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**Determinants of Utilization of Malaria Prevention Strategies in  
Mariakani, Kilifi County**

Mary W. Nthiga, <sup>2</sup>Msanzu J. B and <sup>3</sup>Kikuyi G. M

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\*<sup>1</sup>Mary W. Nthiga, <sup>2</sup>Msanzu J. B. and <sup>3</sup>Kikuvi G.M.

<sup>1</sup>Medical Department, Kenya ports Authority, P.O. Box95009-80104 Mombasa, Kenya

<sup>2</sup>Department of Pure and Applied Sciences, Technical University of Mombasa, P.O. Box 90420-80100, Mombasa

<sup>3</sup>Department of Public and Community Health, School of Public Health, Jomo Kenyatta University of Agriculture and Technology, P.O. Box 62000-00200 Nairobi

Corresponding email address: [marynthiga@yahoo.com](mailto:marynthiga@yahoo.com)

### Abstract

**Purpose:** This study investigated the utilization of malaria prevention strategies in Mariakani area in Kilifi County, Coastal Kenya.

**Methodology:** A descriptive cross sectional study design was adopted. Three hundred and eighty five (385) households were targeted in Kadzozzo, Mitangoni and Township Locations. The Locations were selected using random sampling technique while the respective households in the Locations were randomly selected. Univariate, bivariate and multivariate analyses were conducted and significance tests conducted at 5% level of significance. Frequency tables, graphs and charts were used to present the findings. Only 327 households were positively identified and the house hold successfully interviewed.

**Results:** The study established that most of the inhabitants of this area (86.5%) had suffered from malaria in the past. Majority of the inhabitants in this area were aware that malaria is caused by mosquito bites (from *Anopheles* mosquitoes) and so to protect themselves or members of their households, majority of them knew that they needed to sleep under insecticide treated mosquito nets, as well as cut surrounding bushes. Case management was utilized by a majority of the inhabitants, specifically because it is the most common and effective way of treating malaria in Kenya. Utilization of case management as a malaria prevention strategy was mainly determined by recent malaria experience. Utilization of ITNs was significantly influenced by past malaria history (occurrence vs. non-occurrence), knowledge of existence of ITNs and the experience of having used an ITN in the past. Use of IPT was dependent on past malaria experience, knowledge regarding mosquitoes as a source of malaria and knowledge about the existence of IPT. It can be concluded that Mariakani is a malaria prone area with most of the inhabitants highly exposed to the risk of contracting malaria at any one given time. However, the residents here are aware of the need to visit health facility or dispensing chemist to get immediate medication in case of suspicion of a malaria case. The awareness of the spread of

malaria together with utilization of various malaria prevention strategies had contributed to the low malaria incidences in the recent past.

**Policy recommendation:** It is recommended that there should be sustained awareness creation efforts by public health departments at the County and at the National level on the IPT, especially among pregnant women and children in this area. There is need for carrying out further studies in Mariakani, Kilifi County to establish the effectiveness of each of the methods of preventing malaria in the area, and how best all these methods can be integrated in the fight against malaria in this area.

**Keywords:** *Plasmodium, Malaria, First line treatment, Second line treatment.*

### **Background Information**

Malaria is a vector-borne infectious disease caused by a protozoan parasite in the genus *Plasmodium* (WHO, 2008). This parasite is transmitted from an infected human to a health human by female mosquitoes in the genus *Anopheles* (Snow *et al.*, 2005). The infection is usually transmitted by a bite of an infected female anopheles mosquito. People who get malaria are typically very sick with high fevers, shaking chills, and flu-like illness (Greenwood *et al.*, 2005). Malaria occurs mostly in poor tropical and subtropical areas of the world. In many of the countries affected by malaria, it is a leading cause of illness and death.

Globally, malaria has morbidity of between 300 to 500 million and mortality of at least one million people annually (WHO, 2012). Ninety percent (90%) of the mortality due to malaria occurs in sub-Saharan Africa in children under the age of five years (Lehrer *et al.*, 2009; World Malaria Report, 2010). These deaths can however be prevented. Malaria is a heavy burden for the national health system in endemic countries. In Kenya, malaria is a major public health problem, leading to morbidity and mortality in children under five years and pregnant mothers, particularly in the high transmission coastal areas of the country (Kenya Malaria Fact Sheet, 2010). It is responsible for 16% to 20% of all deaths in children under five years (Oruko, 2011). In Kenya alone, the disease accounts for 30-50% of all outpatient attendance and 20% of all admissions to health facilities (NMCP, 2009). Malaria also kills an estimated 34,000 children under five in Kenya every year, and about 3.5 million children are at risk of infection and developing severe malaria (WHO, 1993). In areas with high transmission, the most vulnerable groups are young children, who have not developed immunity to malaria yet as well as pregnant women whose immunity has been decreased by pregnancy (WHO, 2010). In Kenya, an estimated 27 million people (about 70 percent of the population) are at risk of infection (Snow *et al.*, 1999).

Malaria is still an important disease in foci located in irrigation-based agricultural areas, forested areas (for *An. gambiae* Giles, 1902), semi-arid areas (for *An. arabiensis* Patton, 1905) and regions located along or near water bodies (Githeko *et al.*, 1993). In these foci, *Anopheles* mosquitoes easily proliferate and spread to malaria free areas (Mwangangi *et al.*, 2007; Himeidan and Rayah, 2008). The Kenyan coastline is characterized by humid and warm tropical climate. The total precipitation varies from 900 to 1500 mm per annum along the coastal belt (Mbogo *et al.*, 2003). Long rains and intermittent rain with long spells of sunshine provide a suitable environment for mosquito vector proliferation (Martens *et al.*, 1999). This type of

climate favours breeding of a variety of malaria vectors along the coastline (Mwangangi *et al.*, 2007). A study conducted in Kisumu, Kenya showed a 22% increase in the prevalence of malaria parasites after a period of extensive rainfall (Imbahale *et al.*, 2010). In 2010, clinically diagnosed malaria accounted for 30% of outpatient hospital visits in Kenya (NMCP, 2010). Impact of the investment in malaria control over the past ten years and the gains made in reducing morbidity and mortality are difficult to measure within the routine health system as nearly all fevers are diagnosed and treated as malaria (WHO, 2012). This situation makes it necessary to conduct periodic household surveys to gather knowledge on utilization of malaria control strategies. Such information is lacking in most malaria endemic areas in Kenya such as Mariakani where this study will be conducted.

## **Materials and methods**

### **Study Site**

The study was carried out in 3 rural Locations within Mariakani, Kilifi County. Mariakani is situated in Coastal Kenya at 3° 52' 0" South and 39° 28' 0" East. The 3 Locations were; Mitangoni, Kadzonzo and Mariakani Urban Area. Mitangoni Location hosts Highway, Weighbridge and Kafichoni villages. Kadzonzo Location hosts Kakuna, Kwajuri and Kaptuku villages, while Mariakani Urban Area hosts Njoro, Jakaba, Majengo and Makaburini villages.

### **Study Population**

The study population consisted of all household heads in the rural areas of Mitangoni, Kadzonzo, and Mariakani Urban Area.

### **Target Population**

The target population consisted of all adults above the age of 18 years.

### **Study Design**

The study adopted a descriptive cross sectional study design.

### **Sample Size Determination**

To calculate the desired sample size, the statistical formula for population survey used in social science research (Fisher *et al.*, 1983) was used:

$$n = \frac{Z^2 \times p \times q}{d^2}$$

where;

n = minimum sample size required when target population is >10,000

Z = Standard normal deviation (1.96) with confidence level of 0.95

p = proportion of target population

q = 1-p (proportion of target population to have disease)

d = maximum tolerable error = 5%

Hence,

$$n = \frac{(1.96)2x(0.5x0.5)}{(0.05^2)} = 385$$

### **Sampling Technique**

Stratified random sampling was used in order to factor in the disparities in the populations of the selected Locations. The study utilized 104 (31.8%) of the participants selected from Kadzonzo Location, 120 (36.7%) from Mitangoni Location and 103 (31.5%) from Urban Area Location. This was necessary so that all participants got an equal opportunity to participate in the study. Simple random sampling was then used to select the households to be included in the study at the village.

### **Data Collection tools**

Primary data was collected from households using a researcher designed semi-structured questionnaire on social demographics, vector control strategies (utilization of Insecticide Treated Nets –ITNS), Intermittent Prevention Strategies (utilization of IPTp and IPTi), as well as a malaria case management (utilization of Artemisinin Based Combination therapies –ACTs).

An observational check list was used to confirm use of vector control strategies, Intermittent Prevention Strategies, as well as a malaria case management. This approach is relevant in obtaining data during preliminary visits on the geo-physical setting and accurate information that is not captured in the questionnaires (Kothari, 2004).

### **Data management and Analysis**

Quantitative data was cleaned, coded and entered in MS- Excel spreadsheet. It was then exported to Statistical Package for Social Sciences (SPSS) Version 21, where the data was analyzed on univariate (descriptive) statistics, and bivariate (Chi Square) statistics, and logistic regression. To test significance of interaction on various variables, the level of significance was set at  $p \leq 0.05$ . Study findings were then presented using frequency tables, graphs and charts.

### **Ethical Considerations**

This study was approved by the Ethical Review Committee (ERC) of Pwani University. During data collection, participants' informed consent was sought before administering the questionnaires. It was made clear to the participants that their participation was voluntary and where they agreed to participate, they had to sign an informed consent form. Confidentiality of the information shared was maintained and all personal identifiers removed from the data during and after analysis. The main benefit of participation in the survey was that the participants would contribute to knowledge on determinants of utilization of malaria prevention strategies which would be valuable in reducing malaria incidences, while the risk was that there was the possibility of temporary discomfort during the discussion of sensitive information around reproductive history and child survival.

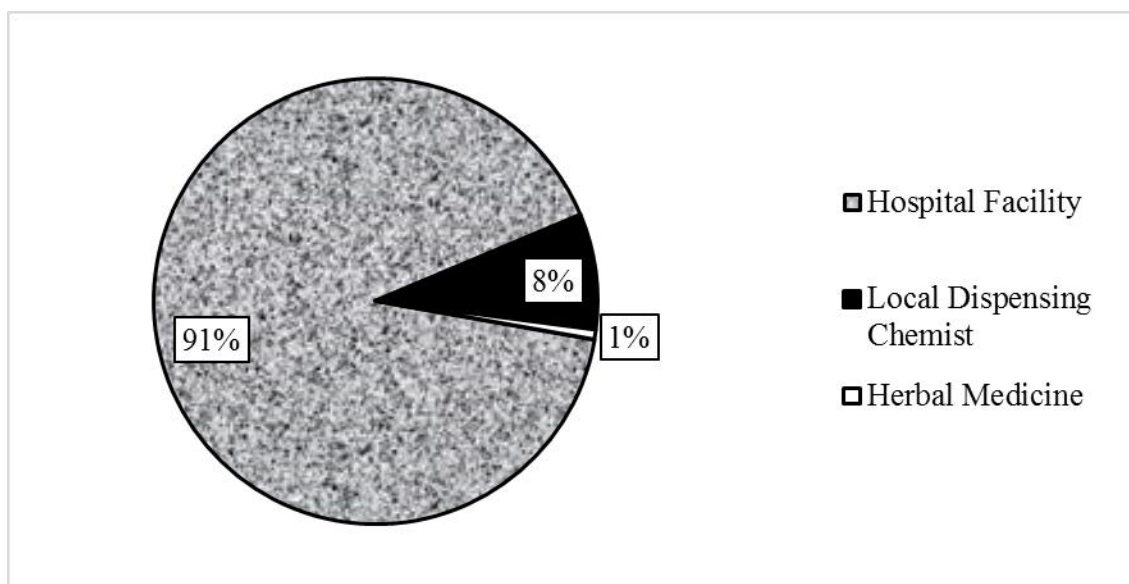


## Results

Out of a sample size of 385 the study achieved 327 respondents, 84.5% rate of response which was sufficient for drawing conclusions about the population of Mariakani Location in Kilifi County.

The study found that 283(86.5%) of the participants had suffered from malaria. The remaining 44(13.5%) of the participants interviewed had never suffered from malaria. At least 299(91.4%) of the participants had themselves suffered from malaria in the past and had witnessed someone suffering from malaria.

For the treatment-seeking behaviour for the participants who had suffered from malaria, 258(91.0%) had received treatment from a hospital facility, 24(8.0%) took drugs bought from a local dispensing chemist while 1(1.0%) depended on herbal medicine as their source of treatment



**Figure 1:** Sources of malaria treatment among study participants

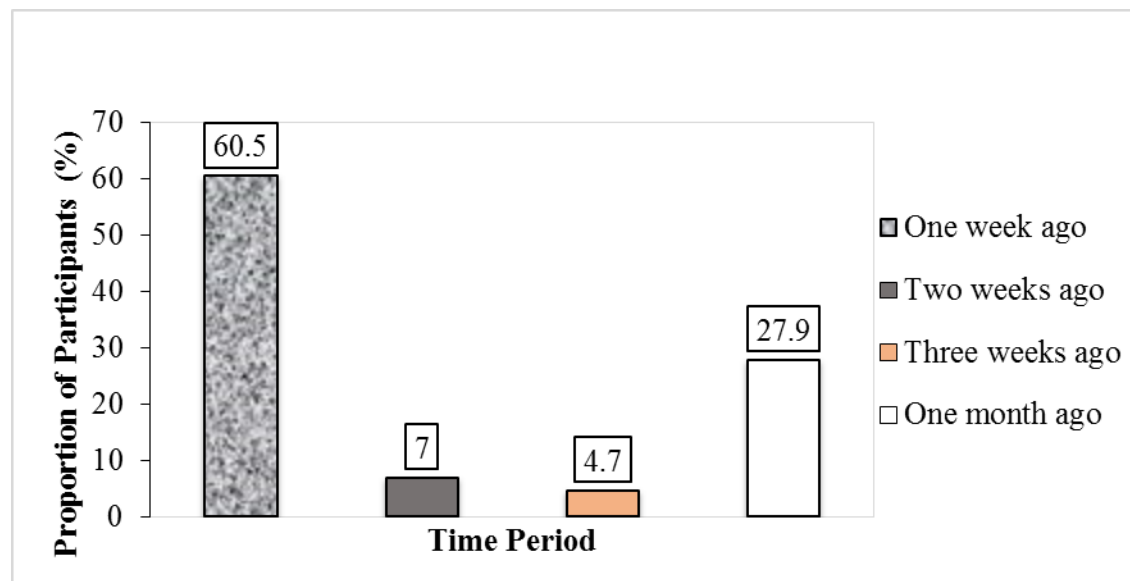
For the respondents who had sought treatment from hospital said that in the hospitals, 197(76.4%) said that they were assured of better facilities, 47(18.2%) said they had access to quality and cheaper malaria drugs; while 11(4.3%) said they were too sick and so were only assured of getting treatment from the hospital. For those who received treatment by using drugs from the local dispensing chemist, 13(54.2%) gave the reason that it was a cheaper alternative, 8(33.3%) said that it was the only available option, 3(12.5%) said that they were too sick and getting to a health facility would consume a lot of time (**Table 1**). There was only one participant who had used herbal medicine and for him, this choice of treatment was cheaper compared to the other treatment alternatives

A majority (284 or 86.9%) had not experienced malaria in the same period. More specifically, 26 (8%) of the participants had experienced signs of malaria within the past week, 3 (0.9%) within

the past two weeks, 2(0.6%) within the past three weeks and 12 (3.7%) within four weeks (Figure 2).

**Table 1: Reasons for the malaria treatment alternatives used by participants during cases of malaria**

Reason for choice:	Source of malaria treatment		
	Hospital	Drugs from chemist	Herbal Medicine
Better facilities	197 (76.4%)	-	-
Cheaper	-	13 (54.2%)	1 (100%)
Only option	1 (0.4%)	8 (33.3%)	-
Quality and cheaper drugs	47 (18.2%)	-	-
Was Very Sick	11 (4.3%)	3 (12.5%)	-



**Figure 2: Proportion of participants who have suffered malaria in the recent past**

When the participants were asked ways in which mosquito bites could be prevented, 35(10.7%) indicated use of mosquito repellents, 322(98.5%) indicated sleeping under treated mosquito nets, while 180(55.0%) indicated cutting bushes surrounding houses. Majority of the participants had more than one response.

When the respondents were asked about the ways of preventing malaria, 20.5%(67) said using drugs from the hospital was one of the ways of preventing malaria, 79.5%(260) said that clearing

surrounding bushes prevented malaria and 4.3%(14) said that vaccination prevented malaria. 260 (79.5%) of the respondents also said that using ITNs prevented malaria infections.

When asked about their source of information on ITNs, 315(96.3%) of the participants had at least heard about ITNs, and most (58.7%) had heard about ITNs from the radio and community health workers. Other sources of this information included the clinic, chief’s meetings, television and church (**Table 2**).

**Table 2: Source of information related to ITNs**

Source of Information	Percentage (%) of participants*
Community Health Worker (CHW)	37.0% (121)
Chief’s meeting (baraza)	18.7% (61)
Church	4.0% (13)
Clinic	35.2% (115)
Radio	58.7% (192)
Television	12.8% (42)

*\*Figures in parenthesis indicate the number of participants*

The reasons for using the ITNs included; to prevent malaria (232 or 72.3%), and protection from mosquito bites (89 or 27.7%). For the participants who were at the time of the study not using ITNs, the reasons given included that they did not have nets (40%), they had no place to hang the nets (30%), it was too hot (15%), while others said nets are for children(15%) (**Table 3**).

**Table 3: Reasons for the respondents not using insecticides treated bed nets**

Reasons for the respondents not using ITNs	Percentage (%) of participants*
Nets are not available	40% (132)
There is no place to hang them in the house	30% (98)
It’s too hot	15% (49)
Nets are only for children	15% (49)

*\*Figures in parenthesis indicate the number of participants*

However, the study showed that 257(97.7%) of the participants had their blood tested for malaria parasites, and 257(97.7%) also had completed the prescribed treatment. All the participants (100%) who had the blood tests done and put on treatment recovered from malaria. Among those who knew the drugs used to prevent malaria in pregnancy; drugs mentioned included quinine (13.4%), Fansidar (9.9%), Metakelfin (6.4%), Amodiaquin (6.4%) and Mefloquine (1.7%).

Chi-square analysis was done to show independence of malaria infection on intervention measures. Malaria incidences were observed to be significantly related to use an ITNs among the



households visited ( $\chi^2 = 6.023$ ,  $p=0.014$ ). The Chi Square analysis also showed a significant result between malaria incidence and ITN use ( $\chi^2 = 12.963$ ,  $p=0.000$ ). For the participants who had received IPT for malaria prevention, the difference in those who had experienced malaria in the recent past was not significant ( $\chi^2 = 0.926$ ,  $p=0.336$ ). For case management, the only factor that significantly influenced completion of malaria treatment was recent malaria experience ( $\chi^2 = 4.786$ ,  $p=0.029$ ).

Having established the determinants of various malaria management and prevention strategies, their specific influence was studied at multivariate level using binary logistic regression with the utilization of strategy as the dependent variable, the determinant (significant factors) as the independent variables and the response 'No' as the reference category. The results are presented on **Table 4 below**. With respect to use of ACTs (case management), the participants who had suffered malaria recently were 4.784 times more likely to have been put on malaria medication (case management) compared to those who had not had an incidence of malaria within a month. The participants who were consistently and correctly using an ITN were 6.124 times more likely to have knowledge regarding the ITN since they heard about it from somewhere compared to those who had not heard about it at all. For the use of IPT(p), participants were 2.552 times more likely to be a past malaria victim compared to those who had never experienced malaria. These participants were also 9.679 times more likely to have heard about IPT(p) compared to those who had never heard of any information regarding the strategy.

**Table 4: Binary logistic outcomes for the determinants of utilization of malaria prevention strategies among the inhabitants of Mariakani, Kilifi County**

Variable/Factor:	Response	Used ACTs	ITNs Used	IPT(p)	IPT(i)
Has ever suffered from malaria	Yes	-	9.843	2.552*	-
	No	1	1	1	1
Has suffered from malaria recently	Yes	4.784*	-	0.694	0.167**
	No	1	1	1	1
Thinks mosquitoes are the source of malaria	Yes	-	-	0	0
	No	1	1	1	1
Has heard about the strategy utilized	Yes	-	6.124*	9.679**	-
	No	1	1	1	1
Has utilized the strategy in the past	Yes	-	0	-	44.1**
	No	1	1	1	1

\*significant at  $p<0.05$ ; \*\* significant at  $p<0.01$

## Discussion

The study found that a majority of the participants had suffered from malaria. Those who had suffered from malaria had mostly sought treatment from a healthy facility and some preferred buying malaria drugs from the chemist in cases of malaria infection. This is in agreement with a study done in Tanzania (Savigny *et al.*, 2004, Mboera *et al.*, 2007), Eritrea and Sudan (Humphrey *et al.*, 2010).

This study found that, the respondents who sought treatment from the hospital and had their blood tested reported hundred per cent recovery. This high number of recoveries was a confirmation of the findings by Adegnika *et al.*(2005) that case management, according to malaria treatment guidelines of Kenya, especially ACTS, is the only effective treatment available.

With the awareness that malaria is caused by mosquito bites (from *Anopheles* mosquitoes) among most of the participants in this area, there is sufficient knowledge on the importance sleeping under ITN mosquito nets, as well as cutting surrounding bushes, although visiting hospital in case of an incidence of malaria still remains a good option.

The study shows that use of IPT uptake was low (36.9%) compared to the other strategies (95.0%). This was attributable to low knowledge levels at 63.5% and also the fact that it only targeted children and pregnant mothers. The study found that knowledge on the drugs used to prevent malaria in pregnancy (IPT) was 52.6% of those who knew at least a drug, while 62.2% of them could not name any drug. This is in agreement with a publication based on a nationally representative household survey in Tanzania that reported a decline between 2005 and 2007 for both IPTp-1 and IPTp-2 (Marchant *et al.*, 2004). In addition, this study estimated coverage of IPTp-1 and IPTp-2 at 70% and 35% respectively but did not identify factors affecting each. This challenge creates need for such a study in malaria endemic regions.

Utilization of case management as a malaria prevention strategy was mainly determined by recent malaria experience. Utilization of ITNs was significantly influenced by past malaria history (occurrence vs. non-occurrence), knowledge of existence of ITNs and the experience of having used an ITN in the past. Use of IPT was dependent on past malaria experience, knowledge regarding mosquitoes as a source of malaria and knowledge about the existence of IPT.

The findings also revealed that malaria cases have been low in the most recent past (13.1%); there are indications that the highest number of cases (60.5%) had been experienced within the past week (second last week of December, 2015) a trend of the number of cases reducing weekly before the time of the study was noted. This was as a result of the El Nino rains and also that Mariakani is considered a coastal town due to its close proximity to the Indian Ocean. This was in agreement with a study conducted in Kisumu, Kenya showed a 22% increase in the prevalence of malaria parasites after a period of extensive rainfall (Imbahale *et al.*, 2010). These findings relate to the conditions outlined by Mbogo *et al.* (2003), Martens *et al.* (1999) and Mwangangi *et al.* (2007) as being favourable for *Anopheles* mosquito breeding.

## Conclusion

The findings of this study suggest that majority of the participants had suffered from malaria infection and were knowledgeable on prevention strategies. Malaria infections were still reported in spite of this awareness. The research subjects are aware that malaria is transmitted by female anopheles mosquito and when they experience malaria infections they seek treatment from the health facility. The findings found some participants administered Self-treatment from the nearest dispensing chemist. The findings also suggest that most respondents Utilized ITNs and non-users cited UN availability of the treated bed net. Knowledge on the utilization of IPT as a malaria prevention strategy is low.

## Recommendations

Malaria being a preventable infection, in view of this possibility to prevent this infection studies need to research more on collect uses and integration of preventive methods. Having demonstrated self-medication from the study finding, the Kenya government, through the Ministry of Health and stakeholders needs to educate the community on drug resistant and its consequences. Some respondents were found without ITNs; measures should be put in place to ensure that more ITNs are provided for the inhabitants who are not covered in this area. This is because there is higher malaria prevalence. The low IPT utilization shows that there is need for initiation of sustained awareness creation efforts by public health departments at the County and at the National level on the IPT, especially among pregnant women and children in this area.

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