HOUSEHOLD OWNERSHIP AND USE OF INSECTICIDE-TREATED NETS AMONG SCHOOL CHILDREN IN AKINYELE LOCAL GOVERNMENT AREA OYO STATE, NIGERIA.

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MATRIC NUMBER: 173401

B.Sc. Microbiology (PORT HARCOURT)

A DISSERTATION SUBMITTED TO THE DEPARTMENT OF EPIDEMIOLOGY AND MEDICAL STATISTICS, FACULTY OF PUBLIC HEALTH, COLLEGE OF MEDICINE, UNIVERSITY OF IBADAN IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH (FIELD EPIDEMIOLOGY) OF THE UNIVERSITY OF IBADAN

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DEDICATION

This project work is dedicated to the Almighty God who gave me a new birth in Christ Jesus as tool in His hand in this end time.

ABSTRACT

In order to combat the burden of malaria, different strategies including Insecticide Treated Nets (ITNs) have been put in place. Several ITNs have been distributed with support from international donors and this necessitates an increase in monitoring and evaluation efforts in order to determine its impact as well as prioritize future programmes. The current standards for estimating impact indicators of ITNs are household surveys such as the Demographic Health Surveys (NDHS) and Malaria Indicator Surveys (MIS) which are expensive and are not conducted frequently enough. Collecting information from school children has been found to be a cheap and fast means for routine monitoring and evaluation of malaria control programmes in some sub-Saharan African countries. The study was conducted to explore school children's report of household ownership and use of ITNs in Akinyele Local Government Area (LGA), Oyo State, Nigeria.

A cross-sectional survey was conducted. A three-stage sampling technique was employed to select 611 pupils from 15 out of 88 primary schools in three selected Wards within the LGA. Information on pupils' socio-demographics, knowledge about malaria prevention methods, report of household ownership and use of ITNs were obtained using a semi-structured interviewer-administered questionnaire. Data was analysed using descriptive statistics and Chi-square. Level of significance was set at 5%.

Respondents' mean age was 10.5±1.7 years; 73.6% were within age 10-13 years; 52.7% were females, 84.6% were Yoruba and 65.3% had under-five children in their households. About a third of the pupils' mothers were reported attained secondary education. Almost all the respondents were aware about malaria. Common symptoms of malaria mentioned were head ache 52.2% and fever 46.3%. The least mentioned symptom was vomiting (13.9%). Sixty six percent of the respondents mentioned mosquito bite as the cause of malaria. Majority (67.6%) of the respondents identified under-five children as the group most vulnerable to malaria. The major sources of malaria prevention information mention are radio 46.0%, mother (36.6%) and teacher (35.7%). Overall, (87.7%) of the respondents had good knowledge about malaria and its prevention. Seventy four percent of the respondents mentioned mosquito nets as the best

protective measure against malaria. The other protective measures against mosquito bite stated are keeping surrounding clean 34.7%, mosquito coil (26.4%), closing windows and doors (25.5%), insecticide spraying (8.0%). Most, (81.7%) of the respondents reported household ownership of at least one ITN. Majority of the respondents (76.4%) reported obtaining ITNs from mass distribution campaigns. eighty nine percent of the respondents reported household use of ITNs by member the night preceding the survey. More than half, (51.6%) of the respondents reported ITN use by under-five children. Class was significantly associated with knowledge about malaria and its prevention (χ^2= 19.223, p < 000) and reported household ownership of ITNs (χ^2= 9.217, p <0.010).

Many of the pupils were knowledgeable about malaria although there were misconceptions about the causes and symptoms of malaria. Majority of the pupils could report household ownership and use of ITNs. They should be considered a potential medium to monitor ITNs ownership and use.

Keyword: Pupils, malaria, ITNs, monitoring, evaluation

Word count: 498

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Justina Ucheojor

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CERTIFICATION

I hereby certify that this research work was carried out by Onwuka, Justina Ucheojor in the Department of Epidemiology and Medical Statistics, Faculty of Public Health, College of Medicine, University of Ibadan, Ibadan, Nigeria.

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LIST OF ACRONYMS

ACT	-	Arteminsinin-Based Combination Therapy
DPT	-	Diphtheria Pertussis and Tetanus
FMoH	-	Federal Ministry of Health
IPT	-	Intermittent Preventive Treatment
ITNs	-	Insecticide Treated Nets
LGA	-	Local Government Area
LLIN	-	Long Lasting Insecticide Nets
MAPs	-	Malaria Action Programme for states
M&E	-	Monitoring and Evaluation
MIS	-	Malaria Indicator Survey
NIAID	-	National Institute of Allergy and Infectious Diseases
NDHS	-	National Demographic and Health Survey
NMCP	-	National Malaria Control Programme
RDT	-	Rapid Diagnostic Test
RMB	-	Roll Back Malaria
UN	-	United Nations
USAID	-	United States Agency for International Development
WHO	-	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

Malaria remains a major public health problem globally, with highest morbidity and mortality in sub-Saharan African countries. Children under-five years of age and pregnant women are the most vulnerable group of the disease (WHO, 2013). Malaria is endemic in Nigeria, with year round transmission (NDHS, 2013).

The National Malaria Control Programme (NMCP) as well as international partners, with the Roll Back Malaria (RBM) goal to reduce malaria related mortality by 50 percent, are combating the disease burden using different strategies including vector control (indoor residual spraying, insecticide-treated nets (ITNs)), prompt and effective treatment, and intermittent preventive treatment (WHO, 2013). Of the several vector control measures available, ITNs have been found to be very effective protecting those sleeping under it and those around it. ITNs have also been shown to reduce under-five mortality in malaria-endemic areas in sub-Saharan Africa by about 20 percent (Lengeler, 2004).

With the current RBM objective to reduce global malaria deaths to near zero cases by 75 percent by the end of 2015 (RBM, 2015), several ITNs have been distributed following the Abuja summit set target of achieving 60 percent coverage among vulnerable population at risk of malaria (WHO, 2000) with support from international donors. The roll back malaria partnership has a goal to achieve 80 percent coverage of ITNs among under-five children and pregnant women (RBM, 2010). The global malaria strategic plan also recommends rapid scale-up of universal population coverage for all the people at risk for malaria (RBM: Global Malaria Strategic Plan, 2008). This scale-up in ITN delivery necessitates an equivalent increase in monitoring and evaluation (M&E) efforts in order to determine the impact of ITN distributions as well as prioritize future programmes (Eng, Vanden, Thwing, Wolkon, Kulkarni, Manya, Erskine, and Slutsker, 2010). The current standard for estimating impact indicators of ITNs are household surveys, but their complexity and expense preclude frequent and decentralized monitoring (Brooker, Kolaczinski, Gitonga, Noor, and Snow, 2009). The household

surveys include Demographic and Health Surveys (DHS) and Malaria Indicator Surveys (MIS), all requires enormous human and financial resources (Takem, Affara, Amambua-Ngwa, Okebe, Ceesay, Jawara, and D'Alessandro, 2013). However, studies in some African countries have shown that collecting information from school children can be a complementary, inexpensive framework for planning, monitoring and evaluating malaria control in Africa (Brooker *et al.*, 2009; Stevenson *et al.*, 2013; Takem *et al.*, 2013). Therefore there is need to explore the assessment of household ownership and use of ITNs using cheap and relatively fast method.

1.2 Statement of the problem

In 2012, malaria accounted for about 207 million cases and 627,000 deaths worldwide, of which over 80% of cases and 90% of the deaths occurred in sub-Saharan Africa where malaria is endemic. Malaria is transmitted throughout Nigeria, accounting for over 40% of the estimated cases and deaths globally (WHO, 2013).

Pregnant women and children under-five years of age are the most at risk of malaria-related mortality and morbidity, especially in areas of stable transmission. It is estimated that 77% of all deaths due to malaria occur among children under-five years of age, and in sub-Saharan Africa, malaria is responsible for about 15% of all deaths among children under-five (WHO,2013). However, malaria also remains one of the biggest killers of school age children, estimated to cause up to 50% of all deaths in this age group in Africa (Brooker 2009). They are the age group most commonly infected with malaria parasites which are usually asymptomatic, so go undetected and thus never get treated. If untreated, these infections can result in anemia and reduce children's ability to concentrate and learn in school (Clarke, Jukes, Njagi, Khasakhala, Cundill, Otido, and Brooker, 2008). School age children are also least likely to sleep under a mosquito net (Noor *et al.*, 2009) and thereby are not only themselves the most exposed to malaria risk, but also contribute to onward malaria transmission to others in the community.

In Nigeria, malaria accounts for 60% of out-patient visits and an estimated 300,000 deaths among children under-five (NDHS 2008). Malaria has been a major barrier to Nigeria's development (Onyido, Obi, Umeanaeto, Obiukwu, and Egbuche, 2011) contributing 11% to maternal mortality and 30% under-five mortality and also places

severe social and economic burdens on the country as a whole with about 480 billion naira lost to malaria annually in the form of treatment costs, prevention efforts and loss of work time (NDHS 2008; 2013).

There are no health information systems that routinely monitor malaria control programmes including insecticide-treated nets coverage (Ndyomugyenyi and Kroeger 2007). Malaria intervention programmes are often monitored using data from household surveys such as National Demographic Survey (NDHS) and Malaria Indicator Survey (MIS) where young children and pregnant women form the sample (Gitonga, Karanja, Kihara, Mwanje, Juma, Snow, 2010). However, household surveys are expensive, not conducted frequently enough to provide annual estimates of ITN coverage for all countries (WHO, 2013), time consuming, technically complicated to undertake and usually provide information for national intervention coverage thereby requiring important human and financial resources (Brooker *et al.*, 2009).

1.3 Justification

Malaria is both preventable and treatable. The goal of malaria prevention through vector control is to protect individuals against infective malaria bites and reduce the intensity of local transmission at community level. The ITNs are very reliable to achieve this goal since it protects the person sleeping under it (individual level) and extends its effect to an entire area (community level). The impact on preventing malaria morbidity and malaria-related mortality may be minimal if ITNs are not properly and consistently used by vulnerable populations (Eisele, Keating, Littrell, Larsen, and Macintyre, 2009).

The importance of monitoring control efforts cannot be overemphasized. Following the recent achievements in global malaria control, there is increased emphasis on monitoring these achievements so as to determine intervention needs (Ashton, Kefyalew, Tesfaye, Pullan, Yadeta, Reithinger, and Brooker, 2011). Programme managers also need data on a monthly basis (or more frequently), to determine whether control programmes are progressing as intended or whether programme adjustment is necessary (WHO, 2013). Monitoring of these intervention programmes is also important to assess their effectiveness and coverage (Ndyomugyenyi and Kroeger 2007).

Since household surveys are expensive and requires a lot of resources including both human and financial, there is need for alternative and simple method that will enable monitoring at more regular intervals. Studies in some sub-Saharan African countries have shown that schools may be used as a sentinel population for monitoring insecticide-treated nets coverage in order to provide timely information that is relevant to planning, implementation and evaluation (Ndyomugyenyi and Kroeger 2007). However, no study has been conducted in Nigeria for monitoring malaria control programmes except a related study that found that school-based surveys of ivermectin-treatment coverage could complement household surveys (Okeibunor, Abiose, Onwujekwe, Mohamed, Adekeye, Ogungbemi, and Amazigo, 2005). Also, since school-age children are gradually becoming the focus for malaria control (Dicko, Diallo, Tembine, Dicko, Dara, and Sidibe, 2011) and have been increasingly recognized as health messengers for malaria control (Ayi, Nonaka, Adjovu, Hanafusa, Jimba, Bosompem, and Kobayashi, 2010), it is important to know their knowledge of malaria prevention.

This study assessed school children's knowledge about malaria and malaria prevention methods as well as their report of household ownership and use of ITN.

The results from this exploratory study provides information that school children can report on malaria vector control programmes and that they can serve as potential alternative for monitoring and evaluating malaria vector control interventions that is cheap and timely.

1.4 Research Questions

The research questions answered in this study are

1. What is school children's knowledge about malaria prevention methods?
2. Can school children report on ownership/possession and use of ITNs in their households?
3. What is the relationship/ if any, between socio-demographic characteristics and knowledge of school children about malaria and malaria prevention methods and reported ownership of ITNs by respondents?

1.5 Study Objectives

Broad Objective

The broad objective of this exploratory study was to obtain school children's report of household ownership and use of insecticide treated nets (ITNs) and to assess their knowledge about malaria prevention in Akinyele Local Government Area.

Specific Objectives

1. To assess the knowledge of school children about malaria prevention methods.
2. To obtain school children's report of household ownership of ITNs.
3. To obtain school children's report of use of ITNs.
4. To determine the relationship between socio-demographic characteristics and knowledge of school children about malaria and malaria prevention methods.
5. To determine the relationship between socio-demographic characteristics and reported ownership ITNs by respondents.

1.7 Operational Definitions of Terms

Household: A household consists of one or more people who live in the same dwelling and also share at meals or living accommodation, and may consist of a single family or some other grouping of people.

Insecticide-treated nets (ITNs): Refers to nets that have been treated with insecticide and need on-going treatment, or LLINs, which are the most frequently distributed type of net in Nigeria (MIS, 2010).

Insecticide treated nets ownership: Based on reported household ownership of at least one ITN (NDHS, 2013).

Insecticide treated nets use: Refers to the proportion of households in which one or more members of the household reportedly slept under the net the night preceding the study (NDHS, 2010)

Under-five children: Children within 0-59 years.

CHAPTER TWO

LITERATURE REVIEW

2.1 Epidemiology of Malaria

There were 207 million estimated cases of malaria and 627,000 deaths in 2010, out of which about 86% were children under-five years of age and over 90% of deaths occur in African countries, followed by the South-East Asia 6% and Eastern Mediterranean Regions 3% (WHO, 2011). Malaria is prevalent in 106 countries of the tropical and semitropical world, with 35 countries in central Africa bearing the highest burden of cases and deaths. Of the 35 countries that accounted globally for about 98% of malaria deaths, 30 were located in sub-Saharan Africa, with four countries (Nigeria, Democratic Republic of Congo, Uganda and Ethiopia) alone accounting for about 50% of deaths on the continent (WHO, 2010). However, a recent systematic analysis has estimated that the global malaria deaths increased from 995 000 in 1980 to a peak of 1 817 000 in 2004, decreasing to 1 238 000 in 2010. The study estimated more deaths in individuals aged 5 years or older than has been estimated in previous studies: 435 000 deaths in Africa and 89 000 deaths outside of Africa in 2010 (Murray *et al.*, 2012).

Malaria is transmitted throughout Nigeria, accounting for over 40% of the estimated malaria deaths and cases globally (WHO, 2013). Five ecological zones define the intensity and seasonality of transmission and the mosquito vector species; Mangrove swamps, Rain forest, Guinea-savannah, Sudan- savannah and Sahel-savannah. The duration of the transmission season decreases from year round transmission in the south to three months or less in the north. Malaria account for 60% of outpatient visits and 30% of hospitalizations among children under five years of age (NDHS, 2008) and is responsible for an estimated 300,000 deaths in children under five years of age. Malaria also contributes to an estimated 11% of maternal mortality (NMCP, 2008).

The causative agent of malaria is plasmodium, a human parasite. Human malaria is caused by four species of plasmodium: P. falciparum, P. vivax, P. malariae, and P. ovale. However, new specie, P. knowlesi has recently been identified. The parasite first enters the blood stream through the bite of an infected female Anopheles mosquito. As she

feeds, the mosquito injects small amount saliva containing an anticoagulant along with small haploid sporozoites.

Of the four Plasmodia species that infect human beings (*P. falciparum*, *P. vivax*, *P. malariae*, and *P. ovale*), P. falciparum and *P. vivax* cause the significant majority of malaria infections. *P. falciparum*, which causes most of the severe cases and deaths, is generally found in tropical regions, such as sub-Saharan Africa and Southeast Asia, as well as in the Western Pacific and in countries sharing the Amazon rainforest. *P. vivax* is common in most of Asia (especially Southeast Asia) and the Eastern Mediterranean, and in most endemic countries of the Americas (WHO, 2013).

P. vivax is transmitted in 95 countries in tropical, sub-tropical and temperate regions, except where there is a natural absence of anopheles mosquitoes (east of Vanuatu in the South Pacific) or among populations lacking the Duffy receptor on red cells (Baird, 2008). It is only *P. vivax* malaria that occurs in the temperate latitudes up to the Korean peninsula and across the southern temperate latitudes of Asia to the Mediterranean Sea (Baird, 2008). Approximately 2.6 billion people are at risk of infection with *P. vivax* malaria, and the ten countries with the highest estimated population at risk, in descending order, are India, China, Indonesia, Pakistan, Viet Nam, Philippines, Brazil, Myanmar, Thailand and Ethiopia (Guerra, 2009). Estimates of annual infections range from 70 to 390 million, with about 80% occurring in South and Southeast Asia (Hay *et al*, 2004). In eastern and southern Africa, 10% of malaria cases are due to *P. vivax*, whereas it accounts for more than 1% of cases in western and central Africa (Mendis *et al*, 2001). Outside of Africa, *P. vivax* accounts for more than 50% of all malaria cases and about 80-90% of *P. vivax* outside of Africa occurs in the Middle East, Asia, and the Western Pacific and 10-15% in Central and South America (Mendis *et al*, 2001).

P. malariae is wide spread throughout sub-Saharan Africa, much of Southeast Asia, into Indonesia, and on many of the islands of the western Pacific. It is also reported in areas of the Amazon Basin of South America (Collins *et al*, 2007). *P. ovale* is found in Africa and sporadically in Southeast Asia and the Western Pacific. *P. malariae* and *P. ovale* contribute to only a small number of malaria infections, but the incidence of *P. malariae*

is probably underestimated. *P. knowlesi* is a primate malaria species that is being increasingly reported from remote areas of Southeast Asia from countries such as Malaysia, Thailand, Viet Nam, Myanmar and Phillippines (Daneshvar *et al.*, 2009)

2.2 Knowledge about malaria and preventive methods.

Several studies have assessed knowledge of malaria symptoms, causes, risk and preventive methods.

2.2.1 Previous School-Based Studies on Knowledge of Malaria Symptoms, Causes, Risk and Preventive Methods

School age children are gradually becoming the focus of malaria control. A study by Ayi et al. (2010) has shown that school children can be engaged as health messengers for malaria. The study was conducted in Ghana to determine the impact of school-based malaria education intervention, not only on children but also on adult community members. The study found that engaging school children as health messengers influenced community adults to improve their knowledge about the cause of malaria, prevention, and bed net practices. Knowledge is an important prerequisite for instigating behaviour change and could likely inform attitudes about malaria health-related behaviours (Hwang *et al.*, 2010).

2.2.1.1 Knowledge about symptoms of malaria

There are so many studies that have assessed the signs and symptoms of malaria among school children. The common signs and symptoms of malaria that are usually identified by respondents include fever, chills, head ache, vomiting, and feeling cold. A study conducted in Pakistan among school going children indicated that fever (56.15%) was the most common symptom of malaria (Ahmed *et al.*, 2014). Most of the respondents in a study conducted in Calabar, Nigeria were knowledgeable about malaria symptoms with fever (32.8%) recorded as the highest mentioned by the respondents (Eko *et al.*, 2013).

2.2.1.2 Knowledge about the cause of malaria

Several studies have shown that school children's knowledge about causes of malaria is high. However, they still suppose stagnant water, drinking dirty water, hunger, and overwork as causes of malaria Dambhare et al. (2012). A study that assessed knowledge, attitude and practices on malaria prevention among secondary school students of boarding schools in Morogoro District reported that (97.7%) of the respondents knew mosquito bite as a cause of malaria (Balowa, 2006). Studies among adolescents in Cross Rivers State, Nigeria reported that 77% (Udonwa *et al*., 2010) and 85% (Eko *et al*., 2013) of the respondents identified mosquito bite as a cause of malaria. Knowledge about mosquito bite (69.8%) as a cause of malaria was high in a study conducted among school adolescents in India (Dambhare *et al*., 2012). A study conducted in Ibadan, South West Nigeria reported that (89%) of the respondents mentioned mosquitoes as the causative agent of malaria (morenikeji, 2009).

2.2.1.3 Knowledge about the people who are most vulnerable to malaria

The under-five children and pregnant women are the people most vulnerable to malaria disease. Most of the studies among school children did not assess knowledge about the people that are most vulnerable to malaria. However, a study in Cross Rivers State, Nigeria among adolescents recorded that (25.8%) of the respondents felt that children are the most vulnerable to malaria while only (8.7%) of the respondents mentioned pregnant are also vulnerable to malaria (Eko *et al*., 2013).

2.2.1.4 Sources of information about malaria and malaria prevention

The sources of information about malaria by different studies varied. A Study conducted in Nigeria by Udonwa et al. (2010) reported radio (33.8%) as the highest source of malaria information and a study conducted also in Ethiopia by Debela et al. (2014) reported radio (42.2%) as the highest source of information. According to findings from other studies, teacher was the highest source of information. The studies conducted in Tanzania found teacher 43.5% and 47.4% respectively to be the highest source of information reported (Balowa (2006); Edson *et al*., 2007).

2.2.1.5 Knowledge of malaria prevention methods

Vector control is the most effective method of malaria prevention methods and the mosquito nets (treated or untreated) is the most known vector control method. This review therefore focuses on Insecticide treated nets (ITNs) are effective tools for malaria prevention and has been shown to significantly reduce under-five mortality in malaria-endemic areas in sub-Saharan Africa (Lengeler, 2004). It has been observed that knowledge of mosquitoes as the cause and ITNs as the preventive measure of malaria is associated with ownership of ITNs (Hwang *et al.*, 2010). Studies in Cross Rivers State Nigeria among adolescents by Eko et al. (2013) and Udonwa et al. (2010) reported that the respondents (41.9%) and (25.7%) respectively stated ITNs as the most recognized preventive methods against mosquito bite. A study in Tanzania among school children also report untreated nets (32.1%) as the perceived best control measures by the respondents (Edson *et al.*, 2007). The other method of personal protection against mosquito bites include mosquito coil, insecticides, closing of windows and doors, keeping surrounding clean, filling up potholes (Balowa, 2006; Udonwa *et al.*, 2010; Dambhare *et al.*, 2012; Eko *et al.*, 2013).

2.2.1.6 Relationship between Socio-demographic Characteristics and Knowledge about Malaria and Malaria Prevention

Only a few studies checked the association between socio-demographic characteristics and malaria and malaria prevention. A study conducted in China by Yin et al. (2013) found a statistically significant association between malaria awareness and some socio-demographic characteristics such as age, level of education and gender of the respondents. There were significant differences of awareness of malaria among three age groups, the percentages were 58.95% (age six to nine), 60.29% (age ten to 14) and 61.63% (age ≥15). Awareness of malaria was better in females than males. In addition, awareness of malaria in high school students was better than in elementary school students.

2.3 Malaria Control Measures

Various control measures have achieved some progress in the control of the disease, but malaria is still a major public health problem in Africa (Lutje *et al.*, 2011). The control

measures have helped to eliminate malaria in North-America and most of Europe and have greatly reduced the burden of malaria in other parts of the world. However, the effectiveness of these interventions waned with the advent of insecticide resistance of malaria parasites and mosquito vectors (NIAID, 2008). The new tools that are currently used to address these challenges include (1) vector control through the use of insecticide treated nets (ITNs), indoor residual spraying (IRS) and larval control (2) chemoprevention for the most vulnerable population such as pregnant women and children under five years of age (3) confirmation of malaria diagnosis through microscopy and rapid diagnostic tests (RDTs) for every suspected cases and timely treatment with appropriate antimalarial medicines (WHO, 2013).

2.4.1 Vector Control

Vector control is defined as measures of any kind directed against a vector of disease and intended to limit its ability to transmit the disease. It is an important part for reducing malaria transmission (Karunamoorthi, 2011). This method attack different behaviours or life stages of the mosquitoes (Control and Undefine, 2011). The different strategies of vector control include insecticide treated nets (ITNs), indoor residual spraying (IRS), and larval control. However, ITNs and IRS are the most successful of the different vector control strategies (Raghavendra *et al*., 2011).

2.3.1.1 Insecticide Treated Nets

Insecticide treated nets has been shown to be the most cost-effective malaria prevention tool, protecting both the person sleeping inside it and those around it (Karunamoorthi. 2011). It is one of the important malaria prevention tools that have been since the 1990s (Roll Back Malaria. 2011). Insecticide-treated bed nets have long been advocated for personal protection against vector -borne diseases including malaria. Treated bed nets can have a powerful impact on mosquito density and sporozoite rate (Atkinson *et al*., 2009). The target of the Roll Back Malaria partnership is 80% coverage of ITN/LLIN among the pregnant women and children under-five by 2015 (Roll Back Malaria. 2011). Instead of targeting protection at young African children and pregnant women, WHO now recommends coverage of insecticide-treated nets for all individuals at risk of malaria (WHO, 2013).

In Nigeria, the main method of malaria prevention employed is the use of ITNs or LLINs. Nigeria implements a nationwide LLIN routine distribution system through which every pregnant woman receives an LLIN at first antenatal care visit and a child receives an LLIN at the completion of the third dose of diphtheria pertussis and tetanus vaccine (DPT3) (NDHS, 2013).

2.4 Roll Back Malaria

Roll back malaria (RBM) is a global partnership and initiative of national governments, civil society, non-governmental organizations, research institutions, professional associations, UN and development agencies, development banks, the private sector and the media, against malaria (Roll Back Malaria Framework, 2000). It was conceived by the WHO, World Bank, UNDP and UNICEF in 1998 with the goal of halving malaria deaths by 2010 (Balter, 2000; Nabarro and Tayler 1998). Its emphasis has been on the fast implementation of malaria control programs in the African region, based on the Regional and Global Strategy for Malaria Control. Its objective is to reduce the malaria burden in involved countries by half through interventions that are adapted to local needs and by reinforcement of the health sector. The major mechanism for achieving this was through intensified national action at country-level partnerships strategically working together towards common set goals within the context and procedural guidelines of the health sector. The countries were to be supported by partnerships that involved three levels: sub regional, regional and global which would generate support networks, thus, providing the necessary technical assistance. Roll Back Malaria also encouraged strategic investments in the development of better tools and intervention strategies through focused support for research, including operational research (Roll Back Malaria Framework, 2000).

2.5 Monitoring Malaria Control Programmes

Data on malaria control programmes including ITNs are usually available through household surveys. Household surveys are not conducted regularly enough to provide annual estimates (WHO, 2013). Demographic Health Survey (DHS), MICS (Multiple Indicator Cluster Survey) and Malaria Indicator Survey (MIS) are three major household surveys that are commonly used to monitor malaria indicators. The MIS is focused solely

on malaria, while DHS and MICS provide information on a broader range of health and population indicators including family planning and maternal and child health (Global Fund, 2011).

2.6 Impact of Insecticide Treated Nets

Insecticide treated nets has been shown to be effective against malaria. There are evidences from over 81 trials conducted in a range of malaria transmission settings worldwide showing that use of ITN substantially reduces the frequency and severity of malaria. A systematic review of 22 randomized controlled trials conducted in children and adults in sub- Saharan Africa (13), Latin America (5), Thailand (2), Pakistan (1) and Iran (1) showed that ITN reduced clinical episodes by around 50% in both stable and unstable malaria areas and for both *Plasmodium falciparum* and *P. vivax* infections (Lengeler, 2004).

A Study from Somalia (Noor *et al.*, 2008) found that sleeping under a net the previous night was associated with a 71% lower risk of *Plasmodium* infection in school-aged children. A randomized control trial in Kenya showed that the estimated rate of mortality in children reported to have used a recently treated bednet was about 56% of that for children who did not use an ITN (Fegan *et al.*, 2007). In a study of the effectiveness of ITN in malaria prevention among children aged (5 to 6) years, the use of ITN was found to be 84.1% more effective in reducing marked level of parasitemia (Nwankwo and Okafor, 2009). In addition, less fever has been reported in households that possessed bed nets (Yusuf *et al.*, 2010).

2.7 Distribution of ITNs

There are several ways to procure or obtain a mosquito net in Nigeria. A pregnant woman may receive a mosquito net during a routine antenatal care visit. Parents of children under age 5 may receive a net during a routine immunization visit to a health facility. Mosquito nets can also be obtained during mass distribution campaigns, and they can be purchased directly through various avenues (MIS, 2010). As at 2010, the major source of ITNs was through mass distribution campaign accounting for 60.5% of the ITNs owned by respondents (MIS, 2010).

2.8 Reported Household Ownership of ITNs

One of the important core ITN indicators for malaria control programmes is the proportion of households owning an ITN. Using these measures, many studies have shown that efforts to increase ITN ownership have made tremendous progress. The proportion of households in Africa estimated to own at least one insecticide-treated net rose from 17% in 2006 to 31% in 2008 (WHO, 2009). The proportion of households with at least one net after LLIN distribution campaign in a South West State of Nigeria increased from 23% before the campaign to 95.2% (Oyeyemi *et al.*, 2010). According to the National Demographic Health Survey (NDHS), 2008 and 2013, the proportion of households in South West Nigeria that owned at least one ITN were (6.0%) and (42.3%) respectively. Also, the proportion of households in Oyo State Nigeria that own at least one ITN was 39.1% (NDHS, 2013). In addition, Malaria Indicator Survey (MIS), 2010 reported household ownership of at least one ITN as (40.5%) for South West Nigeria. In Kebbi State Nigeria, a household survey reported 73.5% ownership of ITNs (Naphthali and Fana, 2014).

2.9 Reported Household Use of ITNs

In order to be protected, households must not only own ITN but also use them. An important core ITN indicator for malaria control programmes is the proportion of the population who own at least one ITN and sleep under it a night before a survey. However, studies have shown that ownership of ITN do not guarantee its use. For instance, a study conducted in Ekiti State South West Nigeria, of the 95.2% that own a net, only 59% slept under ITN the night before the survey. In South West Nigeria, ITNs utilization rate were found to be are 28.6% and 16.0% (MIS, 2010; NDHS, 2013). In Oyo State Nigeria, ITNs utilization rate was found to be 31.4% (NDHS, 2013).

Insecticide treated nets have been shown to reduce under-five mortality in malaria-endemic areas in sub-Saharan Africa by 20 % (Lengeler, 2004). Therefore another indicator for ITN use is the proportion of vulnerable populations sleeping under an ITN. However, the use of ITNs by vulnerable groups has been found to be lower than household ownership (Korenromp *et al* , 2003; Miler *et al*, 2007; Eisele, 2009). In South West Nigeria, only 16.2% and 37.8% of under-five children were reported to have used

ITNs (MIS, 2010; NDHS, 2013). However, 43.1% of under-five children in Oyo State used ITNs (NDHS, 2013).

2.10 Previous School-Based Studies on Ownership and Use of ITNs

The Roll Back Malaria and Millennium Development Goal is to achieve 80% coverage of ITNs among children under-five and pregnant women who are the most vulnerable to malaria (Roll Back Malaria, 2005), however, ITN ownership and usage by vulnerable groups continues to fall short of RBM targets, and additional strategies are needed to increase ownership and usage (Thwing *et al.*, 2008). A study recommends coverage of the population as a whole as the protection of the vulnerable groups can only achieve maximum public health impact if complemented by strategies that also achieve broad coverage of the population as a whole (Killeen *et al.*, 2007).

Another study found that Intensified malaria control efforts among young African children may increase disease risks among older children who attend school and whose education may be impaired by malaria and therefore recommends that free bed nets should be provided to schoolchildren and should be widely promoted as this may bring individual and community benefits (Brooker *et al.*, 2008).

In a study that reviewed the demographic health surveys or malaria indicator surveys of 18 nations in malaria endemic African countries undertaken between 2005 and 2009, it was found out that school-aged children (5 to 19 years) who are the greatest reservoirs of infections are the least protected with ITNs as about 38%-42% of the population not protected by ITNs was among 5-19 years and therefore recommends that with increasing school enrolment rates, school-delivery of ITNs should be considered as an approach to reach universal ITNs coverage and improve the likelihood of impacting upon parasite transmission (Noor *et al.*, 2009). This is also in line with an intervention study in Ghana that found out that participatory health education intervention contributed to the decreased malaria prevalence among children and therefore recommended that the strategy can be applied as a complementary approach to existing malaria control strategies in West African countries where school health management systems have been strengthened (Ayi *et al.*, 2010)

Brooker et al (2009) in a review of historical experience and current rationale for the use of schools and school children as a complementary, inexpensive framework for monitoring, planning and evaluating malaria control programme in Africa, stated that effective malaria control requires information on both the geographical distribution of malaria risk and the effectiveness of malaria interventions. However, the current standard for estimating malaria infection and impact indicators which include household cluster surveys preclude frequent and decentralized monitoring because of their complexity and expense. Therefore, school-based surveys may provide proximate estimates of the coverage of community-wide malaria interventions. A study in Uganda showed that schoolchildren's report of bed net ownership could be used as a proxy of household ownership and coverage at the community level, therefore providing a cheap and relatively fast method of estimating coverage at the community level (Ndyomugyenyi and Kroeger, 2007). The school children reliably reported net ownership and the proportion of children protected in their households. The study was a comparative study that compared the report of household ownership of nets between school and household. The overall household ownership of ITN reported by the school and household surveys was 23% and 22% respectively and there was a significant correlation between the both (Ndyomugyenyi and Kroeger, 2007). The findings from another school-based study in Kenya reported 44.2% bed net ownership (Gitonga *et al.*, 2010).

CHAPTER THREE

METHODOLOGY

3.1 Study Area

The study was conducted in Akinyele Local Government Area (LGA) of Oyo State. Akinyele LGA is one of the eleven LGA's that make up the Ibadan metropolis with total land area of about 464.892 square kilometres and a population density of 516 persons per square kilometre. Akinyele local government area lies between latitude 7o 29' to 7o 40' while its longitude ranges from 3o 45' to 4o 04' (Ajadi *et al*, 2012). It is located along the northern area of Ibadan city. The LGA shares boundaries with Afijio LGA to the north, Lagelu LGA to the east, Ido LGA to the west and Ibadan north LGA to the south, and its headquarters in Moniya. Akinyele LGA is urban and rural, and is made up of twelve geo-political wards namely Ikereku (ward 1), Labode/Oboda/Olanla/ (ward 2), Arulogun (ward 3), Onidundu/ Amosun (ward 4), Moniya (ward 5), Akinyele (ward 6), Iwokoto/Amosun (ward 7), Ojoo/Ajibode/Orogun/Owe/Kankon (ward 8), Alabata (ward 10), Okegbemi/Mele (ward 11), Iroko (ward 12).

According to the 2006 census as released by the National Population Commission, the population of Akinyele local government was 211,359. The population is dominated by the Yoruba ethnic group with other ethnic groups as minority. The people of Akinyele are mainly traders and artisans.

The area experiences a tropical type of climate. Akinyele Local Government recorded a mean annual temperature of about 32°C. The relative humidity can be as high as 95% area and a total of about 1250mm as mean annual rainfall. The area is located in the forest belt of the country, particularly in the tropical rain forest. The forest is not as extensive as it used to be in the area. It is now restricted to some parts, such as Ijaiye forests reserve, International Institute of Tropical Agricultural [IITA] forest reserve to mention but a few. Generally, the vegetation in the area is broadly dominated by palm trees and the area may be referred to as a "dry forest belt". The soil of the area were formed from rocks of pre-Cambrian basement complex formation particularly granites,

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gneisses, quartz-schist, biotite gneisses and schist. They were formed under moist semi-deciduous forest cover and belong to the major soil group called ferruginous tropical soil.

There are fifty six (56) health facilities in Akinyele LGA (see Appenix III), of which thirty two (32) are primary Health Care (PHC), one (1) Secondary, one (1) Tertiary and twenty two (22) Private.

In Akinyele LGA, there are thirty five (35) public secondary schools and thirty three (33) private secondary schools, seventy eight (78) private primary schools and one hundred and twenty three (123) public primary schools registered with the State Ministry of Education.

A total of 132, 251 Long Lasting Insecticide Nets (LLINs) were distributed in Akinyele LGA between May 2nd and 5th, 2014 through the universal net campaign organized by the National malaria Elimination Programme of the Federal Ministry of Health (FMoH). Each household in the LGA received two nets (Oyo State Ministry of Health).

3.2 Study Design

This study was a descriptive cross-sectional survey.

3.3 Study Population

The study population were primary school pupils, males and female between the ages 7 and 13 years.

3.3.1 Inclusion Criteria

All pupils in primary 4 to 6 who were present in school on the days of visit were recruited into the study.

3.3.2 Exclusion Criteria

Pupils in primary 4 to 6 whose relations in any of the other classes were already participating in the study were exempted from the study.

3.4 Sample Size Estimation

The conventional Leslie Kish formula for calculating sample size was used at 95% level of confidence was used:

$$N = \frac{(Z\alpha/_2)^2 \times pq}{d^2}$$

Where,

N = minimum sample size

$Z_{\alpha/2}$ = standard score 95% confidence interval=1.96

d = difference = 0.05

q =1-p

According to Ndyomugyenyi and Kroeger, (2007), the proportion of reported household ownership of at least one ITN among school children in Uganda is 23%. This study adopted this prevalence in determining the minimum sample size.

p = 23%, Percentage of reported household ownership of at least one ITN (Ndyomugyenyi and Kroeger, 2007)

q = 1- p = 1-0.23= 0.77

d= level of precision= 0.05

$$N = \frac{(Z\alpha/_2)^2 \times pq}{d^2}$$

$$N = \frac{1.96^2 \times 0.23\,(1-0.23)}{0.05^2} = 272.1$$

A 10% of non-response rate was estimated as follows;

1-10/100 = 0.9

272.1/0.9 = 302.3 ≈ 302 with design effect of 2.

Total population = 302 ×2 = 604

3.5 Sampling Technique

A three-stage sampling technique was used to select the respondents.

Stage 1: Selection of wards in Akinyele LGA

Three wards from the existing twelve (12) wards were selected using simple random sampling. There were eighty eight (88) public and private primary schools in the three selected wards (see appendix III).

Stage 2: Selection of schools

Fifteen (15) schools were proportionately selected out of the 88 public and private primary schools in the three selected wards (see Table 3.1 below). Proportionate allocation of the sample size was carried out to select the number of respondents to be interviewed from each school (see Table 3.2 for details)

Stage 3: selection of respondents in each class

The pupils from primaries four, five and six (4, 5 & 5) in selected schools were first grouped by sex using the class register followed by random selection from the classes using balloting method.

Table 3.1: Distribution of schools in the wards in Akinyele LGA

Wards	Number of schools in the ward	Proportion of schools to be selected from each ward; No of schools in the ward x No of schools to be used in the study Number of public and private primary schools in Akinyele LGA
3	15	$\frac{15 \times 15}{88} = 2.56$
5	39	$\frac{39 \times 15}{88} = 6.65$
8	34	$\frac{34 \times 15}{88} = 5.795$
TOTAL	***88**	****15**

*Number of public and private primary schools in Akinyele LGA = **88**

Number of schools to be used in the study = **15

Table 3.2: Distribution of number of respondents from each school

S/N	Name of Schools	Number of pupils in Pry 4, 5 & 6	Proportion of respondents to be selected in each school
1	H.L.A.I Primary School	144	144 x 611 / 1575 = **56**
2	I.D.C Primary School	170	170 x 611 / 1575 = **66**
3	Royal Diadem Nursery and Primary School	60	60 x 611 / 1575 = **23**
4	I.D.C Primary School	117	117 x 611 / 1575 = **45**
5	St. David's Primary School	91	91 x 611 / 1575 = **35**
6	St. John's Anglican Primary School	66	66 x 611 / 1575 = **26**
7	Divine Heritage Nursery and Primary School	92	92 x 611 / 1575 = **36**
8	Community Primary School I	189	189 x 611 / 1575 = **73**
9	Sankay Nursery and Primary School	164	164 x 611 / 1575 = **64**
10	Islamic Mission Primary School II	284	284 x 611 / 1575 = **110**
11	Ebenezer Anglican Primary School I	148	148 x 611 / 1575 = **57**
12	Trinity Nursery and Primary School	9	9 x 611 / 1575 = **3**
13	Shalom Nursery and Primary School	7	7 x 611 / 1575 = **3**
14	Twobis Nursery and Primary School	11	11 x 611 / 1575 = **4**
15	I.D.C Primary School	23	23 x 611 / 1575 = **9**
	TOTAL	***1575**	****611**

*Total number of pupils in primary 4, 5 and 6 from all the 15 schools = 1575

**Sample size (N) = 611

Table 3.3: Distribution of number of respondents in each class (Pry 4)

S/N	Name of Schools	Number of pupils in Pry 4	Total number of pupils in Pry 4, 5 & 6	Number of respondent in the school	Proportion of respondents to be selected in Pry 5
1	H.L.A.I Primary School	74	144	56	$\frac{74}{144} \times 56 = 29$
2	I.D.C Primary School	72	170	66	$\frac{72}{170} \times 66 = 28$
3	Royal Diadem Nursery and Primary School	20	60	23	$\frac{20}{60} \times 23 = 8$
4	I.D.C Primary School	44	117	45	$\frac{44}{117} \times 45 = 17$
5	St. David's Primary School	36	91	35	$\frac{36}{91} \times 35 = 14$
6	St. John's Anglican Primary School	26	66	26	$\frac{26}{66} \times 26 = 10$
7	Divine Heritage Nursery and Primary School,	46	92	36	$\frac{46}{92} \times 36 = 18$
8	Community Primary School I	65	189	73	$\frac{65}{189} \times 73 = 25$
9	Sankay Nursery and Primary School	78	164	64	$\frac{33}{62} \times 28 = 14$
10	Islamic Mission Primary School II	106	284	110	$\frac{106}{284} \times 110 = 41$
11	Ebenezer Anglican Primary School I	54	148	57	$\frac{54}{148} \times 57 = 21$
12	Trinity Nursery and Primary School	4	9	3	$\frac{4}{9} \times 3 = 1$
13	Shalom Nursery and Primary School	3	7	3	$\frac{3}{7} \times 3 = 1$
14	Twobis Nursery and Primary School	3	11	4	$\frac{3}{11} \times 4 = 1$
15	I.D.C Primary School	10	23	9	$\frac{10}{23} \times 9 = 4$

Table 3.3: Distribution of number of respondents in each class (Pry 4)

S/N	Name of Schools	Number of pupils in Pry 4	Total number of pupils in Pry 4, 5 & 6	Number of respondent in the school	Proportion of respondents to be selected in Pry 5
1	H.L.A.I Primary School	74	144	56	$\frac{74}{144} \times 56 = \mathbf{29}$
2	I.D.C Primary School	72	170	66	$\frac{72}{170} \times 66 = \mathbf{28}$
3	Royal Diadem Nursery and Primary School	20	60	23	$\frac{20}{60} \times 23 = \mathbf{8}$
4	I.D.C Primary School	44	117	45	$\frac{44}{117} \times 45 = \mathbf{17}$
5	St. David's Primary School	36	91	35	$\frac{36}{91} \times 35 = \mathbf{14}$
6	St. John's Anglican Primary School	26	66	26	$\frac{26}{66} \times 26 = \mathbf{10}$
7	Divine Heritage Nursery and Primary School,	46	92	36	$\frac{46}{92} \times 36 = \mathbf{18}$
8	Community Primary School I	65	189	73	$\frac{65}{189} \times 73 = \mathbf{25}$
9	Sankay Nursery and Primary School	78	164	64	$\frac{33}{62} \times 28 = \mathbf{14}$
10	Islamic Mission Primary School II	106	284	110	$\frac{106}{284} \times 110 = \mathbf{41}$
11	Ebenezer Anglican Primary School I	54	148	57	$\frac{54}{148} \times 57 = 21$
12	Trinity Nursery and Primary School	4	9	3	$\frac{4}{9} \times 3 = \mathbf{1}$
13	Shalom Nursery and Primary School	3	7	3	$\frac{3}{7} \times 3 = 1$
14	Twobis Nursery and Primary School	3	11	4	$\frac{3}{11} \times 4 = 1$
15	I.D.C Primary School	10	23	9	$\frac{10}{23} \times 9 = 4$

Table 3.4: Distribution of number of respondents in each class (Pry 5)

S/N	Name of Schools	Number of pupils in Pry 5	Total number of pupils in Pry 4, 5 & 6	Number of respondent in the school	Proportion of respondents to be selected in Pry 5
1	H.L.A.I Primary School	38	144	56	$\frac{38}{144} \times 56 = 15$
2	I.D.C Primary School	48	170	66	$\frac{48}{170} \times 66 = 19$
3	Royal Diadem Nursery and Primary School	25	60	23	$\frac{25}{60} \times 23 = 10$
4	I.D.C Primary School	37	117	45	$\frac{37}{117} \times 45 = 14$
5	St. David's Primary School	31	91	35	$\frac{31}{91} \times 35 = 12$
6	St. John's Anglican Primary School	28	66	26	$\frac{28}{66} \times 26 = 11$
7	Divine Heritage Nursery and Primary School,	34	92	36	$\frac{34}{92} \times 36 = 13$
8	Community Primary School I	59	189	73	$\frac{59}{189} \times 73 = 23$
9	Sankay Nursery and Primary School	66	164	64	$\frac{66}{164} \times 64 = 26$
10	Islamic Mission Primary School II	107	284	110	$\frac{107}{284} \times 110 = 41$
11	Ebenezer Anglican Primary School I	53	148	57	$\frac{53}{148} \times 57 = 20$
12	Trinity Nursery and Primary School	5	9	3	$\frac{5}{9} \times 3 = 2$
13	Shalom Nursery and Primary School	4	7	3	$\frac{4}{7} \times 3 = 2$
14	Twobis Nursery and Primary School	7	11	4	$\frac{7}{11} \times 4 = 3$
15	I.D.C Primary School	6	23	9	$\frac{6}{23} \times 9 = 2$

Table 3.5: Distribution of number of respondents in each class (Pry 6)

S/N	Name of Schools	Number of pupils in Pry 6	Total number of pupils in Pry 4, 5 & 6	Number of respondent in the school	Proportion of respondents to be selected in Pry 5
1	H.L.A.I Primary School	32	144	56	$\frac{32}{144} \times 56 = 12$
2	I.D.C Primary School	50	170	66	$\frac{50}{170} \times 66 = 19$
3	Royal Diadem Nursery and Primary School	15	60	23	$\frac{15}{60} \times 23 = 6$
4	I.D.C Primary School	36	117	45	$\frac{36}{117} \times 45 = 14$
5	St. David's Primary School	24	91	35	$\frac{24}{91} \times 35 = 9$
6	St. John's Anglican Primary School	12	66	26	$\frac{12}{66} \times 26 = 5$
7	Divine Heritage Nursery and Primary School,	12	92	36	$\frac{12}{92} \times 36 = 5$
8	Community Primary School I	65	189	73	$\frac{65}{189} \times 73 = 25$
9	Sankay Nursery and Primary School	20	164	64	$\frac{20}{164} \times 64 = 8$
10	Islamic Mission Primary School II	71	284	110	$\frac{71}{284} \times 110 = 28$
11	Ebenezer Anglican Primary School I	41	148	57	$\frac{41}{148} \times 57 = 16$
12	Trinity Nursery and Primary School	0	9	3	$\frac{0}{9} \times 3 = 0$
13	Shalom Nursery and Primary School	0	7	3	$\frac{0}{7} \times 3 = 0$
14	Twobis Nursery and Primary School	1	11	4	$\frac{1}{11} \times 4 = 1$
15	I.D.C Primary School	7	23	9	$\frac{7}{23} \times 9 = 3$

3.6 Instruments for Data Collection

A semi structured questionnaire (see appendix I) that employed both interviewer-assisted and interviewer-administered method was used for data collection in this study. The questionnaire used was adapted from Malaria Indicator Survey (MIS) 2010 and National Demographic Health Survey (NDHS) 2013 and was grouped under four sections as follows:

Section 1: **Socio-demographic Information**

This section elicited information on the background of the respondents which include age, class, and religion.

Section 2: **Knowledge on malaria prevention method**

This section obtained information on symptoms, causes, risk, and prevention methods of malaria.

Section 3: **Ownership of Insecticide-Treated Nets (ITNs)**

This section elicited information on household ownership of insecticide treated nets from respondents, whether they had ITNs, how many ITNs they had in their households, and how they obtained it.

Section 4: **Use of Insecticide-Treated Nets (ITNs)**

This section elicited information on household use of ITNs from respondents including whether they use it, their pattern and frequency of use.

3.6.1 **Validity of the Instrument**

The questionnaire used for this study was pre-tested among pupils in Ibadan North Local Government Area, Ibadan. The responses were coded, entered and analysed with SPSS version 20. The outcome of the pre-test was used to correct and modify some of the questions.

3.7 Data Collection Procedure

Research assistants, a total of seven (7) of which six (6) were MPH students who were experienced in field data collection, one undergraduate student, and the class teachers helped in administering the questionnaire. The research assistants were all trained on the

objective of the study prior to data collection. Data was collected between October and November 2014. During the study, approval was obtained from the head masters or head mistress of the school as well as the class teachers of each of the classes. The questionnaires were completed during school hours and were administered only to the pupils who gave verbal consent after explaining the purpose of the research, time that would be spent and the benefits of the research.

3.8 Data Analysis

The questionnaires were edited manually to ensure completeness, consistency and accuracy of information collected. Each of the questionnaires was serially numbered and the responses coded manually using a coding guide after carefully reviewing the responses on all the questionnaires. After coding the entire questionnaire, a file structure was designed on SPSS version 20 for entering the data. Each of the responses on the questionnaires was entered into the computer using SPSS version 20 software.

The questionnaires entered on SPSS were analysed. Descriptive statistics such as percentages, frequency counts, mean, and standard deviation were used to summarise the data. Multiple response analysis was used to assess knowledge on symptoms, causes, risks and prevention methods of malaria. The responses for knowledge given by the respondents were scored with a score of one for every correct response and zero for every wrong response. A 17-point knowledge scale was used in the assessment of respondent's knowledge of malaria and malaria prevention. The total knowledge scores of each respondent were calculated at the end of the scoring. Knowledge score ≤ 50 and ≥ 50 were considered poor and good knowledge respectively. Chi-square test was used to test the association between dependent variable and categorical independent variables at 0.05. level of significance.

3.8.1 Variables

Independent Variables: The independent variables in this study are personal information which includes; age, gender, religion and current class in school and some household characteristics such as mother's occupation, mother's level of education and so on.

Dependent Variables: The dependent variables in this study are;

1. Reported household ownership of ITNs
2. Reported household use of ITNs

3.9 Ethical Considerations

Ethical approval to carry out the study was obtained from the Oyo State review committee, Ministry of Health (see appendix IV). Permission was also obtained from the Oyo State Universal Primary Education Board before proceeding to the schools that participated in the study. The Heads of the different schools that participated in the study stood as proxy for their parents and gave consent. Participation of the pupils was voluntary and those who decided to withdraw during the study were permitted to do so. The research did not cause any form of harm to the pupils and was conducted at a time that was convenient for them, not affecting their studies. Confidentiality of the information given from the pupils was ensured. Serial numbers were written on each questionnaire and no names were required from the participants.

CHAPTER FOUR

RESULT

4.1 Socio-Demographic Characteristics of Respondents

Table 4.1 and 4.1.1 shows the socio-demographic characteristics of the respondents. All the proposed 611 respondents were interviewed. Respondents' age ranges from 7-13 years with a mean age of 10.5 ± 1.7 years and the majority of the respondents (73.6%) were between the ages 10-13 years. Three hundred and twenty two (52.7%) of the respondents were females while the remaining two hundred and eighty nine (47.3%) were males. About half of the respondents (54.5%) were Muslims. Five hundred and twenty eight (86.4%) of the respondents were Yoruba. With respect to the class of the respondents, (40.1%), (34.5%), and (25.4%) were in Primary 4, 5 and 6 respectively.

About quarter of the respondents' fathers (25.9%) and mothers (64.3%), were reported to be traders. Two hundred and thirteen (34.9%) of the respondents reported that the highest education attained by their mothers was secondary education, while (4.1%) had no formal education. Of all the respondents, (15.7%) did not know their mother's level of education.

The respondents' mother's parity ranged from 1-12 with a mean reported mother's parity of 4.64 ± 1.79. The respondents' number of children in households ranged from 1-15 with a mean of 5.32± 2.47. Of the 611 respondents, three hundred and ninety nine (65.3%) said they had siblings under-five years.

Table 4.1 Socio-demographic characteristics of primary school children in Akinyele Local Government Area of Oyo State, Nigeria

Characteristics	Frequency N= 611	%
Age group (Years)		
7-9	161	26.4
10-13	450	73.6
Sex		
Male	289	47.3
Female	322	52.7
Class		
Primary 4	245	40.1
Primary 5	211	34.5
Primary 6	155	25.4
Religion		
Christianity	278	45.5
Muslims	333	54.5
Tribe		
Yoruba	528	86.4
Hausa	33	5.4
Igbo	29	4.7
Others	21	3.4
Mother's Occupation		
Civil servant	31	5.1
Trader	393	64.3
Artisan	110	18.0
Teacher	46	7.5
Professional	6	1.0
Not working	25	4.1
Father's Occupation (N= 606)		
Civil servant	86	14.1
Trader	158	25.9
Teacher	32	5.2
Transporter	107	17.5
Artisan	127	20.8
Farmer	51	8.3
Professional	22	3.6
Not working	16	2.6
Others	7	1.1

Table 4.1.1 Other Socio-demographic Characteristics of Primary School Children in Akinyele Local Government Area of Oyo State, Nigeria

Characteristics	Frequency N= 611	%
Mother's Level of Education		
Primary School	79	12.9
Secondary School	213	34.9
Tertiary Institution	198	32.4
No Formal Education	25	4.1
Don't know	96	15.7
Mother's Parity		
1-3	165	27.0
4-6	365	59.7
7-10	81	13.3
Number of Siblings		
1-4	258	42.2
5-10	330	54.0
11-20	23	3.8
Has siblings Under-five		
Yes	399	65.3
No	212	34.7

4.2 Knowledge of Respondents about Malaria

Table 4.2 shows the knowledge of respondents about symptoms, causes and risks of malaria. Majority of the respondents (97.7%) mentioned they have heard about malaria and (46.3%) mentioned fever as a symptom of malaria. Common symptoms of malaria listed were Head ache (52.2%), feeling cold (38.7%), joint pain (18.2%), and vomiting (13.9%). Three hundred and eighty four (66.3%) of the respondents mentioned mosquito bite as the cause of malaria. They also mentioned stagnant water (14.7%), hunger (6.4%), too much work (5.4%), and drinking dirty water (43.4%) as the cause of malaria. The respondents mentioned children (67.6%) under five as the people most likely to be seriously affected by malaria. Dry season (39. 5%) and rainy season (31.8%) were mentioned as seasons in the year when mosquitoes bite most. Five hundred and forty seven (91.6%) of the respondents answered that mosquitoes bite mostly at night.

4.2 Knowledge of Respondents about Malaria

Variable	Frequency	%
Ever heard of the disease malaria? N= 611		
Yes	597	97.7
No	14	2.3
***Symptoms of malaria**	N= 597	
Head ache	309	52.2
Fever	274	46.3
Feeling cold	229	38.7
Joint pain	108	18.2
Vomiting	82	13.9
Others	97	16.4
Don't know	13	0.5
***Causes of Malaria**		
Mosquito bite	384	66.3
Drinking dirty water	251	43.4
Stagnant water	85	14.7
Hunger	37	6.4
Too much work	31	5.4
Others	70	12.1
Don't know	44	7.6
***People at risk of malaria**		
Children under-five years	356	67.6
Adults	231	43.8
Pregnant women	158	30.0
Don't know	44	8.3
Seasons in the year when mosquitoes bite most		
Dry season	236	39.1
Rainy season	192	39.5
Throughout the year	92	15.4
Don't know	79	13.2
Time of the day when mosquitoes bite most		
At night	547	91.6
In the afternoon	31	5.2
In the morning	16	2.7
Others	3	0.5
Don't know	4	0.7

*Multiple response

4.2.1. Knowledge of Respondents about malaria prevention methods

Table 4.2.1 shows the knowledge of Respondents about malaria prevention methods.

Three hundred and sixty seven (60.1%) of the respondents have heard about how to avoid getting malaria in the past twelve months before the study and the major source of information was radio (46.0%), followed by mother (36.5%) and teacher (35.7%).

About (73.8%) of the respondents mentioned mosquito nets (treated/untreated) as protective measures against mosquito bite while (34.7%) stated keeping surrounding clean as a protective measure. Mosquito coil as well as closing windows and doors were mentioned by (26.4%) and (24.5%) of the respondents respectively while 8.0% mentioned insecticide spraying as protective against mosquito bite and specified other protective measures mentioned included covering with clothes, using broom to drive away mosquitoes, and using herbs.

Concerning the advantages of sleeping under a mosquito net, (79.2%) of the respondents mentioned that it avoids mosquito bites, (33.6%) stated that it prevents malaria, and (19.0%) stated that it protects from other insects. Three hundred and ninety-one (65.5%) of the respondents replied that mosquito nets have no disadvantage. Of the number of respondents who had heard about ITNs, (61.6%) mentioned that it kills mosquitoes, (33.7%) stated that it drives away mosquitoes from the net, and (27.8%) pointed that it kills and drives other insects/pests.

4.2.1 Knowledge of Respondents about malaria prevention methods

Variable	Frequency	%
Heard about to prevent getting malaria in the past 12 months? N= 611		
Yes	367	60.1
No	244	39.9
***Methods or products used to protect against mosquito bites**		
Mosquito nets	268	72.0
Keeping surrounding clean	126	34.7
Mosquito coil	96	26.4
Closing windows and doors	89	24.5
Mosquito cream applied on the body	58	16.0
Insecticide spraying	29	8.0
Others	30	8.3
Don't know	6	1.7
Ever heard of a mosquito net N= 611		
Yes	597	97.7
No	21	2.3
***Good things about sleeping under a mosquito net** N= 597		
Avoids mosquito bites	472	79.2
Avoids getting malaria	200	33.6
Avoids the disturbing sound of mosquitoes	119	20.0
Protects others insects	113	19.0
Don't know	22	3.7
Others	7	1.2
Bad things about sleeping under a mosquito net		
No bad things	391	65.5
Don't know	106	17.8
It is hot sleeping under a mosquito net	87	14.6
Others	13	2.2
Ever heard of insecticide-treated nets (ITNs) N= 597		
Yes	565	94.6
No	32	5.4
***Good things about ITNs against untreated mosquito nets**		
Kills mosquitoes	343	61.6
Drives mosquitoes away from the net	188	33.8
Kills and drives other insects/pests	155	27.8
Prevents malaria	97	15.9
Other	4	0.7
Don't know	74	13.3
Bad things about ITNs against untreated mosquito nets		
No bad things	276	48.8
Smells bad	140	24.7
Other	14	2.5
Don't know	136	24.0

*Multiple response

4.2.1.1 Knowledge of Respondents about malaria prevention methods cont'd

Variable	Frequency	%
***Source of information about how to prevent getting malaria** N= 367		
Radio	165	46.0
Mother	131	36.5
Teacher	128	35.7
Television	67	18.7
Friends and relatives	38	10.6
Can't recall	24	3.9
Father	22	6.1

***Multiple response**

4.4.2 Composite Knowledge Score of Respondents on Malaria and Malaria Prevention

Table 4.2.2 shows the composite knowledge score of respondents on malaria and malaria prevention. Among the respondents who have heard about malaria, five hundred and twenty four (87.8%) had good knowledge about malaria symptoms, causes, risk and prevention while (12.2%) who had poor knowledge

4.2.2 Composite Knowledge Score of Respondents on Malaria and Malaria Prevention

Variable	Frequency	%
Knowledge		
Good	524	87.8
Poor	73	12.2
Total	597	100

4.3 Reported household Ownership of Insecticide-treated nets (ITNs)

Table 4.3 shows reported household ownership of insecticide-treated nets (ITN). Majority of the respondents (81.7%) reported having at least one ITN in their households. The number of ITNs owned varied. One hundred and thirty seven (27.5%) reported owning one ITN, (49.3%) reported having two ITNs while (23.2%) said they had three or more ITNs in their households.

Source of ITNs

The respondents identified the sources of the ITNs they had in their households. Three hundred and eighty one (76.4%) said it was given to their parents by the local government, (13.6%) said their parents bought the ITNs they had in their households, (9.2%) said it was a gift and (0.6%) said they got from the government and also purchased some while only one of the respondents did not know the source of the ITNs in their household.

Table 4.3 Reported Household Ownership of Insecticide-Treated Nets by Respondents

Variable	Frequency	%
Have insecticide-treated nets in household N= 611		
Yes	499	81.7
No	112	18.3
Number of insecticide-treated nets in household N= 499		
Two	246	49.3
One	137	27.5
Three or more	116	23.2
Source of insecticide-treated nets		
Given by government	381	74.6
Purchased	68	13.6
Gift	46	9.2
Both government and purchase	3	.6
Don't know	1	0.2

4.4 Reported Household Use of Insecticide-treated nets (ITNs)

Table 4.4 shows that four hundred and forty three (88.8%) of the respondents who have at least one ITN in their households stated that members of their households were currently using ITNs of which (67.7%) said they and members of their households slept under ITNs the previous night before the survey and (65.7%) of the respondents said that they and members of their households sleep under ITNs daily. The results also showed that, of the respondents that had brother/sister under-five years, (51.6%) reported that their under-five brothers/sisters use ITNs. One hundred and two (23.0%) of the respondents who were currently using ITNs reported that all members of their households use ITNs.

The respondents were asked to indicate the number of persons that sleep under one ITN in their household. Table 4.5 also shows that a few of the respondents (13.8 %) reported one person sleeping under one ITN, majority (42.9%) and (42.4%) reported two, and three or more persons sleep under one ITN, respectively.

Table 4.4 Reported Household Use of Insecticide-Treated Nets by Respondents

Variable	Frequency	%
Ever used insecticide-treated nets	N= 499	
Yes	447	89.6
No	52	10.4
Households currently using ITNs	N= 449	
Yes	443	88.8
No	56	11.2
Frequency of use	N=443	
Everyday	291	65.7
Once in a while	102	23.0
At least once a week	50	11.3
All members of the household use ITNs		
Yes	102	23.0
No	341	77.0
Number of insecticide-treated nets currently in use in households		
Two	203	45.8
One	192	43.3
Three or more	48	10.8
Number of persons who sleep under one insecticide-treated net		
Two	190	42.9
Three or more	188	42.4
One	61	13.8
Last time anybody in household slept under insecticide-treated nets		
Last night	300	67.7
A week ago	78	17.6
A month ago	37	8.4
A year ago	28	6.3
Insecticide-treated net in household is hung on the wall		
Yes	393	88.7
No	50	11.3
***People who use ITNs in the households**		
Mother	306	69.5
Father	228	51.8
Brother/Sister	300	68.2
Brother/Sister Under-five	227	51.6

*Multiple response

4.5 Relationship between Socio-Demographic Characteristics and Knowledge of Respondents about Malaria and Malaria Prevention

The relationship between socio-demographic characteristics of respondents and knowledge about malaria symptoms, causes, risks and prevention is presented in (Table 4.5). The result shows more females (88.3%) than males (87.2%) had good knowledge. A significantly higher proportion of respondents within the ages 7-9 (92.3%) had good knowledge compared to those within 10-13 (86.2%) (p= 0.044). The knowledge about malaria symptoms, causes, risks and prevention varied in the different classes of the respondents. A significantly higher proportion of respondents in primary 6 (92.9%) had good knowledge compared to those in primary 5 (92.2%) and primary 4 (85.5%) (p= 0.000). More Christians (84.2%) had good knowledge, compared to Muslims (76.6%) (p= 0.00) and this is statistically significant.

Table 4.5 Relationship between Socio-Demographic Characteristics and Knowledge about Malaria and Malaria Prevention

Variable	Knowledge			
	Good	Poor	χ^2	P-value
Sex				
Female	279 (88.3%)	37 (11.7%)	0.168	0.681
Male	245 (87.2%)	36 (12.8%)		
Age range				
7-9	144 (92.3%)	12 (7.7%)	4.048	*0.044
10-13	380 (86.2%)	61 (13.8%)		
Class				
Pry 6	144 (92.9%)	11 (7.10%)	19.223	*0.000
Pry 5	190 (92.2%)	16 (7.8%)		
Pry 4	190 (80.5)	46 (19.5%)		
Religion				
Christianity	250 (84.2%)	21 (15.8%)	9.275	*0.002
Muslim	274 (79.6%)	52 (20.4%)		

***Statistically significant as p ≤ 0.05**

4.6 Relationships between Socio-Demographic Characteristics and Reported Household Ownership of At Least One ITN

Socio-demographic characteristics with school children's report of household ownership of at least on ITN are reported in table 4.6. More females (84.5%) than males (78.5%) reported household ownership of at least one ITN (p= 0.059). A higher proportion of respondents within the ages 10-13 (82.2%) reported household ownership of at least one ITN compared with those within ages 7-9 (81.1%) (p = 0.555). A significantly higher proportion respondents in primary five (86.3%) compared with those in primary six (84.5%) and primary four (75.9%) (p=0.010) reported ownership of at least on ITN. A higher proportion of respondents who were Christians (84.2%) reported household ownership of at least one ITN compared with those who were Muslims (79.6%) (p=0.144).

Table 4.6 Relationships between Socio-Demographic Characteristics and Reported Household Ownership of At Least One ITN

Variable	At least one ITN			
	Yes	No	χ^2	P-value
Sex				
Male	227 (78.5%)	62 (21.5%)	3.572	0.059
Female	272 (84.5%)	50 (15.5%)		
Age range				
7-9	129 (80.1%)	32 (19.9%)	0.349	0.555
10-13	370 (82.2%)	80 (17.8%)		
Class				
Pry 4	186 (75.9%)	59 (24.1%)	9.217	0.010*
Pry 5	182 (86.3%)	29 (13.7%)		
Pry 6	131 (84.5)	24(15.5%)		
Religion				
Christianity	234 (84.2%)	44 (15.8%)	2.135	0.144
Muslim	265 (79.6%)	68 (20.4%)		

***Statistically significant as p ≤ 0.05**

Table 4.6 Relationships between Socio-Demographic Characteristics and Reported Household Ownership of At Least One ITN

Variable	At least one ITN			
	Yes	No	χ^2	P-value
Sex				
Male	227 (78.5%)	62 (21.5%)	3.572	0.059
Female	272 (84.5%)	50 (15.5%)		
Age range				
7-9	129 (80.1%)	32 (19.9%)	0.349	0.555
10-13	370 (82.2%)	80 (17.8%)		
Class				
Pry 4	186 (75.9%)	59 (24.1%)	9.217	0.010*
Pry 5	182 (86.3%)	29 (13.7%)		
Pry 6	131 (84.5)	24(15.5%)		
Religion				
Christianity	234 (84.2%)	44 (15.8%)	2.135	0.144
Muslim	265 (79.6%)	68 (20.4%)		

***Statistically significant as p ≤ 0.05**

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATON

5.1 Socio-demographic Characteristics

In this study, the ages of the respondents ranged from 7-13 years with a mean age of 10.5 ± 1.7 years. However, the age range used by different school-based studies varies. This age range was used in this study with the assumption that pupils within this age range are more likely than those of higher age range to have under-five children in their households. Of all the respondents, (65.3%) indicated having children under-five in their households. Majority of the respondents were within the ages (10-13) years. This is comparable with a study among primary school children in which most of the respondents (70.0%) were within the ages (10-14) years (Debela *et al.*, 2014). There were more females than males in this study. This corroborates a study in Cross Rivers State, Nigeria that reported more females (52.5%) than males and in Ethiopia that recorded 65.7% of females (Worku *et al.*, 2014). The majority of the respondents in this study were from Yoruba ethnic group, this is because Akinyele Local Government Area (LGA) Oyo State Nigeria is located in South-western, Nigeria which is predominantly a Yoruba-speaking area.

5.2 Knowledge of school children about malaria and malaria preventive methods

School children are gradually becoming the focus of malaria vector control programmes. Studies have shown that school children are reliable health messengers (Ayi *et al.*, 2010) and could also be a good medium for monitoring control programmes (Brooker *et al.*, 2009; Stevenson *et al.*, 2013; Takem *et al.*, 2013). It is important to assess knowledge about malaria among them to be sure they are passing the right messages. The findings of this study showed that majority of the respondents (97.7%) had heard about the malaria disease. This is in line with other schools studies (Dambhare *et al.*, 2012; Eko *et al.*, 2013). Dambhare et al. (2012) in a study conducted in India reported that 84.7% of the respondents heard about malaria disease while Eko et al. (2013) in a study conducted in Calabar, Nigeria, recorded 100% of the respondents knew about malaria disease.

About half of the respondents in this study had knowledge of symptoms of malaria as fever. This is comparable with Dambhare et al. (2012) study in which fifty one percent identified fever as a symptom of malaria as well as a study conducted in Calabar, Nigeria that recorded fever (32.0%) as the highest symptom of malaria mentioned by respondents (Eko *et al.*, 2013).

Many of the respondents (66.3%) correctly identified mosquito bites as the cause of malaria. This corroborates findings from other studies (Balowa, 2006; Udonwa *et al.*, 2010; Dambhare *et al.*, 2012; Eko *et al.*, 2013; Morenikeji, 2009).

More than half of the respondents knew that under-five children are the most vulnerable to malaria disease. However, only a few of the respondents (26.0%) knew that pregnant women are also vulnerable. This is in keeping with the findings of Edson et al. (2007) that recorded as low as 8.7% for respondents who knew pregnant women as vulnerable population.

The result presented in this study also shows that the sources of malaria prevention information varied among respondents. The radio, mother, and teacher were the main sources of malaria prevention information with radio (46.0%) as the most mentioned. This finding corroborates the findings of Udonwa et al. (2010) conducted among school adolescents in Cross Rivers State who reported that radio (33.8%) was the highest source of malaria prevention information among the respondents and Debela et al. (2014) who also recorded radio (42.2%) as highest source of information. The percentage of teachers (35.7%) as a source of malaria prevention information contrast the 47.4% (Edson *et al.*, 2007) and the 43.5% by Balowa (2006) found among school children in Tanzania. This may be an indication that the Nigerian educational system has dropped because health education is part of the primary schools curriculum.

Many of the respondents in this study were aware of the different methods of preventing mosquito bites with mosquito nets (treated or untreated) 73.8% as the highest followed by keeping the surrounding clean (34.7%). This is in line with the findings of Eko et al (2013) and Udonwa et al. 2010) who also reported bed net as the most recognized method of personal protection against mosquito bites. Almost all of the respondents (94.6%) were

also aware of insecticide treated nets. This may be because there had been intense insecticide treated nets distribution campaign in the communities where this study was done in the last six months preceding the data collection. The composite knowledge score revealed that that more than half of the respondents in this study have good knowledge about malaria symptoms, causes, risk and prevention.

5.3 Reported Household Ownership of ITNs

The result presented showed that more than a half of the respondents reported household ownership of at least one ITN. The findings from this study corroborates that of household surveys in Ekiti State, South West Nigeria which reported (95.3%) of households owning at least one ITN (Oyeyemi *et al.*, 2010) and also in Kebbi State Nigeria which reported 75.3% of the respondents had at least one ITN (Naphthali *et al.*, 2014). However, this is far higher than the 44.2% bed net ownership reported by school children in Kenya (Gitonga *et al.*, 2010). This is also in keeping with the Nigerian Malaria Indicator Survey (MIS, 2010) which reported (40.5%) and the National Demographic Health Survey (NDHS, 2013) report of 42.3% and 39.1% for South West and Oyo state Nigeria, respectively. However, NDHS and MIS are national population surveys and cannot be compared with this study. The respondents were able to identify the source of the available ITNs in their households. More than a half of the respondents stated that it was got from mass distribution campaigns. This is in line with the Nigerian MIS. (2010). which stated that mass distribution campaigns are the main distribution channel for mosquito nets generally with (60.5%) of the mosquito nets in South West Nigeria obtained from mass distribution campaigns.

5.4 Reported Household use of ITNs

Studies have shown that ownership of ITNs does not guarantee the use of it. For instance, a study conducted in a South Western State in Nigeria reported (95.3%) ownership and utilization rate of 59% (Oyeyemi et al., 2010). Hence, it is important to monitor use among vulnerable groups and the population at large. The indicators for use of ITNs include the proportion of respondents who slept under ITN the previous night, the proportion of under-five children who use ITN, the proportion of pregnant women who used ITN during pregnancy. The findings from this study highlight that more than half of

all the respondents that reported owning a net also reported that members of their households slept under ITN the night before the study. This higher than the household report of ITN/LLIN utilization rate of 28.6% and 16.0% by NDHS (2013) and MIS (2010), respectively as well as the NDHS (2013) report of household ITN/LLIN utilization rate (31.4%) for Oyo State Nigeria. Another key finding in this study is that about half of the respondents (50.4%) that indicated having ITNs in their households stated use of ITNs by under-five children. This is higher than the NDHS, (2013), report of (37.8%) and the MIS. (2010) report of (16.2%) utilization rate of ITNs/LLINs among under-five children in South West Nigeria as well as NDHS. (2013) report of utilization rate (43.1%) of ITNs/LLINs among under-five children for Oyo State Nigeria.

5.5 Relationship between Socio-Demographic Characteristics and School Children's Knowledge about Malaria and malaria Prevention

The findings from this study showed that there was a statistically significant difference between class of respondents and knowledge about symptoms, causes, risks and symptoms of malaria. A higher proportion of the respondents in primary six (92.3%) had good knowledge compared to those in primary five and four. This could be as a result of what they are being taught in the class. While more females (88.3%) had good knowledge than males (87.2%), the difference was not statistically significant (p= 0.681). This is in contrast with a study in China which found a statistical significant difference between gender and awareness of malaria (Yin *et al.*, 2013).

5.6 Relationship between Socio-Demographic Characteristics and Reported Household Ownership of at least one ITN

Some studies have shown that reported household ownership of ITN among school children could complement report from household heads. There was a statistically significant difference between class of respondents and reported ownership of ITNs. More of the respondents in primary five (86.3%) as compared to those in primary four and six reported household ownership of at least one ITN. This may be because of the age of the pupils in that class, most of the respondents within age 10-13 years were in primary five.

5.7 Limitations of study

1. This study was a cross-sectional study that recruited only the pupils that were present in school on the day of data collection. This might have resulted in selection bias as it is possible that the result of the pupils not included in this study would have had significant impact on the study.

2. The parents of the pupils should have been interviewed to verify the responses of the school children to provide better information to suggest use of school children in monitoring of ITNs. However, this study was to explore their reporting ability.

3. One of the limitations with school surveys is that it may be difficult to assess the proportions of pregnant women who slept under ITN during pregnancy which is one of the indicators for monitoring ITN use.

5.8 Conclusion

In this study, most of the pupils had good knowledge about malaria and malaria prevention methods. The most common malaria prevention method mentioned by the pupils was mosquito nets and the radio was the major source of information. However, there were misconceptions about the causes and symptoms of malaria. The pupils were able to report household ownership of insecticide-treated nets (ITNs). They were able to state the numbers as well as the source of the ITNs in their household. Majority of the pupils reported household ownership of at least one insecticide-treated net. The reported household use of ITNs was high and more than half of the respondents reported ITN use by under-five children. Therefore, school children should be considered a potential medium for routine monitoring and evaluation of ownership and use of insecticide-treated nets by malaria control programmers.

5.9 Recommendations

Based on findings from this study, the following recommendations are suggested:

1. School children should be taught about the causes of malaria and how to prevent it so that they can be effective health messengers with regard to malaria prevention.

2. A study comparing the school children's report and that of their parents on ITN ownership and use should be carried out to validate the school children's report.

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APPENDIX 1

QUESTIONNAIRE
HOUSEHOLD OWNERSHIP AND USE OF INSECTICIDE TREATED NETS IN AKINYELE LOCAL GOVERNMENT AREA

Dear Pupils,

My name is **ONWUKA JUSTINA U.**, a Postgraduate Student of the University of Ibadan. The purpose of this study is to assess school children's report of ownership and use of insecticide treated nets. The findings from this study will provide information on the progress of malaria control programme and may also provide a potential alternative method for monitoring malaria interventions. Your identity, responses and opinion will be kept strictly confidential and will be used for the purpose of this research only. Please note that you do not have to write your name on this questionnaire, also try to give honest answers to the questions as much as your maximum co-operation will assist in making this research a success.

Would you want to participate in the research? (1) YES ☐ (2) NO ☐

Thank you very much.

Official Use Only

Interviewer's name:---------- Serial No:---------- Date:----------

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QUESTIONNAIRE

Instruction: Please answer the following questions; Circle the correct answers

OPTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

S/N	Question	Code	Response
1	Sex	1	Male
		2	Female
2	What was your age on your last birthday?		
3	What class are you now?	1	Pry 4
		2	Pry 5
		3	Pry 6

S/N	Question	Code	Response
4	Are you a Christian, Muslim or any other religion?	1	Christian
		2	Muslim
		3	Traditional
5	What is your tribe?	1	Yoruba
		2	Hausa
		3	Igbo
		4	Others
6	How many children does your mother have?		
7	What is the total number of children in your household?		
8	How many children under-five years old are there in your household?	1	One
		2	Two
		3	Three
		4	Four
		5	Five and more
		6	None

9	What does your mother do?	1	Civil servant
		2	Trader
		3	Artisan
		4	Teacher
		5	Professional
		6	Not working
10	What does your father do?	1	Civil servant
		2	Trader
		3	Teacher
		4	Artisan
		5	Transporter
		6	Farmer
		7	Professional
11	What is your mother's level of education?	1	Pry school
		2	Secondary school
		3	Tertiary institution
		4	No formal education
		5	do not know

SECTION B: KNOWLEDGE OF RESPONDENTS ABOUT CAUSES, SYMPTONS, RISKS AND PREVENTIVE METHODS OF MALARIA

S/N	Question	Code	Response
12	Have you Ever heard of the disease malaria?	1	Yes
		2	No
13	What are the symptoms of malaria? **Tick as many as you know**	1	Fever
		2	Headache
		3	Joint pain
		4	Feeling cold
		5	Vomiting
		6	Others
14	What are the causes of malaria? **Tick as many as you know**	1	Being bitten by mosquitoes
		2	Stagnant water
		3	Hunger
		4	Work
		5	Drinking dirty water
		6	Don't know
		7	Others
15	People are most likely to be seriously affected by malaria?	1	Children under-five years
		2	Pregnant women
		3	Adults
		4	Don't know
16	What seasons in the year does mosquitoes bother or bite the most?	1	Rainy season
		2	Dry season
		3	Throughout the year
		4	Don't know
17	What time in a day do mosquitoes bother or bite the most?	1	At night
		2	In the morning
		3	In the afternoon
		4	Others
		5	Don't know
18	Have you heard about how to avoid getting malaria in the last 12 months?	1	Yes
		2	No
19	Where/How did you hear about how to avoid getting malaria? **Tick as many as you know**	1	Teacher
		2	Mother
		3	Father
		4	Radio
		5	Television

		6	Friends and relative
		7	Can't recall
20	What methods or products do you know that protect against mosquitoes? **Tick as many as you know**	1	Mosquito nets
		2	Insecticide spraying
		3	Keeping surroundings clean
		4	Closing windows and doors
		5	Mosquito cream applied on the body
		6	Mosquito coil
		7	Others
		8	Don't know
21	Have you ever heard of a mosquito net?	1	Yes
		2	No
22	What are the advantages of sleeping under a mosquito net? **Tick as many as you know**	1	Avoids getting bitten by mosquitoes
		2	Avoids getting malaria
		3	Protects against other insects
		4	Avoids the disturbing sound of mosquitoes
		5	Others
		6	Don't know
23	What are the disadvantages of sleeping under a mosquito net?	1	No disadvantage
		2	It is hot sleeping under a net
		3	Others
		4	Don't know
24	Have you ever heard of (insecticide	1	Yes

	treated nets) ITNs?	2	No
25	What are the advantages of ITNs against untreated nets? **Tick as many as you know**	1	Kills mosquitoes
		2	Drives mosquitoes away from the net
		3	Kills/ drives other insects/ pests
		4	Preventing malaria
		5	Others
		6	Don't know
26	What are the disadvantages of sleeping under ITNs?	1	No disadvantage
		2	Smell is bad
		3	Other
		4	Don't know

SECTION C: OWNERSHIP OF INSECTICIDE-TREATED NETS

S/N	Question	Code	Response
27	Do you have ITNs in your household?	1	Yes
		2	No
28	How many ITNs do you have in your household?	1	One
		2	Two
		3	Three and more
		4	None
29	How did your parents get the ITNs for your house?	1	Given by government
		2	Bought in the market
		3	Both government and market
		4	Gift
		5	Don't know
		6	None
30	The ITNs you have in your household was bought by you parents.	1	Yes
		2	No
31	The ITNs in your household was given to your parents by local government.	1	Yes
		2	No

SECTION D: USE OF INSECTICIDE TREATED NETS

S/N	Question	Code	Response
32	Have you ever used ITNs?	1	Yes
		2	No
33	If yes to 32 above, how often do you use ITNs?	1	At least once a week
		2	Everyday
		3	Once in a while
		4	Never used
		5	No more using
34	Who else uses the available ITNs in your household? **Tick as many as you know**	1	Mother
		2	Father
		3	brother / Sister
		4	brother / Sister under-five
		5	No one uses ITN
35	How many ITNs are you using currently in your household?	1	One
		2	Two
		3	Three and more
		4	None
36	How many persons in your household sleep under one ITN?	1	One
		2	Two
		3	Three and more
		4	None
37	Did you or any member of your household sleep under ITNs last night?	1	Yes
		2	No
38	When was the last time you or anybody in your household slept under ITNs?	1	Last night
		2	Last week
		3	A month ago
		4	A year ago
		5	Not using
39	Is the ITNs in your household is hung on the wall?	1	Yes
		2	No

APPENDIX II

Wards with public and private Primary Schools in Akinyele Local Government Area

Ward 3 (with names of public and private Primary Schools)	Ward 5 (with names of public and private Primary Schools)	Ward 8 (with names of public and private Primary Schools)
I.D.C Primary School	Islamic Mission Primary School I	H.L.A.I Primary School
I.D.C Primary School	Islamic Mission Primary School II	I.D.C Primary School
St. John's Anglican Primary School	Islamic Mission Primary School III	I.D.C Primary School
St. Andrew's Anglican Primary School	I.D.C Primary School	St. Matthew's Primary School
St. Peter's Primary Schoo	St. Andrew's Primary School	St. Matthias Anglican Primary School I
St. Stephen's Primary School	C.P.S	St. Matthias Anglican Primary School II
Royal Diadem Nursery and Primary School	Ebenezer Anglican Primary School I	Al-Fitrah Academy
I.D.C Primary School	Ebenezer Anglican Primary School II	Banez International School
St. David's Primary School	Community Primary School I	Al-tariq Nursery and Primary School
St. John's Primary School	Community Primary School II	Brain Builder Nursery and Primary School
Miracle Nursery and Primary School	Community Primary School III	The Light (An-Nur) Nursery and Primary School
Shalom Nursery and Primary School	Achiever Nursery and Primary School	Trinity Nursery and Primary School
Methodist Primary School	Auntie Tola Nursery and Primary School	Two and Two Preparatory Nursery and Primary School

Ward 3 (with names of public and private Primary Schools)	Ward 5 (with names of public and private Primary Schools)	Ward 8 (with names of public and private Primary Schools)
Methodist Primary School	Best by Grace Nursery and Primary School	Twobis Nursery and Primary School
I.D.C Primary School	Bestley Nursery and Primary School	Wisdom Group of Schools
	Christ Victory Nursery and Primary School	Ayobade Nursery and Primary School
	Daru-salam Nursery and Primary School	B'Alpha Heights Nursery and Primary School
	Dotmot Nursery and Primary School	Bright Star Nursery and Primary School
	Favours Nursery and Primary School	Glory Academy Nursery and Primary School
	Future care kiddies college	Universal Nursery and Primary School
	Foundation of life private School	Jubilee Nursery and Primary School
	Jibson Nursery and Primary School	I.D.C Primary School
	Golden Rock Academy	Command Day Nursery and Primary School
	Grandslam Nursery and Primary School	God's Time Nursery and Primary School
	Jay-Jay Nursery and Primary School	Inter State Nursery and Primary School
	New Era Nursery and Primary School	Mountain Top Nursery and Primary School
	Sankay Nursery and Primary School	Oluyemi Nursery and Primary School

	Ward 5 (with names of public and private Primary Schools)	Ward 8 (with names of public and private Primary Schools)
	Al- amanah Nursery and Primary School	Premier Nursery and Primary School
	With God Nursery and Primary School	Prestige Foundation Nursery and Primary School
	New Beginning Nursery and Primary School	Privilege Nursery and Primary School
	Amao Nursery and Primary School	Prof. Labore Nursery and Primary School
	Divine Heritage Nursery and Primary School	Strong Foundation Nursery and Primary School
	Al-qudus Nursery and Primary School	Comfort Unique Nursery and Primary School
	Praise International Kiddies Kollege	The Gospel Faith Nursery and Primary School
	Awwal Islamic Nursery and Primary School	
	Victory Nursery and Primary School	
	Amazing Grace Nursery and Primary School	
	Boladayo Nursery and Primary School	
	K&F Nursery and Primary School	
15	39	34

Total = 88

	Ward 5 (with names of public and private Primary Schools)	Ward 8 (with names of public and private Primary Schools)
	Al- amanah Nursery and Primary School	Premier Nursery and Primary School
	With God Nursery and Primary School	Prestige Foundation Nursery and Primary School
	New Beginning Nursery and Primary School	Privilege Nursery and Primary School
	Amao Nursery and Primary School	Prof. Labore Nursery and Primary School
	Divine Heritage Nursery and Primary School	Strong Foundation Nursery and Primary School
	Al-qudus Nursery and Primary School	Comfort Unique Nursery and Primary School
	Praise International Kiddies Kollege	The Gospel Faith Nursery and Primary School
	Awwal Islamic Nursery and Primary School	
	Victory Nursery and Primary School	
	Amazing Grace Nursery and Primary School	
	Boladayo Nursery and Primary School	
	K&F Nursery and Primary School	
15	39	34

Total = 88

Appendix III

Health Facilities in Akinyele Local Government Area

S/N	Ward	Name Of Public Facility	Address	Ownership	Type
1	Ward1(Ikereku)	Ikereku Primary Health Centre	Ikereku	Local	Primary
2	Ward2 (Olanla)	Pade Model Health Centre	Pade	Local	Primary
3	Ward2 (Olanla)	Alade Health Centre	Oba Alade	Local	Primary
4	Ward 3(Aroro)	Aroro Health Centre	Aroro	Local	Primary
5	Ward 3(Aroro)	Adegbite Foundation Cottage Hospital	Igbo-Ol Oyin	Private	Primary
6	Ward 4(Onidundun)	Onidundun Health Centre	Onidundun	Local	Primary
7	Ward 5(Moniya)	Well Care Clinic	Moniya	Private	
8	Ward 5(Moniya)	Moniya General Hospital	Moniya	State	Secondary
9	Ward 5(Moniya)	Moniya Primary Health Centre	Moniya/Hq	Local	Primary
10	Ward 5(Moniya)	Folawiyo Hospital	Apapaodan	Private	
11	Ward 5(Moniya)	Folayo Maternity &Clinic	Apapa	Private	
12	Ward 5(Moniya)	Aged&Widow Clinic	Moniya	Local	Primary
13	Ward 5(Moniya)	Orelope Hospital	Moniya	Private	
14	Ward5(Moniya)	Akinyele Tbl Clinic	Moniya	Local	Primary
15	Ward 5(Moniya)	Christ Hope Hospital&Maternity	Moniya	Private	
16	Ward 5(Moniya)	Mercy Land Maternity&Child Welfare Clinic	Moniya	Private	
17	Ward 5(Moniya)	Cottage Hospital	Moniya	Private	
18	Wrad5(Moniya)	Ibukunolu Hospital	Moniya	Private	
19	Ward 5(Moniya)	Alanu Ni Oluwa Maternity Clinic	Moniya	Private	
20	Ward 5(Moniya)	Hope Life Maternity Clinic	Moniya	Private	
21	Ward 5(Moniya)	Akinolu Hospital	Moniya	Private	
22	Ward 5(Moniya)	Olufunmilayo Hospital	Moniya	Private	
23	Ward 6(Akinyele)	Akinyele Primary Health Clinic	Akinyele	Local Govt.	Primary
24	Ward 6(Akinyele)	Khara Health Centre	Akinyele	Local Govt.	Primary
25	Ward 6(Akinyele)	Alagbaa Health Centre	Alagbaa	Local Govt.	Primary
26	Ward 6(Akinyele)	El-Shaddai Clinic	Akinyele	Private	
27	Ward6(Akinyele)	St'patrick Hospita	Akinyele	Private	
28	Ward 7(Iwo Koto)	Iwokoto Health Centre	Iwo Koto	Local Govt.	Primary
29	Ward 7(Iwo Koto)	Apapa Odan Primary Health Centre	Apapa Odan	Local Govt	Primary
30	Ward 8(Ojoo)	Ojoo Primary Health Clinic	Ojoo	Local Govt.	Primary
31	Ward8(Joo)	Aisha Memorial Hospital	Ojoo,Express	Local Govt	Primary
32	Ward 8(Ojoo)	Orogun Health Centre	Orogun	Local Govt	Primary
33	Ward 8(Ojoo)	Owekankan Health Centre	Owekankan	Local Govt.	Primary

34	Ward 8(Ojoo)	Sasa Primary Health Centre	Sasa	Local Govt.	Primary
35	Ward 8(Ojoo)	St'athony Clinic	Orogun	Private	
36	Ward 8(Ojoo)	Hamdala Hospital	Opposite Ojoo Mkt	Private	
37	Ward 8(Ojoo)	Olive's Hospital And Maternity	Ojoo	Private	
38	Ward 8(Ojoo)	Mosolape Maternity Centre	Ojoo	Private	
39	Ward 8(Ojoo)	Olufunmilayo Maternity	Ojoo	Private	
40	Ward 8(Ojoo)	As-Salam Hospital	Sasa,Road	Private	
41	Ward 8(Ojoo)	Ajibode Primary Health Care Centre	Ajibode	Local	Primary
42	Ward 8(Ojoo)	Fajimi Hospital	Ojoo	Private	
43	Ward 8(Ojoo)	2 Div Medical Serv. Hospital	Federal		Tertiary
44	Ward 9(Ijaye)	Ijaye Primary Health Centre	Ijaye	Local Govt.	Primary
45	Ward 9(Ijaye)	Iware Primary Health Clinic	Iware	Local Govt.	Primary
46	Ward 9(Ijaye)	Jarija Health Clinic	Jarija/Sangobon	Local Govt.	Primary
47	Ward 9(Ijaye)	Atan Health Clinic	Atan	Local Govt.	Primary
48	Ward 10(Alabata)	Alabata Primary Health Centre	Alabata	Local Govt.	Primary
49	Ward 10 (Alabata)	Elekuru Primary Health Centre	Elekuru	Local Govt.	Primary
50	Ward10(Alabata)	Ajibade Health Centre	Ajibade	Local	Primary
51	Ward10(Alabata)	Oloosa Health Post	Oloosa	Local	Primary
52	Ward 11(Olorisa-Oko)	Olorisa Oko Primary Health Centre	Olorisa-Oko	Local Govt.	Primary
53	Ward11(Olorisa-Oko)	Mele Health Centre	Mele	Local	Primary
54	Ward 11(Olorisa-Oko)	Victory Clinic	Olorisa-Oko	Private	
55	Ward 11(Iroko)	Iroko Health Clinic	Iroko Ii	Local Govt.	Primary
56	Ward 11(Iroko)	Oretu Health Centre	Oretu	Local Govt.	Primary

APPENDIX IV

TELEGRAMS.....

TELEPHONE.....

MINISTRY OF HEALTH

DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION

PRIVATE MAIL BAG NO. 5027, OYO STATE OF NIGERIA

Your Ref. No. .....

All communications should be addressed to the Honourable Commissioner quoting

Our Ref. No. AD 13/ 479/ 732

November, 2014

The Principal Investigator,
Department of Epidemiology and Medical Statistics,
Faculty of Public Health,
University of Ibadan,
Ibadan.

Attention: Onwuka Justina

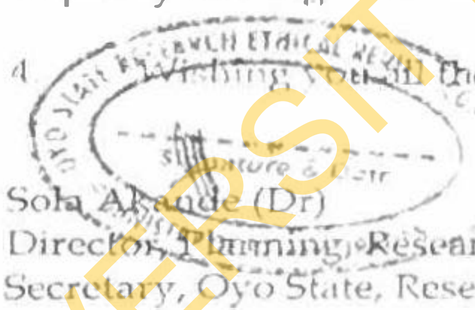
Ethical Approval for the Implementation of your Research Proposal in Oyo State

This acknowledges the receipt of the corrected version of your Research Proposal titled "School Children's Report of Household Ownership and use of Insecticide Treated Nets in Akinyele Local Government Area, Ibadan, Nigeria"

2. The committee has noted your compliance with all the ethical concerns raised in the initial review of the proposal. In the light of this, I am pleased to convey to you the approval of committee for the implementation of the Research Proposal in Oyo State, Nigeria.

3. Please note that the committee will monitor closely and follow up the implementation of the research study. However, the Ministry of Health would like to have a copy of the results and conclusions of the findings as this will help in policy making in the health sector.

4. Wishing you all the best



Sola Afande (Dr)
Director, Planning, Research & Statistics
Secretary, Oyo State, Research Ethical Review Committee