

FACTORS ENCOURAGING THE USE OF INSECTICIDE TREATED BED-NETS BY WOMEN FOR MALARIA CONTROL IN NDAVAYA AND KINANGO DIVISIONS IN KINANGO DISTRICT OF KENYA

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ABSTRACT

The aim of this study was to investigate and compare the factors that influence the use of Insecticide Treated Bed-Nets (ITNs) by women for malaria control in Ndavaya and Kinango Divisions of Kinango District of Kenya. A cross-sectional survey design using systematic sampling technique was applied to collect data from 204 women selected randomly from the two divisions. Semi structured questionnaire, Key Informant Interview and Focused Group Discussion were the instruments used to gather data. Data on variables such as age, educational level, incomes and source of nets were summarized using graphs. Chi-square test was applied to test whether the deviations observed were as a result of chance or due to other factors. Results indicated among others that the use of ITNs increased with the level of education and income. The government therefore should develop a communication package for malaria endemic areas, encourage further research to establish the factors that influence use of ITNs as well as explore the efficacy of indigenous malaria control mechanisms, using the appropriate government agencies.

Keywords: *ITNs, women, malaria, determinants*

INTRODUCTION

The use of Insecticide Treated Bed-Nets (ITNs) protects against mosquito bites including *Anopheles gambiae* and *Anopheles Funestus* that harbour and spread the protozoa. Globally, malaria results in 300 to 500 million clinical episodes and one million deaths annually (Toure and Coluzzi, 2000), 90% occur in Africa. Malaria is caused by protozoa of the genus *Plasmodium* (Cattani and Lengeber, 1997). The disease is transmitted by the bite of an infected female *Anopheles* mosquito. In Kenya according to Snow *et al* (1993), the disease leads to morbidity and mortality contributing to 30% of outpatient cases, 20% of admissions and 15 to 35% of hospital deaths. Kinango District records over 41% outpatient morbidity due to malaria. Malaria control measures include environmental hygiene practices, application of insecticides, intermittent presumptive treatment and prompt and effective case management.

At the end of 2004, 107 countries and territories had areas at risk of malaria transmission. Some 3.2 billion people live in areas at risk of malaria transmission.

Patterns of malaria transmission and disease vary remarkably between regions and even within individual countries. Malaria remains a major global problem, exacting an unacceptable toll on the health and economic welfare of the world's poorest communities (WHO, 2005b).

Sixty percent of all the cases of malaria worldwide, 75% of global falciparum malaria cases and more than 80% of malaria deaths occur in Sub-Saharan Africa. Malaria causes about 18% of deaths in children fewer than 5 years of age. It also causes anaemia in children and pregnant women and leads to low birth weight, premature birth and infant mortality in Africa (WHO, 2005b). Malaria infection during pregnancy is the primary cause of up to 10,000 maternal anaemia-related deaths in Sub-Saharan Africa annually (Guyatt and Snow, 2001). In endemic African countries, malaria accounts for 25-35% of outpatient visits, 20-45% of hospital admissions and 15-35% of hospital deaths (WHO, 2008). In Africa malaria mostly affects populations in the west including Nigeria, Benin, Senegal, Sierra Leone and parts of central Africa such as Democratic Republic of Congo. Most of the East African countries including Uganda, Tanzania, Kenya, and Somalia are affected. Angola and Mozambique are also endemic in the south besides Chad and Sudan in the North.

In Kenya, malaria is the leading cause of morbidity and mortality, especially in young children and pregnant women. Approximately 40% of the population has suffered from malaria and 72 children under the age of 5 years die of malaria daily (GoK, 1998). Malaria causes an estimated 34,000 deaths annually. It accounts for 30% of outpatient attendances, nearly 20% of admissions and 15 to 35% of hospital deaths, imposing a great burden on already fragile health-care systems (MoH, 2006; WHO, 2005b). The level of endemicity of malaria in Kenya varies from region to region and there is a big diversity in risk of malaria infection largely driven by climate and, the effects of altitude (Guyatt et al., 2004). The western parts of Kenya around Lake Victoria, the Rift Valley highlands and coastal areas carry the greatest burden of the disease. In the coastal region including Kinango District the prevalence of Malaria exceeds 50 percent (MoH, 2006).

Use of ITNs in malaria control

In Kenya, the Ministry of Health recommends four major strategies to combat malaria (MoH, 2006). These include the use of Insecticide Treated Bed-Nets by pregnant women and children under five years, environmental control of mosquitoes, administration of Intermittent Presumptive treatment for mothers during pregnancy and early diagnosis and correct treatment of the disease. Insecticide Treated Bed-Nets (ITNs) have shown promise in reducing malaria morbidity and mortality (MoH, 2001a). The net protects against vector mosquitoes such as *Anopheles gambiae* and *Anopheles funestus*, which generally bite at night (MoH, 2006). The insecticide, a synthetic pyrethroid such as permethrin acts by killing, irritating and repelling mosquitoes from the net thus improving the barrier when the net drapes directly upon the inhabitant or becomes torn. When used at high coverage and re-treated

with insecticide biannually, ITNs confer area-wide effects on the mosquito population, protecting those living in houses lacking nets (WHO, 2008). A recent study in western Kenya showed that ITNs were associated with reductions of 38% in the incidence of malaria parasitemia and 47% in the incidence of severe malarial anemia during pregnancy (Republic of Kenya, 1991). At the time of delivery, the prevalence of placental or maternal malaria was reduced by 35%, and the prevalence of low birth weight was reduced by 28% (Ter Kuile *et al.*, 2003). A review of results of efficacy trials of ITNs in Sub Sahara Africa reported that their correct use could save up to six lives for every 1,000 protected children less than five years of age (WHO, 2008).

ITNs also improve the health of pregnant women and their newborn children in areas with high burden of malaria and HIV infection (Osero, Otieno and Orago, 2005) According to PSI-Kenya (2006), over 6 million ITNs had been distributed by the end of year 2005, with an additional 5 million targeted for distribution in 2006 - 2007. Due to concerted efforts of the government and other stakeholders, the national mosquito net ownership in 2005 was 44%, while ITN ownership was at 21%. Similarly, rural net ownership was at 37% compared with urban net ownership of 62% (PSI-Kenya, 2006). The 2007 Kenya Malaria Indicator Survey shows that 48% of households own at least one ITN while 23% of households own more than one ITN (DOMC, 2009). The same survey found that approximately 33% of urban women slept under an ITN compared with 31% in the rural areas.

MATERIALS AND METHODS

A cross-sectional survey design was employed to gather data from women residing in Kinango District of Coast Province in Kenya. Ndavaya Division was purposefully selected due to its low ITN uptake and minimal external efforts towards promoting ITNs use. Conversely, Kinango Division that has recorded high ITNs usage and has had intensive interventions to scale up ITNs use was also purposefully chosen for comparison purposes. This design was considered suitable for the study because it would allow logical description of the current interrelation of variables of interest within the study population. It would also provide an opportunity to document the situation without any manipulation.

Kinango District in Coast Province of Kenya borders Kwale and Msambweni to the East while Kilifi and Taita lie to its North and West respectively. It covers an area of 1,848km² (CBS, 1999) with three divisions including Kinango, Ndavaya, and Samburu. It has one government hospital and 6 dispensaries. The area has a warm and sub-humid climate with mean annual temperature and rainfall of 26°C and 500mm per annum respectively. The area is majorly inhabited by the Duruma, Kamba and Maasai communities. The literacy level is about 15% and 75% of the people who subsist on less than 1US\$ per day. In the Coast Province, Kinango district registers the lowest ITN usage by women who are a key target group in reduction of malaria incidences (MoH, 2005).

Kinango District has three divisions with a population of 200,599 people. Kinango has 43,764 residents; Ndavaya Divisions has 44,858 while Samburu Division has 111,979 people. The target population for the study consisted of 20,383 women of reproductive age (15-49 years) residing in Ndavaya and Kinango Divisions. Most of them were subsistence farmers, with some practicing pastoralism and trading in livestock, foods and grain. Kinango Division has 12,514, while Ndavaya has 7,869 women within reproductive age.

Purposive sampling was used to select Ndavaya Division that has had minimal interventions to scale up ITN uptake and also Kinango Division which has benefited immensely from Non governmental Organizations (NGOs) and Community Based Organizations (CBOs) promoting ITNs use for comparison of variables. The two divisions were allocated an equal number of respondents while the locations in each division provided respondents proportional to their number of households as per the Central Bureau of Statistics (CBS) data. Systematic sampling was then applied to select 204 respondents with every 10th household being visited. A starting point was randomly identified from a list of households compiled by the Central Bureau of Statistics (Ministry of Finance and Planning, 1999). Further, all households that had participated in the survey were skipped during the actual data collection.

Epi Info™ version 3.4 Statcalc function (CDC, 2007) was used to determine the appropriate sample size. Epi Info™ was preferred because it is a database and statistical software for epidemiological studies developed by Centre for Disease Control and Prevention for conducting outbreak investigations, managing databases in public health surveillance and general statistics applications. Therefore to run Statcalc for the required sample, the parameters employed included:

Size of population - 20,383 (CBS, 1999)

Expected frequency of the factor - 16% (ITN use by women in Kinango District)

Worst acceptable result - 21% (National ITN usage - PSI 2006)

Confidence level - 95%

This gave a sample size of 204 women

The principal investigator supervised the collection of data, facilitated interviews and moderated focussed group discussions assisted by three research assistants who were recruited from the study area. Adequate training was given to the 3 research assistants on administration of questionnaire and facilitation of focus group discussions and key informant interviews. Data collection took three weeks and all the 204 sampled study respondents participated. Key Informants in this study included the District Public Health Officer -Kinango, Public Health Officers in charge of Ndavaya and Kinango Divisions, 4 Community Health Workers (CHWs) drawn equally from the two divisions and 6 traditional (*Kaya*) elders. The officers were consulted at their respective offices while the *Kaya* elders were interviewed at their homes. A Focussed Group Discussion (FGD) of 13 women was held in Ndavaya while another comprising 11 women was facilitated in Kinango. The higher number of participants in Ndavaya was necessary to represent the expansive division and the

various ethnic groups that reside there. The participants were drawn from the 6 locations constituting the two divisions with their ages ranging from 18 to 42 years.

A total of 204 women with equal representation for both Ndavaya and Kinango divisions were interviewed during the study. Use of local dialects for communication and indigenous research assistants enabled the process to run smoothly. One FGD each was conducted in each division while Key Informant Interviews were undertaken with community elders and public health officials in the two divisions. Data were collected on the respondent's socio-demographic characteristics, access to health services, use of ITNs and the various determinants of ITN use by women in Kinango and Ndavaya Divisions.

RESULTS AND DISCUSSION

Ownership of Insecticide Treated Bed-Nets

Over 80% of the respondents in Kinango division had mosquito nets compared to 64% in Ndavaya (Figure 1). The proportion of respondents with or without bed-nets in Ndavaya and Kinango Divisions differed significantly.

Types of bed-nets used by women

The proportion of women having both normal and long lasting mosquito nets was more in Kinango than in Ndavaya Division. Data showed that Kinango had over 52% of the women using Long Lasting Insecticide Treated Nets (LLITNs) while Ndavaya Division had only 39% within this category. Those having normal nets were 25% in Ndavaya and 29% in Kinango. However, 36% of women in Ndavaya had no nets while Kinango had only 19% within this category. LLITNs are the type of bed-nets that are treated during manufacturing and have residual insecticide of up to three years. The type of mosquito nets used by women in Ndavaya and Kinango Divisions differed significantly.

Family members who used ITNs

In Ndavaya Division, 40% of the women used ITNs together with their children aged below five years as compared to Kinango Division. However, 16% of the women in Ndavaya said that everybody used a mosquito net compared with 31% in Kinango. In Ndavaya division 12% of respondents said it was parents only who used ITNs compared to 33% in Kinango. In Ndavaya 32% of the children aged below 5 years sleep alone under mosquito bed nets as compared to 20% in Kinango. The variations between the family members who used ITNs in the two divisions of was highly significant.

Frequency of ITNs use

Majority of the women interviewed in Kinango and 42.2% in Ndavaya use the nets daily. Only 2% of the respondents in Ndavaya used nets thrice per week while Kinango had 8.8%. Besides, 12.7% of respondents in Ndavaya and only 2% in Kinango used nets twice. Those who used nets once were 2.9% in Ndavaya and 2% in Kinango. A good number of respondents did not use nets in both divisions with

40.2% in Ndavaya and 22.5% in Kinango. The frequency of using ITNs in Kinango District varied very significantly across the two divisions.

Source as a determinant of ITN use

In Ndavaya 64.1% of women who sourced their mosquito nets from Makembau CBOs used them as compared to 60.8% in Kinango. In Kinango 78.7% of the respondents sourced their ITNs from C.H.W and used them as compared to 87.9% in Ndavaya. Further, 61.5% of the respondents from Ndavaya who sourced their mosquito nets from Public Health Technicians (PHT) used them as compared to 64.2% in Kinango. In Ndavaya only 47.3% of the respondents who sourced their ITNs from local public dispensaries used them as compared to 49.3% in Kinango. Similarly, in Kinango 59.6% of the respondents who sourced their mosquito nets from NGOs used them as compared to 62.4% in Ndavaya. Ndavaya had also 66.3% of respondents who sourced their ITNs from Mivuco CBO and utilized them as compared to 64.1% of Kinango. Notably, 72.8% of nets from other sources were used in Ndavaya as compared to 70.5% in Kinango. Majority of respondents who sourced mosquito nets from the local MoH dispensary did not use them at home, perhaps indicating need for appropriate sensitization before the bed-nets are issued to the women. The use of mosquito nets is very significantly influenced by source.

Role of husbands in the use of ITNs

Notably, 30% of the husbands who supported and encouraged their wives to use mosquito nets were found in Kinango Division while Ndavaya had only 13%. Further, 39% of the husbands to respondents in Ndavaya Division did not like the use of mosquito nets while Kinango had 25%. Some women; 48% in Ndavaya and 45% in Kinango noted that there was no influence from their husbands regarding the use of ITNs. However, it could be submitted that the influence of the husbands significantly determine the use of mosquito nets by women in both areas.

Influence of income levels

In Ndavaya 70.5% of the respondents earning less than Ksh.1,000 did not use a mosquito net as compared to 29.5% who used. Moreso, 61%, of the respondents earning between Ksh.1,000 - 3000 did not use ITNs while 39% used. About 52.5% of the respondents earning between Ksh.3,001 - 6,000 did not use ITNs while 47.5% used them. Similarly, 41.5% of the respondents earning between Ksh.6,001 - 9,000 did not use ITNs compared to 58.5% who used, with 34.7% of the respondents earning between Ksh.9,001 - 12,000 not using ITNs compared to 65.3% who used.

Most respondents earning an income of over Ksh.12,000 used ITNs while only 15.4% in this category never used them at home. A similar scenario was replicated in Kinango where 69.8% of the respondents earning less than Ksh.1,000 never used ITNs compared to 30.2% who used. About 62.4%, of the respondents earning between Ksh.1,000 - 3000 did not use ITNs while 37.6% used. A whole 56.2% of the respondents earning between Ksh.3,001 - 6,000 did not use nets while 43.8% utilized them. Similarly, 43.5% of the respondents earning between Ksh. 6,001 - 9,000 did

not ITNs while 56.5% used them. Respondents earning between Ksh. 9,001 - 12,000 had 31.3% not using ITNs compared to 68.7% who used. As in Ndavaya, 80.2% of the respondents earning an income of over Ksh.12,000 used ITNs while only 19.8% never used them. The use of ITNs was significantly influenced by the income levels of women in Kinango District.

Family size as a determinant to ITN use

Only 13% of the respondents in Ndavaya and 10% of respondents in Kinango with a family size of 1-2 members used ITNs. Most of the respondents in Kinango 39% who used ITNs were in the family category of 3-4 members while Ndavaya had 14% in this class. Majority of the respondents in Ndavaya who used ITNs were in the family size of 5 - 6 members as compared to 30% in Kinango. In the family size of 7 - 8 members, 17% of respondents in Ndavaya used ITNs compared to 20% for Kinango. In the family size of 9 members and above 10% of the respondents in Ndavaya used ITNs while Kinango had only 1% (Figure 4.25). The use of ITNs in both divisions was found to be significantly influenced by the size of respondent's family.

Influence of training and awareness creation

Majority of Kinango respondents and 61% of respondents in Ndavaya who had been trained on how to use ITNs indeed used them at home. However, 27% of the respondents in Kinango and 39% in Ndavaya used ITNs at home although they had not been trained on how to use them (Figure 4.26). Training was found to have significant influence on the use of ITNs in Kinango and Ndavaya.

Educational level as a determinant of ITN use

About 81% of the respondents in Ndavaya and 89% in Kinango who had reached tertiary level of education used ITNs as compared to 19% and 11% respectively who did not use. In Ndavaya 58% of women who acquired secondary education used ITNs compared to 72% in Kinango. Notably 42% and 28% of respondents in Ndavaya and Kinango respectively who had high school education did not use ITNs. However approximately 37% of the respondents in Ndavaya and 44% in Kinango who had acquired primary level of education used ITNs compared to 63% and 56% respectively who did not use. In Ndavaya majority of respondents who had no formal education did not use ITNs compared to 16% who used. More so 74% of women in Kinango in a similar category did not use ITNs with only 26% using them. Educational level of the respondents was found to significantly influence the use of ITNs by women in Kinango and Ndavaya Divisions.

Influence of the type of occupation

In Ndavaya 56.2% women who worked as peasant farmers used ITN at home as compared to 43.8% who did not. Most of women who were engaged as teachers used ITNs while only 13.3% did not use them. Similarly, 75.2% of business women in Ndavaya used ITNs compared to 24.8% who did not. Only 37.4% of the unemployed women used ITNs as compared to 62.6% who did not. In Kinango

54.8% women who worked as peasant farmers used ITN at home as compared to 45.2% who did not while majority of respondents who were employed as teachers used ITNs with only 17.6% not using. Notably, 68.8% of business women used ITNs compared to 31.2% who did not. Only 34.9% of the unemployed women used ITNs as compared to 65.1% who did not. The occupation of women was thus significantly associated with use of ITN by women in Ndavaya and Kinango.

Socio-demographic characteristics

The age of the respondents in the two divisions did not differ significantly. This could be attributed to the fact that climatic conditions and lifestyles in the two areas are quite similar. However, Ndavaya had fairly larger family sizes than Kinango Division. This perhaps was due to the massive interventions within Kinango by NGOs towards scaling up of family planning services. The findings corroborates with the results of the Kenya Demographic and Health Survey of 2008 which notes that access to reproductive health services is associated with reduced fertility rates (Kenya National Bureau of Statistics, 2009). Notably, both divisions had the Duruma ethnic group as the most dominant community although Kinango had a huge Kamba migrant community. FGDs revealed that the immigrants were from the neighboring Kubo Division which has a settlement scheme around Shimba Hills area. A number of them had moved and settled in Kinango Division.

Ndavaya had a bigger percentage of the respondents who were not employed compared to Kinango with most of them being peasant farmers. Data also showed that fewer women in Ndavaya had acquired formal education compared to Kinango and this could explain the small number of Ndavaya women who were in formal employment. Kinango similarly had more respondents earning over Ksh.9,000 per month and fewer earning between Ksh.1,000 to 3,000 monthly. More women in Kinango relied on salaries and wages while Ndavaya had the greater proportion of women who depended on livestock sales for income. Interviews with respondents indicated that men controlled sale of livestock and therefore this source was not readily available for women to convert to disposable income. Data suggested that salaries and wages availed ready and higher incomes to women in both divisions.

Access to health care

Kinango division had more women seeking treatment from private clinics compared to Ndavaya. This could be due to the better income levels of the respondents in Kinango and proximity to Kinango town which had several private health facilities. Conversely, Ndavaya had more of the women who sought treatment from traditional healers. Participants in FGDs indicated that health facilities in Ndavaya were fewer and one had to walk long distances to reach the centers. Perhaps due to this better access to conventional health care by women in Kinango, the division also had more women who had accessed laboratory services, utilized ante-natal services and taken malaria prophylaxis in pregnancy. This was in agreement with the findings of the 2007 Kenya Malaria Indicator Survey which showed a similar trend in the country (Division of Malaria Control, 2009).

Women perception of basic malaria epidemiology

There were greater concerted efforts in Kinango to control mosquito breeding compared with Ndavaya. More respondents in Ndavaya felt that the government had the responsibility to control mosquito breeding in their area. Lack of a coordinated system to control malaria in Ndavaya might have led to this view. This was coupled with minimal understanding of malaria transmission by women in Ndavaya and thus the disinterest in measures to control its spread. Being pastoralists, more women in Ndavaya used cow dung smoke while more women in Kinango used insecticides to keep away mosquitoes. Respondents in Kinango had higher incomes and could access markets easily and perhaps that is why they used insecticides. Ndavaya had a higher proportion of women who did not re-treat their bed-nets as required after six months compared to Kinango. This is in line with findings reported in Uganda by Nuwaha (2001) that knowledge of malaria transmission in the community led to increased bed-net use and retreatment.

Use of insecticide treated bed-nets

The ownership of ITNs differed significantly between the two divisions with a higher ownership being recorded in Kinango. Similarly ownership per family was higher in Kinango than in Ndavaya. This perhaps gave further evidence to the role played by knowledge on malaria transmission and better incomes. Kinango had a bigger proportion of women who used Long Lasting ITNs as recommended in the National Strategic Plan, 2008-2012 (Ministry of Public Health and Sanitation, 2009). Consistency in use of ITNs was more in Kinango than Ndavaya and the former had a larger number of women who slept under the nets on the night preceding the study. Perhaps due to minimal civil society activities in Ndavaya, more women had acquired their nets from Ministry of Health facilities while a larger percentage of Kinango women had received their ITNs from Community Based Organizations (CBOs) in the area. More women in Kinango indicated that they had bought their nets at over Ksh. 400 while Ndavaya had more women who had acquired their nets for free. Alaii et al., (2003) demonstrated in a study in western Kenya that better incomes and awareness on malaria contribute to the ability and willingness to purchase ITNs from shops and nearby markets.

Socio-cultural and economic determinants to ITNs use by women

Women from a considerable range of socio-economic status were represented which probably reflected the urban catchment area of Kinango Town and the largely dry Ndavaya. In both divisions, data showed that many of the factors indicative of relative wealth in a poor community were associated with increasing levels of knowledge - and that knowledge was positively associated with ITNs uptake among women. The results are consistent with the findings of Nganda, Drakely, Reyburn and Marchant (2004) in Tanzania, indicating the use of ITNs was lowest among women from the poorest homesteads with use increasing with homestead incomes. Approximately 70% of respondents in Ndavaya and Kinango earning less than Ksh.

1,000 per month were not using ITNs. Only 15% and 20% of women in Ndavaya and Kinango respectively with an income of over Ksh.12,000 did not use ITNs. Cost has been reported as a major barrier to ITN ownership and use in other studies. An evaluation undertaken in Congo (DRC) by Audrey et al., (2008) found that contrary to beliefs of local stakeholders, the vast majority of women in this study did not report thinking that bed-nets provided free of charge were less effective or that they would preferred to use one that they had bought compared with one provided free of charge. As noted by Nuwaha (2001) in Uganda this study identifies education as a strong predictor of ITN use by women perhaps owing to exposure to information on malaria transmission and ability to access and purchase a net, particularly if the woman is employed. Women with tertiary level of education were thrice as likely to use ITNs compared to their counterparts who had no formal education. This suggests better understanding of malaria transmission and prevention as one goes up the education ladder and hence adoption of ITN as a control measure. However, use of ITNs was higher in Kinango even compared within similar education levels. Perhaps this was a result of sensitization undertaken in the division by civil society groups.

Audrey et al (2008) also noted in a study in the Democratic Republic of Congo (DRC) that net ownership and net use was higher among those with secondary school education or higher. Increased education, particularly for young women, has been found to be associated with a number of beneficial health outcomes, including reduced infant and maternal mortality. The presence of children aged below five years in the homestead seemed to potentially increase the chances of women using ITNs. In Ndavaya 40% of the respondents stated that they used ITNs with their children aged below five years. However, only 16% of the respondents in Kinango shared a similar trend, perhaps indicating that children in Kinango were sleeping in separate beds with their mothers. Overall, the focus on under fives could be attributed to the initiative by the Ministry of Health to avail ITNs to all pregnant women and children less than five years of age. In both areas ITNs were normally sold to mothers at a subsidized cost of Ksh.50 or occasionally issued for free during National Immunization Days (NIDs). Focused Group Discussion (FGDs) and Key Informant Interview (KII) deliberations confirmed that majority of Aid Agencies involved in malaria control and prevention in both Ndavaya and Kinango also issued ITNs for free to mothers and children below the age of five. Free-distribution of ITNs resulted in substantial increases in net coverage compared to subsidized, "social marketing" approaches. Despite incomes differing significantly in both Ndavaya and Kinango Divisions, it was clear that this variable is a powerful determinant of ITN use among women. As Meltzer et al (2003) realized, cost is a clear factor in ITN uptake as individuals who are on stable income are more likely to purchase and use ITNs.

The marital status of women had a significant role to play in ITN usage in both Kinango and Ndavaya. In Ndavaya division, about 75% of married women reported to be using ITNs while 80% of married women in Kinango were using ITNs. Minority of single and widowed women were found to be using ITNs in both

divisions. Ndavaya had a bigger proportion of widows (60%) not using ITNs compared to the 55% of Kinango. This might point to a lack of time by the widows to attend public awareness forums on malaria control due to competing demands at home and limited incomes. FGDs revealed some window support mechanisms in Kinango. Husbands significantly determined use of mosquito nets by women in both divisions. The study indicates a strong association between support from husbands and consistent use of ITNs by the respondents. However, during KII with two *Kaya* elders, (the custodians of Mijikenda heritage), it was revealed that most men were uncomfortable sleeping under ITNs due to various reasons. As community protectors, men felt trapped while under an ITNs at night just in case they needed to respond to a distress call within their homestead or the neighbourhood. The elders also opined that visibility was limited through the bed-nets when monitoring the situation in their compounds at night. Besides, the ITN made the bed warmer and thus uncomfortable to sleep during hot weather. Notably, most men in the majority Digo and Duruma communities had a separate bed from their wives.

Effect of perceptions and knowledge of malaria

The attitudes and behavior of mothers regarding malaria and its prevention are important determinants of success in malaria control programs that promote ITNs use in rural Africa as argued by Alaii et al. (2003) in a study in Western Kenya. This study suggests that information disseminated to mothers through community health workers, public health professionals and facility nurses about ITNs and malaria was received and retained. Awareness was significantly greater in mothers residing in Kinango Division than in Ndavaya. Notably Kinango also had higher numbers who had been sensitized on ITNs use and were indeed utilizing them as compared to Ndavaya's 61%. This suggests that there could have been gaps in the manner in which awareness was created in Ndavaya, making it not as effective as in Kinango. Further, it was found that a higher proportion of mothers from Kinango identified mosquitoes to be the sole cause of malaria, compared with those from Ndavaya. Data also revealed that majority of women in Kinango compared to only 32% in Ndavaya participated in activities to control mosquito breeding. This may have been as a result of enormous promotional campaigns on malaria prevention undertaken by various civil society groups in Kinango. These groups (NGOs and CBOs) receive donor funds that they use to undertake trainings and social marketing on ITNs use in the community.

Community Health Workers (CHWs) were also found to be more active in Kinango division. Their role is vindicated by a study in Luwero district in Uganda where Kiwuwa and Mufubenga (2008) noted that through the use of trained community owned resource persons, pregnant women were periodically made aware about the consequences of malaria in pregnancy and the necessity of an early Ante Natal Clinic (ANC) visit so as to benefit from administration of a full Intermittent Prophylaxis Treatment (IPT) regimen and acquisition of ITNs. The results of this study suggest that creation of awareness increased the rates of ITNs use among women. Previous attendance of a training session was significantly associated with

ITN use in both divisions. Numerous awareness campaigns had been undertaken in Kinango on malaria control and prevention while little sensitization had been done in Ndavaya. This could explain the low levels of ITNs adherence in the latter. In Tanzania, Nganda, Drakely, Reyburn and Marchant (2004) found that ITN use increased when individuals received health promotional activities about ITNs. This included consistent use and impregnation with insecticides when necessary. Use of ITNs by children under five years and pregnant women who are most vulnerable was also recorded in the Tanzania study and attributed to awareness creation.

Perceptions as to whether ITNs really control malaria are important among women as they determine use or non-use. During FGDs, women in Ndavaya indicated that they did not think ITNs would help them address the malaria problem. Most women in the division had not been sensitized on malaria prevention and this could explain their viewpoint. The findings therefore demonstrated that access to information on malaria as was the case in Kinango, and the options available for control and prevention would go a long way in increasing the consistent use of ITNs by women. The findings also underpin the importance of women's knowledge of malaria in pregnancy and of antenatal attendance for the uptake of preventative interventions. As argued by the Ministry of Health (2001a), effective malaria interventions are available and there is political will to implement them in order to maximize the potential for health impact. It is thus essential to empower the intended recipients of interventions by providing the knowledge which can influence their health decisions.

Environmental predictors of ITNs use by women

Weather conditions play a significant role in determining use of ITNs by women. During focused group discussions with women in Ndavaya, participants indicated that they were hesitant to use bed-nets during hot periods because they made them uncomfortable. Data analysis showed that in Kinango, 27% of respondents did not use the nets they had because they made their beds unbearably hot compared with 40% for Ndavaya. The higher percentage in Ndavaya could have been due to the fact that the area has higher average temperatures compared to Kinango. Besides, Ndavaya women had minimal awareness on malaria control measures and this could have contributed to the reduced adherence. Key Informant Interviews (KII) also revealed that most of the people in both areas living near areas known to support mosquito breeding including dams, rivers and forests were more responsive to ITN use. The findings are in tandem with those of Alaii et al., (2003) who observed that environmental disposition had a significant influence on ITNs use particularly when combined with health promotional activities within the target community. This shows that weather patterns and other environmental elements play a significant role even among a sensitized population as in the case of Kinango division.

Source and access as determinants of ITNs use

A significant number of women acquired their bed-nets at subsidized prices from the Ministry of Health clinics while others particularly in Kinango received nets for free from NGOs and CBOs operating in the area. Most women in the two divisions resided over 15km away from the nearest government health facility, the latter are mandated by the government to ensure maximum ITN coverage in the country as per the National Health Sector Strategic Plan of 2005 - 2010. Women in such areas are, therefore, unable to attend antenatal clinics as required due to the long distances they have to cover despite their state of pregnancy. Further they are also unable to take their children for child welfare clinics (MoH, 2005). In effect these women neither access information on malaria prevention nor benefit from the subsidized ITNs at the MoH facilities. Further, they are denied Intermittent Prophylaxis Treatment (IPTp-SP) which is a crucial intervention to prevent malaria during pregnancy for women in malaria endemic areas such as the coast where this study was conducted (MoH, 2004).

A related study in Tanzania found that women attending Ante Natal Clinic were more likely to participate in health education sessions, and therefore more likely to use IPTp-SP than women who did not (Nganda, Drakely, Reyburn and Marchant, 2004). Besides, women using ITNs were more likely to cite the ANC sessions and community health workers as their most important source of health information. The study noted a strong association between distances from respondents' home to the nearest facility and their use of ITNs. 74% of respondents in Ndavaya and 87% in Kinango living within a radius of less than one Kilometre to a health facility used ITNs at home. Within a distance of over 5km only about 40% used ITNs in both divisions. As observed by Osero, Otieno, and Orago (2005), availability of healthcare services increases ITN use among women. More so in Nigeria, Onwujekwe, Hanson and Fox-Rushby (2003) demonstrated that ITNs distribution strategies that decrease time and travel costs to households are needed to increase net coverage. This shows that establishment of more primary healthcare facilities leading to reduction of radius of access by women would ultimately increase uptake of ITNs as envisaged. This would also impact on ANC and IPT coverage thus a reduction in malaria morbidity and mortality in the country (MoH, 2005).

The importance of access to resources has been illustrated by Meltzer et al., (2003) previously for both preventative interventions and treatment. At the time of this study, ITNs were sold at Ksh 50 to pregnant women via the antenatal clinics in the Ministry of Health facilities (MoH, 2005). Social marketing of bed-nets at the national and local levels had also been undertaken targeting pregnant women and children under five who are the high risk groups as indicated in the PSI report of 2006. In order to increase national coverage Nganda, Drakely, Reyburn and Marchant (2004) noted that the Tanzania government initiated ITN voucher scheme for pregnant women to improve access. It was hoped that via mass health education and substantial price subsidy, some socio-economic inequities in access will also be addressed. FGD

participants in the two divisions indicated that presence of Community Health Workers (CHWs) within their villages greatly enhanced accessibility of ITNs and hence promoted their use. Indeed, 88% and 79% of respondents in Ndavaya and Kinango respectively who acquired their nets from CHWs utilized them at home. The discrepancy between the two divisions could be attributed to the effectiveness of CHWs in Ndavaya as attested during FGDs with women. A previous study done in Mali by Michelle et al., (2005) demonstrated that individuals who used ITNs were predominantly from communities that had distribution and net-treatment services in their village - a role played by CHWs. Besides, the study showed that community involvement was an important factor to the success of programs aimed at scaling up ITNs uptake.

CONCLUSIONS AND RECOMMENDATIONS

The study revealed that fewer women in Ndavaya owned and slept under ITNs compared with their counterparts in Kinango. Access to a health facility was also found to positively contribute to increased usage of ITNs in both divisions. Low income levels among women, insufficient levels of knowledge about malaria transmission and prevention and limited involvement of men in malaria control initiatives were found to hinder ITNs uptake among women. Higher levels of formal education and better incomes were positively associated with increased use of ITNs. Community health workers were more effective in promoting consistent use of ITNs due to their proximity to the women and acceptance within the community. Various environmental factors including weather patterns and location of mosquito breeding grounds near homes influenced use of ITNs.

The government, development agencies and communities must prioritize education of girls at least up to secondary school level. This would enhance their understanding of basic malaria transmission routes. School Health Programs (SHP) should be initiated to sensitize girls and boys on use of ITNs and employment of other malaria control methods. There is need to tailor a malaria package for use in Information, Education and Communication (IEC) in malaria endemic zones of the country. Communities should be organized into focused units for raising awareness on malaria and the importance of sleeping under ITNs. CHWs should serve as ITNs distribution agents and Trainer of Trainers (ToT) on malaria and other health concerns within the villages. Maternal and Child Health (MCH) Clinics should be re-invigorated and used to distribute ITNs to women. Women should utilize existing structures and organisations within the community to promote use of ITNs by them. Men should take active roles towards ensuring that women in Kinango and Ndavaya Divisions sleep under ITNs. They should avail funds to their wives for purchase of ITN and also encourage them to consistently sleep under ITNs.

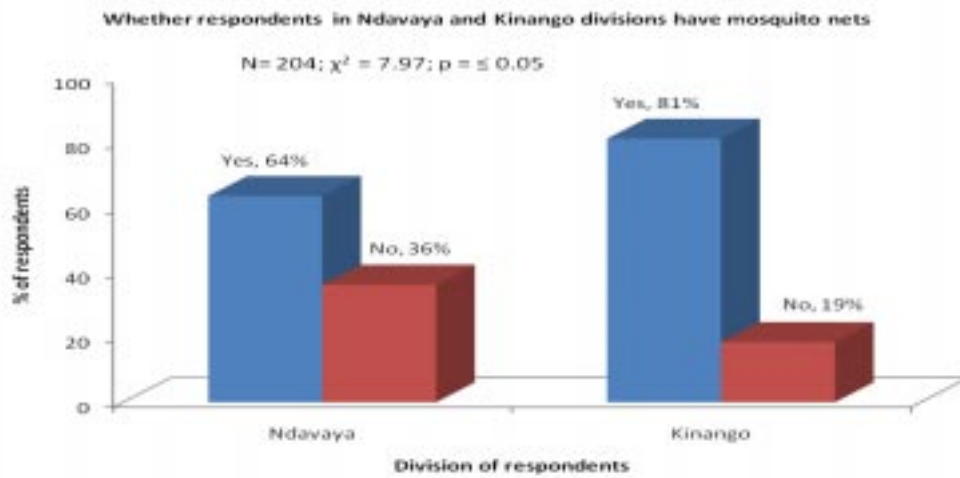


Figure 1: Ownership of bednets in Ndavaya and Kinango Divisions

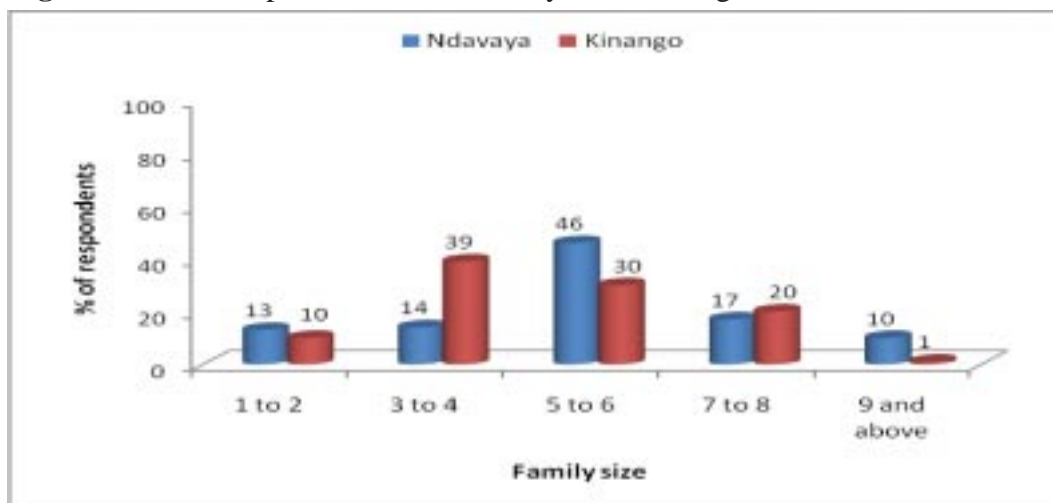


Figure 2: Family size as a determinant of ITN use

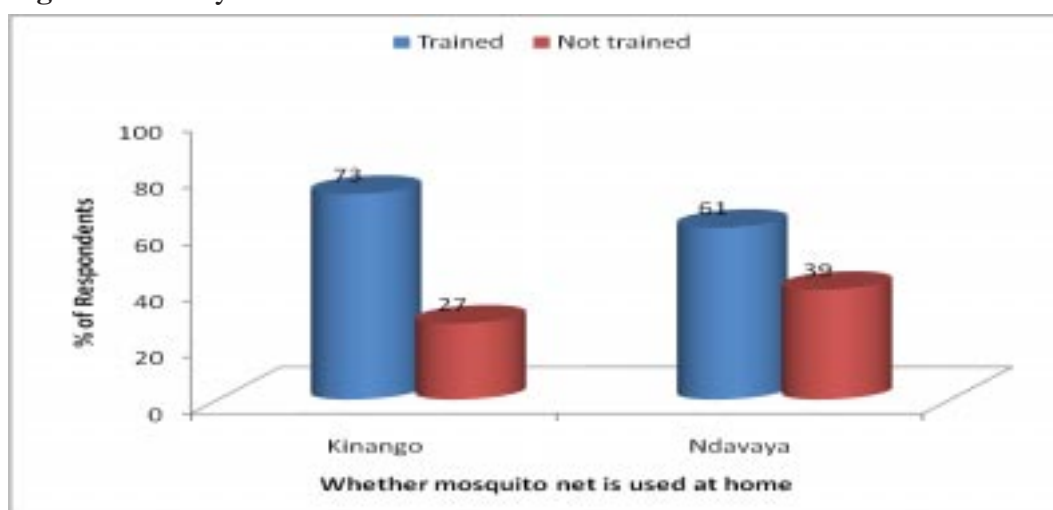


Figure 3: Influence of training on ITNs use in Ndavaya and Kinango Divisions

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