HI):

Although houses are not the only place where malaria is transmitted, in many endemic regions, they remain the major transmission area (Barreaux et al., 2017; Huho et al., 2013; Bayoh et al., 2014). In the past, improved homes was thought to have aided in the eradication of malaria in the United States and the significant drop of the disease in Europe (Zhao, Smith, Tatem, 2016). Traditional houses made of natural materials end up leaving multiple gaps through which mosquitoes can enter, so modern houses tend to be more malaria-resistant than old architectural houses made of natural materials that leave multiple gaps through which mosquitoes can enter (Tusting *et al.*, 2015), They also provide protection comparable to ITNs in some situations (Barreaux *et al.*, 2017; Kirby et al., 2009). Between 2008 and 2015, statistics from demographic health survey, as well as malaria identifier surveys, were conducted in 21 countries in SSA, revealing that newresidential housing reduces malaria incidence when compared to the traditional house building (Tusting *et al.*, 2017). Modern housing was linked to a 9 to 14 percent reduction in the incidence of malaria infection across all surveys (Tusting *et al.*, 2017). According to the study, malaria prevalence among children living in modern houses ranged from 0.3 percent (Senegal 2013–2014) to 61.2 percent (Burkina Faso 2010), while it ranged from 1.5 percent (The Gambia 2013) to 79.8 percent (Burkina Faso 2010) among children living in traditional houses (Tusting, 2017). The full screening or closing of openings such as windows, doors, and eaves, as well as the installation of ceilings, is referred to as house improvement. Indoors, the goal is to reduce mosquito-human contact. As a result, as one of the supplementary malaria control interventions, it aids in providing malaria protection indoors

ii. Mass drug administration (MDA):

Without first testing for infection and regardless of the presence of symptoms, mass drug administration is the treatment of an entire population in a geographic area with a curative dose of a drug (Centers for Disease Control and Prevention). It has been used to control malaria since the early 1930s, and in the 1950s, WHO advocated for its elimination (Poirot, Hwang, Kachur, Slutsker, Skarbinski, 2010). MDA combined with anti-malarials has been shown to be effective when used in conjunction with other malaria control measures. During the Garki Project in Northern Nigeria in 1969, for example, MDA in combination with sulphadoxine pyrimethamine and IRS achieved high levels of malaria control (Molineaux & Gramiccia 1980).An estimated 70% of Nicaragua's population received a combination of primaquine and chloroquine, which prevented 9200 malaria cases (Garfield & Vermund, 1983). Ivermectin is proving to be a success in malaria control, especially for residual malaria, according to recent developments. Ivermectin is a human-safe endectocide.

Swarm sprays:

Another vector control method that has been underutilized is this one (Chaccour et al., 2015). The locations of mating swarms appear to be linked to swarm markers on the ground, such as wells, wood piles, or the line between footpaths and grass (Diabaté et al., 2011). (Manoukis et al., 2009; Assogba et

al., 2014). In a recent field trial in Burkina Faso, a group of 20 volunteers from a village were recruited to spray 300 swarm locations with aerosols as they appeared over a nine-day period.In comparison to a control village, these spray treatments reduced mosquito (An. gambiae s.l) density by 80% over a 10-day period. It resulted in a significant decrease in female insemination (Sawadogo et al., 2017). There is still more work to be done in order to measure its impact on disease burden, as there is with many other methods that are still in development

iii. Targeting livestock:

The majority of malaria vector species have more varied feeding habits, feeding on both livestock and humans (Bureaux et al., 2017). Treatment of livestock structures (e.g., IRS of cattle sheds) could be used to target mosquitoes that feed on livestock (Bureaux et al., 2017). Insecticides applied directly to cattle via dipping, sponging, or spraying have been shown to kill mosquitoes and reduce malaria in humans [Hewitt & Rowland, 1999; Mahande, Mosha, Mahande, Kweka, 2007]. (Rowland et al., 2001). Another option for eradicating malaria mosquito's is to use systemic veterinary insecticides that affect mosquitoes when they feed on blood. Ivermectin has been proven to kill mosquitos while also shortening the lifespan of survivors in cattle.. (Chaccour *et al.*, 2015; Naz, Maqbool, Ahmad, Anjum, Zaman, 2013).

Awareness of Malaria Prevention measures:

The very first step in malaria prevention is to be aware of the dangers of malaria and its consequences. Because consistent evidence has proved the link between individual good health knowledge, health behavior, and health outcomes, health awareness is critical (Friis, Vind, Simmons, Maindal, 2016). People with a low level of individual health awareness are more than twice as likely to have poor health outcomes, according to research (Australian Commission on Safety and Quality of Health Care, 2013). Admittedly, reports on malaria awareness and associated factors around the world are inconsistent and contradictory (Obol, Lagoro, Garimoi, 2011; Goshu & Yitayew, 2018; Oladimeji, Tsoka, Gwegweni, Ojewole, Yunga, 2019; Adebayo, Akinyemi, Cadmus, 2015).

Previous research has it that women who live in cities, have a higher family monthly salary, and have received academic training have a better understanding of the causes, symptoms, and signs of malaria, as well as prevention techniques (Goshu & Yitayew, 2018). According to the World Health Organization, having a good understanding of malaria causes, signs and symptoms, route of exposure, and prevention methods did lead to the use of malaria preventative measures and improved wellbeing behavior (WHO, 2013).

Previous studies on malaria knowledge, attitudes, and practices (KAP) in African countries have revealed the impact of malaria misconceptions on malaria control efforts (Obol, Lagoro, Garimoi, 2011; Vundule, Mharakurwa, 1996; Weisgrau, 1995; Singh, Musa, Singh, Ebere, 2014). Thus, assessing malaria knowledge among women of reproductive age is critical, as women are primarily responsible for home-based malaria management, particularly among the most vulnerable group (children under the age of five years) (Mutegeki, Chimbari, Mukaratirwa, 2017).

Furthermore, in areas where malaria transmission is high (such as Nigeria's Jere LGA), pregnant women are more susceptible to malaria (Sohail et al., 2015; Chaponda, Chandramohan, Michelo, Mharakurwa, Chipeta, Chico. 2015).

Despite the benefits of malaria awareness in malaria control efforts, little has been known about knowledge levels among Jere LGA child- bearing aged women about regarding malaria causal factors, clinical signs, and mitigation.. In a study, Malawian women of reproductive age were asked to rate their level of knowledge about malaria's causes, symptoms, and prevention methods. The study findings revealed that living in a city expanded women's knowledge of malaria. Women from city environments may be more open to messages or relevant data from the media and other health-related messages than women from rural locations, such as television, ratio, newspapers, posters or billboards, peer educators, and so on. Women who had direct connections to radio, television, and had seen or heard malaria messages were much more likely to be urban dwellers, according to the current study's findings. Prior research in Nigeria (Singh, Musa, Singh, Ebere, 2014), Ethiopia (Bewley, Ledger, Nikolaou, 2009), and Tanzania (Singh, Musa, Singh, Ebere, 2014) found similar results (Mutegeki, Chimbari, Mukaratirwa, 2017)

Utilization of Malaria Prevention measures:

Malaria prevention measures are used differently by different age groups (Rut stein & Johnson, 2004). Using data from 41 DHS and MIS surveys (2005–2012) in Sub-Saharan Africa, a review of a multi-country comparison of ITN use versus ITN access found that over 80% of those with access to an ITN within their household reported using an ITN the previous night. Previous interpretations of the net use gap as a failure of behavioural change communication interventions differ from these findings. The interpretations were inaccurate, and the disparity was caused primarily by a lack of intra-household access (Deressa & Ali, 2009).

A further investigation in western Kenya found that, despite widespread mosquito net possession, usage is surprisingly low, with seasonal fluctuations (Sohail *et al.*, 2015). During the wet seasons, parasite prevalence in under-five children not using ITN was 14 percent and 11 percent, respectively, in an area called Emutete, according to the study. Even during dry season, parasite incidence was 10% in children under the age of five who did not use ITN and 4% in children who did (Sohail *et al.*, 2015). In 2016, an estimated 47% of malaria-prone people slept without a treated net (Obol, Lagoro, Garimoi, 2011).

Awareness and access to affordable healthcare are heavily influenced by socioeconomic status. Poverty is linked to poor health-seeking behavior in general, and low ITN uptake and use in particular (WHO, 2019). Despite the fact that many health ministries and non-governmental organizations (NGOs) freely or inexpensively distribute ITNs, their erroneous and inconsistent use continues to be a problem.

II. Methodology

This study adopted survey research design to assess awareness and use of malaria prevention measures among child bearing aged women in Jere LGA, Borno State. Child-bearing aged women constitute the population of the study. A Convenience Sample was used to select 381 respond enthusing Krejcie and Morgan population sample size determination table. (Krejcie & Morgan, 1970)

RESULT AND DATA ANALYSIS

Respondents' Socio-demographic Information

S/No	Variables		Frequency	Percentage
1.	Age	10-19	21	6
		20-29	154	44
		30-39	119	34
		>40	56	16
2.	Marital Status	Married	147	42
		Single	126	36
		Divorced	70	20
		Separated	0	0
		Widowed	7	2
3.	Education Attainment	None	70	20
		Primary	105	30
		Secondary	105	30
		Tertiary	70	20
4.	Occupation	Civil Servant	140	40
		Farming	0	0
		Trading	70	20
		Student	49	14
		Housewife	21	06
		Total	**350**	**100%**

Field Survey, 2021

As shown in table 4.1, most respondents 154(44%) are in the age bracket of 20 to 29 years, followed by 119 (34%) which falls within 30-39, 56(16%) of the respondents are above 40years, and aged between 10-19years represents 21(6%) of the total respondents. Data on marital status shows that 147(42%) of the respondents are Married, followed by Single 126(36%), Divorced70(20%), Separated and Divorced make the remaining 7 (2%). On Educational Attainment, 70(20%) are uneducated, 105(30%) of the respondent have attended primary school; 105(30%) have attended secondary school, and 70(20%) have attended tertiary institutions. Data on Occupation shows that; most of the respondent are civil servants 140(40%), followed by Trading 70(20%), Students 49(14%), Housewife and Farming consumes the remaining 21(6%).

Research Question 1: Are there Malaria Prevention measures Available?

Availability of Malaria Prevention measures

S/N	Statement	Reponses	Frequency	Percentage
1.	Are there Insecticide treated mosquito nets (ITNs) available at your disposal?	Yes No	294 56	84 16
2.	Are there insecticide sprays available in your community?	Yes No	224 126	64 36
3.	Are there mosquito repellents available for destroying larva sources in your community?	Yes No	315 35	90 10
4.	Do you have access to malarial control drugs?	Yes No	308 42	88 12
5.	Do you have access to basic sanitary tools for house improvement?	Yes No	329 21	94 06
		Total	**350**	**100%**

Source: Field Survey, 2021

Table 4.2 shows the respondents awareness of availability of malaria prevention measures, results reveals that 294(84%) agreed that insecticide treated mosquito nets (ITNs) are available at their disposal while 56(16%) disagree.224(64%) agreed that insecticide sprays are available while 126(36) disagreed. 315, representing 90% agreed that mosquito repellents are available for destroying larva sources in their community while 35(10%) disagreed same. Results on access to malarial control drugs reveals that; 308(88%) respondents agreed that they have access to it and 42(12%) disagreed. Results on access to basic sanitary tools for house improvement reveals that; 392(94%) agreed that they have access to basic sanitary tools and the remaining 21(6%) disagreed.

Research Question 2:

What is the level of awareness of malaria prevention measures among child-bearing aged women in Jere LGA, Borno State

Level of Awareness of Malaria Prevention Measures among Child-bearing aged women in Jere LGA, Borno State

S/N	Statement	Responses	Frequency	Percentage
1.	Do you know that mosquito causes malaria?	Yes No	322 28	92 8
2.	Are you aware that insecticide-treated mosquito nets (ITNs) control the occurrence of mosquito bite?	Yes No	315 35	90 10
3.	Are you aware that proper use of indoor spraying reduces the spread of mosquito?	Yes No	308 42	88 12
4.	Do you know that mosquito repellents help in reducing mosquito bite?	Yes No	315 35	90 10

5.	Do you know that use of mosquito zapper prevent mosquito bite?	Yes No	119 231	34 66
6.	Do you know that removing stagnate water prevent mosquito breeding?	Yes No	182 168	52 48
7.	Does modifying the environment help in controlling vectors?	Yes No	280 70	80 20
8.	Do you know that vector control helps to prevent malaria diseases?	Yes No	280 70	80 20
9.	Do you know that proper sanitation helps in reducing the spread of mosquito?	Yes No	203 147	58 42
10.	Do you know that anti-malaria drugs reduce the occurrence of malaria?	Yes No	189 161	54 46
		Total	**350**	**100%**

Source: Field Survey, 2021

Table 4.3 shows the respondents awareness of malariaprevention measures. It is indicated that 322, representing 92% are aware that malaria occurrence is as a result of mosquito bite, while 28, representing 8% were unaware.315(90%) are aware that intermittent treated nets (ITNs) control the occurrence of malaria while 35, representing 10% were not aware.308(88%) are aware that using indoor residual spraying reduce the spread of mosquitoes while 42, representing 12% were not aware. 315(90%) are aware that mosquito repellents help in reducing mosquito bites while 35, representing 10% were not aware. 119, representing 34% are aware that proper use of mosquitoes zapper prevent mosquitoes bite while 231, representing 66% were not aware. 182(52%) are aware that removal of stagnant water reduces mosquitoes breeding, while 168, representing 48% were not aware. 280 representing 80% are aware that modifying of environment control the vector while 70, representing 20% were not aware.280, representing 80% are aware that vector control reduces the occurrence of malaria while 70, representing 20% were not aware. 203, representing 58% agreed that proper sanitation helps in reducing the spread of mosquitoes while 147, representing 42% were not aware.189, representing 54% are aware that anti-malarial drugs reduces the occurrence of malaria while 161, representing 46% were notaware.

Research Question 3: What is the level of use of malaria prevention measures among child-bearing aged women in Jere LGA, Borno State?

Level of Use of Malaria Prevention Measures among Child-bearing aged women in Jere LGA, Boron State

S/N	Statement	Responses	Frequency	Percentage
1	Do you use indoor spraying to prevent mosquito bite?	Yes No	280 70	80 20
2	Do you clean the environment to prevent mosquito breeding?	Yes No	343 7	98 02
3	Do you use to remove stagnate water to reduce mosquito breeding?	Yes No	203 147	58 42

4	Do you use long lasting insecticide treated nets (LLITNS)?	Yes No	329 21	94 06
5	Do you know that insecticide resistance help in vector control?	Yes No	175 175	50 50
6	Do you use mosquito repellents to prevent mosquito bite?	Yes No	245 105	70 30
7	Do you use anti-malaria drug to prevent malaria?	Yes No	315 35	90 10
8	Do you use mosquito zapper to prevent mosquito bite?	Yes No	70 280	20 80
		Total	**350**	**100%**

Source: Field Survey, 2021**:**

Table 4.4 shows the respondents use of malaria prevention measures. Results indicate that 280, representing 80% used indoor spraying to prevent mosquito bite, while 70, representing 20% do not utilize same.343(98%) keep their environment clean in order to prevent mosquitoes breeding, while 7, representing 2% do not indulge in keeping their environment clean.203(58%) used to remove stagnant water to reduce mosquito breeding. 329(94%) use long lasting insecticide treated nets (LLITNs) in reducing mosquito bitesat the same time 175, representing 50% used insecticides resistance in controlling vectors. Results also shows that 245(70%) used mosquito repellent to prevent mosquitoes bite. 315, representing 90% of the respondents used anti-malarial drugs to prevent malaria and lastly 70(20%) used mosquito zapper to prevent mosquitoes bite.

III. Discussion

This study is under taken to assess the awareness and use of malaria prevention measures among child-bearing aged women in Jere LGA, Borno State.

Based on the findings of the study, it is evident that malaria prevention measures are available in Jere LGA. The result of this study also revealed that respondents have access to insecticides treated mosquito nets (ITNs), insecticide sprays, mosquito repellents, access to malarial control drugs and access to basic sanitary tools for house improvement. This is also consistent with the findings of a study conducted in Eastern India by Wylie et al., (2010) to assess the availability and use of malaria prevention strategies; Bed nets were available in all facilities in Chhattisgarh, but only 14.4% of health workers recommended their use. Bed nets were present in the homes of 40% of the pregnant women polled. Despite the fact that only 1.4 percent of all households had an insecticide-treated bed net, 40% of all women said their homes had been sprayed with insecticide. Only two (0.7%) of the 280 observed visits received anti-malarial chemoprophylaxis with chloroquine, and only one (0.4%) received intermittent preventive therapy.

According to the study's findings, there is a high level of awareness of malaria prevention measures among child-bearing aged women in Jere LGA.Result also also revealed that respondents are aware that mosquito causes malaria, mosquitoes repellent help in reducing malaria, use of long-lasting mosquitoes net control occurrence of malaria infection, proper use of indoor residual spraying reduces the spread of mosquitoes, use of mosquitoes zapper prevent

mosquitoes bite, removal of stagnant water to prevent mosquitoes breeding among others. This is similar to one study in Bangladesh where majority of the respondents were considered aware of malaria prevention measures(Saha et *al.*, 2019).

Based on the findings of the study, it is evident from that there is active utilization of various malaria prevention measures among respondents in Jere LGA. The result of this study also revealed there is high use of indoor residual spraying among respondents, cleaning of the environment, respondents use to remove stagnant water in order to avoid mosquitoes breeding, the use of Intermittent Treated Nets (ITNs), Insecticide resistance, anti-malarial drugs, and mosquito zappers are all used to prevent the spread of malaria, among other things. This is in line with the findings of Erhun and Adebayo (2002) according to him, the use of insecticide bed nets and medications reduces human-vector contact and malaria transmission, and the prevalence of malaria infection can be significantly reduced by using insecticide bed nets.This is also consistent with the findings of Tinashe (2018), who found that the use of indoor residual spraying and long-lasting insecticide-treated nets has resulted in a decrease in malaria incidence and prevalence in Sub-Saharan Africa.

Majority of the respondents attained some level of education, ranging from primary to tertiary level. It is not surprising that the results displayed those with positive attitudes towards the practice as respondents with better educational status, which is an indicator that education made them more receptive.

Age also plays a vital role in influencing this phenomenon. As revealed by the study, the middle age women of 28-35 years were more receptive, probably because they are in their prime age, as youths are believed to be easily convinced on issues than the adults. This result seem to agree with what the ten years after Beijing progress report on malaria prevention measures (2005) said that malaria prevention is linked to women's status in society, their health, educational level, maturity level (age) and their economic development.

Occupation in its way has no much influence on this practice, as every woman of child-bearing age had equal chance to practice same.

IV. Conclusion

Based on the findings of this study we conclude that malaria prevention measures are available in Jere LGA, Borno State; there is awareness of malaria prevention measures among child-bearing aged women in Jere LGA, Borno State and the use of malaria prevention measures among child-bearing aged women is available.

V. Recommendations

The following suggestions are made based on the findings of this study:

i. Health personnel especially at the Primary Health Care should intensify regular awareness

ii. campaigns on the utilization of malaria prevention measures, to ensure continual compliance and making it to become a habit.

iii. Government should provide in abundance malaria prevention measures at every health centre in the study area and to also cut the purchase price of these equipment's.

iv. Child-bearing aged women should regularly keep their surrounding clean and make the use of other malaria prevention measures a habit; this will ensure safety from contracting malarial disease which is disastrous to health and comes along with economic burden

VI. References

1) Abasiattai AM, Etukumamana EA, Umoiyoho AJ: Awareness and Practice of Malaria Prevention Strategies amongPregnant Women in Uyo, South-South, Nigeria. The Internet.J. Gyn. Ob. 2009, 11:1

2) Adebayo AM, Akinyemi OO, Cadmus EO. Knowledge of malaria preventionamong pregnant women and female caregivers of under-fivechildren in rural southwest Nigeria. PeerJ. 2015;3:e792.

3) Alnwick, D. (2001). Meeting the Malaria challenge. African Health, 23(6)18-19

4) Anumedu, C.I; Adepoju, A; Adediran, M; Adeoye, O; Kassim, A; Oyenile, I; et al (2006) Malaria prevention and treatment seeking behaviour of young Nigerian adults. Annals of African Medicine, 5(2):82-88

5) Assogba BS, Djogbenou L, Saizonou J, Diabate A, Dabire RK,Moiroux N, et al. Characterization of swarming and mating behaviourbetween Anopheles coluzzii and Anopheles melas in a sympatryarea of Benin. Acta Trop. 2014;132:53–63.

6) Australian Commission on Safety and Quality of Health Care. Consumers,the health system and health literacy: Taking action to improve safetyand quality. Consultation paper, 2013. https ://www.safet yandq ualit y.gov.au/sites/defau lt/files /migra ted/Consu mers-the-healt h-syste m-and-health-liter acy-Takin g-actio n-to-impro ve-safet y-and-quali ty2.pdf.

7) AwineT., MalmK., Bart-PlangeC., and SilalS. P., "Towardsmalaria control and elimination in Ghana: challenges anddecision-making tools to guide planning," GlobalHealthAction,

8) Barreaux P, Barreaux AMG, Sternberg ED, Suh E, Waite JL,Whitehead SA, et al.

9) Priorities for broadening the malaria vectorcontrol tool kit. Cellpress. 2017. Barreaux et al. give a detailedaccount of new methods that are under development, latestinformation.

10) Bayoh MN, Walker ED, Kosgei J, Ombok M, Olang GB, GithekoAK, et al. Persistently high estimates of late night, indoor exposureto malaria vectors despite high coverage of insecticide treated nets.Parasit Vectors. 2014;7(1):380. https://doi.org/10.1186/1756-3305-7-380.

11) Bhatt S, Weiss DJ, Cameron E, Bisanzio D, Mappin B, Dalrymple U, et al. The effect of malariacontrol on Plasmodium falciparum in Africa between 2000 and 2015. Bhatt et al described the majorimpact that has been there since the introduction of Roll Back Malaria on malaria burden. Provides in general the malariamap in SSA.

12) Calderaro A, Piccolo G, Gorrini C, Rossi S, Montechinni S,Dell'Anna ML, et al. Accurate identification of six human Plasmodium species causing imported malaria, including Plasmodium ovale wallikeri and Plasmodium knowlesi. Malar J. 2013;12(1):321.https://doi.org/10.1186/1475-2875-12-321.

13) Chaccour CJ, Rabinovich NR, Slater H, Canavati SE, Bousema T,Larceda M. Establishment of the ivermectin research for malariaelimination network: updating the research agenda. Malar J. 2015.Gives a detailed account of ivermectin for malaria control. It isimportant to highlight it as ivermectin used mostly in MDA forneglected tropical diseases has shown to kill malaria mosquitoesonce it is ingested.

Gives latest information on new methodsunder development.

14) Chaponda EB, Chandramohan D, Michelo C, Mharakurwa S, Chipeta J,Chico RM. High burden of malaria infection in pregnant women in a ruraldistrict of Zambia: a cross-sectional study. Malar J. 2015;14:380.

15) Collins KA, Samuel KD, Edwin A A, Kwadwo A, Korum,Francis KN. Malaria related beliefsand behaviour insouthern Ghana: implications for treatment, prevention andcontrol. Trop Med Intl Hlth 1997; 2(5): 488–99.

16) Deressa W, Ali A. Malaria-related perceptions and practices of womenwith children under the age of five years in rural Ethiopia. BMC Public Health. 2009;9:259.

17) Diabaté A, Yaro AS, Dao A, Diallo M, Huestis DL, Lehmann T.Spatial distribution and male mating success of Anopheles gambiaeswarms. BMC Evol Biol. 2011;11(1):184. https://doi.org/10.1186/1471-2148-11-184.

18) Erhun., W.O. and Adebayo., A. (2002). Students' management of perceived malaria in a Nigerian University. Journal of Social and Administrative Pharmacy. 19(4)..

19) Fillinger U, Lindsay SW. Larval source management for malariacontrol in Africa: myths and reality, Malar J. 2011.

20) Friis K, Vind BD, Simmons RK, Maindal HT. The relationship betweenhealth literacy and health behaviour in people with diabetes: a Danishpopulation-based study. J Diabetes Res. 2016;2016:7823130.

21) Garfield RM, Vermund SH. Changes in malaria incidence aftermass drug administration in Nicaragua. Lancet. 1983;2(8348):500–3.

22) Goshu YA, Yitayew AE. Malaria knowledge and its associated factorsamong pregnant women attending antenatal clinic of Adis ZemenHospital, north-western Ethiopia, 2018. PLoS ONE. 2019;14:e0210221.

23) Gueye CS, Newby G, Gosling RD,Whittaker MA, ChandramohanD, Slutsker L, et al. Strategies and approaches to vector control innine malaria eliminating countries: a cross-case study analysis.2016. Gueye CS et al. stress the benefits of combining vectorcontrol methods and the impact it has had on disease burden.

24) KimbiH. K., NkesaS. B.,. Ndamukong-NyangaJ. L, SumbeleI. U. N., AtashiliJ., and AtangaM. B. S., "Knowledge and perceptionstowards malaria prevention among vulnerable groupsin the BueaHealthDistrict,Cameroon,"BMCPublic Health, vol.14, no. 1, article no. 883, 2014

25) Hewitt S, Rowland M. Control of zoophilic malaria vectors byapplying pyrethroid insecticides to cattle. Tropical Med Int Health. 1999;4(7):481–6. https://doi.org/10.1046/j.1365-3156.1999.00433.x.

26) Huho B, Briet O, Seyoum A, Sikaala C, Bayoh N, Gimnig J, et al.Consistently high estimates for the proportion of human exposure tomalaria vector populations occurring indoors in rural Africa. Int J Epidemiol. 2013;42(1):235–47. https://doi.org/10.1093/ije/dys214.

27) Kirby MJ, Ameh D, Bottomley C, Green C, Jawara C, Milligan M,et al. Effect of two different house screening interventions on exposureto malaria vectors and on anaemia in children in TheGambia: a randomised controlled trial. Lancet. 2009.

28) Koenker H, Keating J, Alilio M, Acosta A, Lynch M, Traore NF.Strategic roles of behavior change communication in a changingmalaria landscape. Malar J. 2014.

29) Krejcie, R.V., & Morgan, D.W. (1970). Determining Sample Size for ResearchActivities. Educational and Psychological Measurement, 30, 607-610

30) Lengeler C. Insecticide-treated bed nets and curtains for preventing malaria. Cochrane Database Syst Rev. 2004;2:CD000363.

31) Lim SS, Fullman N, Stokes A, Ravishankar N, Masiye F, MurrayCJL, et al. Net benefits: a multi-country analysis of observationaldata examining associations between insecticide-treated mosquitonets and health outcomes. PLoS Med. 2011;8(9):e1001091. https://doi.org/10.1371/journal.pmed.1001091.

32) Mahande AM, Mosha FW, Mahande JM, Kweka EJ. Role of cattletreated with delta- methrine in areas with a high population ofAnopheles arabiensis in Moshi, Northern Tanzania. Malar J. 2007;6(1):109. https://doi.org/10.1186/1475-2875-6-109.

33) Manoukis NC, Diabate A, Abdoulaye A, Diallo M, Dao A, YaroAS, et al. Structure and dynamics of male swarms of Anophelesgambiae. J Med Entomol. 2009;46(2):227–35. https://doi.org/10.1603/033.046.0207.

34) Matovu F, Goodman C,Wiseman V,MwengeeW. How equitable isbed net ownership andutilisation in Tanzania? A practical applicationof the principles of horizontal and vertical equity. Malar J. 2009;8(1):109. https://doi.org/10.1186/1475-2875-8-109.

35) Molineaux L, Gramiccia G. The Garki Project. Research on theepidemiology and control of malaria in the Sudan Savanna ofWest Africa. WHO; 1980.

36) Mutegeki E, Chimbari MJ, Mukaratirwa S. Assessment of individual andhousehold malaria risk factors among women in a South African village.Acta Trop. 2017;175:71–7.

37) Naz S, Maqbool A, Ahmad MUD, Anjum AA, Zaman S. Efficacyof ivermectin for control of zoophilic malaria vectors in Pakistan.Pak J Zool. 2013;45:1585–91.

38) NkuoAkenjiT.K.,NtoniforN.N., Ching J. K. et al., "Evaluatinga malaria intervention strategyusing knowledge, practices andcoverage surveys in rural Bolifamba, southwest Cameroon,"Transactions of the Royal Society of Tropical Medicine andHygiene, vol. 99, no. 5, pp. 325–332, 2005.

39) Noor AM, Kirui VC, Brooker SJ, Snow RW. The use of insecticidetreated nets by age: implications for universal coverage in Africa.BMC Public Health. 2009;9(1):369.https://doi.org/10.1186/1471-2458-9-369.

40) Nworgu, B.G. (2006). Educational research: Basic Issues & Methodology (2nd ed.). Nsukka:University Trust.

41) Obol J, Lagoro KD, Garimoi OC. Knowledge and misconceptions aboutmalaria among pregnant women in a post-conflict internally displacedpersons' camps in Gulu District, Northern Uganda. Malar Res Treat. 2011;2011:107987.

42) Okullo AE, Matovu JKB, Ario AR, Opigo JB, Wanzira H, OguttuDW, et al. Malaria incidenceamong children less than 5 years during and after cessation of indoor residual spraying in NorthernUganda. Mal J. 2017. Okullo et al. cement the significance ofhaving IRS as a control method and the impact it causes onceit seizes to be applied. Published in 2017.

43) Oladimeji KE, Tsoka-Gwegweni JM, Ojewole E, Yunga ST. Knowledge ofmalaria prevention among pregnant women and non-pregnant mothersof children aged under 5 years in Ibadan, South West Nigeria. Malar J.2019;18:92.

44) Oresanya OB, Hoshen M, Sofola OT. Utilization of insecticidetreatednets by under-five children in Nigeria: assessing progresstowards the Abuja targets. Malar J. 2008.

45) Oshikoya, K.A. (2006). Malaria treatment in Lagos Private clinics/hospitals: physicians' compliance of the World Health Organization recommendations. Nigeria Medical Practitioners, 45(5): 102-110

46) Pluess B, Tanser FC, Lengeler C, Sharp BL. Indoor residualspraying for preventing malaria. Cochrane Libr. 2010. Pluess Bet al. showed the importance of IRS in several studies and thisgives good detail to the article concerning IRS.

47) Poirot E, Hwang J, Kachur SP, Slutsker L, Skarbinski J. Mass drugadministration for malaria. Cochrane Rev. 2010.

48) Raouf S, Mpimbaza A, Kigozi R, Sserwanga A, Rubahika D,Katamba H, et al. Resurgence of malaria following discontinuationof indoor residual spraying of insecticide in an area of Uganda withpreviously high-transmission intensity. Okullo et al. also describethe impact of having IRS as a vector control method. 2017.

49) Rosero-Bixby L. Spatial access to health care in Costa Rica and its equity: a GIS-based study. Soc Sci Med. 2004;58(7):1271–84.https://doi.org/10.1016/S0277-9536(03)00322-8.

50) Rowland M, Durrani N, Kenward M, Mohammed N, Urahman H,Hewitt S. Control of malaria in Pakistan by applying deltamethrininsecticide to cattle: a community-randomised trial. Lancet. 2001;357(9271):1837–41. https://doi.org/10.1016/S0140-6736(00)04955-2.

51) Ruhago GM, Mujinja PG, Norheim OF. Equity implications ofcoverage and use of insecticidetreated nets distributed for free orwith co-payment in two districts in Tanzania: a cross sectional comparativehousehold survey. Int J Equity Health. 2011;10(1):29.https://doi.org/10.1186/1475-9276-10-29.

52) SahaA, Malabika S,Moktadir K, Guangyu Land MüllerO, Knowledge, attitudes, and practicesregarding malaria control among the slashand burn cultivators in Rangamati Hill tracts of Bangladesh. Journal of Malaria(2019) 18:216https://doi.org/10.1186/s12936-019-2849-0

53) Sawadogo SP, Niang A, Bilgo E,Millogo A,Maiga H, Dabire RK,et al. Targeting male mosquito swarms to control malaria vectordensity. PLoS One. 2017;12(3):e0173273.

https://doi.org/10.1371/journal.pone.0173273.

54) Shulman, C.E & Durman, E.K. (2003). Importance and Prevention of malaria in Pregnancy. Trans Royal Society of Medical Hygiene, 97(1):30-35

55) Singh Neeru , Singh MP, Saxena Ajay, Sharma VP, Kalra NL.Knowledge, attitude, beliefs and practices (KABP) study relatedto malaria and intervention strategies in ethnic tribals of Mandla(Madhya Pradesh). Curr Sci 1998;75(12): 1386–90.

56) Singh R, Musa J, Singh S, Ebere UV. Knowledge, attitude and practices on malaria among the rural communities in Alero, Northern Nigeria. J Fam Med Prim Care. 2014;3:39.

57) Sohail M, Shakeel S, Kumari S, Bharti A, Zahid F, Anwar S, et al. Prevalence of malaria infection and risk factors associated with anaemia among pregnant women in semiurban community of Hazaribag, Jharkhand,India. Biomed Res Int. 2015;2015:740512.

58) Taylor C, Florey L, Ye Y. Equity trends in ownership of insecticidetreatednets in 19 Sub-Saharan African countries. 2017.

59) Tinashe A, Alinune N, Robert S, Henk V, Michele V, Kamija S.Prevention Efforts for Malaria. Current Tropical Medicine Reports(2018) 5:41–50 https://doi.org/10.1007/s40475-018-0133-y

60) Tusting LS, Bottomley C, Gibson H, Kleinschimdt I, Tatem AJ,Lindsay SW, et al. Housing improvements and malaria risk inSub-Saharan Africa: a multi-country analysis of survey data. 2017. One of the new methods under development, house improvement,is well described and latest evidence is shown on itssignificance and how it can be adopted as one of the vectorcontrol methods.

61) Tusting LS, Ippolito MM, Willey BA, Kleinschmidt I, Dorsey G, Gosling RD, et al. The evidence for improving housing to reducemalaria: a systematic review and meta-analysis. Malar J. 2015;14(1):209. https://doi.org/10.1186/s12936-015-0724-1.

62) Tusting LS, Thwing J, Sinclair D, Fillinger U, Gimnig J, BonnerKE, et al. Mosquito larval source management for controlling malaria.Cochrane Libr. 2013.

63) Vijayakumar KN, Gunasekaran K, Sahu SS, Jambulingam P.Knowledge, attitude and practiceon malaria: A study in atribal belt of Orissa state, India with reference to use of longlasting treated mosquito nets. Acta Trop 2009;112:137-42

64) Vundule C, Mharakurwa S. Knowledge, practices, and perceptions aboutmalaria in rural communities of Zimbabwe: relevance to malaria control. Bull World Health Organ. 1996;74:55.

65) Weisgrau S. Issues in rural health: access, hospitals, and reform. Health Care Financ Rev. 1995;17:1.vol. 10, no. 1, Article ID 1381471, 2017

66) Wessen AF. Human ecology and malaria. Am J Trop MedHyg 1972; 21: 658–62.

67) WHO. Global technical strategy for malaria 2016–2030. Geneva:World Health Organization;2015. http://www.who.int/malaria/areas/global_technical_strategy/en/

68) WHO. Insecticide-treated mosquito net: a WHO position statement.Geneva: World Health Organization; 2007.

69) WHO. Malaria; Malaria in Pregnant Women. Geneva, World Health Organization,2019. https ://www.who.int/malar ia/areas /high_risk_group s/pregnancy/en/ Accessed 10 Jan 2020).

70) WHO. Prevention and control of malaria epidemics. Geneva, World HealthOrganization, 2013. https ://www.who.int/malar ia/publi catio ns/atoz/epide mics_tg.pdf. Accessed 10 Jan 2020.

71) World Malaria Report 2016. The report gives great highlights of the current malaria burden andsituation in malaria prevention and control.

72) World Health Organization (2018) World Malaria Report. https://apps.who.int/iris/bitstream/handle/10 665/275867/9789241565653-eng.pdf?ua=1

73) Wylie J, Ahmar H, Neeru S, Mrigendra P, Jordan T, Mobassir H, Lora S, Kojo Y, Camellia B, Mohamad I, Meghna D, Venkatachalam U, William B, Aditya P, Davidson H (2010) Availability and utilization of malaria prevention strategies in pregnancy in Eastern India. BMC Public Health 2010, 10:557. http://www.biomedcentral.com/1471-2458/10/557

74) Yadav SP,Tyagi BK, Ramanath T. Knowledge, attitudeand practice towards malaria in rural communities of theepidemic prone Thar desert, northwestern India. J ComDis.1999; 3(2): 127–36.

75) Zhao X, Smith DL, Tatem AJ, Exploring the spatiotemporal driversof malaria elimination inEurope. Mal J. 2016.