THE EFFECTS OF SOCIAL MARKETING ON MALARIA KNOWLEDGE AMONG PRIMARY SCHOOLCHILDREN IN KILOMBERO DISTRICT

By

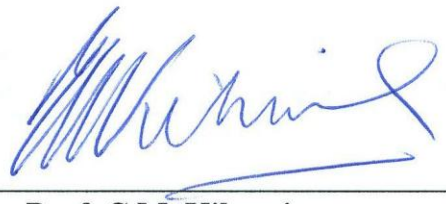
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A dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Public Health of Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences

CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled ***The Effects of Social Marketing on Malaria Knowledge among Primary schoolchildren in Kilombero District*** in partial fulfillment of the requirements for the degree of Master of Public Health (MPH) of Muhimbili University of Health and Allied Sciences.



Prof. C.M. Kihamia
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Date: 01/06/2010

DECLARATION AND COPYRIGHT

I, **Christopher Eliatosha Mshana**, declare that this **dissertation** is my own original work and that it has not been, presented and will not be presented to any other university for a similar or any other degree award.

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ACKNOWLEDGEMENTS

I am greatly indebted to those who made this work possible. Firstly I would like to appreciate funding support from Novartis Foundation for Sustainable Development (NFSD) through the ACCESS Project implemented by Ifakara Health Institute. Exclusive thanks to Alexander Schulze. Secondly I would like to extend my appreciation to my supervisor Prof. C.M Kihamia who despite of his tight schedule he made this work to be done.

Thirdly I would like to mention ACCESS team, I very much thank Dr. Flora Kessy for encouragement and support, Ahmed Makemba, Kaka Iddy Mayumana, Karin Gross, Sandra Alba, Angel Dillip, Dr. Robert Tillya and Dr. D. Mboya for their support, comments and inputs of this work. Fourthly, I would like to mention Imamu Mapemba and Upendo Edward for all the efforts they made during data collection.

Fifthly, I would like to thank Amaniel Mono for his time and made the data entry successful. Also sincere thanks are addressed to Mathew Alexander and Abdalah Mkopi for their time and support during data analysis.

Lastly but not least, I would like thank my family; my wife Veronica Mshana for her valuable support for the entire period of my study, my parents Mr & Mrs. Eliatosha Mshana, my brothers and my sisters and my friends for their support and encouragement during my studies.

Dedication

This dissertation is dedicated to my beloved family, my wife Veronica Mshana, my son Chris Jr. Mshana and my daughter Cathy Mshana.

Abstract

This is a cross-sectional case control study design conducted to assess the effect of social marketing intervention aimed to improve malaria knowledge among primary schoolchildren in the Kilombero district. A multistage sampling technique was used; and a total of 1698 schoolchildren from selected primary schools participated. Self-administered questionnaire with multiple choice options was used to collect data on malaria knowledge, sources of malaria IEC, communication channels and extracurricular activities. Data were entered and analyzed using STATA statistical package. Results showed that high proportion of schoolchildren in intervention schools were significantly knowledgeable compared to those of non-intervention ($p<0.001$). However, schoolchildren in both study groups had very low knowledge on malaria treatment. School-based malaria education and health facilities were the most important primary sources of malaria IEC by 76% and 80% in intervention and non-intervention schools respectively. Malaria booklets were significantly prevalent and preferred communication channels in the intervention schools by 92.7% ($p<0.001$). Public leaflets were prevalent channel by 69% in non-intervention schools. Malaria songs, Drama and Poems were mostly noticed extracurricular communication activities in intervention schools by 94%, 96% and 96% respectively. Low proportion of extracurricular activities being noticed in non intervention schools. Social marketing with selected communication channels and extracurricular activities could enrich school-based malaria education hence improve malaria knowledge among primary schoolchildren.

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List of Abbreviations

ALu	Artemether-Lumefantrine
EFA	Education for All
GDP	Gross Domestic Product
IEC	Information, Education, Communication
IPD	In-Patient Department
IHRDC	Ifakara Health Research Development Centre
IHI	Ifakara Health Institute
INT	Insecticide Treated Net
IPTp	Intermittent Preventive Treatment for pregnant women
KINET	Kilombero Insecticide Treated Net Project
MoH	Ministry of Health
MoHSW	Ministry of Health and Social Welfare
MUHAS	Muhimbili University of Health and Allied Sciences
NGO	Non Governmental Organization
OPD	Out-Patient Department
PSI	Population Service International
RA	Research Assistant
RBM	Roll Back Malaria
SP	Sulphadoxine-Pyremethamine
UNICEF	United Nations Children's Fund
WHO	World Health Organization

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

Malaria remains a major public health concern in Tanzania; it accounts for most out-patient (OPD) and in-patient (IPD) attendances in health facilities for both children and adults. Consequently, it is the leading cause of death in both groups (MoHSW, 2006a). The disease is preventable but multiple factors including environmental, political, and socio-economic factors hinder effective prevention and control. In addition, malaria continues to cause a lot of suffering through illness, disability, and death because of the inadequate health education/ communication and weak health system.

Children are the most vulnerable group to malaria in Sub-Saharan Africa as about 90% of all malaria deaths occur in this age group (Snow, *et. al.,* 2005). Many children who survive an episode of severe malaria may suffer from learning impairments or brain damage (WHO, 1998). The children who survive to school age continue to be vulnerable to malaria, and estimates from Africa indicate that 20-50% of all school children experience at least one clinical malaria attack each year (Clark, *et. al.,* 2004). Prolonged and repeated illnesses may result to absenteeism from school for significant amounts of time. School attendance is also affected when other members of the family suffer from malaria. Girls in particular may stay at home to care for sick people.

Thus, malaria can reduce both the opportunity and the ability of children to learn (WHO and UNICEF, 2003).

In Tanzania, efforts to control malaria have been increased at different levels. A number of methods both at individual and national level have been employed in the country. These includes prompt effective diagnosis and treatment of cases at primary health facilities, Intermittent Presumptive Treatment (IPTp), vector control (the use of treated mosquito nets- ITNs), Indoor residual spray (IRS) and behavior change communication (BCC) through mass media. However, these strategies face various obstacles among others including inadequate financial and material resources for the improved quality health care provision, human resources for health; and an inefficient health education, information and communication mechanism.

Health education is an important strategy in supplementing community based malaria control approaches. Effective health education could make communities more aware of and knowledgeable about the disease and ultimately reinforce prompt and appropriate actions for prevention and control. Social marketing approach plays an important role in health education, promotion and malaria communication in particular. This approach employs the experience of commercial marketing techniques to a product or services which have a social benefit. The main motivation is to improve the social gain of the community rather than the financial gain of the marketer (Andreasen, 1995).

Social marketing is best interpreted as an approach to strategically planning the implementation and evaluation of programs with a focus on target audiences. It is regarded as a planning tool, that is a theory driven and consumer focused (Thackeray and Neiger, 2000). Social marketing provides an avenue to active participation of all actors in the program in order to ensure the needs of the target audience are maximized. In an effort to control malaria in the country; social marketing approach played a significant role to promote the use of ITNs as effective preventive measures since nineties (1990's).

In addition to promotion of ITNs, social marketing is used to design and implement behavior change communication campaigns of different health programs includes malaria, HIV/AIDS, nutrition etc. Effective communication should be relevant to local context of the target audiences and sustainable. Through formative research, social marketing pays attention on the needs of the target audiences in order to ensure that, information delivered is relevant and it address the problem; and the methods and strategies designed to disseminate information are appropriate. Frequent exposure and consistence of messages dissemination results to effectiveness, high coverage, and recall of the key messages hence influence behavior and attitude change towards the problem addressed.

In an attempt to control malaria through primary schools, malaria education has been incorporated in the school curriculum. However is not often taught as independently single subject, it is within the science subject under diseases control topic. Also there is no relevant malaria training module developed as well as other malaria education, information and communication (IEC) materials. Social marketing as an approach with focus on the needs of the target audiences could be appropriate strategy for developing a platform for malaria communication in primary schools. Marketing techniques could be used to enrich school curriculum and the contents of the science syllabus. Social marketing provide an avenue to include extracurricular malaria communication activities hence to enable schoolchildren to actively participate in the process of planning and implementation of malaria communication activities at schools. Through this process schoolchildren can understand the problem and be able to transform the knowledge acquired into practice.

Based on this the ACCESS Programme implemented by the Ifakara Health Institute (IHI) with financial support from Novartis Foundation for Sustainable Development (NFSD) adopted a social marketing approach to increase knowledge and awareness on malaria, and promote prompt and appropriate treatment seeking from reliable and appropriate sources in Ulanga and Kilombero districts (Hetzel, *et al.*, 2007c). Appropriate malaria information, education and communication will increase the understanding of malaria hence lead to behavior change and improve practices for malaria prevention and control among the community members.

The Programme uses different communication approaches to stimulate demand for access to health care including malaria treatment and diagnosis. The primary target audiences of the campaigns were parents and caretakers of children under five years of age and pregnant women. Also, other household members and the general population were secondary target groups in the project. Tertiary audiences included community leaders, health workers, primary school teachers and children, and drug dispensers (Hetzel, *et al*., 2007c).

The importance of malaria communication in primary schools within the study area was revealed during introduction and sensitization meetings of the ACCESS Programme. Parents called for detailed malaria training to primary school teachers and children. They argued that, schoolchildren were the most affected, agent of change and also they are the future parents hence having appropriate malaria knowledge could be of useful to them and community at large. In addition, it is observed that in the study area grown up schoolchildren normally stay with their young brothers and sisters at home when their parents have moved to the *shamba* during farming season. Therefore if they know signs and symptoms of the disease they may report immediately (ACCESS Programme, 2005).

This study therefore, assessed the effects of social marketing intervention recently conducted to impart relevant malaria knowledge among primary schoolchildren in Kilombero district.

It was a cross-sectional case control study design aimed to establish casual relationship between social marketing intervention and improved malaria knowledge. It compared a proportion of schoolchildren with malaria knowledge among those exposed to social marketing intervention and non-exposed as a control group in order to draw conclusion.

Results of this study showed significant differences in malaria knowledge among schoolchildren exposed to social marketing intervention compared to non-exposed. High proportions of schoolchildren in intervention schools were knowledgeable on malaria with respect to causes, mode of transmission, recognition, treatment, prevention and severity of the disease. Despite of these differences, results showed that both study groups have very low knowledge with respect to malaria treatment particularly on the dosage instructions of the recommended first line antimalaria (ALu).

This dissertation has six chapters; the introduction part, statement of the problem, conceptual framework, research questions and objectives of the study is presented in chapter one. Literature review of the study is presented in chapter two followed by methodology of the study in chapter three. Key research findings are summarized in chapter four followed by discussion of the major findings in chapter five. Conclusion and lastly recommendations basing on the major findings of this study is presented in chapter six.

1.2 Statement of the Problem

The importance of school health education has been recognized by local and international community. The scaling up of the school health is a major strategy of the Education for All (EFA), while the Focusing Resources on Effective School Health partnership (FRESH) has aimed to raise awareness of and implement appropriate strategies for effective school health, hygiene, and nutrition programs around the world. Regardless of the significant progress made in the improved integration of the education and health sectors, the inclusion of malaria-related activities remains largely limited to project-specific initiatives rather than any coordinated effort through partnership (WHO and UNICEF, 2003).

In Tanzania, efforts have been made to control malaria through primary schools. Malaria education is incorporated within the school curriculum and is limited taught as a part of science syllabus in diseases control topic. With such platform, malaria education in primary schools is instructed during a formal routine school program. Poor didactic teaching methods and communication relationship between the teachers and their pupils might hinder their participation in creating their own and effective way of disease control. Several studies revealed that the knowledge hierarchy is quite clear and teaching is top-down, one way process directed by the teacher (Bishop, 1986; Bruner, 1996).

In most cases teachers and pupils consider the curriculum as extremely condensed. Under this premises, pupils remain with limited possibilities to grasp and develop ownership of the knowledge they received in the classroom. It is argued that traditional approach has led to shift the focus towards participatory approaches that encourage pupils own exploration and discovery and relate the information presented with everyday life (Hawes, 1997). Despite of good intention to incorporating malaria education in primary school's curriculum, but the system is faced with critical drawbacks includes limited and inappropriate communication strategies, irrelevant malaria information, education, and communication (IEC) materials and ineffective communication channels.

Effective malaria communication approach needs to involve different levels throughout planning, implementation and monitoring of the intervention. Social marketing approach provides an avenue to linking different important aspects needed to enrich primary schools malaria communication. It offers a potential of employing commercial marketing techniques and extracurricular malaria communication activities to complement class-based education. However little has been done to provide evidence on the usefulness and effectiveness of social marketing approach in imparting relevant malaria knowledge among primary schoolchildren. This study seeks to assess the effects of the social marketing intervention as an approach used to improve malaria knowledge with regards to causes, mode of transmission, recognition, prevention, treatment and severity among primary schoolchildren in Kilombero district.

1.3 Rationale of the Study

Social marketing intervention has been conducted only recently, thus providing the opportunity to assess its effects on imparting relevant malaria knowledge among schoolchildren. The findings of this study would enable to provide valuable recommendations feasible and appropriate framework for malaria information, education and communication in primary schools in Tanzania. Additionally, the findings will assist to:

1. Inform primary schools implementing malaria communication campaigns on how to enhance social marketing approach in order to maximize its effectiveness hence produce concrete argument to use as a platform for primary schools' malaria control framework.
2. Determine appropriate and effective malaria communication channels and extracurricular malaria communication activities to be employed in order to impart relevant malaria knowledge among primary schoolchildren.
3. Inform both education and health planners in planning and designing appropriate malaria control policy, curriculum and strategies for Tanzanian primary schools.

1.4 Research Questions

This study explored the following research questions: -

1. Is social marketing an appropriate approach to improve malaria knowledge among primary schoolchildren hence being adopted for primary school's malaria health education?

2. Is there any association between malaria knowledge and schoolchildren's demographic characteristics (age, sex and class level)?
3. What are the primary and preferred sources of malaria information, education and communication (IEC) among primary schoolchildren?
4. What are the prevalent and preferred malaria communication channels among primary schoolchildren?
5. What are the prevalent and preferred extracurricular malaria communication activities among primary schoolchildren?

1.5 Conceptual Framework

The conceptual framework below provides the root cause of low malaria knowledge among primary schoolchildren consequently poor health care seeking behavior for malaria prevention and control.

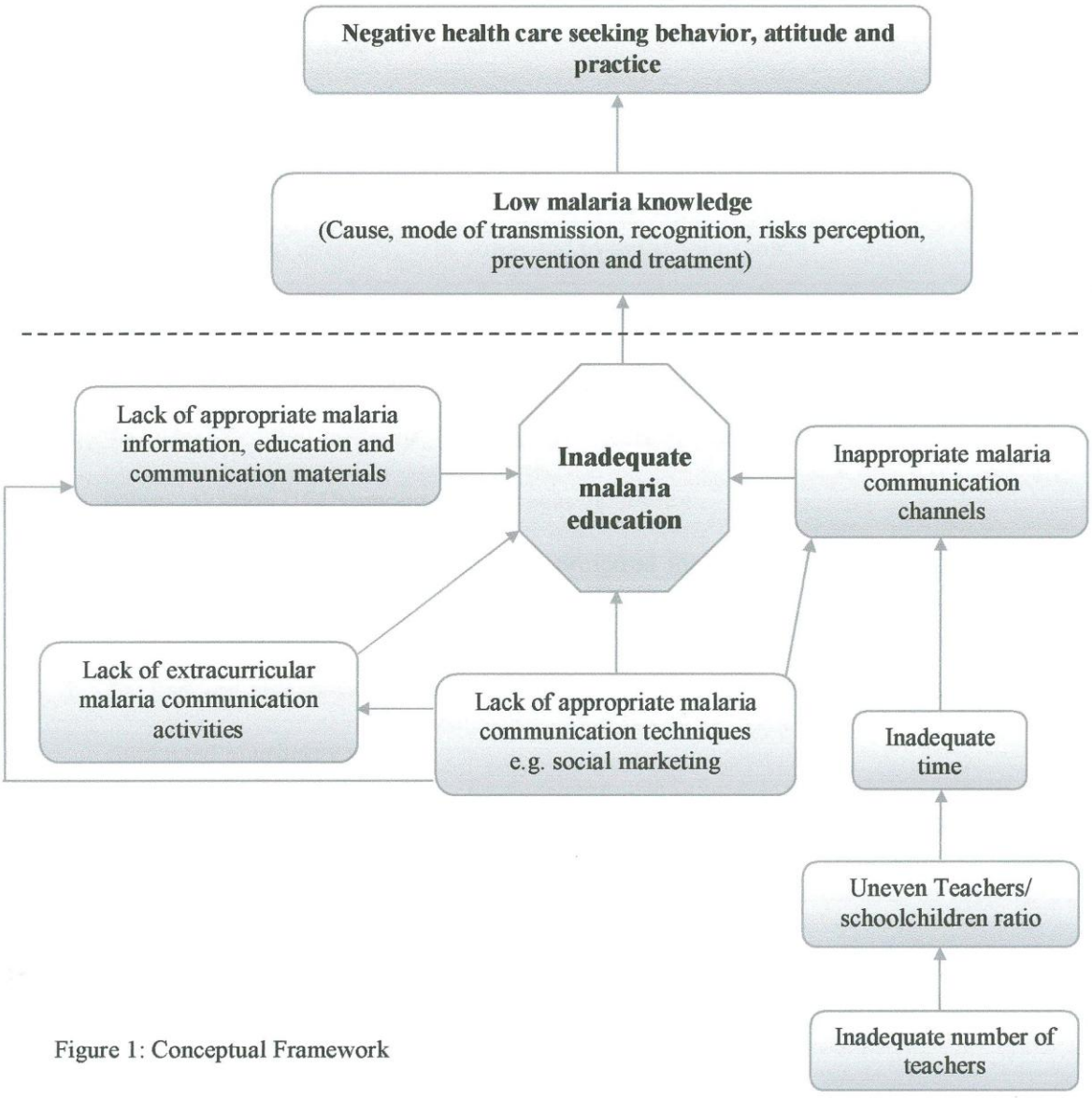


Figure 1: Conceptual Framework

1.6 Research Objectives

1.6.1 Broad Objective

The broad objective of the study was to understand the effects of social marketing intervention on malaria knowledge among primary schoolchildren

1.6.2 Specific Objectives

Specifically the study aimed to: -

1. To determine the proportion of schoolchildren with malaria knowledge among those exposed to intervention as compared to those not exposed
2. To compare the proportion of schoolchildren with malaria knowledge by demographic characteristics (age, sex and class level)
3. To identify the primary sources of malaria information, education and communication (IEC) among primary schoolchildren
4. To find out the frequently noticed and preferred malaria communication channels among primary schoolchildren
5. To find out the most preferred extracurricular malaria communication activities conducted in primary schools

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Burden of Malaria

Malaria remains a major public health problem and endemic to the poorest countries in the world particularly sub – Saharan Africa. Malaria attributes from 400 to 900 million clinical cases and up to 2.7 million deaths each year (Breman, 2001). Children are the most vulnerable group to malaria in Sub-Saharan Africa as about 90% of all malaria deaths occur in this age group (Snow, *et. al.,* 2005). Other high-risk groups include pregnant women, non-immune travelers, refugees and other displaced persons, and people of all ages living in areas of unstable malaria transmission (WHO and UNICEF, 2003).

In Tanzania, about 95% of population is exposed to the risk of malaria infection. This makes Tanzania to be one of the most highly malaria endemic countries in the world. Tanzania has unacceptably high burden of morbidity and mortality caused by malaria. Every year, 14–18 million new malaria cases are reported in Tanzania, resulting in 120,000 deaths. Of these deaths, 70,000 are in children less than five years of age (MoH, 2002). Malaria is the leading cause for < 5 years old admissions (49%) and it is the leading cause of deaths for pediatric admissions. Malaria contributes to 39.4% and 48% of all outpatients less than 5 years of age and aged 5 years and above, respectively (MoHSW, 2006a).

Malaria is a major contributor to poverty and poor economic performance. It is estimated that 121 million USD are annually spent on the prevention and control of malaria in Tanzania; amounting to 3.5% of the GDP. One-third of public health facilities expenditures are devoted to malaria (USAID – CDC, 2005). Malaria therefore, is not only a health, but also a major development issue. Study revealed that malaria has a major socio-economic impact often leading families into poverty as it might lead on the one hand to decreased learning capacities in children, students, and trainees in the age range of 5–25 years and on the other hand to a loss of economic productivity in the workforce age range 15–55 years (Kitua, 2003).

2.2 Effects of Malaria on Schoolchildren

Children are the most vulnerable group to malaria in Sub-Saharan Africa as about 90% of all malaria deaths occur in this age group. Many children who survive an episode of severe malaria may suffer from learning impairments or brain damage (WHO, 1998). The children who survive to school age continue to be vulnerable to malaria and estimates from Africa indicates that 20-50% of all schoolchildren experience at least one clinical malaria attack each year (Clark, *et. al.,* 2004). Prolonged and repeated illnesses may result to absenteeism from school for significant amounts of time. School attendance is also affected when other members of the family suffer from malaria. Girls in particular may stay at home to care for sick people. Thus, malaria can reduce both the opportunity and the ability of children to learn (WHO & UNICEF, 2003).

The study conducted by Fernando, *et. al.,* (2003) suggests that malaria attacks have an adverse impact on the educational attainment of schoolchildren and the prevention of these attacks significantly improves educational attainment of children living in malaria endemic area. Malaria is considered as the most important cause of seizures in early childhood. In Kenya, Waruiru, *et. al.,* (1996) found that malaria accounted for 31.3% cases of seizures. Asindi, *et. al.,* (1993) have provided further evidences on the high proportion of seizures attributed to malaria, ranging from 16% in Zimbabwe to 70% in Nigeria. Epileptic seizures can cause serious learning disabilities in children, resulting in poor cognitive performance and reduced school attendance.

2.3 Efforts to Control Malaria in Tanzania

Over the last two decades, morbidity and mortality from malaria have been increasing due to deteriorating health systems, growing drug and insecticide resistance, periodic changes in weather patterns, civil unrest, human migration, and population displacement (WHO and UNICEF, 2003). Recognition of the unacceptable mortality and morbidity from malaria in Africa, and the availability of a number of evidence based, cost-effective interventions, led to the formation, in 1998, of the Roll Back Malaria initiative. In the Abuja Declaration of April 2000, African Heads of State resolved to support scaling-up of the following interventions, which, if brought to scale in malaria-endemic countries, could have a significant impact on both morbidity and mortality from malaria.

The interventions form the core of the Roll Back Malaria Strategy, aimed at halving mortality from malaria in Africa by 2010. In responding to this declaration, Tanzania through The National Malaria Medium-Term Strategic Plan strengthened previous initiatives aimed at reducing malaria morbidity and mortality in the country by 25 % by 2007 and by 50 % by 2010 in line with the RBM goals. The focal point to this strategy is to reduce the level of malaria so that it does not continue to be a major public health problem or an obstacle to socio-economic development (MoH, 2002). On the way to addressing the objectives; the Ministry of Health and Social Welfare advocates four main pillars against malaria control in Tanzania. These include; improved malaria case management and effective treatment, malaria vector control using insecticide treated mosquito nets (ITNs), malaria intermittent presumptive treatment during pregnancy (IPTp) and malaria epidemic preparedness, prevention and control.

However, these strategies face various obstacles including inadequate financial and material resources for the improved quality of health care provision, human resources for health; and an inefficient health education, information and communication mechanism (Mboera, *et. al.,* 2007). In principle the Tanzania malaria control policy emphasizes the primary health care approach and not separate vertical programmes. Nonetheless, for many years malaria control strategies have been implemented through the vertical approach (National Malaria Control Programme). Due to the nature of the vertical programmes, most districts have failed to develop effective interventions in respect to their local context.

2.4 Malaria Communication in Tanzania

Malaria communication campaigns through mass media have been introduced in Tanzania since nineties. These campaigns promote prompt recognition of signs and symptoms of malaria and health care seeking behaviors for appropriate and effective treatment. Health communication is a fundamental component in virtually every form of public health. As Mboera (2007) argued, health communication can enable the community to have certain set of knowledge and information on disease transmission, signs and symptoms, control and prevention measures. However; knowledge alone is not adequate to control disease transmission and even prevention. Enabling factors and supporting environment are essential. These include sanitation and hygiene, appropriate waste water disposal, access to quality health care services etc.

Tanzania has advanced considerably in the implementation of social marketing of Insecticide Treated Nets (ITNs). This strategy has been developed through various studies and is currently being implemented at national level (Magesa, 2005). Social marketing can be defined as the application of commercial marketing technologies to the analysis, planning, execution, and evaluation of programs designed to influence the voluntary behaviors of target audiences in order to improve their personal welfare and that of their society. (Andreasen, 1995). Thus social marketing is an approach where the experience of commercial marketing is applied to a product or idea which has a social benefit, with the main motivation to improve the social gain of the community rather than the financial gain of the marketer (Andreasen, 1995).

Social marketing approach is more audience focused towards influencing voluntary behavior change. It has been applied into different public health intervention including malaria, HIV and AIDs, maternal health, family planning, sanitation and hygiene, tuberculosis etc. For years now Population Service International (PSI) is implementing social marketing of insecticide-treated nets in Tanzania. Ifakara Health Research and Development Centre (IHRDC) pioneered social marketing for insecticide treated nets through KINET project. The project was in the line with the philosophy of social marketing as the most appropriate technique to reach the target population with the insecticide-treated nets as a malaria control intervention (Nathan, *et. al.,* 2005).

2.5 Malaria Education in Primary Schools

The importance of schools in health promotion in developing countries is increasingly being recognized (World Bank, 1993). In Tanzania, there are considerable efforts on school health programmes, however they are mainly focusing on controlling parasitic disease such as schistosomiasis, and intestinal helminthes (Partnership of Child development, 1999). In Tanzania malaria education in primary schools is not taught as a single independent subject rather it is within a science syllabus under the diseases control topic. This premise provides a potential platform to enhance malaria contents within the syllabus and participatory communication approaches within the formal school routine. This could be a move to address the current poor didactic teaching methods and communication relationship between the teachers and their pupils that might hinder their participation in creating their own and effective way of disease

control. Several studies revealed that the knowledge hierarchy is quite clear and teaching is top-down, one way process directed by the teacher (Bishop, 1986; Bruner, 1996).

In most cases teachers and pupils consider the curriculum as extremely condensed. With this situation, pupils remain with limited possibilities to grasp and develop ownership of the knowledge they received in the classroom. It is argued that traditional approach has led to shift the focus towards participatory approaches that encourage pupils own exploration and discovery and relate the information presented with everyday life (Hawes, 1997). Effective malaria communication needs to involve different levels in planning, implementation and monitoring of the intervention. This involves the use of multiple and appropriate communication channels.

Health education and promotion can be communicated through mass media, public meeting, literacy classes and seminars (Mboera, *et. al.*, 2007). Community participation seems to be necessary and essential but is not much exploited. UNICEF's work in Mozambique shows ongoing participatory communication techniques are more effective than a one-time non-participatory messaging approach (Raphael, 2003).The most feasible way to achieve community participation is to use the existing social and community structures like for example primary schools. The involvement of the education sector in health interventions has already proven to be costs–effective and sustainable. Studies show that prompt and presumptive treatment provided in school is an affordable option to control malaria to school children (Brooker, *et. al.*, 2000).

Therefore, schools might be an effective entry point for malaria control in the community. Schoolchildren are important partners and can be among the best target groups for malaria control in the community. Schoolchildren can be important agent for change. Simple key malaria messages imparted to them can be conveyed to their parents; hence help to promote a community wide understanding and be knowledgeable on malaria and the means to control. Having malaria knowledge, children can easily recognize signs and symptoms and they will inform their parents early to seek for timely and effective treatment (WHO and UNICEF, 2003). Moreover, school children will be the future parents, thus frequent relevant malaria messages throughout their primary education, would enable them to put the knowledge acquired into practice.

In this context, there will be a sense of ownership of malaria knowledge and recall of key issues ultimately promoting positive health behavior. In developing countries a large part of disease prevention already relies on health education of their children through Non Governmental Organizations (NGOs) initiatives such as health promoting schools and Child to Child program by World Health Organization (WHO) and UNICEF, respectively. Interestingly, these programs are based on the principle of making children both actors and messengers of the health and prevention for themselves, other children, their family and community. Moreover, the significant progress made in the improved integration of the education and health sectors, the inclusion of malaria-related activities remains largely limited to project specific

initiatives rather than any coordinated effort through partnership (WHO and UNICEF, 2003).

2.6 Social Marketing Concept and its Application to Health Education

Social marketing is best interpreted as an approach to strategically planning the implementation and evaluation of programs with a focus on target audiences. Social marketing is regarded as a planning tool, that is a theory driven and consumer focused (Thackeray and Neiger, 2000). In principle therefore social marketing needs a clear understanding of the context in which the intervention is conducted. Once interventions are developed through formative research, social marketing pays close attention to pre testing. Prior to the production of messages, materials, and full- scale program implementation, key elements including methods, communications, and strategies are presented to the members of the target audience and feedback is received for modification.

As Weinreich, (1999) pointed out social marketing involves selecting effective and efficient methods of reaching each audience segment, finding out where and how audience members get their information, and how to use appropriate channels to distribute a message, product or program. Under these contexts it can be argued that social marketing has potential techniques necessary to raise public awareness and provide advice on health issues. It employs a communication mix approach to disseminate health information.

Social marketing with a bunch of communication approaches has great potential in health communication efforts (Lazarsfeld and Merton, 1996). This includes package of mass media, interpersonal and printed communication. Also it incorporate extracurricular communication activities in order to stress key messages that could trigger changes in behavior hence improve health of society.

Basing on this premise, social marketing plays an essential role in health education as health information would improve knowledge and understanding about the causes of health and illness and to give health advice and support to help people manage their own health. Improving people's ability to access health information will increase their capacity to make informed choices about their health-related behaviors. Empowering individuals and groups through knowledge is an important health promotion objective. An effective school health education programme requires an appropriate communication to disseminate understandable and useable information. For individuals, effective health communication can help raise awareness of health risks and solutions to provide motivation and skill needed to reduce these risks (Mboera, 2007).

Therefore an appropriate health education strategy is expected to increase the knowledge of both the provider and the receiver, and hence change in behavior. Such knowledge should always be able to empower the receiver to solve his/her problems in a sustainable manner. Primary schools are potential social structures that could be used to channel malaria communication with appropriate approach for best knowledge

improvement and retention. The adoption of social marketing approach in primary school's health education on malaria is expected to promote active participation of different actors in the entire process of the program; consequently maximize knowledge ownership and sustainable best practice towards malaria control and prevention.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Area

The study was conducted in Kilombero district in Morogoro region south-eastern Tanzania. The Kilombero River separates the Ulanga and Kilombero districts and forms the vast Kilombero Valley floodplain. Large parts of this valley are flooded during the rainy season which usually lasts from November to May yearly. The climatic and ecological conditions in the floodplain are favourable for mosquito breeding (Armstrong, *et. al.,* 1999). Malaria is holo-endemic and is one of the main burdens of disease in the study area. It is contributing substantially to morbidity and mortality among schoolchildren and the community as a whole. Kilombero has a total population of 350,000 people and a total of 147 primary schools.

Ifakara Health Institute (IHI) through ACCESS Project implemented a social marketing campaign to improve malaria knowledge and understanding in 38 primary schools. The project involved Health Teachers who trained the schoolchildren and empowered them in developing and implementing extracurricular malaria communication activities in schools. Prior to this, intensive malaria Information Education and Communication (IEC) training was conducted to Health Teachers in order to equip them with relevant malaria knowledge and health communication skills including program planning and implementation by using a logical framework approach.

3.2 Study Design

The study was a cross-sectional case control design. It aimed at understanding the effect of social marketing interventions on malaria knowledge. The study compared the proportion of schoolchildren with malaria knowledge among those exposed to intervention and those not exposed as a control group.

3.3 Study Population

The subjects of the study comprised both male and female primary schoolchildren in Kilombero district. Therefore, the respondents recruited in the study involved those schoolchildren in schools where the social marketing intervention was carried and those not exposed as a control group.

3.4 Sample and Sampling Methods

A multistage sampling method was used to get schools and classes to be involved in this study. A Table of Random Numbers (TRN) was used to get schools to be involved in the study from all primary schools registered in district. A list of all primary schools within the social marketing intervention area and another list for non intervention schools were prepared to get sampling frame. A simple random sampling method was used to get six primary schools exposed to malaria social marketing intervention and corresponding six schools not exposed to social marketing intervention as a control. All standard six and seven schoolchildren were included in the study, where as a total of 1698 schoolchildren were recruited.

These two classes were chosen as they had received and completed the malaria training module developed as compared to other lower classes. The total number of schoolchildren per class differed in each school; it ranged from 30 – 130. The X^2 test was used to compare categorical variables of the selected schoolchildren (sample) in both intervention and control groups; these included age groups, sex and class grade. Results indicated that, there were no significant differences among the sample in the study groups.

Table 1: Distribution of Schoolchildren per Class in each School

Study group	School name	Class		Total
		Std six	Std seven	
Intervention	Kiyongwile	52	58	110
	Mbingu	95	100	195
	Miembeni	68	103	171
	Mkangawalo	44	55	99
	Namawala	129	120	249
	Ihanga	48	46	94
	Total	**436**	**482**	**918**
Control	Jongo	111	111	222
	Kapolo	59	49	108
	Kibaoni	57	50	107
	Kikwawila	30	51	81
	Michenga	78	78	156
	Mahutanga	44	62	106
	Total	**379**	**401**	**780**

3.5 Data Collection Instrument

A semi-structured questionnaire with multiple choice options comprising of 38 questions was developed in English and translated in Kiswahili (see appendix 3). The tool was pre tested with schoolchildren in other schools not included in the study in order to assess the validity of the contents before administering to the target population. The questionnaire comprised seven sections in which the first section elicited socio-demographic characteristics, and the following five sections captured information on malaria knowledge in respect to causes, mode of transmission, recognition, prevention, treatment and risk perception of the disease. The last section explored the primary and the most preferred sources, channels and extracurricular malaria information, education and communication (IEC) among primary schoolchildren.

3.6 Recruitment and Training of Research Assistants

Two Research Assistants were recruited. Prior to the actual fieldwork, Research Assistants were trained in order to familiar them with the data collection tool; and how to supervise schoolchildren when filling it. Additionally; they were briefed on research ethics, administrative and other logistics issues.

3.7 Data Collection Procedure

Data were collected on daily basis; two primary schools per day were covered. Prior to this, data collection schedule was developed and introduction letters were sent to respective primary schools. The letters pointed out the objectives of the study, participants, date and time for data collection.

On arrival to respective primary schools a brief meetings with Head Teachers, Teacher on duty and Health Teachers were conducted. The aim was to clarify any misunderstandings and to share with them data collection process. Following to this, Head Teachers introduced the team to schoolchildren of the respective classes and thereafter Principal Investigator took over the sessions to share the objectives and ethical issues. Although it was required to ask informed consent of parents when interviewing minors (children below 18 years), such consent was requested from the Head Teachers of respective schools as the guardians of the pupils. Each Research Assistant facilitated one class and Principal Investigator provided an overall supervision. However, for schools with more than 150 participants in total, it was advised to split them into 3 classes in order to ensure effective supervision. A thorough review of each filled questionnaire was done to ensure completeness and accuracy.

3.8 Data Processing and Analysis

All questionnaires were thoroughly reviewed and numbered. Also two open ended questions were coded from the list of possible responses. Data were entered and analyzed using STATA version 10 statistical packages to explore the relationships between variables in study. Frequencies of coded options and other tendencies were examined and tabulated. Chi squire test was applied to determine statistical significant differnces between study variables. Univariate logistic regression model was performed to determine association between respondent's demographic characteristics and malaria knowledge.

3.9 Study Variables

Dependent Variables

The dependent variables in this study are those which describe the knowledge with respect to the mentioned areas; these are knowledge of malaria with respect to:

1. causes
2. mode of transmission
3. recognition of types, signs and symptoms
4. prevention
5. treatment
6. risk perception

Independent Variables

1. Age (years)
2. Sex (male of female)
3. Education level (standard 6 or 7)
4. Appropriateness of sources, channels and extracurricular malaria IEC (nominal e.g. Radio, Posters, Booklets, Songs, Poem, Drama, Social marketing etc.)

3.10 Ethical Considerations

The ethical approval to carry out the study was obtained from the research and publication committee of Muhimbili University of Health and Allied Sciences (MUHAS).

And, research permission was requested from the authorities of the Morogoro Region and the Kilombero District through the Regional and District Administrative Secretaries, respectively. In addition, Head Teachers of selected schools were briefed on the purpose of the study through District Education Office (DEO). Lastly, participants were clearly explained on the aim of the study, and obtained their verbal informed consent before were requested to fill in the questionnaires. For the purpose of confidentiality, participants were assured anonymity and the information provided whether orally or in writing was strictly used for research purposes only.

3.11 Limitation of the Study

The study did not have any baseline data; therefore, it was difficult to establish the degree of change on malaria knowledge among schoolchildren who were exposed to the social marketing intervention and to draw unequivocal conclusion.

CHAPTER FOUR

4.0 RESULTS

4.1 Background Information of Respondents

As shown in Table 2 and 3 below, a total of 1698 schoolchildren in both groups participated in the study and of those studied 1046 (61.6%) and 652 (38.4%) were from the intervention and non-intervention schools respectively. The mean age was 14 years and ranged from 10-21 years of age. The study participants constituted both girls and boys with a proportion of 52% and 48% respectively. About 52% of study participants were of standard seven and 48% were of standard six. Majority of the study participants 1383 (81.7%) were in the age group of 10-15 years. The statistical analysis showed that there were no statistical significant differences among the study sample with regards to the age, sex and class level $p>0.05$.

Table 2: Distribution of the Study Sample by Schools

Schools	Sex		Respondents
Intervention schools	**Male**	**Female**	**No.**
Mkangawalo	48	51	99
Mbingu	91	104	195
Namawala	109	140	249
Kiyongwile	61	49	110
Miembeni	74	97	171
Jongo	106	116	222
Total	**489**	**557**	**1046**
Non-intervention schools			
Kibaoni	57	50	107
Kapolo	58	50	108
Kikwawila	38	43	81
Michenga	78	78	156
Mahutanga	49	57	106
Ihanga	44	50	94
Total	**324**	**328**	**652**

Table 3: Distribution of Respondents' Demographic Characteristics by Study Groups

Demographic characteristics	Intervention schools		Non Intervention schools		Statistical test
	No.	%	No.	%	p=value
Sex					
Male	489	46.8	324	49.7	
Female	557	53.2	328	50.3	0.238
Total	1046	100	652	100	
Age group					
10 – 15	846	80.8	541	83.2	
16 – 21	200	19.2	109	16.8	0.212
Total	1046	100	650	100	
Class grade					
Standard VI	499	47.7	316	48.5	
Standard VII	547	52.3	336	51.5	0.760
Total	1046	100	652	100	

4.2 Malaria Knowledge by Study Groups

Malaria knowledge among schoolchildren is summarized in Tables 4, 5, 6, and 7 below. Results are presented based on the cause and mode of transmission, types of malaria, recognition of signs and symptoms, risk perception and effects of malaria to vulnerable groups, prevention and treatment of different forms of malaria. In general results indicated that, schoolchildren exposed to social marketing intervention had significantly higher knowledge compared to the control group $p<0.001$.

4.2.1 Knowledge on the Cause and Mode of Transmission of malaria

As summarized in Table 4 below, a total of 1002 (95.8%) schoolchildren in intervention schools correctly attributed *plasmodium* parasite to the cause of malaria as compared to 434 (66.6%) of non-intervention schools. In addition, 986 (94.3%) and 466 (71.5%) schoolchildren in intervention and non-intervention schools respectively correctly attributed female *Anopheles* bite mosquito as a common vector responsible for malaria transmission. These results showed that, schoolchildren exposed to social marketing intervention had a significant high malaria knowledge on cause and mode of transmission compared to those of non-intervention schools ($p<0.001$)

4.2.2 Knowledge on the Types and Recognition of Malaria

Schoolchildren's knowledge on types and recognition of signs and symptoms of malaria are also presented in Table 4 below. A total of 889 (85%) schoolchildren in intervention schools correctly identified types of malaria as compared to 182 (27.9%) of non-intervention schools.

Schoolchildren in the intervention schools were significantly knowledgeable on identifying the types of malaria compared to those of non-intervention schools ($p<0.001$). Also an average of 75.9% and 57.2% of schoolchildren in intervention and non-intervention schools respectively were able to identify at least 3 signs and symptoms of uncomplicated malaria. Loss of appetite, headache and feeling cold were the most prominently mentioned signs and symptoms, among others. The statistical test indicated that, schoolchildren exposed to social marketing were significantly knowledgeable on recognition of signs and symptoms of malaria compared to those not exposed to intervention ($p<0.001$)

Results also demonstrated that, an average of 62.4% of schoolchildren in intervention schools were able to identify at least 3 signs and symptoms of complicated malaria compared to 45.3% of schoolchildren in non-intervention schools. Convulsion, behavior change and anemia were the most prominently mentioned signs and symptoms, among others. A significant higher malaria knowledge on recognition of signs and symptoms of complicated malaria was observed among schoolchildren in intervention as compared to non-intervention schools ($p<0.001$).

Table 4: Distribution of Respondents' Malaria Knowledge on Cause, Mode of Transmission and Recognition by Study Groups

Variables	Intervention Schools (n=1046)		Non-intervention schools (n=652)		Statistical test
	No.	%	No.	%	p-value
Cause and mode of transmission					
Parasite – *Plasmodium*	1002	95.8	434	66.6	0.000
Vector - female Anopheles mosquito	986	94.3	466	71.5	0.000
Types of malaria					
Complicated and uncomplicated	889	85	182	27.9	0.000
*Recognition of Uncomplicated malaria					
Loss of appetite	731	69.9	339	52	0.000
Headache	869	83	415	63.7	0.000
Feeling cold	781	74.7	365	56	0.000
*Recognition of Complicated/ severe malaria					
Convulsion	863	82.5	377	57.8	0.000
Behavior change	468	44.7	182	27.9	0.000
Anemia	629	60.1	328	50.3	0.000

*Multiple responses

4.2.3 Knowledge on Risk Perception, Vulnerability and Effects of Malaria

Tables 5 below illustrated malaria knowledge among schoolchildren on risk perception, vulnerability and effects. About 75.9% and 70.1% of the schoolchildren in intervention and non-intervention schools agreed malaria as a life threatening disease; and if not effectively treated can cause death. A total of 1442 schoolchildren had malaria attack; 899 (86%) and 543 (83.3%) in intervention and non-intervention respectively. Results also showed that, about 95.5% and 89.4% schoolchildren in intervention schools knew children under the age of five years and pregnant women are highly susceptible to malaria respectively, this is compared to 85% and 63.2% of schoolchildren in non-intervention schools respectively.

Furthermore; results revealed that, schoolchildren in intervention schools were more knowledgeable in the identification of the effects of malaria to pregnant women. About 90.5% mentioned abortion, 84.3% prematurity delivery, 62% low weight delivery and 46.6% mentioned death among mothers. These results were compared with 66.6%, 52%, 47.7% and 39.9% respectively for the control group. Likewise schoolchildren in intervention schools had higher knowledge on the effects of malaria among children under the age of five years. High proportion; 82%, 60.8%, 64% and 48.2% of schoolchildren in intervention schools identified cognitive impact, splenomegaly, convulsion and deaths respectively. Statistical test found that, schoolchildren in intervention schools had significantly higher knowledge on risk perception and vulnerability of malaria compared to non-intervention schools ($p<0.001$).

Table 5: Distribution of Respondents' Malaria Knowledge on Risk Perception and Effects by Study Groups

Variable	Intervention schools (n=1046)		Non-intervention schools (n=652)		Statistical test
	No.	%	No	%	P-value
Is malaria a dangerous and can cause death?					
Yes	794	75.9	457	70.1	0.001
No	234	22.4	167	25.6	
I don't know	18	1.7	28	4.3	
Total	1046	100	652	100	
Have you ever had malaria attack?					
Yes	899	86	543	83.3	0.096
No	91	8.7	57	8.7	
I don't remember	56	5.4	52	8.0	
Total	1046	100	652	100	
*Vulnerable groups in the community					
Children < 5 years of age	999	95.5	554	85	0.000
Pregnant women	935	89.4	412	63.2	0.000
*Effects of malaria to pregnant mothers					
Abortion	947	90.5	434	66.6	0.000
Pre maturity delivery	924	84.3	344	52.8	0.000
Under weight delivery	649	62	311	47.7	0.000
Deaths	487	46.6	257	39.4	0.004
*Effects of malaria to under fives					
Cognitive impact	858	82	237	36.4	0.000
Splenomegaly	636	60.8	194	29.8	0.000
Convulsion	669	64	358	54.9	0.000
Deaths	504	48.2	258	39.6	0.000

*Multiple responses

4.2.4 Knowledge on Preventive Measures of Malaria

There was considerable malaria knowledge among schoolchildren on preventive measures as illustrated in Table 6 below. High proportion 94.7% and 77.5% of schoolchildren in intervention and non-intervention schools respectively accepted that malaria can be prevented by different methods. About 69.7% of respondents from intervention schools admitted insecticide treated mosquito bed nets (ITN's) as the best personal protection method as compared to 75.3% in non-intervention schools. These results were contrary to others as higher proportion of schoolchildren in non-intervention schools significantly identified ITNs as the best malaria preventive methods compared to intervention schools ($p=0.01$). In addition, a proportion of 77.7% of schoolchildren in intervention schools mentioned source reduction as another method to prevent malaria compared to 65.8% schoolchildren in non-intervention schools.

Furthermore, a proportion of 65.8% schoolchildren in intervention schools correctly identified intermittent presumptive treatment (IPTp) and ITNs as important preventive methods among pregnant mothers compared to 56.7% of non-intervention schools. These results revealed significant difference on malaria knowledge with respect to pregnant mothers' preventive methods between schoolchildren in intervention and in non intervention schools ($P<0.001$).

Table 6: Distribution of Respondents' Malaria Knowledge on Prevention by Study Groups

Variable	Intervention schools (n=1046)		Non-intervention schools (n=652)		Statistical test
	No.	%	No	%	p-value
If they know any malaria preventive methods					
Yes	990	94.7	505	77.5	
No	56	5.3	147	22.5	0.000
Total	1046	100	652	100	
*Perceived effective malaria preventive method					
Use of ITN's	729	69.7	491	75.3	0.012
Sources reduction	237	77.7	42	65.8	0.000
Preventive methods for pregnant mothers					
Subsidized ITN,s and IPTp	688	65.8	369	56.7	0.000

*Multiple responses

4.2.5 Knowledge on Effective Treatment of Malaria

The findings of malaria knowledge with respect to effective treatment and awareness on the changes of malaria treatment regime among schoolchildren are summarized in Table 7 below. Majority of schoolchildren 1010 (96.6%) and 598 (91.7%), in intervention and non-intervention schools respectively admitted malaria is a curable disease. About 95.2% and 80.7% of schoolchildren in intervention and non-intervention schools respectively knew antimalaria medicine.

Results also showed that 69.7% and 55.7% of schoolchildren in intervention and non-intervention schools respectively were aware on the change of malaria treatment regime. Statistical significant difference was observed on malaria knowledge with regards to the understating of antimalaria drugs and awareness on the change of malaria treatment regime between schoolchildren exposed to intervention and those not exposed ($p<0.001$)

Results on effective treatment of different forms of malaria revealed that, about 68.4% of schoolchildren in intervention schools correctly identified ALu as effective recommended antimalaria for uncomplicated malaria compared to 44.8% in non-intervention schools. A very low proportion of schoolchildren 32.7% and 17.2% in intervention and non-intervention schools respectively were able to identify quinine as effective antimalaria for complicated malaria.

Despite of low proportion, but schoolchildren exposed to social marketing intervention had significantly more knowledgeable compared to control group ($p<0.001$). An average proportion 45.5% and 42.9% of schoolchildren in the intervention and control schools respectively were knowledgeable on ALu dosage instructions. There was no statistical significant different on ALu dosage instructions between schoolchildren exposed to social marketing intervention and those not exposed ($p>0.05$).

Table 7: Distribution of respondents with malaria knowledge on Treatment by Study Groups

Variables	Intervention schools (n=1046)		Non-intervention schools (n=652)		Statistical test
	No.	%	No	%	p-value
Is malaria a curable disease					
Yes	1010	96.6	598	91.7	0.000
No	19	1.8	31	4.8	
I don't know	17	1.6	23	3.5	
Do you know any antimalaria drug					
Yes	996	95.2	526	80.7	
No	50	4.8	93	14.3	0.000
I don't know	-	-	33	5.0	
Awareness on the changes of treatment regime					
Yes	729	69.7	363	55.7	
No	279	26.7	228	35.0	0.000
I don't know	38	3.6	61	9.3	
What anti malaria replaced SP					
ALu	518	49.5	292	44.8	0.057
What is anti malaria for uncomplicated malaria					
ALu	715	68.4	289	44.3	0.000
What is anti malaria for complicated malaria					
Quinine	342	32.7	112	17.2	0.000
What is the criteria for administering ALu					
Age and weight	761	72.8	452	69.3	0.128
What is a full course of ALu					
Six doses for three days	260	24.9	149	22.9	0.348
What is ALu dosage instructions					
1st at 0hr, 2nd after 8hrs and the rest after 12hrs @	406	38.8	238	36.5	0.340

4.3 Schoolchildren's Malaria Knowledge by Demographic Characteristics

Further analysis to assess association between malaria knowledge and schoolchildren's demographic characteristic (class level, sex and age) was done through univariate logistic regression model.

4.3.1 Association between Malaria Knowledge on Causes, Mode of Transmission, Recognition and demographic characteristics

Results in (Table 8a) below showed that the older age group 16-21 year old schoolchildren were more knowledgeable on the causes of malaria compared to younger age group (10-15) years. The findings suggested that with increases in age there is a 29% increase in the odds of knowing that malaria is caused by *plasmodium* parasite. It is evidenced that this understanding statistically different, by class of the schoolchildren (OR: 0.63, 95% CI 0.49-0.84; p=0.002). Also boys were more knowledgeable on malaria transmission compared to girls; being a boy increases the probability of knowing malaria is transmitted by female Anopheles mosquito bite by 14% although it was not significant.

Results on recognition of different types of malaria indicated that being a boy contributed to a slight increase in the odds of knowing uncomplicated and complicated types of malaria by 10%. This understanding statistically differs by class of the schoolchildren (OR: 0.78, 95% CI 0.64-0.97; p=0.02). In addition, schoolchildren from older age group 16-21 years recognize headache as a symptoms of uncomplicated malaria by19% whereas; there was a slight increase in the odds in recognizing other

sign (feeling cold). It is indicated that the knowledge on the signs and symptoms of uncomplicated malaria statistically differs by sex and class of the schoolchildren (OR: 0.79, 95% CI 0.64-0.99; p=0.04) and (OR: 0.68, 95% CI 0.56-0.85; p=0.001) respectively.

Also boy schoolchildren were more likely to recognize convulsion as a sign of complicated malaria as it increases the odds by 30%; and it is observed to be statistically significant (p=0.01). Contrary to this, results revealed that, being in older age group, standard seven and a boy decreases odds of recognizing anemia as another sign of complicated malaria by 15%, 19% and 22% respectively. Statistical significant was observed only on class level and sex (OR: 0.81, 95% CI 0.67-1.00; p=0.05) and (OR: 0.78, 95% CI 0.64-0.95; p=0.01) respectively.

Table 8a: Association between Malaria Knowledge on (Causes, Mode of Transmission, Recognition) and Demographic Characteristics

Variable	Odds Ratio	95% Conf. Inter		P Value
		Lower	Upper	
Cause of malaria (*Plasmodium* Parasite)				
Age	1.2938	0.8659	1.933	0.209
Class level	0.6399	0.4854	0.8438	*0.002
Sex	1.2641	0.9643	1.6572	0.09
Mode of transmission (Female anopheles mosquito)				
Age	0.8999	0.6219	1.301	0.574
Class level	0.8039	0.6064	1.0656	0.129
Sex	1.1406	0.866	1.5022	0.349
Types of malaria (Complicated and Uncomplicated)				
Age	0.9249	0.7063	1.2112	0.571
Class level	0.7861	0.6401	0.9654	*0.022
Sex	1.104	0.9033	1.3494	0.334
Signs & symptoms of uncomplicated malaria				
Headache				
Age	1.1987	0.8788	1.6346	0.252
Class level	0.9393	0.7458	1.1829	0.594
Sex	0.7962	0.6355	0.9975	*0.047
Feeling cold				
Age	1.0104	0.762	1.34	0.943
Class level	0.687	0.5553	0.8487	*0.001
Sex	1.0083	0.8198	1.2401	0.937
Signs & symptoms of complicated malaria				
Convulsion				
Age	0.9203	0.6882	1.2306	0.575
Class level	1.0666	0.8529	1.3339	0.572
Sex	1.3027	1.0462	1.622	*0.018
Anemia				
Age	0.8595	0.6618	1.1161	0.256
Class level	0.8186	0.6699	1.0004	*0.05
Sex	0.7829	0.6439	0.9518	*0.014

*Statistical significant P <0.05 or P=0.05

4.3.2 Association between Malaria Knowledge on Risk perception, Effects and Demographic Characteristics

Summarized in (Table 8b) below are results on the association between malaria knowledge on vulnerability, sex and age. Being boy schoolchildren increases the odds of knowing children under the age of five years are more susceptible group by 30%; whereas older age group (16-21) years slight more likely to mention pregnant women by 5% are vulnerable. The findings showed the understanding is statistically differrent by class of the schoolchildren (OR: 0.39, 95% CI 0.27-0.57; p<0.0001) and (OR: 0.62, 95% CI 0.49-0.80; p<0.0001) respectively.

Results also indicated that, being in older age group 16-21 years and standard seven contribute to a slight increase in the odds of knowing abortion as the effects of malaria among pregnant women by 3% and 15% respectively. Also it increases the odds of knowing pre mature delivery as another malaria effect to pregnant women by 23% and 25% respectively. This was seen to be statistically differrent by sex of schoolchildren (OR: 0.69, 95% CI 0.54-0.89; p=0.004). Furthermore the findings showed that schoolchildren in the older age group were slightly knew that convulsion is the effect of malaria to children under the age of 5 years by 6%. This was statistically proved that the understanding is differ by class and sex of the schoolchildren (OR: 0.80, 95% CI 0.66-0.98; p=0.03) and (OR: 0.77, 95% CI 0.63-0.94; p=0.01) respectively.

Table 8b: Association between Malaria Knowledge on (Risk Perception, Effects) and Demographic Characteristics

Variable	Odds Ratio	95% Conf. Inter		P Value
		Lower	Upper	
Vulnerable groups (Children < 5 years of age)				
Age	0.8065	0.4915	1.3233	0.395
Class level	0.3903	0.2672	0.5702	*0.000
Sex	1.3045	0.9177	1.8543	0.138
Vulnerable groups (Pregnant women)				
Age	1.051	0.7522	1.4677	0.772
Class level	0.6289	0.4914	0.8049	*0.000
Sex	0.9321	0.7337	1.1842	0.565
Effects of malaria to pregnant mothers				
Abortion				
Age	1.0398	0.7493	1.443	0.815
Class level	1.1581	0.8972	1.495	0.26
Sex	0.6929	0.5402	0.8888	*0.004
Pre mature delivery				
Age	1.2319	0.91	1.6678	0.177
Class level	1.2521	0.9967	1.5729	*0.053
Sex	0.8968	0.718	1.1202	0.337
Effects of malaria to children under five years				
Cognitive impact				
Age	0.9192	0.7009	1.2054	0.542
Class level	0.8013	0.6513	0.9859	*0.036
Sex	0.9338	0.7628	1.143	0.507
Convulsion				
Age	1.0655	0.8153	1.3924	0.642
Class level	0.8025	0.655	0.9832	*0.034
Sex	0.7726	0.6336	0.94193	*0.011

*Statistical significant P <0.05 or P=0.05

4.3.3 Association between Malaria Knowledge on Prevention and Demographic Characteristics

Table 8c below illustrates that, schoolchildren in the older age group and those of standard seven were more likely to identify ITNs as the most effective personal protection against malaria by 54% and 43% respectively. These results were found to be statistically significant (p=0.005 and 0.001) respectively. No association was observed between demographic characteristics and knowledge of subsidized ITNs and IPTp as effective malaria prevention methods for pregnant women.

Table 8c: Association between Malaria Knowledge on Prevention and Demographic Characteristics

Variable	Odds Ratio	95% Conf. Inter		P Value
		Lower	Upper	
Perceived malaria prevention method (ITN's)				
Age	1.5439	1.1429	2.0856	*0.005
Class level	1.4361	1.1511	1.7916	*0.001
Sex	0.8783	0.7079	1.0896	0.238
Preventive methods for pregnant women				
Subsidized ITN,s and IPTp				
Age	0.9249	0.7079	1.2084	0.567
Class level	0.8375	0.6827	1.0274	0.089
Sex	0.9899	0.8108	1.2084	0.92

*Statistical significant P <0.05 or P=0.05

4.3.4 Association between Malaria Knowledge on Treatment and Demographic Characteristics

Age group and class level showed positive association with malaria knowledge particularly on treatment and change of malaria treatment policy. The increases in the odds of knowing SP was replaced by ALu by 39% and 19% have been noticed on older age group (16-21) years and standard seven respectively. Result on the age group was found to be statistically significant (p=0.01). Also a slight increase in the odds of knowing ALu is effective drug for uncomplicated malaria by 7% and 25% was revealed on the same demographic characteristics respectively. Results on class level was found to be statistically significant (p=0.03).

Contrary to the above findings, it is observed that schoolchildren in the older age group and standard seven were less likely knowing effective drug for complicated malaria by 41% and 33% respectively; these results were statistically significant (p=0.001 and p=0.02) respectively. It is also observed that being in the older age group (16-21) years and a boy increases the odds of knowing criteria by 17% and 26% respectively. Statistical significant difference was observed on sex (p=0.03). In addition to this boys were more likely knowledgeable on full course of ALu by 37% and it was significant (P=0.01). Also it was evidenced that the understanding of full cause differs by class level of the schoolchildren (OR: 0.77, 95% 95% CI 0.62-0.98; p=0.03). Furthermore results showed that being in the older age group (16-21) years slightly increases the odds of knowing ALu dosage instructions by 6%.

Table 8d: Association between Malaria Knowledge on Treatment and Demographic Characteristics

Variable	Odds Ratio	95% Conf. Inter Lower	Upper	P Value
What anti malaria replaced SP (Alu)				
Age	1.3958	1.0759	1.8108	*0.012
Class level	1.1964	0.9806	1.4596	0.077
Sex	0.9765	0.8043	1.1856	0.81
What is anti malaria for uncomplicated malaria (Alu)				
Age	1.0758	0.8267	1.4001	0.587
Class level	1.2504	1.0219	1.5299	*0.03
Sex	0.9053	0.7436	1.1022	0.322
What is anti malaria for complicated malaria (Quinine)				
Age	0.5951	0.4335	0.817	*0.001
Class level	0.7707	0.6158	0.9644	*0.023
Sex	0.8422	0.6758	1.0497	0.126
What are criteria for administering Alu (Age and weight)				
Age	1.1704	0.8693	1.5759	0.3
Class level	0.8679	0.6973	1.0803	0.205
Sex	1.2566	1.0136	1.5579	*0.037
What is a full course of Alu (Six doses for three days)				
Age	0.7371	0.5397	1.0067	0.055
Class level	0.7794	0.6175	0.9837	*0.036
Sex	1.3753	1.0958	1.725	*0.006
What is ALu dosage instructions				
1st at 0hr, 2nd after 8hrs and the rest after 12hrs @				
Age	1.0566	0.8095	1.3791	0.686
Class level	0.961	0.7836	1.1786	0.702
Sex	0.8697	0.7124	1.0616	0.17

*Statistical significant P <0.05 or P=0.05

4.4 Malaria Information, Education and Communication (IEC)

An analysis of malaria information, education and communication (IEC) channels among primary schoolchildren was done in order to determine the primary sources and most noticed and preferred malaria communication channels. Further, the study investigated the extracurricular malaria communication activities, which were also effective in imparting malaria knowledge.

4.4.1 Primary Sources of Malaria IEC

Figure 2 below, summaries the findings on primary sources of malaria IEC. Awareness of malaria information was high among the study groups. High proportion of schoolchildren in both study groups and control had seen or heard malaria IEC for the period of the past six months prior to this study. About 76% of schoolchildren in intervention schools were most frequently exposed to school-based malaria education as compared to 43% in the control group; whereas 80% of schoolchildren in the control schools were frequently exposed to health facilities based malaria IEC; about 73% of the schoolchildren in the intervention schools were also exposed to health facilities education. A small proportion of primary sources of malaria IEC among schoolchildren were attributed to community meetings, mass media and churches or mosques.

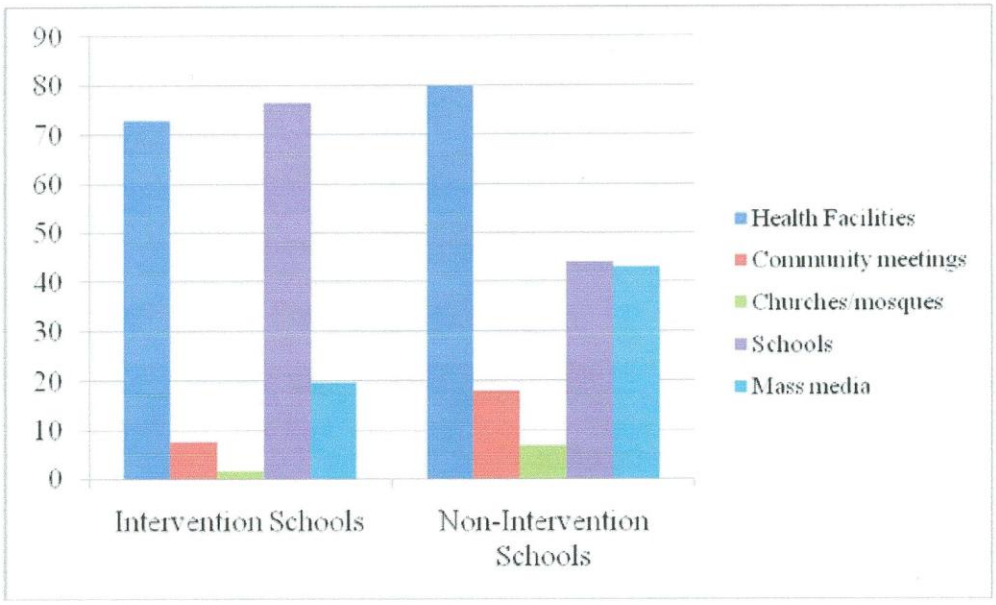


Figure 2: Primary Sources of Malaria IEC by Study Groups

4.4.2 Most Prevalent and Preferred Malaria Communication Channels

Figures 3 and 4 below summarize results on the most prevalent and preferred communication channels among schoolchildren in both study groups. The results indicated that 92.7% of schoolchildren in the intervention schools had significantly higher level of exposure to Booklets produced during social marketing campaign ($p<0.001$), followed by class-based education (64.4%) and Radio (55.8%). However, schoolchildren in non-intervention schools were frequently exposed to public leaflets (60%), followed by posters (59%) and T-shirts/caps (48.5%). Study results revealed that, there was a difference between noticed and preferred channels among study groups and T-shirts and caps being preferred in both study groups.

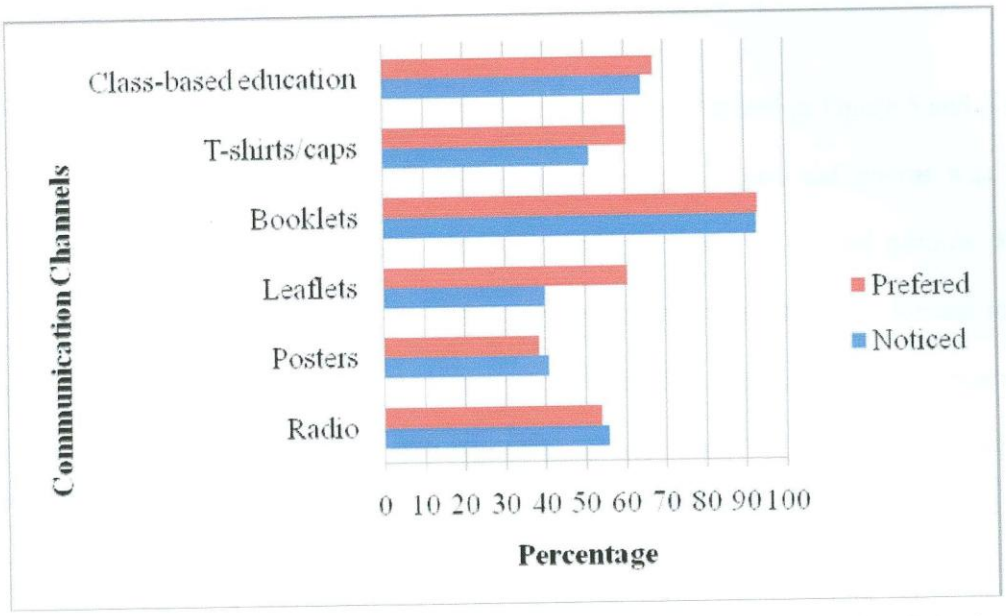


Figure 3: Most Prevalent and Preferred Communication Channels in Intervention Schools

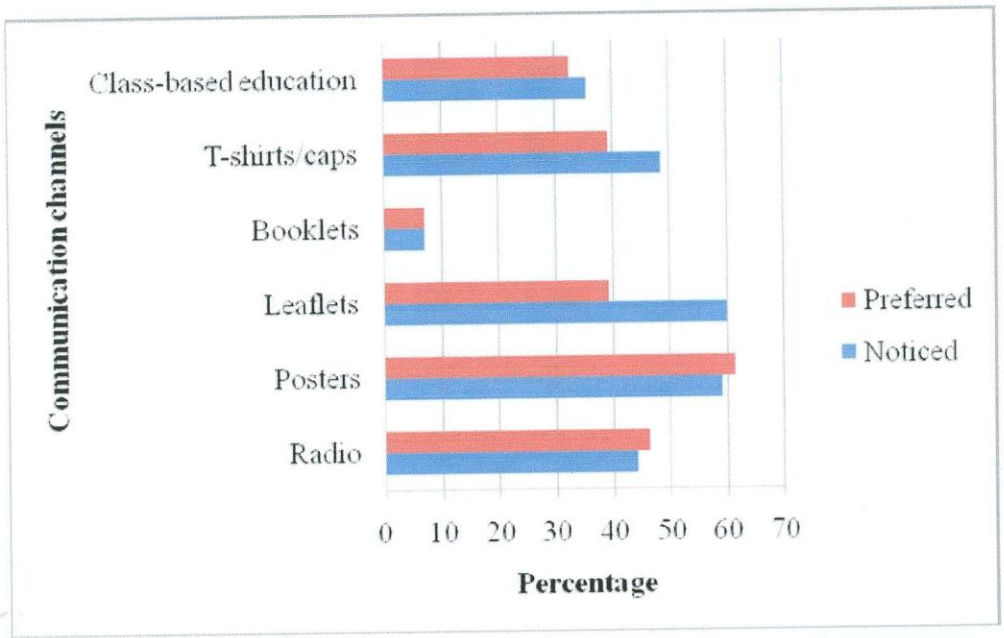


Figure 4: Most Prevalent and Preferred Communication Channels in Non-intervention Schools

4.4.3 Extracurricular Malaria Communication

Extracurricular malaria communication results are summarized in Figure 5 and 6 below. A statistically significant exposure to malaria songs, drama and poems was highly observed in intervention schools ($p<0.001$) as compared to control schools. Results indicated malaria songs, drama and poems were most frequently performed to 94%, 96% and 96% respectively in intervention schools compared to non-intervention schools. About 92.5% of the schoolchildren in intervention schools mentioned the use of extracurricular malaria communication compared to 7.6% in non-intervention schools.

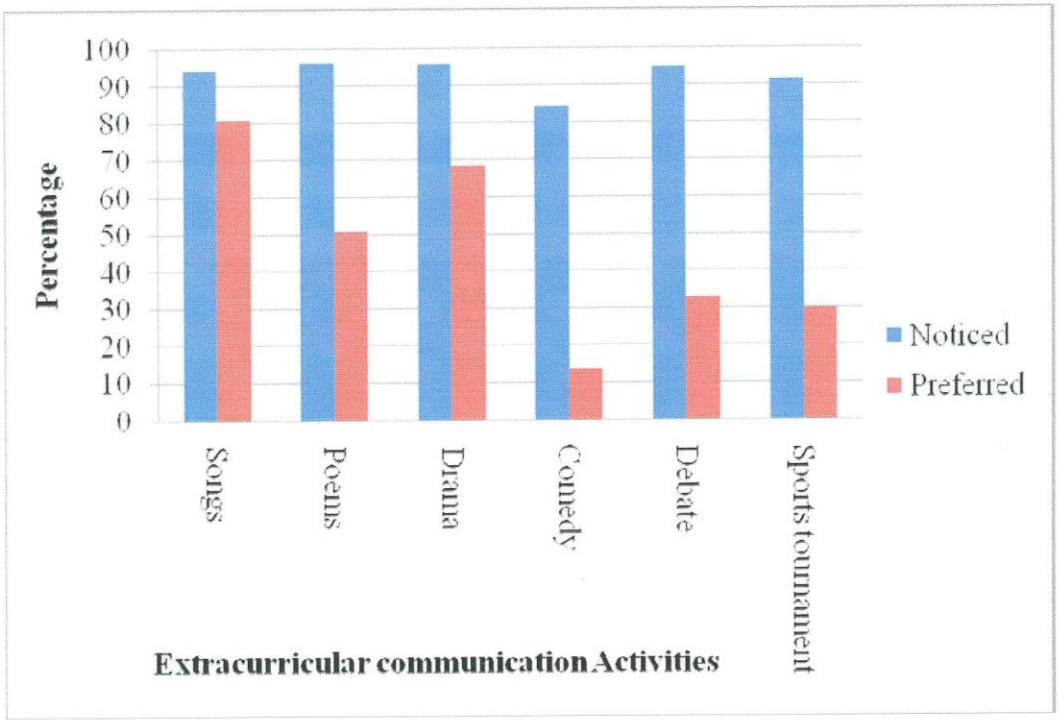


Figure 5: Most prevalent and Preferred Extracurricular communication in Intervention Schools

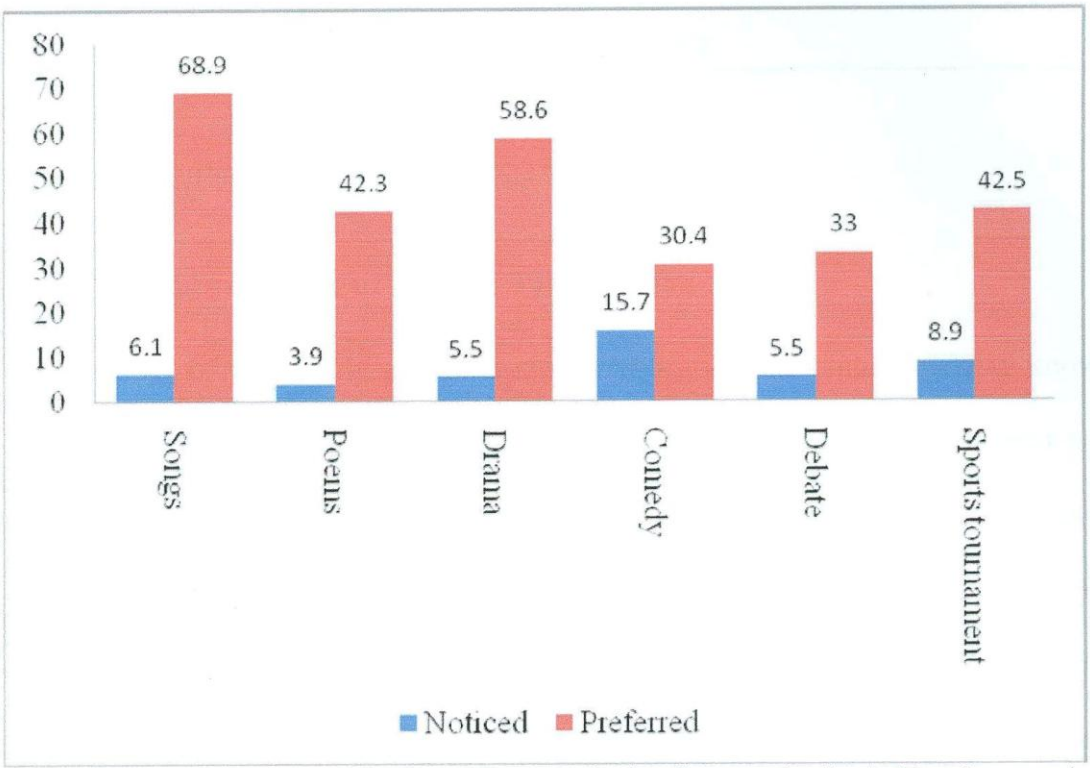


Figure 6: Most Prevalent and Preferred Extracurricular Communication in Non-intervention Schools

CHAPTER FIVE

5.0 DISCUSSION

5.1 Cause and mode of Malaria Transmission

The results of this study revealed statistical significant higher malaria knowledge among schoolchildren exposed to the social marketing intervention compared to those not exposed. The findings suggest that schoolchildren exposed to intervention had higher knowledge on the causes and mode of transmission of malaria respectively compared to those not exposed. Significant proportions of schoolchildren in non intervention schools were unaware on the causal link between mosquitoes and malaria. Most of them were not able to distinguish between the causative agent and the mode of malaria transmission. This situation is common to most of the people. Results of this study showed that, social marketing intervention enabled schoolchildren to differentiate between malaria causative agent and transmission vector.

High proportion of schoolchildren exposed to intervention attributed *Plasmodium* parasite as causative agent and female Anopheles mosquito as a transmission vector respectively. The study conducted in West Kenya indicated that health intervention enabled most children to modify the concept of illness to incorporate a specific diagnosis linked to causes (Onyango W, 2004).

Understanding the root causes of health problems is a precondition for schoolchildren to initiate prevention and control of the health problems. As Mboera, (2007) argued, serious obstacles in most disease control strategies include lack of effective health information, education and communication programs. Health communication is a fundamental component in virtually every form of public health. To manage disease in an effective and sustainable manner, the community needs to have a certain set of knowledge and information on disease transmission, signs and symptoms, control and prevention measures

5.2 Types and Recognition of Signs and Symptoms of Malaria

Understanding types of malaria is a prerequisite for accessing prompt and effective malaria treatment (ACCESS Programme, 2007). In addition, this could enable the schoolchildren to recognize and distinguish between signs and symptoms of each type. Schoolchildren in intervention schools were significantly knowledgeable on recognizing the signs and symptoms of malaria compared to the control schools. Majority of schoolchildren in non intervention schools incorrectly mixed-up types with signs and symptoms of malaria. This aspect is common to most of community members where they tend to label type of malaria depending on the pattern of signs and symptoms observed. Simple key malaria messages imparted to schoolchildren can be conveyed or passed through to their peers and parents; hence help to promote a community wide understanding and be knowledgeable.

Having malaria knowledge, children can easily recognize signs and symptoms and they will inform their parents early to seek for timely and effective treatment (WHO and UNICEF, 2003).

In the study area, it is observed that grown up schoolchildren normally stay with their young brothers and sisters at home when their parents moved to the "*shamba*" during farming season. Therefore it is important for these children to know signs and symptoms of the disease as they will report immediately to their parents (ACCESS Programme, 2005). Skilled-based health education can give children ability to recognize the signs and symptoms of malaria, and the need to seek timely and effective treatment for it (World Bank, 2003). Understanding of these signs and symptoms could also resolve some misconception among community members about the disease like convulsion which is misconceived and be related to witchcraft and being treated to traditional healers. Schoolchildren can act upon based on the malaria knowledge they have acquired. As Onyango W, 2005 argued, the participatory nature of the intervention, which emphasized individual and mutual action taking school and home, seemed to increase children's awareness in relation to disease concept.

5.3 Risk Perception and Effects of Malaria

Children under the age of five years and pregnant women are highly susceptible groups to malaria. About 90% of all deaths occurring in sub-Saharan Africa are attributed to these groups (WHO and UNICEF, 2003).

Results of this study also indicated that 73.6% of schoolchildren in both study group mentioned that malaria is a life threatens disease. A total of 87.4% and 74% of schoolchildren in intervention and control schools respectively revealed children under the age of 5 years and pregnant women being at higher risk of malaria attack compared to other groups in the community. This study showed that, high proportion of schoolchildren in the intervention group were significantly knowledgeable on the effects of malaria to the most vulnerable groups; compared to control schools. Among of the most frequently effect mentioned by the schoolchildren was the cognitive impact to children under the age of five years.

The findings of this study are similar with those of other studies conducted in other places like Kenya, Zimbabwe, and Nigeria etc. As literature shows; many children who survive an episode of severe malaria may suffer from learning impairments or brain damage (WHO, 1998). Imparting knowledge on the effects of malaria to schoolchildren enables them to understand future impact in their learning process. This would therefore promote preventive positive health behavior and take precaution to themselves, their young sisters and brothers; by emphasizing the key messages to their parents and caretakers. Additionally, schoolchildren are future parents, thus appropriate malaria communication will enable them to create a sense of knowledge ownership that will be passed from generation to generation.

5.4 Preventive Measures of Malaria

Results showed that schoolchildren perceived ITN as effective personal protection method; followed by reduction of mosquito breeding sources as another appropriate preventive method among others. Despite of significant knowledge on malaria preventive methods, application of this knowledge in their everyday life still is questionable basing on the fact that ownership of the ITNs is out of their capacity. However it is argued that, school-based health education will result into positive change of attitude towards malaria prevention and control. Simple message that teachers relay to schoolchildren is to encourage their younger ones to sleep under treated mosquito nets and pregnant mothers to comply with IPTp (World Bank 2003).

Participatory health education studies in Kenya have shown that school-based health education messages can be translated into practice, in terms of malaria prevention. For example, a health education project among primary level schoolchildren in Kisumu, Kenya showed that although no significant changes were observed in the knowledge of malaria, there was an effort to avoid being bitten by mosquitoes and an increased awareness and positive change of attitude towards malaria (Ogutu *et al.,* (1992). Also studies of different diseases have shown an association between health education and improvement of desirable knowledge, leading to positive change in attitude and practices. In Thailand; school-based malaria education significantly resulted into schoolchildren changing their behavior positively towards malaria prevention.

Teachers send key malaria prevention methods to the community through schoolchildren by using different methods like newsletters and sometimes through outdoor activities, thus being important messengers for malaria prevention (Okabayashi, *et. al.,* 2006).

To achieve a comprehensive and sustainable malaria prevention and control in the country, malaria programs should be incorporated in education system particularly primary education and linked with the local communities. Linking the community with education sector towards struggling against malaria is of vital importance (Rojas, 2001). Social marketing provide an opportunity to promote participatory approach in malaria prevention and control. Schoolchildren can send malaria related messages to their parents, but great and positive impact in term of behavior and attitude change would depend on the level of knowledge and involvement of the community itself in the programs. Study by Rojas, 2001 revealed the opportunity of channeling relevant health messages to the community through schoolchildren though the impact not yet evidenced.

Study conducted by Marsh *et. al.,* 1996 has shown that school-based health education messages can be translated into practice in terms of malaria prevention. Although school children may not be able to influence their parents, they themselves will become parents of the next generation of at-risk children.

5.5 Effective Malaria Treatment

Results in the study showed that most of the schoolchildren 74% accepted that malaria is a life threatening disease and can cause death if not effectively treated. Recently Tanzania has changed malaria treatment policy from monotherapy to combination therapy in 2006. Majority of schoolchildren were aware of the change of malaria treatment regime, however very low proportion of schoolchildren understand that ALu is the drug that replaced SP. This is among of the shortfall of health sectors in which the community was not well prepared for the newly introduced drug.

Study by (Nsimba, 2005), pointed out things to be considered when introducing new antimalarial drugs. Among of the most important practical aspect of community involvement and acceptability of new anti malarial drug are community sensitization, mass media, newspapers, radios and Televisions.

The results of this study found schoolchildren exposed to social marketing intervention to be significantly knowledgeable on effective treatment of different forms of malaria compared to non-intervention schools, but in general the knowledge was low. About 68.4% and 44.3% of schoolchildren in intervention and control schools correctly attributed effective treatment of uncomplicated to ALu respectively. Also 32.7% and 17.2% of schoolchildren in intervention and control schools correctly attributed effective treatment for complicated malaria to Quinine respectively.

Still other schoolchildren attributed SP as the first line antimalaria for uncomplicated malaria and others incorrectly attributed ALu as effective antimalaria for complicated malaria. It is important for schoolchildren to understand the correct antimalaria for a specific type of malaria. In principle community should promptly recognize malaria symptoms hence seek for appropriate treatment from reliable sources. In order to achieve these objectives, uncomplicated malaria must be recognized and diagnosed early and the correct treatment administered without delay.

This study established that, majority of schoolchildren were not knowledgeable on ALu dosage instructions. On average only 23.9% of schoolchildren in both study groups correctly responded on ALu dosage instructions. Adherence to dosage instruction is very important in order to ensure reasonable amount of medicine sufficient to kill parasites in the body. Proper instructions on how to take and comply with full course of ALu if given to schoolchildren might be communicated to their parents.

The process of taking medicine involves mathematics in terms of number of pills, hours, days etc; teachers could incorporate in mathematic topics and should repeatedly remind schoolchildren. Frequent exposure of the same message would increase the understanding and recall of the message consequently translated to positive practices. These findings emphasize a need for clear, simple messages about the appropriate drug and dosage instructions.

5.6 Association between Malaria Knowledge and Demographic Characteristics

Analysis to determine association between schoolchildren's malaria knowledge and demographic characteristics demonstrated some variations across different parameters. In general results signified the likelihood in the increase of malaria knowledge by age and sex with respect to causes, mode of transmission, recognition of types; signs and symptoms of malaria. On the other hand a negative association was found on class levels of the schoolchildren within the same malaria knowledge patterns; and it was significant ($p<0.05$). Malaria knowledge on risk perception, effects, prevention and treatment increases with class level. These results were statistically significant ($p<0.05$). In most cases age and class level matches and it is expected the older age schoolchildren to be in the upper class. This picture has been disclosed in this study whereas; 80% of 309 schoolchildren of the older age group (16-21) years were in standard seven.

Basing on this, it shows that the level of understanding differs with demographic characteristics of the schoolchildren. The findings point out the necessity for prior thorough assessment of malaria information and the means to disseminate. Schoolchildren of different classes shouldn't be given an equal weight when developing communication strategies. Teaching protocol should be developed and clearly explain the cutoff point of malaria information to be taught in each class level. This could make possible for schoolchildren to concentrate on the specific key messages equivalent to their age and class grade within a considerable amount time.

Thus effective and appropriate communication strategies play an important role in disseminating malaria information. Information should be communicated at the right time to the right audiences and with the right channels. Extracurricular malaria communication activities could be the appropriate means to ensure effective participation of all schoolchildren. Boys and girls in each class should be encouraged to join in one of the extracurricular malaria performance. However, message to be conveyed should be simple, clear and attractively presented in order to be easily understood and retained by the schoolchildren. However pre testing of key messages and communication strategies with schoolchildren is a crucial aspect to be considered when designing primary schools malaria communication intervention. This could help to reduce knowledge disparities across demographic characteristics, hence ensure effectiveness and coverage of the intervention.

5.7 Information, Education and Communication (IEC)

Malaria communication for behavior change is an increasingly important activity for Roll Back Malaria (RBM) partners. Message delivered through school-education programs provide an important avenue through which this behavior change can be affected (World Bank 2003). However effective health communication targeted behavior change depends on the overall process of planning and implementation.

End product of effective health communication is to impart a relevant set of knowledge and information for disease transmission, signs and symptoms, control and prevention measures (Mboera, 2007).

Results in this study indicate that, school-based social marketing approach imparted considerable malaria knowledge among schoolchildren exposed to intervention. Thackeray and Neiger, 2000 argued that, social marketing is best interpreted as an approach to strategically planning the implementation and evaluation of programs with a focus on target audiences. Social marketing is regarded as a planning tool, that is a theory driven and consumer focused. Social marketing provides an opportunity for all actors in the program to actively participate in planning and implementation. Furthermore, results showed that most of the schoolchildren had information about malaria from different sources. The primary source of malaria IEC varies between study groups. High proportion of schoolchildren in intervention schools point out that school-based malaria education as a primary source whereas health facilities highly mentioned among schoolchildren in non intervention schools.

However, schoolchildren exposed to social marketing intervention were significantly knowledgeable on malaria compared to those not exposed. These results portray the relevance and appropriateness of malaria IEC designed during social marketing intervention. Results of this study are similar to study conducted by Edson *et, al.,* 2004 in southern-west Tanzania where teachers were identified as an important source of information. This shows that if teachers were equipped with relevant malaria knowledge and appropriate malaria communication techniques would be potential resource persons in malaria communication in rural areas.

In addition communication channels and strategies plays a major role to ensure target audiences receive desired information as intended. Poor didactic teaching methods and communication relationship between the teachers and their pupils might hinder their participation in creating their own and effective way of disease control. As Bishop, 1986 and Bruner, 1996 argued, knowledge hierarchy is quite clear and teaching is top-down, one-way process directed by the teacher. This is a traditional method of teaching and it does not provide opportunity to schoolchildren to conceptualize and link the problem with their daily life practice.

Furthermore results of this study showed that, schoolchildren in intervention schools were significantly exposed to several communication channels; these include class-based education, printed materials, and extracurricular communication like songs, drama, poems etc. A total of 92.7% of schoolchildren in the intervention schools had significantly higher level of exposure to booklets produced during social marketing campaign $p<0.001$ as compare to public leaflets found to be highly exposed to schoolchildren in non intervention schools. It is important to take into consideration the appropriateness and relevance of IEC materials reflecting the target audiences. Schoolchildren in non-intervention schools were exposed to material produced for public uses whereas pictorial malaria booklets designed for schoolchildren. The booklets information was presented in school-based pictorial format with stories in favored of schoolchildren hence being attracted and capture their attention.

Study conducted by Mboera *et, al.,* 2007 in Dodoma, Tanzania showed that local media, mass media, printed materials and interpersonal communication were identified as the most used channels in health information communication. The findings of this study suggested that printed materials in rural areas form an important source of health information. This is similar to results of this study whereas leaflets were mostly identified as a primary source of malaria information among primary schoolchildren in non intervention schools. Social marketing involve the target audience through formative research and pay attention on pre testing the entire process of the program. As Weinreich, (1999) argued, social marketing involves selecting effective and efficient methods of reaching each audience segment, finding out where and how audience members get their information, and how to use appropriate channels to distribute a message, product or program.

It can be argued form the study results that, schoolchildren in non intervention schools were not exposed to appropriate malaria IEC materials. As Mboera LEG, 2007 argued, serious obstacles in most disease control strategies include lack of effective health information, education, and communication programs. Despite of malaria being in the science syllabus, but there is little emphasis on the practical life-skill application of learnt knowledge resulting in a missing link between knowledge learnt and knowledge used. Teachers are further hampered by a lack of relevant health education materials (IEC) in the form of posters, flip charts and training manuals hence they have to rely on out-dated textbooks.

Also methods used to impart knowledge to schoolchildren do not support them to actively participate in the entire process of planning and implementation.

Hearing about malaria is not enough, but materials should contain relevant information and designed specifically for the target audience in order to induce desired positive impact. In this study high proportion of schoolchildren of both study groups heard about malaria, but significantly schoolchildren in intervention schools were knowledgeable compared to control schools. This implies that schoolchildren in intervention schools had repeated exposure to relevant malaria education messages during social marketing campaign. Frequent exposures of relevant malaria messages increase the chance for them to recall and influence their behavior and attitude change towards malaria control and prevention. In this context, there will be a sense of ownership of malaria knowledge.

The use of extracurricular communication strategies will empower schoolchildren to both actors and messengers on malaria prevention for themselves, other children, their family and community at large. Extracurricular malaria communication strategies were designed and implemented as a complement to class-based education. It involved participatory planning and implementation of malaria communication hence enabled them to actively role taking to deliver key messages to their fellows and community at large.

A statistical significant difference were found $p<0.001$ on the use of malaria songs, drama and poems. Results indicated that, extracurricular were most frequently exposed by 94%, 96% and 96% respectively in intervention schools as compared to control schools. These findings were also supported by the study conducted in India as schoolchildren exposed to different health education activities such as live demonstrations, slide shows and when both events were grouped together results to a high average of correct score as compare to control group (Bhati PG, 1995). Also study conducted in Kenya revealed that, positive results were seen as we encouraged the teachers to use various participatory learning methods, including child-to-child approaches (Onyango, *et. al.*, 2004).

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study revealed significant differences in malaria knowledge among schoolchildren exposed to social marketing intervention compared to those not exposed. Significant differences in malaria knowledge were seen on cause, mode of transmission, recognition, risks perception, prevention and treatment of different forms of malaria. However, the findings showed low knowledge on the correct dosage instructions for the recommended first line antimalaria (ALu) in both study groups.

This study also showed that there were variations on malaria knowledge among demographic characteristics of schoolchildren; these include age, sex and class grade. This provides a prerequisite during the designing of health communication campaign on how to incorporate a gender perspective, how to segment target audience with age dimension and how to visage their level of education.

The study results shows that, despite being exposed to public malaria information like leaflets, radio and posters still schoolchildren in non-intervention schools had low malaria knowledge. It can therefore be concluded that, there is a causal relationship between social marketing intervention and improved malaria knowledge among schoolchildren exposed to intervention.

Combination of communication channels supplemented with extracurricular malaria communication activities employed; increase chances for relevant malaria information to be exposed among schoolchildren within the intervention schools. In addition to class based education, printed pictorial malaria booklets were prevalent and preferred communication channels among schoolchildren in intervention schools.

Malaria songs, poems and drama were prevalent extracurricular malaria communication activities to schoolchildren in intervention schools but where most preferred in both study groups. Social marketing intervention with selected communication channels and extracurricular communication activities could enrich school-based malaria education hence improve malaria knowledge among primary schoolchildren.

6.2 Recommendations

Basing on the findings of this study recommendations are focused to project specific implementing primary schools malaria social marketing communication campaign, primary school teachers, education authorities, and researchers.

It is recommended to bridge the gap of malaria knowledge among primary schoolchildren. Despite of being exposed to different sources of malaria information, and malaria being in science syllabus, still the findings signify the importance of appropriate malaria communication approach and strategies targeted to schoolchildren.

Social marketing approach should be further assessed in order to provide evidences based information on its effectiveness in imparting relevant malaria knowledge among primary schoolchildren consequently being used as a platform to enriching contents of malaria within the primary school curriculum.

Moreover, it is also recommended to narrow down communication channels employed during implementation of social marketing intervention basing on effectiveness and coverage. Results showed that, in addition to class based education; pictorial malaria booklets should be considered as the most effective in imparting relevant malaria knowledge among schoolchildren.

Also in order to increase active participation in malaria communication among primary schoolchildren, extracurricular malaria communication like the use of songs, poems and drama should be strengthened. In parallel to this, malaria communication should be interlinked with other subjects like mathematics, English, Kiswahili, Geography, History and Science etc. By so doing malaria messages will be frequently exposed to schoolchildren consequently leading to adaptation and practice of positive health behavior towards malaria prevention and control.

Results showed schoolchildren had low knowledge on malaria treatment particularly on proper ALu dosage instructions. This justifies the need to review social marketing communication strategies and put more emphasis on how to convey the message in a simple manner that can easily be understood by schoolchildren.

This study also provides an opportunity for further research to assess the applicability of malaria knowledge imparted through social marketing to schoolchildren to their communities. An effective innovative malaria communication approach should be designed to bridge a gap on knowledge sharing between schools and community. Extracurricular malaria communication activities can be used to deliver key messages to the community. This includes outdoor activities, stage performance during public special days and organizing sports tournaments that can create public awareness in their respective village.

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