FACTORS INFLUENCING UTILIZATION OF INSECTICIDE TREATED NETS IN MALARIA PREVENTION AND CONTROL AMONG PREGNANT WOMEN IN MSAMBWENI DISTRICT, KWALE COUNTY, KENYA

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To my husband Jacob Matuku, son Shammah Mumo, parents Mutemi and Esther and all those who encouraged me to pursue this study to the end.
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OPERATIONAL DEFINITION OF TERMS

Net is any bed net, whether treated or untreated

ITN or currently-treated net is a net that is an LLIN, or is pre-treated and has been purchased within the last 12 months, or has had insecticide put on it up to and including the last 12 months

LLIN is a net that has a long-lasting insecticide treatment that is effective for up to 20 washes

Parity is the number of times a woman has given birth

Live birth is any delivery of live born

Still birth is delivery from the 28th to 40th weeks of pregnancy to a dead born

Miscarriage-abortion is pregnancy wastage below 28 weeks of gestation

Gravida is the number of pregnancies a woman has had

Primigravida is the first pregnancy

Secundigravida is the second pregnancy

Multigravida is the third or higher number pregnancy
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ABSTRACT

Malaria remains a leading cause of morbidity and mortality in Kenya, especially in young children and pregnant women. To control the malaria problem, the use of ITNs was incorporated into the National Malaria Strategy (NMS) in April 2001 targeting at least 60% of pregnant women should be sleeping under ITNs during their confinement. Only 13% of pregnant women used a bed net during pregnancy, and only 38% of these were ITNs. The study objective was to determine the factors influencing ITNs utilization in Msambweni District among pregnant women attending antenatal care clinic. Coast Province and Msambweni District were sampled purposively. The study was a descriptive cross-sectional survey conducted between March and April 2008, at Msambweni District hospital. Data was collected using interview schedules, from 426 pregnant women on consent. It was cleaned, coded, sorted and analyzed using SPSS version 13.0. Chi-square tests were used to compare proportions. The mean number of nets per household was 2.17. Majority (73.9%) of the study population owned a bed net, 50.5% of them were using a bed net always, 25.6% sometimes and 67.1% were using ITNs. The main reasons given for not using a bed net always included dislike to use bed nets (52.1%) and lack of any to use (47.85%). Most bed nets had been received through health facilities (49.4%) and retail shops (45.7%) and a few from relatives (3.7%) and community aid groups (1.2%). Several factors were identified to be significantly associated with ITN use including marital status, education level, prevention method used, prevention method qualities, side effects in preventive measures and mounting knowledge, household bed nets, reasons for inconsistent use, bed net sources, net retreatment, teaching on net use and household head net use promotion. There was significant association between the prevention measure used and ITNs use ($\chi^2=244.322$, df=3, P<0.001). Among 166 respondents who used bed nets as the only preventive measure, 147 (88.6%) were using ITNs, followed by those using nets in combination with other measures 136 (85.0%) out of 160 respondents. Teaching of effective bed net use was found to be significantly associated with ITNs use ($\chi^2=11.196$, df=1, P<0.005). In conclusion, the proportion of pregnant women using ITNs was 67.1%; there was no significant association between ITN use and reported pregnancy outcome among pregnant women in Msambweni district; pregnant mothers had good general knowledge of signs and symptoms, prevention and source of treatment for malaria; a significant association was noted between personal preferences such as bed net shape and colour and reported malaria episodes and factors that influence ITNs utilization included: malaria knowledge, individual practices and personal preferences. These are strong indicators of ITNs use among pregnant women. The study recommends that both public and private health stakeholders should ensure sustainable ITN availability and accessibility; increase ITN and malaria advocacy, and consider individual practices and personal preferences for bed nets such as bed net shape and colour among different communities before supplying ITNs for malaria control to pregnant women in Msambweni district.
CHAPTER 1: INTRODUCTION

1.1 Background Information

Malaria is a threat to more than 40% of the world’s population, and out of the more than 300 million acute cases each year between 1.1 and 2.7 million people die each year (WHO, 2002a). The global malaria burden is not evenly distributed with Sub-Saharan Africa accounting for 90% of global malaria cases (WHO, 2002b). Malaria constitutes 10% of the total disease burden in Africa (WHO, 2003). It infects 350-500 million people each year, killing 1 million, mostly children and pregnant women in Africa. It is estimated that between 270 and 480 million clinical cases of malaria occur every year in Africa. About 300 million people are estimated to live under the risk of malaria infection in Africa. Malaria is responsible for the major socio-economic problems in tropical Africa (Kaburu, 2001).

Malaria continues to be a national concern in Kenya as it plays a major role in the high mortality rates being experienced currently. It is responsible for 30-50% outpatient treatments, 19% admissions and accounts for 8-10 million treatments per year (Njoroge and Bussmann, 2006). Studies have estimated that 26,000 children die annually – a loss of 72 children / day from malaria related causes. In fact children suffer 2-5 attacks of malaria whereas adults suffer 10-20 days of disability annually (MOH, 2006a). This ultimately reduces the household incomes by 9-13% and the production losses amount to 2-6% of the GDP annually (Kaburu, 2001). One major aim of the Roll Back Malaria
The Roll Back Malaria (RBM) movement promotes the use of ITNs and intermittent presumptive treatment (IPT) with two doses of SP as preventive measures against the adverse effects among pregnant women in Africa (Guyatt et al., 2004). Use of an insecticide treated net (ITN) is now the central focus for the Roll Back Malaria campaign, and disease-endemic countries have embarked on large-scale ITNs distribution programs. The benefits of ITNs social marketing programs in reducing malaria are enormous (Mathanga et al., 2005). Insecticide treated mosquito nets reduce child deaths by approximately 20% and malaria-related infections by 50%. They are safe and a highly effective method of preventing malaria (CIDA, 2007).

In order to control the malaria problem, the Kenya Government, aimed to reduce malaria illness and death in Kenya by 30% by the year 2006 and to sustain that improved level of control until 2010 (MOH, 2006c) This has been achieved (DOMC, 2007). The use of ITNs was incorporated into the National Malaria Strategy (NMS) in April 2001, which states that by 2006; at least 60% of pregnant women should be sleeping under ITNs during their confinement (DOMC, 2001). Prior to the mass distribution of insecticide treated mosquito nets, less than 5% of households in most African countries had ITNs, with the poorest households being the least likely to have a net (CIDA, 2007).
A study across four Kenyan districts of varying malaria endemicity indicated that the coverage of pregnant women with the recommended malaria preventive ITNs in 2001 were less than 10% of the targets set by RBM for 2005 (RBM, WHO and UNICEF, 2005). Only 5% of women slept under ITNs and a further 8% of pregnant women used an untreated bed net, increasing the total coverage to 13%. In Kwale District, 81% of the women visit an antenatal care clinic and 75% attend more than once (Guyatt et al., 2004).

A related study in Ghana and Kenya (Kilifi), in 2003 reported a decrease in the use of ITNs over the two-year trial period. In Ghana there was a decrease to 20% in the previous dry season when temperatures were high and mosquito populations were low. In Kilifi, the proportion of ITNs in use decreased slightly during the project period and more sharply after the project was completed (Alaii et al., 2003).

In Togo, the use of nets was lower than ownership, with 45.7% of all households reporting that they hung an ITN, and 53% (95% CI, 51.4%-55.7%) of children were reported to have slept under an ITN the previous night. Households that reported a pregnant woman had slept in the house the previous night were 12.9% and 44.8% of pregnant women slept under an ITN. Urban ITN usage was 36.3%, while rural ITN usage was 55.7%. Usage varied with age where the young group had the lowest at 49.3% and 25-35 month olds the highest at 57.9% (Wolkon et al., 2006).
1.2 Problem Statement

In Africa, families spend approximately 20% of their income on malaria treatments. Also, at least 24 million pregnancies are threatened by malaria each year and less than 5% of pregnant women receive effective interventions. Malaria in Africa is estimated to cause 15% of maternal anemia and 35% of preventable low birth weight (NetMark, 2008).

Malaria in Kenya remains a major public health problem, a challenge to poverty reduction and a contributor to poor economic development. Over 70% of the population (over 20 million Kenyans) is at risk of malaria infection. Pregnant women and children less than five years are most affected by the scourge. Approximately 6,000 primigravidae suffer from severe anaemia and about 4,000 children are delivered with low birth weight annually (DOMC, 2008). Two thirds of Kenyans live in malaria-endemic areas. Malaria morbidity in Kwale District ranges between 30-40% of outpatient and inpatient attendants in most health facilities and between 10-15% of mortality (KRCS, 2007).

The Kenyan Government is committed to providing ITNs. But only 22% of households in Kenya have at least one mosquito net, 6% have at least one ITN, 10% have more than one net and 3% have more than one ITN (CBS, 2004). Also, only 13% of pregnant women used a bed net during pregnancy where only 38% of these are ITNs (Guyatt et al., 2004). Only 36.5% of pregnant women were using ITN in 2006 (DOMC, 2007). The people at the Coast that have heard about malaria are 98.8% and 78.4% having heard about malaria campaign messages (DOMC, 2006). Yet, the adoption of bed nets for malaria prevention is low (WHO, 2003).
Although nets are being made available to the vulnerable groups in the malaria endemic areas, and advocacy efforts are on the increase, there is a problem in curbing the malaria disease. Study at the Kenyan North coast revealed some socio-cultural issues hindering net use among the residents. This could be the case at the South coast and so there was great need to unearth any factors that hinder net ownership and use among pregnant women in Msambweni district. The study determined the factors which influence ITNs use among the pregnant women in Msambweni district with a view to promoting ITNs use and therefore reduce malaria morbidity and mortality, by correct and consistent use of ITNs.

1.3 **Justification of the Study**

The greatest burden for malaria and the greatest need for prevention and treatment occur in poorly accessible rural settings at the community level. The interventions put in place by the government do not reach them appropriately. A lot of government resources and efforts go to Malaria control activities yet many lives in rural areas continue to be lost as a result of malaria related complications.

The cost and logistical challenge of delivering ITNs across a continent on a sustainable basis is simply beyond the means of governments, NGOs, international organizations and donors alone (NetMark, 2008). The acceptance and proper use of ITNs is difficult (WHO, 2003). Local differences relating to cultural preferences and practices, political organization, and individual perception and belief all contribute to this complexity.
Nevertheless, understanding these issues is integral to successful designing of sustainable ITNs programmes, while working with the local communities (Ibid). While malaria control programmes are successful in bringing ITNs to the Msambweni district hospital, behavioural factors affecting ITNs use have not been much investigated. This study focused on the factors that influence use of ITNs among pregnant women in Msambweni District for appropriate action for ITNs utilization improvement among the pregnant women.

This study looked at household net ownership and use among pregnant women since ITNs had been made widely available, in order to determine levels of ownership and use, and to understand reasons for non-use or sporadic use. This information was essential for refining ITN distribution programs and for developing effective communication for optimal net use and public health impact by policy makers and all health stakeholders.

1.4 Research Questions

1. What is the level of utilization of ITNs among pregnant women in Msambweni District?

2. Is there a relationship between ITNs use and pregnancy outcome?

3. Is there a relationship between malaria knowledge and reported malaria episodes?

4. Is there a relationship between individual ITN quality preferences and reported malaria episodes?

5. Is there a relationship between individual practices and ITNs utilization among pregnant women in Msambweni District?
1.5.1 Null hypothesis
Individual practices and preferences are not associated with ITNs utilization among pregnant women in Msambweni District.

1.5.2 Alternative hypothesis
Individual practices and preferences are associated with ITNs utilization among pregnant women in Msambweni District.

1.6.1 General Objective
To determine the factors that influence utilization of ITNs among pregnant women in Msambweni District.

1.6.2 Specific Objectives
1. To determine the level of utilization of ITNs among pregnant women in Msambweni district.
2. To determine whether there is a relationship between ITNs use and pregnancy outcome among pregnant women in Msambweni district.
3. To establish the relationship between malaria knowledge and reported malaria episodes among pregnant women in Msambweni district.
4. To establish the relationship between personal preferences for ITN qualities and reported malaria episodes among pregnant women in Msambweni district.
5. To establish the relationship between individual practices and ITNs utilization among pregnant women in Msambweni District.
1.7 Significance of the Study
The reduction of malaria burden will contribute directly to the attainment of Millennium Development Goals (MDGS) number 4, 5, 6 that focus on the reduction of child and maternal deaths, and burden of malaria (MDG 4 – reducing child mortality, MDG 5 – improving maternal health and MDG 6 – combating HIV/AIDS, malaria and other diseases) (DOMC, 2008). The public health implications of the expected study results augur well for future ITNs programmes and shall be collated and infused in any proposed ITNs implementation plans. Information gathered from the findings of this study is useful in promoting large-scale ITNs use among pregnant women to reduce malaria morbidity and mortality.

The results of this study will be used in the decision making process in the design of interventions with active community participation, and in the implementation of educational strategies. This is because studies on knowledge, attitudes and practices are becoming more important to design and improve malaria control activities, to establish epidemiological and behavioural baselines and to identify indicators for monitoring programmes.

This study looked at household net ownership and use among pregnant women since ITNs had been made widely available, in order to determine levels of ownership and use, and to understand reasons for non-use or sporadic use. This information was essential for refining ITN distribution programs and for developing effective communication for optimal net use and public health impact.
Participants found without ITNs and willing to use them were advised and referred accordingly. The information obtained from this study would be used for the reduction of malaria morbidity and mortality.

1.8 **Strengths and Limitations**

A major strength of this study is that it includes participants' opinions about their preferences for bed net colour, shapes and prioritization on who to use in case there is a single bed net; this information has not been included in other studies on this topic. The study sample is representative of all women attending ANC in Msambweni District and of all pregnant women in Msambweni District. Study findings would be generalized to all women attending ANC since these women are not any different from other women seeking ANC in Msambweni District.

Due to financial constraints, it was not possible to involve all the vulnerable groups to malaria in the study area like children below five years. The MOH through DOMC was distributing free ITNs during malaria campaigns. In the health facilities, ITNs were available at KES 50 to the vulnerable groups in malaria endemic areas. It was therefore not feasible to establish efficiently the economic factors influencing ITNs utilization among the study population.
CHAPTER 2: LITERATURE REVIEW

2.1 The malaria parasite

Malaria infection is caused by a protozoan parasite of the genus *Plasmodium*. In Kenya, *P. falciparum* is the most prevalent species accounting for 98% of all malaria infections and is associated with significant morbidity and mortality while *P. malariae* and *P. ovale* accounts for 2% of infections. *P. malariae* and *P. ovale* sometimes occur as mixed infections with *P. falciparum* whilst *P. vivax* is very rare (Kaburu, 2001). Transmission of malaria infection is caused by the bite from an infected female *Anopheles* mosquito, which injects sporozoites into the blood stream of the human host. The patient experiences clinical symptoms which include headaches, pain in the joints, chills and fever, vomiting and mild diarrhoea. Treatment requires timely administration of an effective antimalarial drug regimen that clears the acute symptoms and prevents the reappearance of the parasites (MOH, 2006b).

2.2 Clinical features and classification of malaria

The clinical course of malaria may present as uncomplicated or severe. Uncomplicated malaria is usually characterized by fever in the presence of peripheral parasitaemia and other features may include chills, profuse sweating, muscle pains, joint pains, abdominal pain, diarrhoea, nausea, vomiting, irritability and refusal to feed. These features may occur singly or in combination (MOH, 2006b).
Severe malaria is a life-threatening manifestation. It is usually defined by the detection of *P. falciparum* in the peripheral blood in the presence of any of the following clinical or laboratory features (singly or in combination): prostration (inability or difficulty to sit upright, stand or walk without support in a child normally able to do so, or inability to drink in children too young to sit), alteration in the level of consciousness (ranging from drowsiness to deep coma), cerebral malaria (unarousable coma not attributable to any other cause in a patient with *falciparum* malaria), respiratory distress (acidotic breathing), multiple generalized convulsions (2 or more episodes within a 24-hour period), circulatory collapse (shock, septicaemia), pulmonary oedema, abnormal bleeding (Disseminated Intravascular Coagulopathy), jaundice, haemaglobinuria (black water fever), acute renal failure—presenting as oliguria or anuria, severe anaemia (Hb<5g/dl or Hct<15%), hypoglycaemia (blood glucose level<2.2.mmol/l), hyperparasitaemia (parasitaemia of >200,000/µl in high transmission area, or 100,000/µl in low transmission area) and hyperlactataemia (MOH, 2006b).

### 2.3 Malaria infections in pregnancy

Fifty million pregnant women throughout the world are exposed to malaria each year; in malaria-endemic regions, one-fourth of all cases of severe maternal anemia and 20 percent of all low-birth weight babies are linked to malaria (NIAID, 2008). Pregnancy predisposes women living in endemic areas to malaria infections. The primigravidae are more susceptible to malaria infection with a high incidence and more severe complications and parasitaemia than the multigravidae. Anaemia is a common manifestation of malaria in pregnant women with *p. falciparum* infection. Protection
against malaria leads to increased haemoglobin levels in primigravidae and generally prevented anaemia during pregnancy.

Usually, pregnant women are most vulnerable to malaria during the second trimester and the peak prevalence of infection occurs at 13 to 16 weeks gestation. Women living in holoendemic malarious areas frequently develop increased prevalence and severity of malaria infection during pregnancy (MIM, 1999).

Malaria infection during pregnancy is associated with severe anaemia and other illness in the mother and contributes to low birth weight among newborn infants- one of the leading risk factors for infant mortality and sub-optimal growth and development. Malaria worsens HIV by increasing viral load in adults and pregnant women, while in adults with low CD4 cell counts and pregnant women HIV infection worsens malaria. ITNs use reduces mortality and morbidity due to malaria and delay the need for antiretroviral therapy among HIV infected pregnant women (UNICEF, 2006).

2.4 Endemicity of malaria in Kenya

The level of endemicity in Kenya varies from region to region and there is a big diversity in risk of malaria infection largely driven by climate and temperature (including the effects of altitude). In Coast Province, similar endemicity is seen as in the lakeshore with parasite prevalences often exceeding 50%. Among many districts close to Lake Victoria, malaria transmission is throughout the year, the community acquires immunity before adulthood and the risk of the disease and death from malaria is concentrated among
children and pregnant women. However, transmission and the maximal disease risk period exhibit stronger seasonality and the intensity of transmission is lower toward the Somali border.

High malaria risk areas include lakeside, coastal, highland and arid areas while low malaria risk areas include highlands within Central Province, Central areas of Nairobi province and Nakuru District. The greatest burden of malaria is borne by children and pregnant women especially in areas where malaria is transmitted throughout the year (MOH, 2006c).

### 2.5 Malaria transmission in Msambweni district

Malaria transmission in Msambweni district is stable without strong seasonal influence although there is an increase in transmission during the rainy seasons. The frequency of transmission depends on the density and infectivity of the anopheline vectors and the fluctuations of the source of infections, namely gametocyte carriers. The prevalence of malaria in pregnant women in Msambweni district is 11% (Kaburu, 2001). *Anopheles gambiae S.1* and *Anopheles funestus* are the primary vectors of malaria in East Africa (Njoroge and Bussmann, 2006) and are the commonest in Msambweni district (MOH, 2006c).

### 2.6 Diagnostics

New and improved diagnostics are essential for the effective control of malaria. Currently, the most reliable technique for diagnosing malaria is, as it was throughout the
last century, labor-intensive, relying on highly trained technicians using microscopes to analyze blood smears (NIAID, 2008). Finger-prick blood samples are obtained to assess malaria parasitaemia. Malaria parasite prevalence and parasite densities are estimated in Giemsa-stained thick blood films, assuming an average white blood cell count of 8,000 per ll, with species identification carried out on Giemsa-stained thin films. A slide is declared negative after examination of 100 high-powered fields (WHO 2004).

2.7 Prevention of malaria

Malaria is a difficult disease to control largely due to the highly adaptable nature of the vector and parasites involved. While effective tools have been and will continue to be developed to combat malaria, over time the parasites and mosquitoes will evolve means to circumvent those tools if used in isolation or used ineffectively. In order to achieve sustainable control over malaria, a combination of new approaches and tools will be needed (NIAID, 2008).

The Global Malaria Control Strategy stresses the selective use of preventive measures wherever they can lead to sustainable results. These include selective vector control, which involves targeted use of vector control methods alone or in combination to prevent or reduce human-vector contact cost-effectively, while addressing sustainability issues. Indoor residual spraying, use of DDT in malaria control, use of insecticide-treated materials, malaria management in development projects, new developments in Africa (such as urbanization), use of gametocytocidal drugs, chemoprophylaxis and malaria prevention in pregnancy through health promotion and intervention, as well as methods
to reduce the consequences of infection such as use of antimalarial as prophylaxis or as intermittent treatment, use of ITNs, access to early diagnosis and effective treatment for anaemia and clinical malaria are all preventive measures (WHO, 2004).

The best method of malaria prevention is to sleep under an insecticide treated mosquito net (MOH, 2006a). In Kenya several malaria interventions and targets are employed including access to prompt and effective treatment, access to preventive measures including insecticide treated nets (ITNs), Indoor Residual spraying (IRS) and, interventions to control malaria in pregnancy (DOMC, 2006).

2.8 Vector management

Vector control aims to decrease contacts between humans and vectors of human disease. Control of mosquitoes may prevent malaria as well as several other mosquito-borne diseases. Elimination of malaria in an area does not require the elimination of all *Anopheles* mosquitoes capable of transmitting the disease but socio-economic improvements (e.g., houses with screened windows, air conditioning) combined with vector reduction efforts and effective treatment may lead to the elimination of malaria without the complete elimination of the vectors. Vector control for malaria prevention includes insecticide treated bed nets, indoor residual spraying and source reduction (larval control) (ZVED, 2008). Vector management tools such as insecticides, environmental modification, and bed nets are being used for successful malaria control (NIAID, 2008).
2.9 Bed net treatment

There are several insecticides approved by the World Health Organization Pesticides Board (WHOPES) for treatment of mosquito nets, but the one most commonly used in Kenya is deltamethrin. The treatment of the net can be done either at the community level where consumers bring their nets to a central dipping point, or at home with a home treatment kit. Nets can be sold with a home retreatment kit that is bundled together with the net. The insecticide is in tablet form, which is dissolved in a liter of water. The net is then soaked in the solution and then laid out to dry. The insecticide remains effective for approximately six months before the net requires retreatment (Tilson, 2007).

Most nets are made of polyester but nets are also available in cotton, polyethylene, or polypropylene. Currently, only pyrethroid insecticides are approved for use on ITNs which have very low mammalian toxicity but high toxicity to insects and have a rapid knock-down effect, even at very low doses. Pyrethroids have a high residual effect: they do not rapidly break down unless washed or exposed to sunlight. Previously, nets had to be retreated at intervals of 6-12 months, more frequently if the nets were washed. Nets were retreated by simply dipping them in a mixture of water and insecticide and allowing them to dry in a shady place. The need for frequent retreatment was a major barrier to full implementation of ITNs in endemic countries. The additional cost of the insecticide and the lack of understanding of its importance resulted in very low retreatment rates in most African countries (ZVED, 2008).
2.10 Long-Lasting Insecticide-treated Nets (LLINs)

Long-lasting insecticide-treated nets (LLINs) retain lethal concentrations of insecticide for at least 3 years. The WHO Pesticide Evaluation Scheme has recommended five LLINs for use in malaria prevention. These include: DuraNet (Clarke Mosquito Control), Interceptor Net (BASF), NetProtect (Intelligent Insect Control) (also marketed as ICONLife by Syngenta), Olyset Net (Sumitomo chemical) and PermaNet (Vestergaard-Frandsen) (ZVED, 2008).

2.11 ITNs effectiveness

ITNs are the most effective way for families to prevent malaria (NetMark, 2008). They are one of the most effective methods for the prevention of malaria in sub-Saharan Africa where over 2 million people die every year as a result of the disease, the majority of its victims being pregnant women and children under five years of age. ITNs have been shown to decrease severe malaria by 45%, reduce premature births by 42% and cut all-cause child mortality by 17%-63%. For every 1000 ITNs distributed, 5.5 children's lives are saved. Malaria transmission can be reduced by up to 90% through the use of insecticide-treated nets (ITNs), according to efficacy trials (Ibid).

2.12 ITNs distribution

Among the most at-risk populations, the World Health Organization estimates an annual need for over 32,000,000 ITNs. By creating commercial markets for high quality and affordable ITNs to serve those who are able to pay and prefer the convenience and choice of the marketplace, the public sector should focus its limited resources on those most at
risk, who cannot afford to pay, and who need free nets. There should also be an expanded market to increase the options for, and the efficiency of, subsidy mechanisms (NetMark, 2008).

Since 2003, the Ministry of Health through the National Malaria Strategy had distributed free nets to pregnant women and children under five years of age contributing towards the achievement of Abuja targets and the Millennium Development Goals (DOMC, 2006). That initiative was not very successful despite significant supply of nets. The current figure of net distribution stood at less than 10% of the targeted population and the expected impact in reducing morbidity and mortality. In endemic districts, reduction of poverty attributed to the disease as well as improved school attendance for school age children attributable to malaria infection had not been achieved (MOH, 2006a).

The Ministry of Health distributed 3.4 million LLINs in 2006 to children below five years of age in 46 high malaria burdened districts in the country. This formed the largest single distribution of nets that had ever been undertaken globally. The outcome of this activity was the huge improvement in the net ownership (51%) and current usage among the vulnerable populations (67% of children under 5 years). This improved accessibility for the pregnant women in terms of cost of the net and the distance to the net source. This free distribution of long lasting ITNs in 2006 was also pro-poor (DOMC, 2008). The public and NGO sectors also distributed ITNs in Kenya, but there were no sustained interventions of significant size (Tilson, 2007).
2.13 Net distribution channels

PSI/DFID organizations distributed 5 million ITNs between October 2004 and December 2006. These bed nets were delivered through routine clinics in 6 provinces in Kenya. UNICEF also bought bed nets to marginalized groups in North Eastern Provinces (NEP).

2.14 Different types of bed nets distributed in Kenya

Two types of nets were distributed:

1. Supanet which is an ITN that is issued together with insecticide (Powertab) for retreatment.
2. Olyset and Permanet are long lasting insecticide treated nets (LLITNs) that are branded Ministry of Health logo (MOH) and sold at KES 50 (0.60 USD) by PSI.

2.15 Malaria control supporters

The government through the Ministry of Public Health and Sanitation and the Ministry of Medical Services, private sector stakeholders, government parastatals, NGOs and, development partners such as WHO/DFID, UNICEF and USAID provide resources to support national, provincial and district level malaria control activities (DOMC, 2008).

2.16 Research on ITNs and malaria

The strength of community effect depends on the proportion of nearby compounds with treated nets. To maximize ITNs public health impact high coverage with treated nets is essential (Hawley et al., 2003). Using antenatal care clinics to deliver ITNs to pregnant women is feasible at a national level (Guyatt et al., 2002).
There is need to increase demand for nets and insecticide by removing barriers such as cost and affordability, knowledge and behaviour, and promotion and marketing. We need a better understanding of community perceptions and practices in relation to malaria as well as motives for net purchase. In addition, preferences for product quality, size, shape and color in order to develop effective strategies for creating and increasing demand of nets and re-treatment should be understood. Studies aimed at uncovering local attitudes towards bed net use and other means used to prevent mosquito bites are critical. They reveal a multiplicity of variations, and point to the need for behavioural and anthropological approaches in the design and implementation of malaria control programmes (WHO, 2003).

The WHO "Action plan for reduction of reliance on DDT in disease vector control" recommends research into "The effectiveness, sustainability and affordability of insecticide-treated materials (ITMs) (Kimani et al., 2006). His is what was investigated and other possible factors that influence ITN use among pregnant women in Msambweni district.
CHAPTER 3: MATERIALS AND METHODS

3.1 The study area

The study was done at Msambweni District Hospital in Msambweni District, (formerly in Kwale District, Appendix 3.5) of Coast Province. It is an area where malaria is endemic and a major source of morbidity among pregnant women. It is approximately 52 km South West of Mombasa town. Msambweni District is 587.4 square Kilometers. The area has a hot and humid weather typical of coastal areas. The altitude ranges from 0 - 5m above sea level. The inhabitants are mainly Digo ethnic groups who depend mainly on fishing and farming. Annual rainfall is about 1500 mm which occurs in two seasons. The long rains fall between March to May and June and the short rains from October to December, varying from one year to another (Wachira, 1996).

3.2 Study design

The study adopted a descriptive cross-sectional study design. Participants were recruited into the study as they came until the time of study was over and the right number of sample size attained. Data was collected during March and April 2008, at the end of the rainy season when mosquito density and malaria transmission was high. Both quantitative and qualitative data were collected on factors that influence use of insecticide treated nets among pregnant women.
3.3 Variables

A variable is a measurable characteristic that assumes different values among the subjects (Mugenda and Mugenda, 1999).

3.3.1 Dependent variable

This is the variable that indicates the total influence arising from the effect of the independent variable. The dependent variable in this study was ITNs utilization and was measured by the number of respondents who were using ITNs or not.

3.3.2 Independent variables

The independent variable is that which the researcher can manipulate to determine its effects on the dependent variable. Independent variables were all the factors influencing ITNs utilization such as malaria knowledge, individual practices and personal preferences and socio-demographic factors.

3.4 Target population

The study targeted all pregnant women in Msambweni District. This is because the hospital serves people from the whole old Kwale District and beyond and so served as a good catchment area.

3.5 Study population

The study population was all pregnant women from Msambweni district, attending antenatal care clinic at Msambweni district hospital at the time of study.
3.6 Selection criteria

3.6.1 Inclusion criteria
Pregnant women attending antenatal care clinic at Msambweni District hospital who had resided in the area for not less than one year and were willing to consent to participate were included in the study.

3.6.2 Exclusion criteria
Pregnant women who had lived in the study area for less than one year, who were below 18 years of age and or those with mental problems were excluded from the study.

3.7 Sampling techniques and sample size determination.

3.7.1 Sampling of the study area
Purposive sampling was done to get Coast Province because it is hyperendemic for malaria infection. The study was done in Msambweni District hospital. Msambweni District and Msambweni District Hospital were also sampled purposively. No similar study had been done in the new district and the hospital was a catchment area for participants from all over the region. The sample population comprised both urban and rural areas that received free nets and those that did not.

3.7.2 Sampling of the study subjects
Simple random sampling without replacement was done to recruit study participants. All the pregnant women in all the sub locations had equal chances of participating in the study. However, only pregnant women attending antenatal care clinic at the Maternal and
Child Health (MCH) department in Msambweni district hospital were eligible to participate. After receiving the MCH care every mother would be called on to the interview desk. The pregnant woman was asked to give her ANC card so that the interviewer ascertained if she met the inclusion criteria. If so, she would pick a ‘Yes secret ballot paper’ to consent. The next mother would then be invited. A total of four hundred and twenty six pregnant women were interviewed after consenting to participate in the study. About 400 pregnant mothers visited MCH per month. 15 Yes and 5 No secret ballots were used to select the pregnant mothers per day. Data was collected for two months.

3.7.3 Sample size determination

A sample that guaranteed 95% level of confidence to be certain of estimating the true proportion that uses ITNs with an error margin of 0.05 was needed. The percentage of pregnant women that used ITNs at the Coast Province was estimated at 33.6% (MOH/CDC, 2006). The following Kirkwood formula was used to calculate sample size (Kirkwood, 1988):

\[ N = \frac{Z^2 pq}{EM^2} \]

where;

- \( N \) = the representative sample size
- \( Z \) = standard normal deviation (1.96)
- \( p \) = proportion in the population possessing the characteristic of interest estimated at 33.6%
- \( q = 1-p = 100%-33.6% = 66.4\% \)
- \( EM = \) error margin (0.05)
\[ N = 1.96^2 \times 0.336 \times 0.664 / (0.05)^2 \]

\[ N = 343 \]. Hence the minimum sample size was 343 pregnant women. However 426 pregnant women participated in the study to increase the strength of my tests findings. The sample population was representative of all pregnant women in Msambweni District attending antenatal care clinic.

3.8 Construction of research instruments

Construction of research instruments refers to the process of designing the research tools (Interview schedules). This was carefully done in reference to the study objectives in order to ensure that all the areas of interest pertaining to the study were adequately covered. The study objectives guided the nature of the questions asked while the possible responses to the questions were guided by the literature review. Data was collected using standardized content-specific interview schedules (Appendices 3.3 and 3.4) and the results obtained recorded appropriately. The interview schedules were both in English and Kiswahili. Interpretation of each question in the local language was done during the training of the research assistants to ensure that the original idea or the intended meaning was not altered during the interview. The research instrument had been prepared with the help of the supervisors, translated in Swahili and tested for feasibility.

3.9 Pre-testing of data collection tools

Pre-training of the interviewers was done for two days. Pre-testing of the interview schedules was done in a neighboring district (Kwale District Hospital) with ten respondents per interviewer. This hospital was purposively selected to ensure as much
similar characteristics as possible to ensure feasibility of the research. Subject recruitment, data collection and analysis were done as they were done in the main study, first by the principal investigator in the presence of the interviewers (two research assistants), then by the interviewers in the principal investigator’s presence, one at a time. All problems encountered were discussed and a standard approach developed with the help of the supervisors.

3.9.1 Validity

Validity is the accuracy and meaningfulness of inferences which are based on research results. It is the degree to which the results obtained from data analysis actually represent the phenomenon under study (Kothari, 2004). It is how accurately the data obtained represents the variables of the study. Many questions during in-depth interviews were asked to prove true information was collected and avoid bias in respondents.

3.9.2 Reliability

Reliability is one of the measures of relevance and correctness of the data collected to the research hypothesis. It is the measure of the degree to which a research instrument yields consistent results or data after repeated trials (Mugenda and Mugenda, 1999). Reliability in research is influenced by random error such that as the random error increases reliability decreases. In this study reduction of random error was achieved by ensuring accurate coding, instruction to and supervision of the research assistants. This was also enhanced by pre-testing of the data collection tools on a population with similar characteristics to the study population.
3.10 Data collection technique

The research assistants read out the questions for all respondents and they ticked the responses. Data was collected ensuring that same mothers were not recruited twice into the study. Also, the ANC numbers were counterchecked for double entries during data cleaning.

3.10.1 Informed consent forms

Informed consent forms were written in both English and Kiswahili to cater for all levels of education among the pregnant women (Appendices 3.1 and 3.2). So as to reach a target of 343 participants, four hundred and forty pregnant women consented to the study and were interviewed. On arrival, the ANC card was checked; all information about the study was explained to each potential respondent and then given the consent form so that it was read to her. The informed consent statement included the purpose of the project, the benefit to the community, the approximate amount of time it would take, and an assurance of confidentiality. The respondent was asked if she would like to participate, and if she responded affirmatively, then she would be asked to sign, write her name and append the date to consent. If illiterate, all was read to her then asked to consent using a thumb print.

3.10.2 Interview schedules (Data collection tool)

On consenting, all questions on bed nets utilization were read to the participant being given ample time to answer after each. The respondents were not allowed to see the answer options in the questionnaire to avoid bias among the literate. Interviews were carried out in both English and Kiswahili.
3.11 Logistical and ethical considerations

Before the implementation of data collection, permission to conduct the study was sought from Graduate School Kenyatta University who approved the proposal and the Ministry of Health (MOH), Ministry of Education (MOE) and Ministry of Higher Education, Science and Technology who authorized the research to be conducted. The study importance was explained to the pregnant women so that they gave an informed and voluntary consent before recruitment into the study. Confidentiality of the information obtained was observed.

3.12 Data management, analysis and presentation

Data collected from 426 participants was cleaned, coded, sorted, and entered into the computer using Ms. Excel 2003 and then analysed using the Statistical Package for Social Science (SPSS) version 13.0 for windows. In descriptive statistics the means, frequencies, percentages and cross-tabulations were calculated for quantitative information. The relevant and important quotes from the discussions were made to enhance and support the quantitative data. In inferential statistics the Chi-square test was used to establish associations between selected dependent and independent variables. The significance of the relationships was done at 95% confidence level. Chi square reports were then expressed as significant or insignificant depending on the level of association and correct interpretation of the results was made. Data was presented using tables and charts.
CHAPTER 4: RESULTS

4.0.1 Demographic Characteristics of the study population

The demographic information included age, marital status, education level, religion and occupation of the respondents. Table 4.1 shows the various demographic variables that were investigated in the study population and the results on the influence on ITNs use.

Over a half of participants were aged between 20-29 years 272 (63.8%) followed by those aged 30-39 years 89 (20.9%) and age group 10-19 years 65 (15.3%). A high proportion of the respondents were muslims, 386 (90.6%) and the rest 40 (9.4%) were christians. There were no other religions named by the respondents. The sample population was composed of 89.2% married women, 1.4% cohabiting, 7.3% were single, 1.9% divorced and 0.2% widowed pregnant women.

Education levels included ‘No formal education’ (18.5%), ‘Primary’ (65.7%) and ‘above Primary’ (15.7%) levels. Primary level of education had been attained by majority of the respondents (65.7%) while very few (15.7%) had above primary level of education. The second majority 79 (18.5%) had not obtained any formal education at all. Most household heads had attained primary level of formal education (54.7%), 34.5% ‘above primary’ level and 10.8% had not obtained any formal education. Slightly over three quarters of the pregnant women (76.1%) were unemployed, 18.1% operated small businesses, 4.9% were in formal employment and 0.9% were tailors.
Table 4.1 Demographic characteristics of the respondents

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
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<tr>
<td><strong>Age</strong></td>
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</tr>
<tr>
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<td>30-39 yrs</td>
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</tr>
<tr>
<td><strong>Religion</strong></td>
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<td></td>
</tr>
<tr>
<td>Muslim</td>
<td>386</td>
<td>90.6</td>
</tr>
<tr>
<td>Christian</td>
<td>40</td>
<td>9.4</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
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<td>100</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
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<tr>
<td>Single</td>
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<td>9.2</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
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<td>100</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
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<td></td>
</tr>
<tr>
<td>No education</td>
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<td>Primary</td>
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<tr>
<td>&gt;Primary</td>
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<tr>
<td>Employed</td>
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<td>23.9</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>426</td>
<td>100</td>
</tr>
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</table>
4.0.2 Household bed nets, ownership and use before the last delivery

Most households, 164 (38.5%) had less than 2 bed nets, 103 (24.2%) households at least 2 bed nets and 159 (37.3%) households had more than 2 bed nets. About three-quarters of the pregnant women owned bed nets (73.9%). Among the 426 respondents 323 were non primegravid. Among the 323, three quarters, 243 (75.2%) were using bed nets before the previous delivery.

4.1 The status of ITNs use among pregnant women.

The first objective of the study was to establish the proportion of pregnant women using insecticide treated nets for malaria control. It was noted that 217 (50.9%) of the respondents were using bed nets always, 109 (25.6%) sometimes and 100 (23.5%) were not using bed nets at all. Bed net use was defined as use always and sometimes as reported by the respondents and confirmed by direct observation at night. Over three-quarters of the respondents 326 (76.5%) were using bed nets while 100 (23.5%) did not use bed nets at all. ITN use was defined as the use of a bed net that had been treated with an insecticide on acquisition. Therefore, 286 (67.1%) pregnant mothers were using ITNs, 40 (9.4%) were using untreated bed nets and 100 (23.5%) were not using any bed net. ITNs use results were as shown in figure 4.1 below.
4.1.1 Influence of socio-demographic factors on ITN use

There was no significant association between ITNs use and age ($\chi^2=2.002$, df=2, $P=0.368$). Of all the respondents aged between 10-19 years, 63.1% were using ITNs while 36.9% were not. Among respondents aged between 20-29 years, 66.2% were using ITNs while 33.8% were not. Among those aged between 30-39 years, 73.0% were using ITNs.
ITNs and 27.0% were not. Occupation of the respondents was also not significantly associated with ITN use ($\chi^2=0.128$, df=1, $P=0.721$) (Table 4.2).

Table 4.2 Influence of socio-demographic factors on ITN use

<table>
<thead>
<tr>
<th>Variable</th>
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<th>%</th>
<th>ITNs use</th>
<th>Nonuse</th>
<th>Significance</th>
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<tr>
<td>10-19yrs</td>
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<td>24(36.9)</td>
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<td>63.8</td>
<td>180(66.2)</td>
<td>92(33.8)</td>
<td>df=2</td>
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<tr>
<td>30-39 yrs</td>
<td>89</td>
<td>20.9</td>
<td>65(73.0)</td>
<td>24(27.0)</td>
<td>$p=0.368$</td>
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<tr>
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<td>140(32.9)</td>
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<td></td>
</tr>
<tr>
<td>Muslim</td>
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<td>90.6</td>
<td>253(65.5)</td>
<td>133(34.5)</td>
<td>$\chi^2=4.723$</td>
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<td>33(82.5)</td>
<td>7(17.5)</td>
<td>df=1</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>426</td>
<td>100</td>
<td>286(67.1)</td>
<td>140(32.9)</td>
<td>$p=0.030$</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>387</td>
<td>90.8</td>
<td>267(69.0)</td>
<td>120(31.0)</td>
<td>$\chi^2=6.601$</td>
</tr>
<tr>
<td>Single</td>
<td>39</td>
<td>9.2</td>
<td>19(48.7)</td>
<td>20(51.3)</td>
<td>df=1</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>426</td>
<td>100</td>
<td>286(67.1)</td>
<td>140(32.9)</td>
<td>$p=0.010$</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>79</td>
<td>18.5</td>
<td>55(69.6)</td>
<td>24(30.4)</td>
<td>$\chi^2=6.183$</td>
</tr>
<tr>
<td>Primary</td>
<td>280</td>
<td>65.7</td>
<td>178(63.6)</td>
<td>102(36.4)</td>
<td>df=2</td>
</tr>
<tr>
<td>&gt;Primary</td>
<td>67</td>
<td>15.7</td>
<td>53(79.1)</td>
<td>14(20.9)</td>
<td>$p=0.045$</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>426</td>
<td>100</td>
<td>286(67.1)</td>
<td>140(32.9)</td>
<td></td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House wife</td>
<td>324</td>
<td>76.1</td>
<td>219(67.6)</td>
<td>105(32.4)</td>
<td>$\chi^2=0.128$</td>
</tr>
<tr>
<td>Employed</td>
<td>102</td>
<td>23.9</td>
<td>67(65.7)</td>
<td>35(34.3)</td>
<td>df=1</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>426</td>
<td>100</td>
<td>286(67.1)</td>
<td>140(32.9)</td>
<td>$p=0.721$</td>
</tr>
</tbody>
</table>
Religion and ITNs use were significantly associated ($\chi^2=4.723$, df=1, P=0.030). From among 40 christians, 33 (82.5%) were using ITNs while 7 (17.5%) were not. From among 386 muslims, 253 (65.5%) were using ITNs while 133 (34.5%) were not. ITNs use was higher among Christians (82.5%) than among muslims (65.5%).

Marital status was significantly associated with ITNs use ($\chi^2=6.601$, df=1, P=0.010). Of the married, 69.0% were using ITNs while 31.0% were not. Of the singles, 48.7% were using ITNs while 51.3% were not.

Respondent’s education level was significantly associated with ITNs use ($\chi^2=6.183$, df=2, P=0.045). Of those who used ITNs the percentage increased with increasing level of education attained; 63.6% and 79.1% for primary and above primary respectively. Similarly, household heads’ education level associated significantly with ITNs use ($\chi^2=11.833$, df=2, P=0.003). Of those pregnant women who used ITNs the percentage increased with increasing level of education attained by their household heads; 47.8%, 66.1% and 74.8% for ‘No formal education’, ‘Primary’ and ‘above primary’ levels respectively.

4.1.2 Influence of household bed nets, ownership and use before the last delivery on ITNs use

The number of bed nets in the household was significantly associated with ITN use ($\chi^2=38.547$, df=2, P=0.000). Of 164 households which had less than two bed nets, only 81 (49.4%) were using ITNs. Of 103 households which had two bed nets, 78 (75.7%)
were using ITNs. Of 159 households which had more than two bed nets, 127 (79.9%) were using ITNs (Table 4.3). It was noted that ITN use increased with increasing number of bed nets in the household.

Table 4.3 Influence of household bed nets, ownership and bed net use before last delivery on ITN use

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
<th>ITN use</th>
<th>ITN Nonuse</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household bed nets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2</td>
<td>164</td>
<td>38.5</td>
<td>81(49.4)</td>
<td>83(50.6)</td>
<td>( \chi^2 = 38.547 ) df=2 p=0.000</td>
</tr>
<tr>
<td>2</td>
<td>103</td>
<td>24.2</td>
<td>78(75.7)</td>
<td>25(24.3)</td>
<td></td>
</tr>
<tr>
<td>&gt;2</td>
<td>159</td>
<td>37.3</td>
<td>127(79.9)</td>
<td>32(20.1)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
<td>286(67.1)</td>
<td>140(32.9)</td>
<td></td>
</tr>
<tr>
<td>Net ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>315</td>
<td>73.9</td>
<td>281(89.2)</td>
<td>34(10.8)</td>
<td>( \chi^2 = 266.892 ) df=1 p=0.000</td>
</tr>
<tr>
<td>No</td>
<td>111</td>
<td>26.1</td>
<td>5(4.5)</td>
<td>106(95.5)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
<td>286(67.1)</td>
<td>140(32.9)</td>
<td></td>
</tr>
<tr>
<td>Net use before last delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>243</td>
<td>75.2</td>
<td>179(73.7)</td>
<td>64(26.3)</td>
<td>( \chi^2 = 17.025 ) df=1 p=0.000</td>
</tr>
<tr>
<td>No</td>
<td>80</td>
<td>24.8</td>
<td>39(48.8)</td>
<td>41(51.3)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>323</td>
<td>100</td>
<td>218(67.5)</td>
<td>105(32.5)</td>
<td></td>
</tr>
</tbody>
</table>

Bed net use in the previous pregnancy was significantly associated with bed net ownership in the current pregnancy (\( \chi^2 = 20.563 \), df=1, P=0.000). Over three-quarters of pregnant women who used bed nets in their last pregnancy currently owned bed nets (81.5%). There was also a significant association between bed net ownership and current use (\( \chi^2 = 266.892 \), df=1, P=0.000). Among those who owned bed nets 96.6% used them.
Bed net use before the last delivery was significantly associated with bed net use in the current pregnancy \( (\chi^2 = 17.025, \text{df} = 1, P = 0.000) \). Among the 243 respondents who were using bed nets before the last delivery, 179 (55.4%) were using ITNs in the current pregnancy while 64 (19.8%) were not using ITNs at all. Among the 80 subjects who had not used bed nets before the last delivery only 39, (12.1%) were using ITNs in the current pregnancy.

### 4.2 The relationship between ITN use and pregnancy outcome among pregnant women in Msambweni district

A Chi square test was done to establish the relationship between ITNs use and pregnancy outcome among the pregnant mothers. The results were as presented on table 4.4. Out of 323 respondents who were non primagravida 243 (75.2%) reported that they had used bed nets before the last delivery and 80 (24.8%) had not used. There was no significant association between reported bed net use in the previous pregnancy and the pregnancy outcome \( (\chi^2 = 0.124, \text{df} = 1, P = 0.725) \). Over three quarters of the 243 who had used nets 219 (90.1%) had had live births in the previous pregnancy while 24 (9.9%) had had either a still birth or a miscarriage. Of the 80 respondents who had not used nets 71 (88.8%) had had live births in the previous pregnancy while 9 (11.3%) had had either a still birth or a miscarriage.

Out of 323 respondents who were non primagravida 290 (89.8%) reported that they had had a live birth in the last pregnancy and 33 (10.2%) had had either a still birth or a
miscarriage. 198 (68.3%) of the 290 who had had a live birth used ITNs in the current pregnancy and 92 (31.7%) were not using any ITN in the current pregnancy. 20 (60.6%) of the 33 who had had a still birth or miscarriage used ITNs in the current pregnancy and 13 (39.4%) were not using any ITN. There was no significant association between the previous pregnancy outcome and ITNs use in the current pregnancy ($\chi^2=0.794$, df=1, $P=0.373$). These results indicate that a larger proportion of ITNs use was observed among those who had had a live birth than among those who had had a still birth or miscarriage.

Table 4.4 The relationship between ITNs use and reported pregnancy outcome

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency of pregnancy outcome</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Net use before last delivery</td>
<td>Yes</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>323</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Last pregnancy outcome</td>
<td>Live birth</td>
<td>290</td>
</tr>
<tr>
<td></td>
<td>Stillbirth/miscarriage</td>
<td>33</td>
</tr>
<tr>
<td>Total</td>
<td>323</td>
<td>100</td>
</tr>
</tbody>
</table>
4.3 The relationship between malaria knowledge and reported malaria episodes among pregnant women in Msambweni district

4.3.1 Reported malaria infection episodes, a month prior to the study period

Over three-quarters of the respondents had suffered from malaria the month prior to the time of the study 381 (89.4 %) while 45 (10.6%) reported not having been infected (Figure 4.2). However, there was no significant association between past malaria infection and ITN use among the pregnant women ($\chi^2=0.165, df=1, P=0.684$).

![Past malaria infection chart]

Figure 4.2 Reported malaria episodes
4.3.2 The relationship between age, gravidity and household head and reported malaria episodes among pregnant women in Msambweni district

There was a significant association between age of the respondents and reported malaria episodes among the pregnant women ($\chi^2=6.617$, df=2, p=0.037). Among the 381 respondents who reported having been infected, the number of malaria episodes increased with increasing age. 53 (81.5%), 244 (89.7%) and 84 (94.4%) of the respondents in age groups 10-19 years, 20-29 years and 30-39 years respectively were infected with malaria.

Over three-quarters (82.9%) of household heads were ‘Husbands’, 12.4% by parents, 1.9% by self and 2.8% by fathers-in-law (Table 4.5). There was a significant association between the relationship of the respondent and the household head and reported malaria episodes among the pregnant women ($\chi^2=7.230$, df=1, p=0.007). Of 361 respondents whose household heads were husbands, 329 (91.1%) were infected with malaria while only 52 (80.0%) out of 65 whose household heads were parents (mother, father and or father-in-law) were infected with malaria.

Just about a quarter of the pregnant women 103 (24.2%) were primigravidae, 95 (22.3%) secundigravida and 228 (53.5%) multigravida (Table 4.5). There was a significant association between gravidity and malaria incidence among the pregnant women ($\chi^2=6.530$, df=2, p=0.038). Multigravida respondents reported higher rates of malaria incidence 213 (93.0%) than primigravida 88 (85.4%) and secundigravida 81 (85.3%) respectively.
Table 4.5 Influence of selected variables on reported malaria episodes among pregnant women in Msambweni district

<table>
<thead>
<tr>
<th>Variable</th>
<th>Reported malaria episodes</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-19 years</td>
<td>65</td>
<td>15.3</td>
</tr>
<tr>
<td>20-29 years</td>
<td>272</td>
<td>63.8</td>
</tr>
<tr>
<td>30-39 years</td>
<td>89</td>
<td>20.9</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
</tr>
<tr>
<td>Household heads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Husband</td>
<td>361</td>
<td>84.7</td>
</tr>
<tr>
<td>Parent</td>
<td>65</td>
<td>15.3</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
</tr>
<tr>
<td>Gravidity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primigravida</td>
<td>103</td>
<td>24.2</td>
</tr>
<tr>
<td>Secundigravida</td>
<td>95</td>
<td>22.3</td>
</tr>
<tr>
<td>Multigravida</td>
<td>228</td>
<td>53.5</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
</tr>
</tbody>
</table>

4.3.3 The relationship between malaria knowledge and reported malaria episodes among pregnant women in Msambweni district

**Signs and symptoms knowledge**

The main signs and symptoms used to measure knowledge in this case were headache, fever, vomiting and nausea, joint and back pain, poor appetite and diarrhea. Knowledge level was determined by the number of major signs and symptoms the participants knew. Those who knew none were grouped as ‘Not knowledgeable’ (4.2%), those who knew
one or two signs were grouped as ‘Having some knowledge’ (34.1%), and those knowing
more than two signs and or symptoms were grouped as ‘Being knowledgeable’ (61.7%)
(Table 4.6). Over half of the pregnant women in Msambweni District were
knowledgeable on malaria signs and symptoms. There was a significant association
between knowledge on signs and symptoms of malaria and malaria incidence
($\chi^2=105.963$, df=2, p=0.000). Among the 381 respondents who reported having had been
infected, malaria episodes increased with increasing knowledge on signs and symptoms.

**Table 4.6 Influence of knowledge factors on reported malaria episodes**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Reported malaria episodes</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Knowledge in signs and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>18</td>
<td>4.2</td>
</tr>
<tr>
<td>Some</td>
<td>145</td>
<td>34.1</td>
</tr>
<tr>
<td>Good</td>
<td>263</td>
<td>61.7</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
</tr>
<tr>
<td>Prevention qualities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective</td>
<td>86</td>
<td>20.2</td>
</tr>
<tr>
<td>Available</td>
<td>169</td>
<td>39.7</td>
</tr>
<tr>
<td>Cost</td>
<td>88</td>
<td>20.7</td>
</tr>
<tr>
<td>Side effects</td>
<td>71</td>
<td>16.7</td>
</tr>
<tr>
<td>Ignorance</td>
<td>12</td>
<td>2.8</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
</tr>
<tr>
<td>Presence of side effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in the used prevention</td>
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<td></td>
</tr>
<tr>
<td>Yes</td>
<td>46</td>
<td>10.8</td>
</tr>
<tr>
<td>No</td>
<td>368</td>
<td>86.4</td>
</tr>
<tr>
<td>Don’t know</td>
<td>12</td>
<td>2.8</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
</tr>
<tr>
<td>Mounting Knowledge</td>
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<td></td>
</tr>
<tr>
<td>Yes</td>
<td>416</td>
<td>97.7</td>
</tr>
<tr>
<td>No</td>
<td>10</td>
<td>2.3</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
</tr>
</tbody>
</table>
Knowledge on malaria prevention measures used in households among pregnant women in Msambweni district

The preventive measures used by the pregnant mothers were grouped into ‘nothing’ (8.7%), ‘bed nets only’ (38.7%), ‘nets and alternatives’ (35.4%) and ‘alternatives only’ (17.1%). ‘Alternatives’ were classified as preventive measures other than bed nets including sprays, coils, repellents, environmental measures and herbal medicines, used either singly or in combination. The prevention measure used was significantly associated with ITNs use ($\chi^2$=244.322, df=3, P=0.000). Among 166 respondents who used bed nets as the only preventive measure, 147 (88.6%) were using ITNs, followed by those using nets in combination with other measures 136 (85.0%).

Reasons given for preference of a specific preventive measure were grouped into ‘availability’ (39.7%), ‘cost’ (20.7%), ‘effectiveness’ (20.2%), ‘absence of side effects’ (16.6%) and ‘ignorance’ (2.8%) (Table 4.6). Reasons for the used malaria preventive measure were significantly associated with ITNs use ($\chi^2$=57.729, df=4, P=0.000). Bed nets were more effective (19.6%) than alternative methods (0.6%), more available and accessible (29.4%) than alternative methods (10.3%), cheaper (12.7%) than alternative methods (8.0%), and had less side effects (0.2%) than alternative methods (16.4%). There was a significant association between the prevention qualities preferred by the respondents and malaria incidence ($\chi^2$=10.436, df=4, P=0.034). Of 381 respondents who were infected with malaria 372 (97.6%) reported having considered the right qualities of prevention while only 9 (2.4%) were ignorant.
Knowledge of malaria preventive measures (presence of side effects) among pregnant women in Msambweni district

Over three quarters of the study population (86.4%) reported that the malaria preventive measures they used did not have any side effects, 10.8% had negative effects on the users and 2.8% were ignorant of side effects (Table 4.6). The presence of side effects in malaria prevention measures was significantly associated with malaria incidence (χ²=6.856, df=2, P=0.032) and ITNs use (χ²=17.676, df=2, P=0.000). Malaria infection was higher among those participants who reported that their preventive measures had side effects (91.3%). Of 368 pregnant women whose preventive measures had no side effects, 258 (70.1%) used ITNs. Among 46 pregnant women whose preventive measures had side effects 26 (56.5%) used ITNs and 20 (43.5%) were not using ITNs. Among 12 pregnant women who did not know if their preventive measures had side effects 2 (16.7%) used ITNs.

Knowledge on bed net mounting among pregnant women in Msambweni district

Effective bed net mounting was determined by knowing how to hung and tuck in bed nets well under other beddings. Those pregnant women who answered 'yes' were grouped as 'knowledgeable' 416 (97.7%) while those who said 'No' to the question and or did not know how to hung and tuck in bed nets well were grouped as 'not knowledgeable' 10 (2.3%) (Table 4.6). The knowledge on how to mount bed nets was significantly associated with reported malaria episodes (χ²=4.095, df=1, P=0.043). Most of the respondents who were knowledgeable 374 (89.9%) were infected than those not knowledgeable 7 (70.0%). The knowledge on how to mount bed nets was significantly
associated with ITNs use ($\chi^2=10.312$, df=1, P=0.001) with the highest number of ITNs users being those who were knowledgeable (68.3%). Since knowledge increased ITN use but still the malaria episodes reported increased, it meant other underlying factors like inconsistent ITN use were increasing reported malaria episodes due to improper malaria control.

4.3.4 The relationship between ITNs use and reported malaria episodes among pregnant women in Msambweni district

Most of the respondents were using bed nets alone 166 (39.0%), followed by those using nets in combination with other prevention methods 160 (38%) (Figure 4.3). There was a significant association between the prevention type used and ITN use among the pregnant women ($\chi^2=244.322$, df=3, P=0.000). ITN use increased in the order 'using nothing' (0.00%) other methods alone (4.7%), nets in combination (85.0%) and nets alone (88.6%). On the other hand, there was no significant association between bed net use and incidence of malaria observed ($\chi^2=4.018$, df=3, P=0.260). Some underlying factors could be negating bed nets effectiveness such as use inconsistency.
Figure 4.3 Malaria preventive measures used by pregnant women in Msambweni district

4.4 The relationship between personal preferences for nets and reported malaria episodes

4.4.1 Health care source preference for malaria treatment among pregnant women

The knowledge of source of treatment for malaria was determined by where the pregnant women sought help first when infected. Almost three quarters of the study subjects 289 (67.8%) reported that they sought malaria treatment from health facilities once they fell ill with malaria. Other sources of treatment included retail shops 125 (29.3%), traditional healers or herbalists 7 (1.6%) and others did nothing about the infection 5 (1.2%) (table
4.7. The preferred source of malaria treatment was not significantly associated with the reported incidence of malaria ($\chi^2=7.738$, df=3, $P=0.052$). The proportion of incidence of malaria increased in the order, 'nowhere' (80.0%), Health facilities (86.9%), shops (95.2%) and traditional medicine (100.0%) respectively. There was also no significant association between the source for malaria treatment and ITNs use among the respondents ($\chi^2=4.323$, df=3, $P=0.229$).

### 4.4.2 Colour preference for nets among pregnant women

Out of 426 respondents, blue was preferred by the majority 239 (56.1%), white by 91 (21.4%), green by 49 (11.5%), any by 43 (10.1%) and orange by 4 (0.9%) in a decreasing order (table 4.7). There was a significant association between the bed net colour preferred and reported malaria incidence ($\chi^2=10.656$, df=4, $P=0.031$). Results indicated that a smaller proportion of malaria incidence was observed among those who preferred blue colour 204 (85.4%) with only 35 (14.6%) who had not been infected with malaria the previous month. However colour preference was found not to influence ITNs use among the respondents ($\chi^2=6.055$, df=4, $P=0.195$).

### 4.4.3 Shape preference for nets among pregnant women

Of 426 respondents who were interviewed 406 stated their bed net shape preference while 20 preferred any net shape. Only two bed net shapes were mentioned. Out of the 406 respondents, 284 (70.0%) preferred cone shaped bed nets while 122 (30%) preferred the rectangular shaped bed nets (table 4.7). There was a significant association between the preferred bed net shapes and malaria incidence ($\chi^2=5.948$, df=1, $P=0.015$). Thus, of
284 who preferred cone shape, 247 (87.0%) reported having been infected with malaria the previous month. Of 122 who preferred rectangular shape 116 (95.1%) reported having been infected with malaria the previous month.
Table 4.7 Relationship between personal preferences and reported malaria episodes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Reported malaria episodes</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Source of malaria treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td>289</td>
<td>67.8</td>
</tr>
<tr>
<td>Shops</td>
<td>125</td>
<td>29.3</td>
</tr>
<tr>
<td>Tradition/herbs</td>
<td>7</td>
<td>1.6</td>
</tr>
<tr>
<td>Nowhere</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
</tr>
<tr>
<td>Net colour preference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>91</td>
<td>21.4</td>
</tr>
<tr>
<td>Blue</td>
<td>239</td>
<td>56.1</td>
</tr>
<tr>
<td>Green</td>
<td>49</td>
<td>11.5</td>
</tr>
<tr>
<td>Orange</td>
<td>4</td>
<td>0.9</td>
</tr>
<tr>
<td>Any</td>
<td>43</td>
<td>10.1</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
</tr>
<tr>
<td>Shape preferred</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cone</td>
<td>284</td>
<td>70.0</td>
</tr>
<tr>
<td>Rectangular</td>
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<tr>
<td>Total</td>
<td>406</td>
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<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency of ITN use</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Malaria treatment source</td>
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<td></td>
</tr>
<tr>
<td>Hospital</td>
<td>289</td>
<td>67.8</td>
</tr>
<tr>
<td>Shop</td>
<td>125</td>
<td>29.3</td>
</tr>
<tr>
<td>Herbalist</td>
<td>7</td>
<td>1.6</td>
</tr>
<tr>
<td>Nowhere</td>
<td>5</td>
<td>1.2</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
</tr>
<tr>
<td>Net colour preferred</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>91</td>
<td>21.4</td>
</tr>
<tr>
<td>Blue</td>
<td>239</td>
<td>56.1</td>
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<tr>
<td>Green</td>
<td>49</td>
<td>11.5</td>
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<tr>
<td>Orange</td>
<td>4</td>
<td>0.9</td>
</tr>
<tr>
<td>Any</td>
<td>43</td>
<td>10.1</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>100</td>
</tr>
</tbody>
</table>
4.5 Influence of personal practices on ITNs use among pregnant women in Msambweni district

4.5.1 Net sources among pregnant women

About half of bed nets owned had been received through health facilities 161 (49.4%), retail shops 149 (45.7%), relatives 12 (3.7%) and community aid groups 4 (1.2%) (table 4.8). There was a significant association between bed net source and ITNs use ($\chi^2=21.922$, df=3, $P=0.000$). Of 161 respondents who had received their bed nets through health facilities, 153 (95.0%) were using ITNs. Similarly, of 149 respondents who had received their bed nets through retail shops, 123 (82.6%) were using ITNs. In addition, of 12 respondents who had received their bed nets through relatives, 8 (66.7%) were using ITNs. Of 4 respondents who had received their bed nets through community aid groups, 2 (50.0%) were using ITNs.

Table 4.8 Influence of bed net sources on ITNs use

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Bednet distribution channels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitals</td>
<td>161</td>
<td>49.4</td>
</tr>
<tr>
<td>Shops</td>
<td>149</td>
<td>45.7</td>
</tr>
<tr>
<td>Relatives</td>
<td></td>
<td>3.7</td>
</tr>
<tr>
<td>Community aid</td>
<td></td>
<td>1.2</td>
</tr>
<tr>
<td>Total</td>
<td>326</td>
<td>100</td>
</tr>
</tbody>
</table>
4.5.2 **Teaching on net use at the net source among pregnant women**

Nearly a half of the respondents 154 (47.2%) reported to have received some teaching on effective bed net use from the bed net source. Just over half of the pregnant women (52.8%) had not been taught how to use the bed nets effectively, from the net source (Table 4.9). It is noted that teaching was found to be significantly associated with ITNs use ($\chi^2=11.196$, df=1, $P=0.001$). Thus, of the 154 pregnant women who had been taught how to use the bed nets, 145 (94.2%) were using ITNs. This was more than 141 (82.0%) out of 172 respondents who had not been taught how to use the bed nets, who were using ITNs.

4.5.3 **Net age and retreatment among pregnant women in Msambweni district**

Most of the bed nets were 1-2 years old 215 (66.0%), over a quarter 85 (26.1%) were 3-4 years old and only 26 (8.0%) were more than 4 years. Net age in years was significantly associated with ITNs use ($\chi^2=5.914$, df=2, $P=0.052$). ITNs use was higher among 1-2 years old 190 (88.4%) than among the over 4 years old bed nets 19 (73.1%).

Just over a half of the respondents 170 (52.1%) reported to have retreated bed nets with an insecticide for effective use while about a half of them 156 (47.9%) had not retreated their bed nets since acquisition (Table 4.9). Bed net retreatment was found to be significantly associated with ITNs use ($\chi^2=25.213$, df=1, $P=0.000$). Of 170 respondents who reported to have retreated bed nets, 164 (96.5%) were using ITNs. Also, of the 156 respondents who reported to have retreated bed nets, 122 (78.2%) were using ITNs.
4.5.4 Household head promotion on net use among pregnant women

Majority of the respondents 405 (95.1%) reported that their household heads encouraged the use of ITNs while only 21 (4.9%) did not (table 4.9). Bed net use promotion by household heads was found to be significantly associated with ITNs use ($\chi^2=5.901$, df=1, $P=0.015$). Of 405 respondents who reported that their household heads encouraged the use of ITNs, 277 (68.4%) were using ITNs. Of 21 respondents who reported that their household heads did not encourage the use of ITNs only 9, (42.9%) were using ITNs.

| Table 4.9 The influence of teaching, retreatment and household head promotion on ITNs use |
|------------------|------------------|------------------|------------------|------------------|
| Variable         | Frequency        | Significance     |
|                  | N       | %   | ITN use | Nonuse    | $\chi^2$ | df  | $P$  |
| Teaching on use  |                     |                 |         |           |         |     |      |
| Yes              | 154     | 47.2| 145(94.2)| 9(5.8)   | 11.196   | 1    | 0.001|
| No               | 172     | 52.8| 141(82.0)| 31(18.0) |           |     |      |
| Totals           | 326     | 100 | 286(87.7)| 40(12.3) |           |     |      |
| Net age          |                     |                 |         |           |         |     |      |
| 1-2 years        | 215     | 66.0| 190(88.4)| 25(11.6) | 5.914    | 2    | 0.05 |
| 3-4 years        | 85      | 26.1| 77(90.6) | 8(9.4)   |           |     |      |
| > 4 years        | 26      | 8.0 | 19(73.1) | 7(26.9)  |           |     |      |
| Totals           | 326     | 100 | 286(87.7)| 40(12.3) |           |     |      |
| Net retreatment  |                     |                 |         |           |         |     |      |
| Yes              | 170     | 52.1| 164(96.5)| 6(3.5)   | 25.213   | 1    | 0.000|
| No               | 156     | 47.9| 122(78.2)| 34(21.8) |           |     |      |
| Total            | 326     | 100 | 286(87.7)| 40(12.3) |           |     |      |
| Household head use promotion |                     |                 |         |           |         |     |      |
| Yes              | 405     | 95.1| 277(68.4)| 128(31.6)| 5.901    | 1    | 0.015|
| No               | 21      | 4.9 | 9(42.9)  | 12(57.1) |           |     |      |
| Total            | 426     | 100 | 286(67.1)| 140(32.9)|           |     |      |
4.5.5 Reasons for inconsistent use of bed nets among pregnant women in Msambweni district

Bed nets use frequency included: always (217), sometimes (109) and never (100). The reasons given for not using a bed net always included; hotness 88 (42.1%), lack of ITN 87 (41.6%), sometimes there are no mosquitoes 15 (7.2%), personal decision not to use 1 (0.5%), unaffordability 11 (5.3%), suffocation 2 (1.0%), to use after delivery 1 (0.5%), dislike for ITNs 1 (0.5%), paining ribs 2 (1.0%) and or ITN bad physical state (torn) 1 (0.5%) (table 4.10). There was a significant association between these reasons and ITN use among the pregnant women ($\chi^2=155.160$, df=9, P=0.000). These reasons were grouped into two: ‘lack of net’ (100) and ‘dislike for nets’ (109). These reasons were significantly associated with ITNs use ($\chi^2=146.893$, df=1, P=0.000). Out of 209 respondents who reported inconsistent use, 100 (47.8%) reported not having bed nets and 109 (52.2%) reported dislike for ITNs.
Table 4.10 Reasons for not using ITN always among pregnant women in Msambweni district

<table>
<thead>
<tr>
<th>Non-use reasons</th>
<th>Frequency</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>ITN use</td>
</tr>
<tr>
<td>Hotness</td>
<td>88</td>
<td>42.1</td>
<td>76(36.4)</td>
</tr>
<tr>
<td>No ITN</td>
<td>87</td>
<td>41.6</td>
<td>87(41.6)</td>
</tr>
<tr>
<td>Personal decision</td>
<td>1</td>
<td>0.5</td>
<td>1(0.5)</td>
</tr>
<tr>
<td>No mosquitoes</td>
<td>15</td>
<td>7.2</td>
<td>11(5.3)</td>
</tr>
<tr>
<td>Unaffordable</td>
<td>11</td>
<td>5.3</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>Suffocation</td>
<td>2</td>
<td>1.0</td>
<td>2(1.0)</td>
</tr>
<tr>
<td>Use after delivery</td>
<td>1</td>
<td>0.5</td>
<td>1(0.5)</td>
</tr>
<tr>
<td>Dislike ITNs</td>
<td>1</td>
<td>0.5</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>Paining ribs</td>
<td>2</td>
<td>1.0</td>
<td>2(1.0)</td>
</tr>
<tr>
<td>It is torn</td>
<td>1</td>
<td>0.5</td>
<td>0(0.0)</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>209</td>
<td>100</td>
<td>93(44.5)</td>
</tr>
</tbody>
</table>

*χ²=155.160, df=9, p=0.000*

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
<th>ITN use</th>
<th>Nonuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack ITN</td>
<td>100</td>
<td>47.8</td>
<td>1(1.0)</td>
<td>99(99.0)</td>
</tr>
<tr>
<td>Dislike ITN</td>
<td>109</td>
<td>52.2</td>
<td>92(84.4)</td>
<td>17(15.6)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>209</td>
<td>100</td>
<td>93(44.5)</td>
<td>116(55.5)</td>
</tr>
</tbody>
</table>

*χ²=146.893, df=1, p=0.000*
CHAPTER 5: DISCUSSION

5.0.1 Introduction
This study aimed at establishing pregnant mother’s knowledge, practices and preferences towards malaria control. The effect of this knowledge, practices and preferences on malaria incidence and ITNs utilization was established. This effect was used to determine the factors which influence ITNs use in pregnancy so as to reduce malaria incidence. Social and demographic characteristics of the respondents were also established and how they affect ITNs use.

5.0.2 Socio-demographic characteristics of pregnant women in Msambweni district
Age, religion, marital status, education level and occupation
Bed net ownership was found to be influenced by age among the respondents. In effect, ITNs use increased with increasing age of the respondents. This was consistent with previous research that participant age significantly causes variation in bed net use ((Alaïi et al., 2003; Ng’ang’a et al., 2009). This could be due to the perception that adolescent girls and primigravidae are at a low risk of getting malaria (Mbonye et al., 2005). Participants in the age group 20-29 years comprised 63.5% of the net owners followed by those aged above 29 years (23.5%) with only 13.0% being 18 or 19 years old. This could be because those above 19 years old were more exposed to bed nets information and information on malaria and its effects on pregnancy. Other studies have indicated that ITN coverage should be as high as possible throughout all age groups (Teklehaimanot et
al., 2007) since sustained ITN use is not associated with rebound mortality among older children (Eisele et al., 2005).

Religion is an important social aspect, influencing a person’s way of thinking and understanding. Like traditionalists, most Christians recognize the importance of seeking professional services for management of health problems. However some Christian based sects believe that healing comes directly from God and thus do not seek medical attention in case of infection. This came out in the study that some respondents do nothing once they are infected with malaria. Such faiths were responsible for ITNs nonuse and increased malaria episodes in the past month a month prior the study despite the much knowledge on malaria diagnosis, treatment and control as established in this study.

It is noted that married pregnant women used ITNs more than the singles may be because they got support from their husbands to acquire and use the nets in addition to that support from their parents. This was consistent with the findings of previous studies where married women were more likely to own a net and sleep under a net the night before the interview compared to single women (Pettifor et al., 2008). Also, children of married mothers and those mothers living with their partners were four times more likely to use mosquito nets compared to children whose mothers were never married (Mugisha & Arinaitwe, 2003) since breadwinners are more likely to receive protection as previously observed in other studies (Sauerborn et al., 1996).
5.1 The status of ITNs use among pregnant women in Msambweni district.

ITNs use was observed in nearly three quarters of the study subjects (67.1%). More importantly, bed net use in previous pregnancies promoted ITNs ownership and use in the current pregnancy. This was consistent with the findings in northwestern Nigeria where net ownership was 27 percent (Renne et al., 2007). This implied that after starting to use a bed net, a pregnant woman might own and use one in the following pregnancies. High bed net ownership of 73.9% was an increase in household ownership of nets and coverage of pregnant women and children under five years in rural areas from the range of 18% to 22% (Tilson, 2007). Current bed net use by pregnant women in Msambweni District was slightly higher (76.1%) than ownership (73.9%) counter to previous research in which among 351 women interviewed at baseline, 115 (33%) already owned a bed net and only 86 (25%) used one (Pettifor et al., 2008).

The percentage of pregnant women using bed nets consistently (always) was higher (50.47%), compared to the findings of a similar survey in Uganda in 2006 where 29 percent of pregnant women slept under a net the previous night (NetMark, 2007). This could be attributed to the 5 million ITNs distributed by PSI/DFID organizations between October 2004 and December 2006 and 3.4 million LLINs distributed by the Kenyan Ministry of Health in 2006 (DOMC, 2008). Current ITNs use by pregnant women in Msambweni District was almost three quarters (67.1%). This was within range of the findings of a community survey of six African countries where use of ITNs in 2004 by pregnant women of reproductive age varied from 32% to 69% (Baume & Marin, 2007). This was below the Roll Back Malaria objectives of 80% coverage (Roll Back Malaria,
2005) and also below the 85% target for President’s Malaria Initiative (WMD, 2008). The percentage of pregnant women using bed nets always was less than 65% of nets owned which reportedly had someone sleeping under them the prior night as in a similar study done in Ethiopia. This could be attributed to the people being from a rural area (Baume, 2007). But the DFID target of at least 60% of pregnant women sleeping under nets, including both rural and urban coverage, by 2006 had been achieved (Tilson, 2007). Since children whose mothers use mosquito nets are more likely to use them and the youngest child is 3.33 times more likely to use a mosquito net than any other (Mugisha & Arinaitwe, 2003), this was a good indicator that bed nets would be used more among the vulnerable groups in Msambweni District.

5.2 The relationship between ITNs use and pregnancy outcome among pregnant women in Msambweni district

Although a larger proportion of live births were observed among those who had used bed nets in the previous pregnancy, there was no significant association between bed net use in the previous pregnancy and the pregnancy outcome noted. It was also noted that a larger proportion of ITNs use was observed among those who had a live birth than among those who had a still birth or miscarriage. There was no significant association between the previous pregnancy outcome and ITNs use in the current pregnancy. This finding could have been due to net use being overcome by other causes of miscarriages such as poor diet and infections during pregnancy.
5.3 The relationship between malaria knowledge and reported malaria episodes among pregnant women

Proper malaria diagnosis is very important in malaria control. This was consistent with past research in which sixty-eight percent of all women reported having been diagnosed with malaria in the past year, of which 88% were self-diagnosed (Pettifor et al., 2008). Age, gravidity and the household head influenced malaria incidence. Malaria incidence was found to increase with increasing age and gravidity of the respondents. Participant age significantly causes variation in bed net use ((Alaii et al., 2003; Ng’ang’a et al., 2009). Since households headed by male and female have similar levels of net ownership (Mugisha & Arinaitwe, 2003) pregnant women were interviewed without their husbands. Respondents from households headed by husbands reported more cases of malaria than those headed by parents. This is because most of the respondents from households headed by parents were of lower age and more taken care of by their parents than those under husbands. Elsewhere, it has been reported that household heads take a bigger role in decision making for the whole family and so when resources are limited the pregnant women may not benefit from health care. This is true since other research findings showed that occupant relationship to household head significantly caused variation in bed net use (Ng’ang’a et al., 2009).

Malaria incidence increased with increasing knowledge on signs and symptoms. This was consistent with past research that malaria knowledge is an important determinant of bed net ownership and use (Opiyo et al., 2007). However, the findings of this study were contrary to what would be expected. Increasing knowledge on malaria signs and
symptoms should reduce malaria incidence as this would lead to high ITNs use among
the respondents. This was counter to other research that there was no significant
difference in the score between the participant level of knowledge on common signs and
symptoms of malaria (Ng'ang'a et al., 2009).

The preventive measures reported to be used by the respondents were bed nets and
others. This was consistent with previous findings that some mothers were using other
forms of mosquito control such as window screens and/ or fans and insecticide spray or
liquid or coils (Renne et al., 2007). The use of bed nets alone or in combination with
other malaria preventive measures among the pregnant women increased ITNs use.
Proper definition of the right qualities of a preventive measure by the pregnant women
was a good indicator for use of ITNs among the study population in Msambweni district.
A statistically significant relationship between reasons for the used malaria preventive
measure and malaria incidence was noted. Malaria incidence increased with knowledge
of right qualities. Respondents with right knowledge were more infected than those
ignorant. This might be because most of the respondents had other underlying issues to
consider using a particular preventive measure. One quality could be missing in the
measure used like the ITNs were found to be used mostly but then they were not effective
enough to reduce malaria incidence or where not used they were unavailable or
unaffordable.
5.4 The relationship between personal preferences for nets and reported malaria episodes among pregnant women.

There was no significant association observed between the preferred source of malaria treatment and malaria incidence. Malaria incidence was not influenced by where the pregnant women sought health care but the proportion of respondents who opted for other sources of health care apart from health facilities was high 137 (32.2%). Nearly three quarters of the study population knew the good qualities of a good health care source as being effective (66.4%), accessible (20.7%) and affordable (11.3%). Very few pregnant women considered beliefs such as demon possession (1.6%). This lack of influence could be attributed to the fact that health care source preference was found also not to influence ITNs use among these respondents.

A significant association was noted between the bed net colour preferred and malaria incidence. This is because most of the respondents reported that they preferred colours which are attractive (44.8%), don’t show dirt fast (31.2%) and are not associated with evil spirits like white (3.1%). Most of these colour qualities are found in blue and since the respondents got the bed net of their choice, they were sensitized to use them the right way thus reducing malaria incidence the previous month. This concurred with findings of a similar study in Ethiopia, where the vast majority of nets owned (84%) were blue in colour (Baume, 2007).

A significant association was noted between the preferred bed net shape and malaria incidence. Malaria incidence was higher among those respondents who preferred
rectangular shaped bed nets than cone shaped ones. This was consistent with other research that participant shape was one of the key potential factors which determined choice, use and acceptance of bed nets (Ng'ang'a et al., 2009). When asked why the respondents preferred a particular bed net shape the following shape qualities were reported in order of decreasing proportions; Ease to mount without wasting time, space and strings and house beauty (45.1%), attractiveness when mounted (16.9%), More space within (16.2%), useable with and or without a bed (15.0%), does not resemble a coffin (1.9%), and available in shops (0.2%). Most of bed net qualities considered for preference favor cone shape. Those respondents using rectangular shaped bed nets could have been more infected because they used the nets inconsistently or ineffectively like sleeping with the head outside the bed net.

5.5 Influence of independent factors on ITNs use among pregnant women in Msambweni district

5.5.1 Household bed nets

Over three quarters of households (88.7%) had at least one bed net, 67.1% at least one ITN and 61.5% had more than one net, this was higher than in 2003 where only 22% households had at least one bed net, 6% at least one ITN and 10% more than one net (CBS, 2003). This was lower than the findings in Ethiopia where 91% of households owned at least one net, and most owned more than one but the average exceeded that of 1.8 nets per net-owning household (Baume, 2007). Many households owned two or more nets, a good indicator that they were most likely found in rural and semi-urban areas. This pattern reflected the focus of free or highly subsidized net distribution in rural areas.
as advocated by PSI/Kenya (Tilson, 2007). Nationwide, household net coverage rose from 22% to 44% between 2003 and 2005. Household net coverage rose to 59%, with half of the homes having treated nets (Ibid). A significant association was noted between the number of bed nets in the household and ITNs use. Higher number of bed nets in the household increases the chance of ITNs use by the pregnant women may be because of net availability. This was consistent with the findings that when the family owned more than one net, others besides the mother and young child were more likely to be protected by a net. Most frequently, these were children aged 5–14 and, in Ghana only, adult men (Baume & Marin, 2007) who in turn protect the pregnant mothers. There was no significant association between the number of household members and ITNs use ($\chi^2=3.452$, df=3, P=0.327). This was counter to previous findings that household size determines net ownership and use (Alaii et al., 2003).

5.5.2 Net treatment and retreatment

Newer bed nets were more likely to be used than older ones since most nets used currently (66.0%) were those less than two years old. This finding was consistent with that of a similar study that newer nets were used more than older ones (Baume & Marin, 2007). This is justifiable since there was no significant difference between the use of ITN of 2–4 years old and non-use of ITN in child mortality control, while ITNs 0-2 years old were most efficacious (Eisele et al., 2005).

Out of 326 bed nets used, a higher percentage was ITNs 286 (87.7%) than untreated bed nets 40 (12.3%). A significant association was found between net treatment and ITNs use
63

$\chi^2=426.000, \ df=2, \ P=0.000$. ITNs use was highest when net had been treated 286 (100.0%). This was consistent with a study done in 2007 where preliminary bivariate analyses showed that treated nets were used more than untreated nets (Baume & Marin, 2007).

Slightly more than half (52.1%) of all bed nets used had been retreated since acquisition. This high retreatment rate could be attributed to the fact that most of the bed nets were received through health facilities where treatment insecticides and procedure were provided. A significant association was found between bed net retreatment and ITNs use. ITNs use was higher where the bed nets had been retreated 164 (96.5%) than where the bed nets had not been retreated 122 (78.2%). Even if ITNs are used correctly, they must be retreated quite often (Winch et al., 1997). The cost of ITN impregnation, regular re-impregnation and the availability of ITNs are determinant factors for use of ITNs in malaria prevention (Lengeler and Snow 1996; Kroeger et al., 2002).

5.5.3 Sources of bed nets

Most of the bed nets were obtained from health facilities (49.4%) and retail shops (45.7%). Other sources included relatives (3.7%) and community aid groups (1.2%). This was consistent with the findings in Northwestern Nigeria where nets sources included special immunization distributions or antenatal clinics, from their husbands and purchasing (Renne et al., 2007). This complied with P.M.I objective that the long lasting nets would be distributed through ante natal clinics and community outreach activities (WMD, 2008). It was noted that ITNs use was highest when the net source was health
facilities, 153 (95.0%), followed by retail shops 123 (82.6%), relatives 8 (66.7%) and community aid groups 2 (50.0%). When bed nets were acquired through health facilities or retail shops there was a high chance of being used by the pregnant women. Since health system and the retail sector are the main actors in bed nets distribution (Hanson et al., 2008), the distribution domains defined to include outcomes that are broader than ITN supply alone (e.g. ANC dissemination of information, education and communication) should be included. Social marketing projects encourage making needed health products available at subsidized prices, through both traditional and nontraditional outlets (e.g. kiosks and market stalls) (Tilson, 2007). This makes retail shops the second major source of bed nets for pregnant women in Msambweni District.

5.5.4 Teaching on net use at the net source

In this study ITNs use was higher among respondents who had received use teaching 145 (94.2%) than those who had not been taught 141 (82.0%). This was counter to the findings of a previous study that with respect to vocational training mothers who are teachers come from households with the highest mosquito net ownership yet children from these households were less likely to always use mosquito nets (Mugisha & Arinaitwe, 2003).

5.5.5 Household head promotion on net use

In this study ITNs use was higher in households where ITNs use was promoted than where there was no use promotion. According to most household heads 374 (87.8%) ITNs should be used for ‘infections prevention’ and ‘to add comfort’ (6.3%). A few of
them did not promote the use either because of ‘ignorance’ or ‘discomfort’. ITNs use was higher among the pregnant women whose household heads reported that ITNs should be used for infection prevention 256 (68.4%) and comfort 21 (67.7%) than ignorance 9 (42.9%). This was consistent with previous research where the reasons cited for using bed nets in most households by the household head significantly caused variation in bed net use (Ng'ang'a et al., 2009).

5.5.6 Reasons for inconsistent use of bed nets among pregnant women in Msambweni district

The respondents who were not using bed nets always (209) reported the reasons for inconsistent use of bed nets; hotness, lack of ITN, sometimes there are no mosquitoes, nets are less than needed, personal decision not to use, unaffordability, suffocation, to use after delivery, dislike for ITNs, paining ribs and or ITN is torn. This was consistent with previous research where some participants cited lack of enough air circulation, nets were torn, lost, given away, the wrong size, dirty and being washed, being used by husband, too hot, or not yet put up as one of the major problems associated with sleeping under bed (Renne et al., 2007; Ng'ang'a et al., 2009).

These reasons were very varied and so were grouped into two: lack of bed nets and dislike for bed nets. Lacking a bed net included lack of any to use may be because the nets were unaffordable, few in number thus being used by different family members depending on priority, or bad physical condition of the net (torn). This was consistent with the findings of a previous study that cost was reported as the reason for not owning a
net by 48% of the 236 women who did not own one (Pettifor et al., 2008) and insufficient number of nets to cover all residents (Iwashita et al., 2010). Dislike for bed nets might be because of hotness, sometimes there being no mosquitoes, suffocation without fresh air or personal decision not to use because of ignorance. Most of those who ‘did not like using ITNs’, 92 (84.4%) were using ITNs even if not consistently. This was consistent with previous data that some people find nets to be hot, difficult to hang or ill-suited to the sleeping place, or believe themselves protected by other means such as coils or aerosols (Baume & Marin, 2007). Often, there was no single reason for inconsistent or non-use of bed nets. But the reasons overlapped or were interrelated. For example, a net could be torn and no money to buy a new one, but there could be little motivation to use it since the family had not had malaria disease and there were few mosquitoes over the pregnancy period. Because answers were qualitative, there were no percentages associated with them. Following were barriers to optimal bed net use among the pregnant women in Msambweni District:

1. **Perception that malaria is not a problem**

Despite the level of knowledge about malaria (61.7%) some pregnant women said that ‘nets are needed only after the rains when there are many mosquitoes’ and knowing that mosquitoes cause malaria may inadvertently discourage net use in seasons of low mosquitoes.

2. **Perception that ITNs have lost their effectiveness**

Because ITNs initially show dramatic and visible results in killing insects in contact, their diminishing knock-down rate over time is perceived as a sign of ineffectiveness. “No longer effective” was a recurrent theme among some pregnant women as some nets were
torn and others were being used at less than two years since acquisition. Pre-treated nets (not LLINs) from health centers two years old may be no longer effective. Even if the long-lasting KO-Tab 1-2-3® was used, the nets treated with it will be at or near expiration.

3. Difficulty in mounting nets

Some pregnant women preferred cone shaped bed nets to rectangular ones, which are easier to hang in most houses. Rectangular bed nets usually require extra rope for reaching an attachment point which is often difficult to find. It is especially difficult to find four hanging points for a rectangular net and enough space for more than one net.

4. Misinformation and lack of information

Some respondents had been given some information about effective net use at the net source (47.2%) and sometimes they were given incorrect information depending on the net source. Some said that nets should be used when there are many mosquitoes, when cold and during rainy season and by children and pregnant women alone. Some said they would use net once they gave birth and not in pregnancy. Some feared suffocation inside a net and were uncomfortable. Others got wrong information from their religious leaders that 'nets are European and not African' and 'bed nets are not accepted' and others were just ignorant about ITNs. These beliefs and attitudes limit ITNs use among pregnant women making malaria campaigns unsuccessful. Since the study involved the views of the spouses, household heads and religious leaders the reasons for ITNs nonuse could be generalized to the whole community.
CHAPTER 6: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of findings

ITN use was determined by the report of sleeping under an insecticide-treated bed net which was confirmed by direct observation at night. ITN utilization level was 67.1%. Although most of the respondents used bed nets, a considerable number (32.9%) were not using ITNs and 32.5% of the users they were inconsistent. This implies there is need to increase ITN use among the pregnant mothers and cater for the reasons which hinder consistent use. Several factors were investigated to ascertain if they had any influence in the development of ITN use inconsistence.

Education level of both the pregnant mothers and their household heads, occupation, religion, marital status, number of bed nets per household, net ownership, net use before previous delivery, net treatment and retreatment, net use teaching at the source, net age, presence of side effects in the nets, mounting knowledge and household head promotion on net use were found to influence ITN utilization among pregnant mothers.

When asked why the respondents were not using an ITN completely or always, the following reasons were cited; hotness, lack of ITN, personal decision not to use one, unaffordable, sometimes there are no mosquitoes, suffocation and dislike for ITNs. Some of these findings are facts while others are myths and such should help in improving programs for ITN use.
6.2 Conclusions

Based on the results of this study the following conclusions were drawn:

1. The proportion of pregnant women using ITNs was 67.1%. ITNs use is a challenge among pregnant mothers since 32.9% of the 426 pregnant women were not using ITNs and 32.5% of 286 who were using ITNs used them inconsistently.

2. There was no significant association between ITN use and reported pregnancy outcome among pregnant women in Msambweni district.

3. Pregnant mothers in Msambweni district had good general knowledge of signs and symptoms, prevention and source of treatment for malaria. Malaria knowledge increased ITNs use among the respondents but it did not reduce the number of reported malaria episodes.

4. A significant association was noted between personal preferences such as bed net shape and colour and reported malaria episodes. Malaria incidence was lower among those respondents who preferred cone shaped bed nets and blue colored bed nets.

5. Factors that influence ITNs utilization included: malaria knowledge, individual practices and personal preferences.
6.3 Recommendations

Based on the findings of this study, the following recommendations were made:

For policy making and planning

1. The public and private health stakeholders should ensure sustainable availability and accessibility of ITNs among the pregnant women.

2. The Ministry of public health and sanitation and other health stakeholders need to work more in health advocacy to increase malaria knowledge and change incorrect beliefs and practices on malaria and ITNs among pregnant women. This should be done in targeted parts of the country to assuage fears and encourage ITNs use in combination with other malaria preventive measures.

3. The government should consider individual practices and personal preferences for bed nets such as bed net shape and colour among different communities before supplying ITNs to pregnant women.

For further research

A similar study should be carried out in other areas where ITNs use compliance is compromised among pregnant women to establish their practices and preferences on ITNs.
REFERENCES


National Institute on Allergies and Infectious Diseases (2008). Malaria – Basic Biology. USA.


World Health Organization (2004). World Health Organization Expert Committee on malaria. Twentieth report, Experts Committee reports on Malaria – Ch. 8

APPENDICES

Appendix 3.1

FOMU YA KUFAHAMISHA IDHINI KW A WANAWAKE WAJAWAZITO

*Mada:* Utafiti kahusu mambo yanayoathiri matumizi ya neti zilizotibiwa na dawa ya kuzuia wadudu miongoni mwa wanawake wajawazito katika wilaya ya Msambweni.

*Mtafiti mkuu:* Phyllis M. Mutemi (B.Sc.)

Kwa mama,
Umekaribishwa katika utafiti wa matumizi ya neti zilizotibiwa na dawa ya kuzuia wadudu. Utafiti huu unalenga kutafuta sababu zinazoathiri matumizi ya neti kupitia mahojiano. Umeulizwa kwa unyenyekevu kujibu maswali kwa usahihii (ukweli) na kwa kujitolea. Tafadhali kubali kushiriki.

Nimeelezwa kuhusu utafiti huu na nimejibiwa maswali nikatosheka. Ninakubali kushiriki kwenye utafiti huu.

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Appendix 3.2

INFORMED CONSENT FORM FOR PREGNANT WOMEN

Title: A cross-sectional study on factors influencing utilization of insecticide treated nets among pregnant women in Msambweni District.

Principal investigator:
Phyllis M. Mutemi (B.Sc.)

Dear mother,
You are invited to participate in a research project on insecticide-treated nets’ utilization. The study aims to establish the factors influencing ITNs use through interviews. You are kindly requested to answer the questions truthfully and voluntarily. Please consent to participate.

I have been explained to about this study, and answered all my questions satisfactorily. I consent to participate.

Participant’s Signature

Participant’s Name
Date: DD/MM/YY

Investigator’s Signature

Investigator’s Name
Date: DD/MM/YY

Principal Investigator’s Signature

Principal Investigator’s Name
Date: DD/MM/YY
Appendix 3.3

MASWALI JUU YA MATUMIZI YA NETI ZILIZOTIBIWA NA DAWA YA KUZUIA WADUDU KATI YA WANAWAKE WAJAWAZITO KATIKA WILAYA YA MSAMBWENI

Nambari ya Mshiriki (Kitambulisho) / / / / / / Tarehe / / / / / /
Tarafa: ___________________ Kata ___________________ Kijiji ________________

KITENGO A TAKWIMU ZA KIJAMII

1. Umri? Miaka __
2. Mimba hii ina muda gani sasa? Miezi __
3. Kabila?
   [ ] Digo
   [ ] Duruma
   [ ] Kamba
   [ ] Nyingine (Bainisha) ____________________________
4. Kazi?
   [ ] Mke nyumbani
   [ ] Mwajiriwa (kama mwalimu)
   [ ] Mwanabiashara (kama muuza samaki)
   [ ] Nyingine (Bainisha) ____________________________
5. Dini?
   [ ] Mwislamu
   [ ] Mkristo
   [ ] Nyingine (Bainisha) ____________________________
6. Hali yako ya ndoa?
   [ ] Nimeolewa
   [ ] Sijaolewa
   [ ] Nimetalakiwa
   [ ] Mjane
   [ ] Nyingine (Bainisha) ____________________________
7. Kiwango chako chajuu cha elimu?
   [ ] Sijasoma
   [ ] Msingi wa chini
   [ ] Msingi wa juu
   [ ] Upili
   [ ] Polytechnic
   [ ] Ngumbaru
   [ ] Kingine (Bainisha) ____________________________
8. Nani kiongozi wako wa nyumbani?
   [ ] Mwenyewe
   [ ] Bwana
   [ ] Mzazi/ Wazazi
   [ ] Wengine (Bainisha)

9. Kiwango chake cha juu cha elimu?
   [ ] Hajasoma
   [ ] Msingi wa chini
   [ ] Msingi wa juu
   [ ] Upili
   [ ] Polytechnic
   [ ] Ngumbaru
   [ ] Kingine (Bainisha)

10. Watu wangapi wako katika nyumba/ familia yako? __
11. Una neti ngapi zilizotibiwa na dawa ya kuzuia wadudu katika nyumba yako? __
12. Hii ni mimba ya ngapi?
   [1] Ya kwanza
   [2] Zingine (bainisha) __

13. {Kama 12 – (2)}: Ni watoto wangapi ulizaa wakiwa hai?
14. {Kama 12 – (2)}: Ulikuwa ukitumia neti iliyotibiwa kabla kujifungua mtoto wa mwisho?
   [ ] Ndiyo
   [ ] La

15. {Kama 12 – (2)}: Kujifungua kwa mwisho kulikuwaje?
   [ ] Mtoto aliyehai
   [ ] Mtoto aliyefariki
   [ ] Mimba ilitoka/ haribika

KITENGO B MATUMIZI YA NETI ZILIZOTIBIWA SASA

16. Je, una neti iliyotibiwa?
   [1] Ndiyo
   [2] La

17. Mara ngapi wewe hutumia neti iliyotibiwa na dawa ya kuzuia wadudu kitandani?
   [1] Hutumia neti wakati wote
   [2] Hutumia neti wakati mwingine
   [3] Situmii neti kamwe

18. {Kama 17 – (2) au (3)}: Kwa nini hutumii neti wakati wote? _____________

19. {Kama 17 – (1) au (2)}: Umekuwa ukitumia neti kwa muda gani? Miezi __
20. {Kama 16 – (1)}: Ulipata neti yako wapi?
   [1] Hospitali
   [2] Kununua
   [3] Nyingine (bainisha) ________________
21. **Kama 20 – (1)**: Ulipewa neti ulipozuru hospitali mara ya ngapi?
   - Mara ya kwanza
   - Mara ya pili
   - Mara ya tatu
   - Nyingine (bainisha) ______________________

22. **Kama 16 – (1)**: Ulipata neti yako bure?
   - [1] Ndiyo
   - [2] La

23. **Kama 22 - (2)**: Ulilipa pesa ngapi? KShs __ __

24. **Kama 16 – (1)**: Neti yako ina umri gani? Miaka __ Miezi __

25. **Kama 16 – (1)**: Neti yako imetibiwa na dawa ya kuzuia wadudu?
   - [ ] Ndiyo
   - [ ] La
   - [ ] Sijui

26. **Kama 16 – (1)**: Umewahi kuitibu neti yako tangu ulipoipata?
   - [ ] Ndiyo
   - [ ] La
   - [ ] Sijui

27. **Kama 16 – (1)**: Ulifundishwa namna ya kuitumia neti yako mahali ulipoipata?
   - [ ] Ndiyo
   - [ ] La

---

**KITENGO CUZI WA MALARIA NA MATUMIZI YA NETI ZILIZOTIBIWA**

28. Umewahi kuugua ugonjwa wa Malaria?
   - [ ] Ndiyo
   - [ ] La

29. Unajua ishara na dalili gani za Malaria?
   - [ ] Kuumwa na kichwa
   - [ ] Joto
   - [ ] Kutapika na kichefuchefu(kuchafuka kwa moyo)
   - [ ] Maumivu ya viungo na mgongo
   - [ ] Kupoteza hamu ya chakula
   - [ ] Kuharisha
   - [ ] Nyingine (bainisha) ______________________

30. Ukiugua Malaria, hufanya nini kwanza?
   - [ ] Kwenda hospitali
   - [ ] Nunu madawa dukani
   - [ ] Kumwona mganga wa mitishamba/ daktari wa kitamaduni
   - [ ] Nyingine (bainisha) ______________________

31. Kwa nini unachagua aina hii ya matibabu? ______________________
32. Unakinga Malaria vipi kwa nyumba yako?
   [ ] Kunywa madawa ya kinga kadiri ilivyowekwa
   [ ] Dawa ya kunyunyiza (sprays)
   [ ] Dawa ya Mbu (mosquito coil)
   [ ] Mafuta ya kujiipaka kufukuza mbu
   [ ] Chandarua/ neti
   [ ] Kinga za kimazingira
   [ ] Nyingine (bainisha)

33. Kwa nini unatumia kinga hii?

34. Kinga hii ina madhara yoyote kwa watu wa familia yako?
   [ ] Ndiyo (gani ?)
   [ ] La
   [ ] Sijui

35. Ni linii bora zaidi kutumia neti zilizotibiwa na dawa ya kuzuia wadudu?
   [ ] Wakati wa mimba
   [ ] Wakati wa mvua
   [ ] Utotoni (chini ya miaka mitano)
   [ ] Nyingine (bainisha)

36. Unajua kuwamba/ kutengeneza neti kwa matumizi mazuri?
   [ ] Ndiyo
   [ ] La

37. Je, neti zilizotibiwa zina manufaa gani?
   [ ] zinazuilia bughudha za mbu
   [ ] zinazuilia kuenea kwa Malaria
   [ ] Zinazidisha ufaragha katika chumba cha kulala
   [ ] Nyingine (bainisha)

KITENGO D NIA NA DESTURI KATIKA MATUMIZI YA NETI ZILIZOTIBIWA

38. Wewe unapenda rangi gani ya neti iliyotibiwa?
   [ ] Nyeupe
   [ ] Samawati
   [ ] Kijani kibichi
   [ ] Rangi ya machungwa
   [ ] Nyingine (bainisha)

39. Kwa nini unapenda rangi hii?
40. Unapendelea umbo gani la neti zilizotibiwa?
   [ ] Pia (cone)
   [ ] Mraba (rectangular shape)
41. Kwa nini unapendelea umbo hili?

42. Dini yako inapendekeza matumizi ya neti zilizotibiwa?
   [ ] Ndiyo
   [ ] La

43. Kwa nini?

44. Matumizi ya neti zilizotibiwa yanahimizwa katika nyumba yako?
   [ ] Ndiyo
   [ ] La

45. Kwa nini?

46. Ukipata neti nyumbani mwako, ni nani aghalabu aitumie neti hiyo?
   [ ] Mwenyewe
   [ ] Bwana
   [ ] Wazazi
   [ ] Mtoto/ watoto
   [ ] Mwengine (bainisha)

Sahihi ya mtafiti

Jina la mtafiti

Tarehe

Sahihi ya mtafiti mkuu

Jina la mtafiti mkuu

Tarehe
Appendix 3.4

INTERVIEW SCHEDULE ON ITNs USE AMONG PW IN MSAMBWENI DISTRICT

Participant I.D. No. __/__/__/__ Date __/__/__/__
Division________________ Location________________ Village________________

SECTION A Demographics

1. Age? __ Years
2. How old is your pregnancy now? __ Months
3. Ethnic group
   [ ] Digo
   [ ] Duruma
   [ ] Kamba
   [ ] Other (specify) __________________________
4. Occupation?
   [ ] House wife
   [ ] Employed (professional e.g. teacher)
   [ ] Business woman (e.g. fish seller)
   [ ] Others (specify) __________________________
5. Religion?
   [ ] Muslim
   [ ] Christian
   [ ] Other (specify)
6. Marital status:
   [ ] Married
   [ ] Single
   [ ] Divorced
   [ ] Widowed
   [ ] Other (specify) __________________________
7. Your highest level of education?
   [ ] None
   [ ] Lower primary
   [ ] Upper primary
   [ ] Secondary
   [ ] Polytechnic
   [ ] Adult education
   [ ] Other (specify) __________________________
8. Who is your household head?
   [ ] Self
   [ ] Husband
   [ ] Parent(s)
   [ ] Other (specify relationship) __________________________
9. Head of household’s highest level of education?
   [ ] None
   [ ] Lower primary
   [ ] Upper primary
   [ ] Secondary
   [ ] Polytechnic
   [ ] Adult education
   [ ] Other (specify) __________

10. How many persons are there in your household? __
11. How many ITNs are there in your household? __

12. How many pregnancies have you had?
   [1] First
   [2] Other (specify) __

13. {If 12 - [2]}: How many living children have you given birth to? __

14. {If 12 - [2]}: Were you using ITNs before the last delivery?
   [ ] Yes
   [ ] No

15. {If 12 - [2]}: How was your last delivery?
   [ ] Live birth
   [ ] Stillbirth
   [ ] Miscarriage

SECTION B Current ITNs usage

16. Do you have an ITN?
   [ ] Yes
   [ ] No

17. How often do you use an ITN?
   [1] I use a net Always
   [2] I use a net some times
   [3] I don’t use net at all

18. {If 17 - [2] or [3]}: Why haven’t you been using it always?

19. {If 17 - [1] or [2]}: For how long have you been using the net in this pregnancy?
   __ Months

20. {If 16 - [1]}: From where did you get your net?
   [1] Health facility
   [2] Buying
   [3] Others (specify)

21. {If 20 - [1]}: On which visit did you get your net?
   [ ] First visit
   [ ] Second visit
   [ ] Third visit
   [ ] Other (specify) __
22. {If 16 - [1]}; Did you get your net for free?
   [1] Yes
   [2] No

23. {If 22 - [2]}; How much did you pay for it? KShs _ _ _ _

24. {If 16 - [1]}; How old is your net? _ _ Years _ _ Months

25. {If 16 - [1]}; Is the net treated with an insecticide?
   [ ] Yes
   [ ] No
   [ ] I don’t know

26. {If 16 - [1]}; Have you ever re-treated the net since you got it?
   [ ] Yes
   [ ] No

27. {If 16 - [1]}; Were you taught how to use the net from where you got it?
   [ ] Yes
   [ ] No

SECTION C Knowledge on malaria and ITNs use

28. Have you ever suffered from malaria?
   [ ] Yes
   [ ] No

29. What signs and symptoms of malaria do you know?
   [ ] Headache
   [ ] Fever
   [ ] Vomiting and nausea
   [ ] Joint and back pain
   [ ] Poor appetite
   [ ] Diarrhea
   [ ] Others (specify) ____________________________

30. If you fall sick with malaria what do you do?
   [ ] Go to health facilities
   [ ] Buy medicines form retail shops
   [ ] See a traditional healer/ herbalist
   [ ] Others (specify) ____________________________

31. Why do you choose this source of treatment? ____________________________

32. How do you prevent malaria in your household?
   [ ] Chemoprophylaxis (Preventive doses of anti-malarial)
   [ ] Sprays
   [ ] Mosquito coils
   [ ] Repellents
   [ ] Bed nets
   [ ] Environmental measures
   [ ] Others (specify) ____________________________
33. Why use this prevention?

34. Does this method have any side effects on the family members?
   [ ] Yes
   [ ] No
   [ ] I don't know

35. When is it necessary to use ITNs?
   [ ] When pregnant
   [ ] During rainy seasons
   [ ] In childhood (below 5 years of age)
   [ ] Other

36. Do you know how to mount the net for effective use?
   [ ] Yes
   [ ] No

37. What are the benefits of using an ITN?
   [ ] It prevents mosquito nuisance
   [ ] It prevents malaria transmission
   [ ] It offers additional privacy in the bedroom?
   [ ] Others (specify)

SECTION D Attitudes and practices on ITNs use

38. What color of ITNs do you prefer?
   [ ] White
   [ ] Blue
   [ ] Green
   [ ] Orange
   [ ] Other (specify)

39. Why prefer this color?

40. What shape of ITN do you prefer?
   [ ] Cone shape
   [ ] Rectangular shape

41. Why prefer this shape?

42. Does your religion encourage ITNs use?
   [ ] Yes
   [ ] No

43. Why?

44. Is net use encouraged in your household head?
   [ ] Yes
   [ ] No

45. Why?

46. When you acquire a net in your household who is most likely to use it?
   [ ] Self
   [ ] Husband
   [ ] Parents
   [ ] Child/Children
   [ ] Others (specify)
Appendix 3.5 Map of Msambweni District, Kenya

Source: District Development office (2008)
This is to certify that:
Prof./Dr./Mr./Mrs./Miss PHTLLIS_MULI
MUTEMI, of (Address) KENYATTA UNIVERSITY
P.O. BOX 45844 NAIROBI
has been permitted to conduct research in
MSAMBWENI Location,
KWALE District,
COAST Province,
on the topic FACTORS INFLUENCING
UTILIZATION INSECTICIDE TREATED
NETS IN MALARIA CONTROL AMONG
PREGNANT WOMEN IN MSAMBWENI DIVISION
KWALE DISTRICT
for a period ending 30th APRIL, 2008.

Research Permit No. MOST13/001/37C 7.35
Date of issue... 5th NOVEMBER, 2007
Fee received... Shs 500

Signed... M.O. ONDIEKI
Applicant's
Permanent Secretary
Signature
Ministry of
Education
Science and Technology
MINISTRY OF SCIENCE AND TECHNOLOGY
Dear Sir/Madam,

RE: INTRODUCTION OF AN MPH KENYATTA UNIVERSITY STUDENT AT MSAMBWENI DISTRICT HOSPITAL – PHYLLIS M. MUTEMI

The above named student is undertaking a study on “The factors influencing utilization of Insecticide treated nets in malaria control among pregnant women in Msambweni Division, Kwale District, Kenya” within the hospital for her Masters course.

Kindly allow her to work with the necessary departments to acquire the required data. Please accord her the necessary assistance.

Yours faithfully,

Dr. Eric M. Muchiri
Head,
DIVISION OF VECTOR BORNE DISEASES
Phyllis Muli Mutemi  
Kenyatta University  
P.O. BOX 43844  
NAIROBI

Dear Madam,

RESEARCH AUTHORISATION

Following you application to conduct research on: "Factors influencing utilization of insecticide treated nets in malaria control among pregnant women in Msambweni Division Kwale District", this is to inform you that you have been authorized to conduct research in Msambweni in Kwale District for a period ending 30th April, 2008.

You are advised to report to the District Commissioner and the District Education Officer Kwale District before embarking on your research.

On completion you are expected to submit two copies of your research report to this office.

Yours faithfully,

M. O. ONDEKI  
FOR: PERMANENT SECRETARY

CC: The District Commissioner  
Kwale District  
The District Education Officer  
Kwale District

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KENDCOM COMMISSIONER Msambweni

The research report due on 28/02/2008

DMDH

KENDCOM COMMISSIONER Msambweni

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Noted 26.02.08