Local Community Knowledge, Perceptions, and Experiences of Malaria Prevention in the Highlands of Papua New Guinea.

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A thesis submitted in partial fulfilment of the requirements for the degree of

Master of Health Science - Nursing

Unitec Institute of Technology, Auckland, New Zealand.

2010
ABSTRACT

Background
Malaria is becoming common and causing seasonal epidemics in the Highlands of Papua New Guinea (Mueller et al., 2005). Malaria is mainly affecting the health of the local population who live in bush huts. The Highland’s local people’s knowledge, perception and practical measures to prevent malaria were explored in this study.

Objective
This study was aimed at identifying knowledge gaps and other possible environmental impediments that may influence effective participation of the local people.

Method
Interpretive description (a qualitative approach) was used for this study. Data was collected through focus groups (x4) and individual interviews (x4).

Results
There were seven main themes that emerged from this study. Theme One revealed the locals’ knowledge gaps and misconceptions of malaria. Theme Two indicated climate change as a trigger for malaria increase in the Highlands. Theme Three revealed locals’ experiences of current malaria prevention and control strategies. Theme Four emerged as alternative malaria treatment. Theme Five revealed some problems faced by locals with the health care system. Theme Six showed locals’ perception of socio-economic disempowerment, and Theme Seven related to locals’ behavioural factors contributing to malaria.

Conclusion
This study identified Highlands’s local’s knowledge gaps answering the original focus of study. The knowledge gaps indicated essential components for primary health care functions as needing attention, PHC workers in rural areas increased, and health planners to implement suitable approaches with local involvement to build locals’ knowledge capacity for malaria prevention and control.
DECLARATION

Name of candidate: Kolly Tongamp Bang

This thesis entitled: Local Community Knowledge, Perceptions, and Experiences of Malaria Control and Prevention Measures in the Highlands of Papua New Guinea is submitted in partial fulfilment for the requirements for the Unitec degree of Master of Health Science - Nursing.

Candidate’s declaration

I confirm that:

This Thesis represents my own work;

The contribution of supervisors and others to this work was consistent with the Unitec Regulations and Policies.

Research for this work has been conducted in accordance with the Unitec Research Ethics Committee Policy and Procedures, and has fulfilled any requirements set for this project by the Unitec Research Ethics Committee. Research Ethics Committee Approval Number: 2009 1031

Candidate Signature: Date: 16\textsuperscript{th} July 2010

Student number: 1321615
ACKNOWLEDGEMENTS

I would like to acknowledge the guidance, support and prayers of many people who made it possible for this project to be completed. Without your concern, commitment and contributions, this study may not have been possible.

The NZAID Committee - for awarding me the scholarship and meeting the cost of this project.

The Nazarene College of Nursing - Mr White Kintak (Principal) and the College Administration - Thanks for your support and prayers. Knowing that I had a church family I had the strength and courage to move along.

My Family - Moki, Steven, Tanya, Casey and Lora - Thanks for your presence and support in my life. You all contributed in your own ways to this study and this is our success.

Unitec, Auckland, New Zealand - Thanks for offering me a place to study. It was definitely a peaceful place to make a home away from home.

Thesis Supervisors - My thesis supervisors, without your incredible effort, I would not have made it. Thanks very much for your excellent and thoughtful supervision.

Raewyn Castle and Lynette Backhouse - Have provided guidance and direction for personal and professional support.

Tombil Community - The participants, thanks for participating in this study. Council Dickson Kaming and Council Dau Karap - Thanks for allowing me to carry out my project in your community. I appreciate your input.

Supportive friends - I would like to thanks my special friends in Auckland for their encouragement and support in times of loneliness and stresses.

- Cathy Bolinga - thanks for personal support and strength
- Prudence Manua - Thanks for your company and your cheerful heart.
- Pr Tau & Family, Dr Nervelle and Joice Burtle, and New Lynn Church family - for your support and prayers.
- Theresa Bob - Thanks for helping me to settle and feel at home.
- Salote, John Kints, and family - I appreciate your help and support
- Larson Sumai - thanks for your friendship
- Lisa Kamonai - Thanks for your support and encouragement.
- Dr Bang, Pr Mark Kos, Martin and Dr William Tongamp. Thanks for your encouragement and wisdom.

Thank you all.
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LIST OF ABBREVIATIONS

ACT - Artemisinin Combination Therapies

AUS-AID- Australian Aid

CD – Community Development

DDT- Dichlorodiphenyltrichloroethane

IRS - Indoor Residual Spraying

LLINs - Long Lasting Insecticide Nets

PHC - Primary Health Care

WHO - World Health Organization

DOH - Department of Health-Papua New Guinea

HP- Health Promotion

KEY TO TRANSCRIPTS

Participant quotes are italicised and references attached with the participants pseudonym.

[ ] Text altered for clarification

‘ ‘ Uncommon Terms or names used
DEFINITIONS

Artemisinin Combination Therapies (ACTs) - Malaria treatment containing artemisinin derivatives that act actively against falciparum malaria (WHO, 2006).

Determinants of Health - refer to basic areas that determine a person’s state of health such as human biology, environment, and lifestyle. It is regarded that health is maintained and improved through the advancement and application of health science but also through the effort and intelligent lifestyle choices of the individual and society (Talbot & Verrinder, 2005).

Community Development - refers to the process of empowering communities to improve their health and well-being (McMurray, 1999).

Disease Triangle Model - framework, focusing on the infectious agent, the host and the environment commonly used for predicting and controlling disease epidemics (Scholthof, 2007).

Empowerment Process - The process of enabling people or communities to increase power (control) they have over events that influence their lives (Talbot & Verrinder, 2005).

Healthy Island / Healthy Village Concepts - is a definition and a conceptual framework that involves continuously identifying and resolving priority issues related to health, development, and wellbeing, by advocating, facilitating and enabling those issues to be addressed in partnership among communities, organisation and agencies at local and regional level (WHO, 2000).

Health Promotion - is the process of supporting, enabling or empowering communities to increase control over the factors that influence their health and quality of life (Labonte & Lavarack, 2008).
Malaria - or ‘mal aria’ means bad air. It is now identified as caused by a one-cell parasite called plasmodium that gets transmitted from one person to the other through the bites of an infected anopheles mosquito (Kahn, 2008).

Malaria transmission - is the transfer of malaria parasite; the plasmodium from one person to the other through the bites of infected female anopheles mosquitoes or vector intermediaries (Kahn, 2008).

Plasmodium - refers to the protozoan parasite that develops in the gut of mosquitoes and is passed on the saliva of infected mosquitoes each time it takes a blood meal (Kahn, 2008).

Public Health - is the art and science of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, community and individuals with values of equality and social justice (Talbot & Verrinder, 2005).

Social Determinants - Social factors that contribute to health or illness such as social gradient, stress, early life, sexual exclusion, work, unemployment, social support, addiction, food, and transport (Labonte & Laverack, 2008).
CHAPTER ONE: INTRODUCTION TO PROJECT

Introduction to Topic

This chapter introduces the project and how it happened. It states the main aim of this study and outlines the study question and objectives. It provides the personal and professional background of how this study was initiated, and provides a rationale for the topic and its significance. Further, it introduces the method used and provides location of where the study was conducted.

The malaria control and prevention practices employed by the inhabitants of the Highlands of Papua New Guinea (PNG) were a curiosity that prompted me to undertake this study. This curiosity developed as a result of observing the malaria epidemic in 2007 in the Waghi Valley of Jiwaka area. Malaria in the Highlands of PNG, once known as a non-endemic region is becoming endemic, and increasing seasonally (Mueller, Rogerson, Mola, & Reeder, 2008). It is a leading cause of illness and death in PNG (WHO, 2010). There are strategies put in place for control and prevention but effective implementation of these strategies is limited. These are due to inadequate resources, socio-cultural factors, locals’ behavioural factors, and the Highlands’ tough geographical factors (WHO, 2010; Agale & Yaipupu, 2001).

There were few researched articles identified on community assessment of knowledge and practice of primary prevention measures. More research articles cited were related to scientific studies about malaria species in the Highlands, and the demographic, epidemiology and climate change studies. There were few Primary Health Care (PHC) and CD studies identifying suitable programs and approaches for health promotion, and these were utilised.

This project of identifying local populations’ knowledge and practise, and their values for primary prevention of malaria seems to be unique. The project had parameters for adults with experiences of malaria, and required a limited number of participants. This was for the purpose of collecting realistic experiences to meet the purpose of the study. It was open to both the malaria affected and non-affected, carers of those who were
sick, community workers, community leaders and significant key informants. But it was mainly aimed at those who had some experiences of malaria to contribute their realistic experiences.

The Method

The use of the interpretive description according to (Thorne, 2008) which is a qualitative research approach was seen as an appropriate method and used in this project. This was for the purpose of answering the research objectives and interpreting data meanings.

For recording of data, a digital audio recording was used to record the interview and then later transcribed and translated. The transcribed data were later used to identify common themes through in-depth analysis.

Research Question

What are the experience and perceptions of malaria prevention and control by local Highlands people?

The Aim

The study aims were to seek and understand the knowledge, perception, experiences, and malaria prevention measures of the Highlands’ people of PNG.

Objectives

1. To explore the community’s knowledge and understanding of malaria causes, transmission, treatments and preventive measures.
2. To discover how locals used malaria control and preventive measures effectively within the primary prevention focus.
3. Identify what attention (if any) was given to pregnant women and infants since malaria has a greater effect on them.
4. To discover if socio-economic status and social disparities contributed to malaria problems.
5. Identify what malaria preventive strategies work best for the local community.
**Personal and Professional Background**

When enrolling for my Master of Health Science course at Unitec, my course facilitator Dr Jill Yielder asked me to choose a real problem or situation to work with for my thesis. My interest went directly to study the local Highlanders’ knowledge, perception and malaria prevention practice. Therefore, I chose locals’ knowledge and prevention practice of malaria in the Highlands as my topic and developed my study question to work with.

The drive to study the locals’ knowledge and practice was purely based on curiosity. This interest developed when I was working as a clinical tutor with the nursing students in the medical ward at the Kudjip Nazarene Hospital in caring for malaria patients of the 2007 epidemic. I saw the patients completing their full course of anti-malarial treatments as inpatients, and given appropriate medication to be continued at home after discharge. Also, sufficient information about prevention of mosquito bites and modifications of home environment was disseminated. However, most of the same patients returned after a week or two having been re-infected with the same type of malaria or a newer type of malaria. The hospital’s medical ward was seen to be overfull with many patients who were very ill. There were some who died.

In particular, a family member of mine was infected with plasmodium falciparum and vivax malaria. She completed her treatment as ordered by the doctor, but then got re-infected and was admitted over four times and nearly lost her life. With close monitoring of multiple anti-malarial treatments courses and effective prevention of mosquito bites she recovered. It was these experiences that drove my interest in the topic and to explore more.

The malaria epidemic of 2007 in the Highlands was seen as a consequence of global warming and is becoming endemic (Barclay, 2007). Since Highlands people have not accommodated malaria well nor developed immunity like their lowlands counterparts, serious consequences are faced during seasonal epidemics (Mueller et al., 2003). Malaria epidemics can be predicted to be worse now and in the future with the threat of global changes and increase in temperature (Barclay, 2007).
This will particularly occur if malaria control and prevention strategies are not addressed adequately now. Malaria infects anyone, but mostly affects the locals who live in bush huts made of grass, and without protection from mosquito bites. This study also sought to discover relevant impediments such as socio-economic situations, cultural views and practices, and the effectiveness of Primary Health Care (PHC) and Community Development (CD) concepts implemented in local areas.

I chose to study Tombil community as a sample for the Highlands population due to my locality and familiarity of culture, and given permission for entry.

**Rationale**

Malaria was chosen for this study because it is a major contributor of PNG’s mortality and morbidity. It is the main killer for children under five years old, and a major contributing factor for PNG’s maternal mortality rate (370/100,000 child birth) (Mueller et al., 2008). By doing this study, I will be contributing in the fight against malaria and reducing it mortality and morbidity.

The findings of this study can be used in three main ways. Firstly, its findings can be utilised to enhance health teaching about malaria prevention within the local context. Secondly, its results can be used as a signpost to alert primary PHC and CD workers in their approach to local health education and health promotion activities. Thirdly, the finding can be used as evidence-based information by health authorities to plan effective malaria control strategies. Finally, further studies on the Highlands’ communities regarding malaria and disease prevention can find this study useful.

**Study Location**

The location of the study area is indicated in the maps below (Figure 1).
Summary

This chapter provided an overview of this study by introducing the topic, stating the research question, aims and objectives and provided the rationale for this study, and identified the study location. The next chapter introduces the literature review.
CHAPTER TWO: REVIEW OF LITERATURE

Introduction

This chapter provides a summary of main literature about malaria prevention and control activities in the Highlands of PNG. It begins with description of malaria as an infection, identifies mosquitoes and methods of transmission to indicate background information malaria’s aetiology. Then it clarifies sources of information sought and utilised. Further, it identifies environmental factors and socio-cultural and management factors contributing to spread of malaria. It was felt that such factors were important determinants for local’s vulnerabilities to malaria. The impacts of malaria are also discussed to indicate how various individuals and PNG as a nation were affected. Further, specific strategies of malaria control and prevention programs activities are discussed. This is to show that success of malaria programs depends on good program management including workforce and material resources. The program approaches within primary health care (PHC) and community development (CD) for implementing malaria control and prevention activities at peripheral ends or rural areas, were examined to discuss their strengths and limitations. Having good background information was important and supportive for data analysis and the discussions of this study. This chapter concludes with a summary of main issues in the literature review.

Sources of Information

The information was gathered from data bases: Medline, EBSCOhost, and CINAHL. Main key words used in the search were Malaria Control and Prevention in PNG, PHC in PNG, and Malaria in the Highlands of PNG.

The published articles were sourced from various Journals such as PNG Medical Journal, PNG Institute of Research, The American Journal of Tropical Medicine and Hygiene, and Health Promotion International.
Malaria as a Disease and its Vector the Mosquito

The understanding of malaria as a disease and its main transmitting vector, the anopheles mosquito, and the transmission pattern are seen vital for health promotion activities. This is particularly for dissemination of correct information to locals who have dynamic cultural perceptions of health and illness, and their low literacy level (WHO, 2008; Agale & Yaipupu, 2001). The empowering of locals’ knowledge with adequate information about malaria is seen as vital for them to change their behaviours and attitudes. This is particularly for applying correct strategies to minimise mosquitoes and their breeding places, and to avoid mosquito bites and prevent malaria infection.

The understanding of the process of mosquito bites and malaria parasite inoculation is important for enhancing locals’ self-awareness. The main vector that transmits malaria is identified as the female anopheles mosquito (Kahn, 2008). Mosquitoes collect human blood to use as a protein source. This is for laying eggs to complete their life cycle and in the process inject malaria parasites that cause ill-health to humans (Kahn, 2008). See Figures 2.1-2.4 showing parts of a mosquito and how mosquito biting and feeding process occurs.

Figure 2. (Source: Kahn, 2008)

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<td>Figure 2.3. Injecting parasites</td>
<td>Figure 2.4. Indicates blood feeding</td>
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The reasons humans easily get targeted for bites is their body chemistry contains carbon dioxide and lactic acid that attract mosquitoes (Kahn, 2008). While in the process of biting, anopheles mosquitoes inject malaria parasites into the human body. After the malaria parasites are injected in the human body, they travel in the infected person’s blood all the way to the liver where they grow and develop (Kahn, 2008). After 6-9 days parasites leave the liver and enter the blood stream again where they grow and multiply. When a red blood cell bursts, it releases malaria parasites into the person’s bloodstream causing fever, headache and chills as presented clinically (Kahn, 2008).

The microscopic photo below (Figure 3) indicates the process in the blood stream.

*Figure 3.* Infected human red blood cells (top right of centre) by the human malaria parasite, Plasmodium falciparum (the parasite is shown in purple). The newly-formed parasites (left of centre) are ready to invade new red blood cells. (Source: [http://www.sciencedaily.com/releases/2010/02/100218173325.htm](http://www.sciencedaily.com/releases/2010/02/100218173325.htm))

Malaria as an infection is described by its signs and symptoms and caused by the parasitic protozoa called plasmodium (Mueller et al., 2003). In the Highlands four plasmodium species are present (plasmodium falciparum, vivax, malarae, and ovalae). Of these the falciparum and vivax species cause the major problems (Mueller et al. 2003). In the study area (Minj), the plasmodium falciparum and malarae have been identified since the 1960s (Peters, 2004). Of all these species, falciparum is the deadliest type and most malaria deaths in PNG occur from this (Mueller et. al, 2003). These malaria causing plasmodium get transmitted when a non-infected person gets bitten by an infected anopheles mosquito (Kahn, 2008). Further, research indicates behaviour of anopheles mosquito as mainly biting during dusk or dawn, and mainly at night (Mueller et al., 2003).

It is seen that the understanding of malaria and mosquitoes’ behaviour are vital for prevention awareness and for employing correct strategies and avoiding bites. The
practice of avoiding of mosquito bites is the most effective strategy that can be practised by individuals in the Highlands. Such practices include the wearing of long sleeves clothes, applying mosquito repellent cream, sleeping in well screened homes, and using insecticide treated bed nets (Kahn, 2008). However, from clinical experience, it would seem that most local Highlanders do not employ such practices, either due to lack of knowledge, reluctance to apply knowledge, or the lack of resources. Deressa et al., (1999) further emphasizes that locals’ understanding for malaria as insufficient. These indicate the need for disseminating relevant information to build locals’ knowledge capacity to get them more involved in malaria prevention activities.

**Environmental Factors**

The environmental factors contributing to malaria include both physical geography and locals’ behavioural patterns contributing to malaria vulnerability. Physical factors include climate change causing increase in temperature (Barclay, 2007). Barclay, (2007) states that the malaria problem in the Highlands was triggered by global climate change causing an increase in the temperature which aggravates mosquito breeding. Mueller et al. (2003) and Barclay (2007) indicate malaria epidemics in the Highlands as closely associated with both wet or dry seasons, and particularly wet seasons making global climate change significant. It is further predicted that as temperature increases most of Highlands populations will go from a low or no risk to a considerable risk area (Barclay, 2007).

The Highlands altitude is seen as another factor increasing risk for malaria. Because malaria is less common at altitude 1,600-2,000 meters above sea level, population living in these areas have little or no exposure to malaria and generally have no immunity against malaria (Mueller et al., 2003). When these people get infected with malaria, they become seriously ill and this risk is increased further now with climate change causing increase in mosquito population as highlighted by Mueller et al., (2003). In contrast, adults in lowlands have a higher degree of immunity as a result of continual exposure and also have accommodated malaria well (Mueller et. al, 2003). But their Highlands counterparts from seasonal exposure and having less or no immunity become seriously ill when infected (Mueller et. al, 2003). Moreover, the
Highlands’ complex geography with mountainous terrain, fast flowing rivers, and a limited infrastructure like road, and bridges make access for malaria control and prevention activities difficult (WHO, 2008; Hinton et al., 2007).

The Highlands’ malaria transmission is associated with peoples’ behaviour is mobility within malaria endemic and non-endemic areas. Geographically, malaria is common in the lowlands of PNG such as the coastal regions, and lower valleys of the mountains (Mueller et al., 2003). But it is spreading as people move to and from malarial areas carrying the malaria parasites. Most Highlands travellers do not seem to use barrier methods of avoiding mosquito bites, and do not actively use prophylactic anti-malarial drugs as a standard practice (Mueller et al., 2005). Research has shown that 80 % of the episodes of clinical malaria in the Highlands were linked to recent travels to malaria endemic areas (Mueller et al., 2005). These findings highlight that Highlanders are at even greater risk for malaria. Therefore, further population targeted awareness is needed. Also, in my perspective, other strategies such as drugs, bed nets and residual sprays also depended on good knowledge and understanding for compliance. Therefore, enhancing the locals’ understanding of malaria spread by making them aware of climate change, and their vulnerability as Highlanders is vital.

**Highlanders’ Socio-Cultural Factors**

The Highlands’ socio-cultural factors are seen as main impediments to effective malaria control. It is noted that social structures create the life experiences and opportunities which in turn make life easier or more difficult for people to make positive decisions about their health (Talbot & Verrinder, 2005). The social factors contributing to insufficient prevention practices in the Highlands are a no or low income, health inequality, and the low literacy rate and tribal culture.

Employment is seen as a major opportunity for family income and for sustaining a good healthy life. But the majority of the Highlanders are subsistence farmers who sustain their lives outside the formal economic system (WHO, 2006). Some families cannot afford the minimum payment set by hospitals to seek early treatment when sick (Agale & Yaipupu, 2001). Inequality is seen in most Highlands rural families who have no
steady income and resource materials to sustain a healthy life (Barat, 2004). Income and social hierarchy as the main social determinants that provide the ability to buy resources for preventing malaria but low income and low status contributed to the lack of ability to buy sufficient resources (Labonte & Laverack, 2008). Moreover, poverty and culturally marginalized people are mostly affected by malaria (Barat et al., 2004), and this would include most Highlands families.

Education or having the ‘know how’ capability helps people to take a positive approach to life and living (Joshua, 2003). PNG’s literacy rate in the rural areas is seen as 50% (WHO, 2006; Joshua, 2003), and such insufficient education or low literary rate contributes to lack of healthy behaviour such as no or insufficient malaria prevention practices. Those with no formal education have the disadvantage of missing out on health education and illness prevention programs taught in school programs (DOH, 2003). Consequently, locals suffered from preventable diseases due to lack of sufficient prevention knowledge.

Language diversity is another barrier for implementing malaria prevention activities. PNG has eight hundred plus, languages and this includes the Highlands (WHO, 2006). Also each language group or tribal clan has its unique norms and values for addressing health and illness issues. These make implementation of illness prevention activities difficult (WHO, 2006). Tribal fights, which are common in the Highlands, prevent people infected with malaria and their carers from seeking early diagnosis and treatment (Agale & Yaipupu, 2001).

Another major challenge is the perception of illness and health, making it difficult for improving health in PNG (WHO, 2006). The Highlanders perception on illness or fever may often relate to sorcery, ancestral beliefs, and unsolved issues (Agale & Yaipupu, 2001). Some consider fever as a minor problem that will disappear soon by waiting, while others pray for divine intervention or seek a pastor to pray. Most commonly, in the traditional society it appears that diagnosis and treatment decision-making occurs within families and clans prior to seeking a health care facility (Alto, 1996). Sick people often wait for family discussions, supernatural healing, or cash contributions for hospital expenses rather than making an individual reasoned decision in seeking early
treatment. Most importantly, the majority of the population lack awareness of risk related to malaria and health promoting behaviour, and little involvement by local communities in health promotion activities (WHO, 2006). These social and cultural factors determined to a larger extent the illness outcomes like malaria for the Highlands people. In my view, such attitudes, beliefs and behaviours indicate a need for knowledge awareness, proper counselling, and greater motivation efforts for behaviour change. Niven (2000) states that knowledge acquisition is an important skill for risk assessment, decision-making, setting goals and goal attainment. The Highlands peoples’ vulnerability for malaria is seen as contributed to by their social and cultural factors. It is seen that addressing these factors will enhance locals’ behaviour change processes in preventing and controlling malaria.

**Effects of Malaria**

Malaria is a serious infection with both short and long term impacts not only on individuals and their productivity within families, but also PNG as a nation. The short term effects include mild signs and symptoms such as fever and headache (Kahn, 2008). The long term effects include long lasting parasite storage in the liver and causing drug resistance, enlarged spleen with the risk of rupture, anaemia, and neonatal and maternal deaths (Mueller et al., 2003).

Malaria’s effects on women pose a greater danger and women are at high risk for malaria in PNG (Itaki, 2007). This is related to low immunity due to pregnancy and labour of child birth and their general household duties. Studies revealed that when giving birth 40% of primi-gravidas were infected with PF malaria (Mueller et al., 2008; Itaki, 2007). Low birth weights in neonates are also associated with mothers having malaria. Malaria infection in the mother during pregnancy reduces infant birth weight and babies are more likely to weigh less than 2500gms which is a major determinant of infant mortality (Luxemburger et al., 2001). From my clinical experience, mothers with malaria usually have a lower haemoglobin level. This means when delivering babies and losing a minimum amount of blood can easily result in shock. This is also a major contributing factor for maternal deaths in PNG (Mueller et al., 2008).
For children under five years of age, malaria is the number one killer in PNG (Itaki, 2007). These deaths lead to family grief, loss and depopulation.

Malaria affects work productivity. The sick family members with malaria often do not contribute to household activities like, gathering, cooking and cleaning and taking care of domestic animals affecting the routine family responsibilities. Malaria also impacts on productivity outside the family causing economic burden especially for those who work in plantations. Studies from the oil palm plantations in the lowlands with endemic malaria indicated malaria as a greater risk for all inhabitants including both indigenous non-immune locals and expatriates (Pleuss et al., 2009). It contributed to lost days of work, a reduced physical ability, and economic burden (Pleuss et al., 2009). Similar studies conducted in a Highlands valley with mining projects revealed similar results. It was further noted that emphasis on prevention measures were seen to be required to mitigate malaria epidemics (Hii et al., 1997).

Malaria is seen to have impacts on the whole population, a greater risk for mothers and babies, non-immune locals and expatriates, and affected work production and PNG’s economy. Therefore, malaria focused funds and resources directed to prevention activities with adequate supervision and coordination are seen essential for minimising these effects.

**Approach to Malaria Control and Prevention**

**Broad Strategies**

Malaria control and prevention strategies are implemented in PNG through multi-sectoral organisations and the health department. The health department sets policies and implements malaria control and prevention strategies through its PHC services (DOH, 2003). It also it supports church run health services in the rural areas with resources and workforce (WHO, 2010). Malaria control and prevention activities are also supported by the international community and their aid agencies. All play critical roles in supporting and providing tools aiming to minimise and eradicate malaria The donor agencies that help to minimize malaria in PNG are such as Aus-AID, US-AID, NZ-AID (DOH, 2003 ; WHO, 2010). Other stake holders and NGOs working in
collaboration in implementing these strategies include groups such as Rotarians Against Malaria, Population Action International and NGOs helping local Community Development activities (Ashwell & Barclay, 2009).

The broad strategies contributing meaningfully to malaria control and prevention are research, education and the information agencies. The research institutions (PNG Institute of Research and the PNG Medical Research Institute) conduct extensive research and provide evidence-based information for effective treatment intervention for malaria (Rollbackmalaria, 2005; Malau, 2008). The education department increases literacy levels in both young people and adults; thereby increasing the locals’ abilities to communicate and understand information. These are seen as contributing to malaria prevention by enabling locals to communicate better and making their needs known and improving their health and lifestyle. The education programs also contain programs designed for illness prevention and are seen as the most accessible way for implementing malaria prevention programs (DOH, 2003).

Information agencies like the local radio stations, television services and the local newspapers such as “The National” and “PNG Post Courier” contribute to malaria prevention by increasing awareness. These activities indicate multi-sectoral approach toward malaria prevention and control.

**Specific Strategies for Malaria**

The malaria specific strategies of drugs, bed nets and residual sprays are implemented mainly by the DOH and the church health services. These activities are implemented through the PHC system and NGOs through CD and CBHC systems using healthy island concepts (WHO, 2010; DOH, 2003). The success of malaria control depends on the effective implementation of these strategies.

**Anti-malarial drugs**

The prompt and effective treatment using anti-malarial drugs and the emphasis on easy access as a strategy to control malaria is currently the mainstay strategy in the Highlands (DOH, 2003). Anti-malarial drugs are either used for treating malaria or preventing malaria. But drug resistant malaria is seen to reduce the effectiveness of
drug treatments (Schoepflin et al., 2010). The use of anti-malarial drugs as a strategy is further made effective by a good supply of effective drugs, high local compliance and proper diagnosis and treatment. The main treatment for uncomplicated malaria is the combination therapy including chloroquine or amodiaquine plus sulfadoxine pyrimethane since 2000 (Mueller et al., 2003; Schoepflin et al., 2010). It is seen that these treatments are no longer effective due to chloroquine-resistant malaria (Davis, 2008; Mueller et al., 2008).

Drug treatments have been unsuccessful due to a number of reasons. It is due to drug resistance, fault in some patients by interrupting treatment early due to lack of knowledge, or neglecting to complete doses due to the bitter taste of anti-malarial drugs (Joshua, 2003). The studies indicating locals’ attitudes of inconsistencies in taking oral medications as a common practice, and three out of every four patients as having chloroquine resistant falciparum can be main factors (Joshua, 2003). Another factor is the cost involved in purchasing effective drugs. Currently, the artemisinin-based combination therapy (quinine, chloroquine, primiquine, and artemisinin, used alone or in combination) are used for treatment and are found to be very effective (Schoepflin et al., 2010; Mueller et al., 2003; Davis, 2008). However, the cost of making these drugs available is another concern because artemisinin based drugs are currently expensive (Davis, 2008).

Drugs are also used for malaria prevention but there is ineffectiveness. The prophylactic use of anti-malarial drugs in PNG includes two chloroquine tablets taken orally weekly for high risk travellers, and antenatal mothers as a routine. But, not all Highlanders take prophylactic chloroquine as a preventive measure from my observation. Also, Mueller (2008) says that chloroquine use for antenatal mothers is no longer effective, but additional efforts in using multiple strategies like bed nets and the use of intermittent prevention treatment in pregnancy as a safe practice (Mueller et al., 2008).

Further, drugs such as chloroquine, or amodiaquine and sulphadoxine as first line treatment for uncomplicated malaria are seen to have decreased efficacy, and do not seem to totally cure malaria (Schoepflin et al., 2010; Mueller et al., 2008; Davis, 2008).
The problems of treatment failure are seen as not only related to drug resistant malaria, and the presence of complex malaria species in the Highlands, but it is also due to the locals’ behaviour of poor adherence to medicine timing and dosages as prescribed (Genton et al., 1994; Alilio et al., 2004; Mueller et al., 2002). Therefore, artemisinin based combination therapies as current high efficacy drugs should be made available for use with multiple strategies. To maintain efficacy of new drugs, locals need good education for behaviour change to comply with drug treatments (Schoepflin et al., 2010). This will result in anti-malarial drugs as an effective strategy.

**Use of Insecticidal Treated Bed Nets**

The use of insecticidal treated mosquito nets by those at risk is another strategy for malaria control and prevention (WHO, 2008). The mosquitoes mainly bite at night and sleeping inside bed nets provide physical barriers from mosquito bites. The bed nets vary in sizes and can be use as single for individuals or double for families. In the lowlands use of treated bed net is currently the main stay of malaria control (Mueller et al., 2003). Some provinces in the lowlands have almost 60-80% coverage but its efficiency is in question because people were bitten by mosquitoes particularly the vivax before sleeping inside their nets (Mueller et al., 2003). The bed nets’ efficiency in providing physical barrier is vital for high risk areas such as the Highlands, but its cost, unequal distribution, and lack of information on care, and usage sometimes make this strategy ineffective.

Most families in rural Highlands cannot easily access a mosquito net themselves due to price tags attached. They often wait for a donation from friend and relatives or from donor agencies (Fitzpatrick & Ako, 2007). The average cost for a treated net is seventeen to twenty four Kina (PNG Currency unit), almost eight to twelve New Zealand dollars. Some villages in the Highlands have been given bed nets but the even distribution of treated nets is a problem as well as inconsistencies of use during dry seasons (Mueller et al., 2003). Also, bed nets use and care education, and re-treatment processes are not effectively done in the local villages from my observation. These indicate needs for effective service delivery mechanisms and good information dissemination.
Insecticides Residual Spraying

The indoor or residual insecticidal spraying is an environmental control strategy for controlling the mosquito population. With this, insecticides are used to spray indoor walls of living homes and animals sheds aiming to destroy vectors. This is particularly, the mosquitoes breeding sites and the larva and eggs (WHO, 2010). From my experience in the 1980s, this strategy was seen as an effective program with organised malaria teams who conducted both wide awareness and annual sprays covering many isolated bush inlets and malaria was uncommon. The organised malaria team with the use of insecticides such as DDT (Dichloro-diphenyldichloroethane) effectively used in the early 1960-1980 in the Highlands were also noted of keeping malaria under control to less than 1% protecting 70% of the Highlands population (Mueller et al., 2005 ). However, in the late 1980s, this program was abandoned due to financial and logistical constrain, the WHO’s concerns of environmental pollution, and the fact that mosquitoes became resistant to DDT sprays (Mueller et al., 2005; IPEN, 2001). The change of strategy from environmental control to use of drugs implemented on locals that have low compliance to drugs Mueller et al. (2003) is seen as having no major impact on malaria problems these days. From my clinical observation, individual and community efforts in ensuring clean home environments aiming to control mosquito is limited due to the increasing mosquito populations.

The residual spray with alternative insecticides as a stated environmental control strategy (DOH, 2003) is not being implemented effectively in the Highlands. This is due to lack of resources such as insecticides, spray equipments, human resources, and the problem of covering wide areas (DOH, 2003). The lack of coordination of work, and the ineffective village volunteer training make residual sprays less effective (Peters, 2004). The DDT residual spray program done away with has not been replaced in the local communities (Peters, 2004). Consequently, malaria caused mortality and morbidity is currently high with occasional epidemics in the Highlands (Mueller et al., 2003). Therefore, effective residual sprays using other safer insecticides needs to be implemented routinely in the Highlands. This is seen as an effective environmental control strategy to combat the increasing mosquito population now due to global warming as indicated by Mueller et al. (2005).
Management Impacts on Malaria

Malaria is the main contributor for PNG’s mortality and morbidity rates. Therefore, effective management of malaria control programs are vital for successful reduction. While there were specific malaria programs implemented by NGO and other stakeholders, most programs and activities are implemented by the DOH and churches through the PHC system (DOH, 2003). Some ineffective components of management include management style, prevention focus, external factors of health structure and policy changes, and resource distributions.

PHC Management Style

The malaria situation currently faced in the Highlands has been seen as contributed by PHC management styles and changes. The malaria control and prevention activities are implemented through PHC peripheries using the Healthy Island social science concepts DOH (2003). The current management style and approach in both PHC and other community based programs in the rural areas is leniency, with core beliefs in empowerment and participation (Clements et al., 2007; Galea et al., 2000). But prior to that, there existed the ‘top-down’ approach with use of strong autocratic village health committees for supervision of locals’ activities in keeping healthy villages (Clements et al., 2007). Also, prior to these Western Concepts of management and leadership, Highlands communities did have leadership and administration that fostered community participation within their cultural contexts. However, the colonial health administrators, without the consideration and consultation with these stabilised cultural systems set community standards and implemented at the local community using ‘top-down’ approach (Alto, 1996).

The former autocratic style as an outcome-based approach resulted in clean environment, community standards maintained, and caused high community participation according to my perspective. But it would seem that these positive outcomes were temporary and not sustainable. Despite the stresses of the autocratic leadership as a disadvantage found, the benefits of such approach in keeping malaria under control cannot be undermined (Clements et al., 2007). For example, Mueller et al. (2005) indicates malaria prevalence rate as less than 1% in the 1960s to the 1980s.
This was partly contributed by autocratic village health committees in fostering community participation toward environmental modification (Clements et al., 2007).

Locals’ contemporary attitudes and lack of participation in community activities for disease prevention is seen due to changes in management views. As colonization faded and independence emerged in 1975, both the cultural context of administration and the autocracy seem to have faded (Alto, 1996; Temu & Danaya, 2000). In my view, this left huge gaps and locals with no direction for community activities in illness prevention but the feeling of “independent free dwellers of their land.” The introduction of democracy with low control has landed in PNG local areas with no control and a wider leniency. This leads to the difficulty of getting the contemporary population to participate in community health prevention activities.

The current local participation focus is seen embedded in social science based concepts like the Healthy Island or Healthy village concepts with a focus of empowerment and self-reliance (DOH, 2003). These are based on relationships, respect, and mutual understanding, but sustainability is facing a lot of challenges (Ashwell & Barclay, 2009). From my observation, community participation is low in most Highlands communities and malaria and other preventable diseases are increasing. The autocratic health committees done away with have not been replaced adequately in local villages with supportive supervision by the government system. I have observed locals who still seem to perceive someone with position will organise and we will participate in community activities. This is referring to an effective supportive supervision in health prevention activities in the leniency system. It is seen that in the leniency approach, maintaining healthy standards need support, resources and capacity building before locals become competent. Ashwell and Barclay (2009) also support that social science concepts of empowerment cannot be based upon totally in rural communities due to its limitations and incomplete empowerment processes, and the limited resources in PNG. Also, the bio-medically focused health professionals working in local PHC settings are noted as inadequately implementing the valuable social science based concepts of participation, empowerment, and sustainability (Ashwell & Barclay, 2009). Consequently, community participation in keeping clean environment and controlling
malaria is insufficient. This leads to an increase in the mosquito population leading to an increase in malaria epidemic.

There are few successful exemplary program management styles in the Highlands that provide useful tools. This refers to using both modern social science concepts and with cultural administration with the involvement of village leaders resulting in successful implementation of sustainability, participation and empowerment. For example; the Domil community-based health care programs (CBHC) model (Unage, 2009), and the community empowering project initiated by (Fitzpatrick & Ako, 2006). These are two community-based programs that resulted in social and physical health outcomes and reducing malaria.

The significant issues noted in these two programs are; values placed on cultural norms of administration, involvement of village elders, and delivery negotiation, and activity planning and implementing done in participatory approach (Unage, 2009; Fitzpatrick & Ako, 2006). Also, these managers considered religious views and concepts. In my view these approaches considered both the customary way of management, and the social science concepts that worked out fruitfully. Therefore, such management styles and participatory approach provide useful models that can be used for health promotion and illness prevention programs designed for tribal locals.

Factors Affecting Malaria Prevention Programs

Focus and Supervision

The sustainability of malaria prevention programs is important for controlling malaria. But there are factors within CD and PHC that cause program ineffectiveness. These are low prevention focus, resource distribution problems, and inadequate support and supervision. With focus of prevention, Alto (1996) states that most PHC program activities implemented at the village setting were limited by resources, and workforce operating on limited funds focused on immediate curative activities. Ashwell and Barclay (2009) state that some donor funded projects that worked alongside the existing PHC or CD programs either introducing a concept or strengthening an existing program contributed well in village based HP programs. But lack of involvement by DOH
workers and projects having shorter time frames, and doing projects to meet their own objectives have made community ownership and sustainability difficult (Ashwell & Barclay, 2009). Another constraint to program sustainability is non-involvement of community, too much focus on external resources, over-dependence on specific individuals, and project – based nature of work, and lack of political commitment, and insufficient management capacity (WHO, 2000).

Supervision and evaluation are important for program sustainability and effectiveness but there is ineffectiveness in these areas in rural areas (Alto, 1996). Studies revealed that supervisors visiting PHC workers conducted meetings as a central focus while administration and checking was done with the use of checklist (Alto, 1996). The specific management activities such as problem solving, feedback and clinical supervision, training and consultation with community activities were not actively done (Bosch-Capblanch & Garner, 2008). In studies that explored community involvement and participation, community empowerment and participation were effective in malaria control strategies, but good management was needed to enhance community programs (Selve et al., 2000; Fitzpatrick & Ako, 2007). Therefore, disease prevention programs need good attention, close supervision and monitoring for sustainability and effectiveness. Consequently, malaria would be controlled.

**Resources**

Adequate resource supply and good distribution are vital for controlling malaria. The implementations of malaria prevention programs are made effective by workforce, finances, transport, and specific resources like bed nets and residual spray equipment but insufficiency contributes to malaria (DOH, 2003; Ashwell & Barclay, 2009).

The workforce limitation in rural areas is seen to be the major factor causing health problems in rural PNG. This includes doctors, nurses and community health workers (WHO, 2007). A significant former research finding indicates lack of health professionals in the local settings to actually implement community empowerment activities (Welsch, 1988). There are some provinces and districts in PNG do not have designated HP positions that make responsibilities, coordination, and management of HP activities difficult (DOH, 2003). The Community Health Workers (CHWs) given
the training to provide essential and highly effective PHC services to the community were practically not effectively doing so (Ashwell & Freeman, 1995). Most CHWs have shifted to work in hospitals to meet staff shortages while losing their competencies for PHC, and their original focus for the serving larger populations in the underserved rural regions (Ashwell & Freeman, 1995).

In my opinion, the notion that HP is any health workers’ duty is a possible contributor to specific strategies of empowerment and HP roles being overlooked. Dr Satter in WHO (2000) states that practical application of the principles of HP, active participation and ensuring critical roles of PHC staff will promote healthy setting for populations. But this is seemed to have lost focus in PNG rural areas as limited staff attended to immediate curative needs (Alto, 1996). Consequently, locals suffer from easily preventable infections and sometimes there are malaria and other preventable disease epidemics. To restore and increase disease prevention focus and awareness, more health workers need to be employed with conditions favourable in rural areas. This can be done by creating more positions for HP officers, and with proper engagement of village health volunteers into the health system.

The lack of funds and transport are other major resource needs in some rural health care centres (DOH, 2003). For those who have transport available, the cost of running and maintaining are not provided sufficiently by those in control of district funds. These funds seem to be controlled by politically formed groups (Smith, 1997). It would not easily be made up of locals, councillors and district health workers who take direct responsibilities for HP programs or have visions of helping people. Some health centre, operations fees imposed on locals lead to accessibility problems. Other health committees from decentralization set-ups are politically appointed who impose fees for their own gains or use transport for personal use (Smith, 1997).

Such findings indicate the basic foundation of HP rooted in self-determination and empowerment of locals is seen as receiving little attention. The 1978 Alma Ata conference on PHC policies stressed the need for re-allocations of health relevant expenditure in order to provide low cost health services for all and HP focus should be directed to locals own sound culture and economic conditions (Welsch, 1988).
However, PNG’s political factors (Smith, 1997) and health spending on foreign consultants in millions (Abal, 2010) seem to be using up the needed finances for funding rural health activities. Therefore, changing such trends according to (Abal, 2010) by redirecting funds and resources for rural HP activities will be meaningful. Also, minimising political interferences, increasing transparency and accountability, and building local capacity will help reduce the mortality and morbidity of malaria.

**External Factors Affecting Community Programs**

The external policy and structural changes within health department due to politics and economic reasons in PNG contribute to incomplete and unsustainable illness prevention programs, and destabilize work processes. A significant previous research indicates that the DOH’s vertical structure has caused difficulties in communication making HP programs ineffective (Welsch, 1988). The control of health budget and decisions centred at the higher bureaucratic levels has caused problems in transferring these to lower levels (Alilio et al., 2004). The subsequent restructuring of decentralization processes have also caused confusion to roles and responsibilities, and affected coordination and quality management of PHC/CD activities (Bolger et al., 2005).

The structural change ideologies of decentralization with transfer of power, decisions, and finances to the provinces, and districts level is seen as beneficial for local empowerment and benefits (Smith, 1997). But there are also challenges too in PNG as decentralization was often associated with increased politicization (Smith, 1997). The devolution ideologies opens up opportunities for corruption and patronage such as privileges and financial benefits bestowed to political favourites (Smith, 1997). Consequently, locals on the peripheral end suffer from malaria and other preventable diseases due to poor support for HP and CD programs. Moreover, with PNG’s political system, the local health workers, suitable HP officers, and authorities such as village councillors who lived with the locals were less likely to be involved in planning and decisions (Smith, 1997). This is in the areas of resource distribution such as finances making HP ineffective (Smith, 1997).

To improve the health of locals and to control malaria well, HP position and roles needed to be prioritized, involved in decision and resource distribution levels, and
implemented well. Labonte and Larverack (2008) highlight roles of a health promoter as an educator or a watchdog in conducting health messages for increasing peoples capacities to make informed choices about their lives, as a resource broker for developing peoples skills, a community developer, and finally, an advocate or a catalyst influencing policy changes within the perspectives of health determinants. But such functions not given the opportunity for implementation resulting in responsibilities not fully performed (DOH, 2003).

With the health policy and structure, it is noted that structures whether centralized or decentralized, both have advantages in spelling out good health policy, provide direction, authority and clearly defined patterns of work (Bolman & Deal, 2008). But its central control of decisions and finances and political interferences cause difficulty in funding, coordinating and managing out-stationed rural PHC and CD activities designed for preventing malaria according to Bolman and Deal (2008). Consequently, malaria as a preventable disease is increasing. It is seen that accountability, transparency and responsibility not performed well by health managers and political leaders make HP programs unsustainable. Therefore, good management knowledge and skills, a collaborative effort with locals, and good political support will improve the effectiveness of malaria prevention programs in rural areas.

**Summary**

Malaria, a known endemic disease in the lowlands of PNG is also becoming endemic the Highlands, has been reviewed using current literature. The main factors were seen as the Highlands physical geographic challenges, climate change increasing temperature causing mosquito population increase, and the inhabitants’ lack of immunity have contributed to their vulnerability and caused epidemics (WHO, 2010; Mueller et al., 2003). Other factors contributing to malaria spread noted were the local people’s socio-economic situations, external forces, HP program management inefficiencies and having a limited resource capacity making malaria total eradication impossible (DOH, 2003). But prevention with cost effective strategies are available for use by local people given the opportunity of easy access, equitable resources, and programs made effective within systems that operated to address rural health promotion.
activities. The roles and responsibilities of HP officers and roles not actively performed and positions not created were also noted as main factors. The malaria specific strategies such as drugs developing resistance, residual spray not done effectively and treated bed net limitations were discussed. The ineffective PHC system and CD programs with insufficient empowerment and sustainability were seen as making malaria prevention even harder. Therefore, malaria will continue to cause problems in the Highlands of PNG, if more attention is not directed to prevention and done according to the culture and the socio-economic needs of the local people.

This literature review has provided the background information and enhanced the knowledge capacity of the researcher prior to undertaking the project. It also indicates familiarity of malaria as a disease, effects, its treatment and prevention approaches and management pertaining to prevention activities. Therefore, undertaking the project was done with anticipation of some relevant issues as well as new knowledge to be generated.

This chapter provided the main issues surrounding malaria in this study and the summary of literature is listed. The next chapter describes the methodology undertaken and how data was collected for this study.
CHAPTER THREE: THE RESEARCH METHODOLOGY

This chapter describes the methodological approach used for the research. It will commence with a brief overview of the method used which is interpretive description. Interpretive description will be described as a concept and as a method (Thorne, 2008) and why it was seen as suitable for this study. The chapter provides a description of the design, method of data collection and analysis used in the study and the limitations.

**Interpretive Description**

Interpretive description studies provide a “thematic and/or integrative description of a phenomenon of clinical interest, and do so in a manner in which the disciplinary objects of the study are made explicit within the interpretation” (Thorne 2008, p. 75).

Interpretative description is an alternative concept to the available qualitative research methods and specifically designed for the discipline of nursing research (Thorne, 2008). Nurse researchers noted that nursing knowledge was not well served when using the social science based methods. Therefore, developed this method in the mid 1990s to provide as an alternative method for credible research for developing nursing knowledge (Thorne, 2008).

Interpretative description was chosen for two main reasons. Firstly, it provides useful methodological approach for focusing on current practice goals and allows nursing science knowledge to emerge without restrictions other social science based qualitative research designs have (Thorne, 2008). For this reason, I decided to use this method to see what locals perceived about malaria prevention, what strategies were effectively implemented, and what needed to be done. Also to understand what barriers or logical underpinnings that prevented locals from transforming malaria prevention information into practical realities.

This method was seen as having the potential to extract knowledge and practice understood and practiced prior and to generate new insights to shape new enquiries for evidence based practice (Thorne, 2008). This focus was seen relevant to my interest and curiosity of seeking locals past malaria prevention experiences and their current
practice and challenges faced. The results will purposely contribute sound knowledge which is also evidence-based to malaria control and prevention activities in PNG. Thorne (2008) also emphasizes that interpretive description provides a bridge between objective neutrality and abject theorizing, producing results that are academically credible, imaginative, and clinically practical (Thorne, 2008). With that it was noted that caring for the health of humans does not depend alone on biophysical components, but also the mind, and the social world of interaction; experiences and behaviours of applied practice. Therefore, this method considering these distinct study areas was seen suitable and was used in this study.

The Characteristics of Interpretive Description

Thorne (2008, p. 74) outlines seven basic characteristics of interpretive description that she suggests researchers use to guide the research design. These were considered in this study of malaria prevention knowledge and practices to “ensure coherence that distinguishes interpretive description from other generic qualitative description” (p. 75). The seven basic underpinnings outlined by Thorne (2008, p. 74) were noted and followed. The first characteristic emphasizes naturalistic context and respectful manner for comfort and ethical rights of all participants. These were followed respectfully by firstly seeking consent and secondly conducting the interview in a culturally appropriate manner (Appendix C), also refer to data collection. The second characteristic is for attending to the value of subjective and experiential knowledge as fundamental sources of clinical insights. This study took note of locals’ values as indicated in the study objective, during as the interview session, and as discussed in theme six and seven. The third characteristic of interpretive description states that it “capitalizes on human commonalities as well as individual expressions within as shared focus of interest” (Thorne, 2008, p. 74). This characteristic was met by using both focus group and individual interview to identify the community’s common shared views. Fourth, “it reflects issues that are not bounded by time and context but attends carefully to the time and context within which the current expressions are enacted” (p. 74). This characteristic was followed during the interview by waiting and providing enough time until each participant felt satisfied expressing his/her views. The fifth characteristic challenges the researcher to “acknowledge the socially constructed element to human
experience that cannot be meaningfully separated from its essential nature’ (p. 74). This study took note of social structures and cultural determinants and how such contributed to malaria problems to meet this philosophy. The sixth characteristic “recognises that in the world of human experience, reality involves multiple constructed realities that may well be contradictory” (p. 74). The individual negative and positive experiences were both noted in this study and some unimportant issues noted as irrelevant. The last characteristic “acknowledges an in-separable relationship between the knower and the known, such that the inquirer and the ‘object’ of that inquiry interact to influence one another” (p. 74). With this, the researcher had prior knowledge and some information before conducting the study through which was expanded on through interaction with the participants during the data collection. These seven characteristic of the interpretive description study method were considered in this study.

**Study Design**

Interpretive description has no strict design options but data should be linked together in a coherent and defensible manner that would more suitably meet the knowledge generation of the applied health discipline Thorne (2008, p. 73). It capitalizes on human commonalities as well as individual expressions within as shared focus of interest (Thorne, 2008). For this reason thematic analysis and synthesis done using both verbal and non-verbal data with meanings worked out helped to identify main findings as which also generated new insights.

**Data Collection**

**Focus Groups**

Thorne (2008) suggests that focus groups are useful in bringing groups of people with similar experiences together and triggering a group engagement within a topic that generates data. The shared knowledge generated in focus groups is also powerful for public consensus and for creating community social changes (Thorne, 2008). Because of that, this research utilized focus groups to engage locals who had some experience in malaria to discuss malaria in their community.
Focus groups are also used as a strategy for mobilizing powerless consumer groups, or energizing leaders of disadvantaged demographic subsets (Thorne, 2008). This study was considerate in this perspective by including women and youth as powerless groups and some participants as local powerful leaders of the community. Malaria prevention and treatment decisions are often determined by social dynamics as well as cultural norms (Agale & Yaipupu, 2001; Labonte and Laverack, 2008). Therefore, having a group discussion identifying group perspectives, and consensus was thought to be meaningful. In addition, the PNG Highlands people have strong social cohesion, values and common practice within each tribal group. Therefore, use of focus groups was seen as suitable for the purpose of uncovering the locals’ shared perspective and generate group consensus that may be useful in malaria prevention activities and awareness.

Thorne (2008) argues that different forms of communication used in focus groups such as arguing, joking and non-verbal approaches such as gesturing, facial expressions elicit more information than direct responses to question. For this reason, the facilitator took notes of non-verbal communication too.

**Individual Interviews**

Individual interviews are aimed at identifying the experiences only known to that person and provide data which is universally accepted as essential for providing health care (Thorne, 2008). In this study, four participants were identified for individual interview. They were chosen as key informants according to individual constructs as a cultural expert, a village leader, a former malaria control worker and a nurse who contributed meaningfully.

The key informants were notified of structure and organisation of the interview, and personal space was respected and judgemental comments were avoided as recommended by Cohen et al., (2007). Thorne (2008) further indicates another purposeful sampling strategy as the strategic identification of key informants. This is because some members of the community are better equipped than others to provide you with access to what is happening and why it is happening (Thorne, 2008). These were individuals who have societal roles like chiefs, or those who were willing to inform the researcher for building strong interpersonal relationship as a central
component of the process of entering the field, and others who seemed to have some concerns of malaria problems (Thorne, 2008 p. 91). With this, four key informants were chosen as they showed up to participate individually. The first one was a tribal chief, the second one was a former malaria control worker, the third one health workers in the community, and the fourth one was a retired school teacher. These were the interested participants who were keen in this project. Also, they were chosen according to their extended experiential background and their similar exposure to the community groups according to (Thorne, 2008).

**Summary**

This chapter provided justification of the research method utilized. It clarified the research approach as qualitative and methods as interpretative description. The design was basically interpretive and data collection was done from focus group and individual interviews.
CHAPTER FOUR: UNDERTAKING THE PROJECT

This chapter discuss how the project was practically applied. It includes the processes involved with ethical approval, negotiations with community leaders for entry into the community, selection of participants, process of data collection and the development of themes and interpretation of meanings.

Ethical Considerations

Ethical approval for this project was sought and gained from the Unitec Research Ethics Committee on the 14th December 2009 (See Appendix A). Because the project was based on a particular community, permission was sought from the two local councillors earlier in the process. The community entry request letters were sent to the two councillors for access and acceptance in the community. This was done prior to submitting the ethical application. The councillors responded positively in giving their approval for this study to be conducted in their community (See Appendices B & C).

The consent forms and information regarding anonymity and confidentiality were drawn for participants. A separate form was drawn up for the facilitator (see Appendix C). Prior to each interview (including both group and individual) the written consent form and information was disseminated to those who were able to read. The verbal information was provided to those with limited literacy skills. After understanding and accepting to participate in the study, participants were told to sign, put a mark or write their names on the provided form to indicate their consent. In this study individual interviews were offered to anyone who needed to communicate privately, such as a minority groups like women and the socio-economic disadvantaged members of the community. But no one turned up as individual key informant.

Information collected from the project has been kept confidential and pseudonyms used. The digital recorder and the printed data were kept in a secure place while the electronic data was protected by a password. All data will be securely kept for five years as per Unitec policy and then destroyed.
I as a researcher was prepared to deal with any concerns of unpleasant experiences that may possibly surface during the interview. I was prepared to deal with it appropriately to minimise potential harm. There were few emotional and psychological discomforts that surfaced during the interview. But the reassurances provided felt sufficient and there was no need for cessation of interview or referrals. However, such avenues were considered during the process. There were no other risk involved with the intermediaries, participant and the facilitators.

**Participant Selection**

In the community, individuals who were identified as a facilitator, intermediaries, and possible focus group participants were consulted initially. Then the participants for focus groups were recruited by the intermediaries while I did the key informants as they showed up.

With the identified individuals who showed up initially, information about the study was given and the roles of a facilitator, key informant, focus groups participants, and intermediaries were made known. After understanding each of the responsibilities, we all discussed, reflected on individual qualities and chose who to participate in these roles. One facilitator was chosen to manage the audio recording and noting non-verbal information in all focus groups. The decision to assign this role was based on this man’s education level. He had good listening and note taking skills and he had shown confidence in taking note of non-verbal communication. I guided him on use of the digital recorder which he quickly grasped. Selection of intermediaries was based on skills of organisation, good communication and local knowledge of where focus groups can easily be organised and formed. The site for each focus group interview was selected by intermediaries and was based on facilities available like good water, and space for sitting and eating and considered as less prone to disturbance. All four intermediaries chosen were happy and agreed to help out. Other volunteers mentioned that they will help in the project by becoming part of the focus groups or will send information to potential participants. I also gave prior information about key informants’ specifications like being people knowledgeable about malaria, those who were cultural experts, community leaders who were in position for decision making.
Intermediaries were also informed that individual interviews were an option for people from minority groups or women should they prefer. Participant selection and sampling were also made known to the intermediaries. I asked for participants who had experiences in malaria and requested that four different focus groups be formed: for women, men, youth (aged 14 to 17 years) and a mixed gender group. This was done in consideration of purposeful sampling to collect a diverse range of experiences of malaria. Each of the four intermediaries decided which group could easily be formed in their area and consensus was reached as to who would organise which group.

After a week, each intermediary came up with a list of participants who volunteered to participate in the focus groups. On each focus group interview day the facilitator and I went to the chosen area and conducted interview. Any key informant that showed up was recruited and individual interview was done after the focus group.

Arrival at each focus group site involved meeting and greeting with the participants. I clarified information about the purpose of study with the participants. The participants showed understanding of their role in the study and my reasons for study and were keen to participate. Participants understood and agreed to participate by signing the consent forms provided (Appendix C).

**Sampling**

The study participants were recruited through purposeful and snowball sampling (Cohen et al., 2007; Thorne, 2008). Purposeful sampling includes specific individuals within the community who are recruited with some angle of experience of malaria that they might help us better understand realistic experience (Thorne, 2008, p. 91). With snowball sampling, individuals recruited early in the study were able to identify others who met the inclusion criteria and might be interested in volunteering for a focus group (Cohen et al., 2007).

Thorne (2008) cautions that selection of gender specific groups may only give account of experiences that are specific to gender and may not represent experiences of both genders. Therefore, to include the experience if both genders, a mixed gender group was formed.
Sample Size

Another key component of participant selection was the sample size. Thorne, (2008) points that interpretive description can be conducted using any size. Other qualitative studies often use five to thirty participants for smaller studies or even up to two hundred participants depending on what nature of the study. It is further highlighted by Thorne (2008) that too many participants may lead to data ambiguity and too little numbers may do injustice to the topic. Participant size of five to eight are considered sufficient but there are no firm rules regarding what constitute the right sample size for an interpretative study (Thorne, 2008 p. 14.). It is up to the researcher to generate a coherent and defensible claim of the proposed number, cases, subjects or instances for results to be trustworthy (Thorne 2008). This project recruited four focus groups with eight participants each. This was done to represent views of malaria experiences from all the four villages in the study community to meet the study objectives. There were four individuals as key informants leading to total sample of 36 participants.

Selection Criteria

Participants were selected using the criteria below.

Inclusion Criteria

People who were included in this study were:

- Individuals with history of malaria infection.
- Family and friends who had the experience of taking care of people infected with malaria or who died from malaria.

Exclusion Criteria

People who were excluded from the study included:

- People with cognitive impairment.
- Children were told not to come into the interview room to avoid distraction.
- Those who volunteered after 6-10 people have been recruited for a particular group (This was to avoid information overload).
The immediate family and friends of the researcher were not included.

The dates for the focus groups and individual interview were set by the participants in discussions with the intermediaries according to their convenience. The focus groups and two of the individual interviews took place in the local villages. The other individual interviews were done at my house according to participants’ preference.

Prior to all the interviews, including both focus groups and individual interviews, I clarified again the main reasons for the interview and asked for confirmation. The participants confirmed by signing the consent form. Those who provided verbal consent were asked to write their names with a witness to sign.

**Study Participants - Group Characteristics**

*Group One: Male only*

Group one comprised of 8 males aged eighteen (18) or adults. Their views and perspectives were sought within their roles and cultural status as head of the family who make many important decisions in issues affecting their and their families’ lives. They were viewed as protectors for their family and as contributors to decision making in the community at large. Most had experience with malaria while few had no or less encounter with malaria. However, males were included in this study due to the fact that experiences of both genders provide valid data (Thorne, 2008). Their age varied between twenty five to sixty years and none had an income earning job. They were mainly subsistence farmers. Most had limited educational levels at the primary level while only few had high school education up the eighth grade.

*Group Two: Female only*

Group two was females only group and included 8 adult women (over the age of 18). Some were married and had children while some were single mums, and a few never had children. Their jobs were mainly child rearing, and keeping the gardens and domestic animals. None of them had an income earning job and most had limited education at the primary level of education. Only one participant was a tenth grade school leaver.
Group Three: Mixed Gender Group

This group comprised of both males and females and all adults (aged 18 and over. Their characteristics were similar to group one and two. The men were mostly cultural experts and contributed information about customary practices. The women also discussed about their involvement in activities of malaria control.

Group Four: Young Adults

The young adult group comprised of 8 males only. No females turned up despite information given. Mostly were seventeen years of age to age thirty five. Their experiences and approach were different to group one. Most had experience in malaria prevention at the secondary level (practicing malaria prevention practices after having an infection to prevent new infection). All had educational limitations despite a local community school was being at their door step.

Key Informant – Profile

Roller: Male Adult

Rola is a former malaria control field officer who was retired due to the cessation of malaria spraying programs. He had good background knowledge of malaria causes, and how malaria was managed in the past years. He had the ability to compare and contrast current situation of malaria in the Highlands. He was noted as valid information contributor due to his past experiences.

Dikay: Male Adult

Dikay is currently a young leader in the community as a village council. He was educated to grade ten and had some knowledge of directing the village people, and the local’s knowledge and attitudes toward disease prevention. He also had views on how government services and focus for rural health care were like and its effectiveness. He was critical in his discussion about locals’ attitude and prevention participation.
Tisa: Male Adult

Tisa is a former community school headmaster who resigned recently and was involved in voluntary community and church work. He had views of literacy in the community, some good experiences about the malaria epidemic and how locals helped themselves in different situations of life. He also had experiences in cultural ways of disease prevention and the religion point of view. He had great enthusiasm for helping the disadvantaged people and had shown great interest for participation.

Ambel: Young Adult (18 years)

Ambel is a health worker in the community and had views about what diseases were present and how people got involved in taking care of themselves. She had disease knowledge and the ability to discuss health care accessibility and affordability problems among locals.

The facilitator, with my prior coaching, attended all group interviews to take notes of non-verbal responses and manage the digital recorder. The facilitator then helped with transcribing and translation of data from the local language to English.

Key informants, those identified as having specialised knowledge, or experience related to malaria prevention and management of malaria, were interviewed individually. I acted as the co-facilitator for the focus group and did individual interview. The consents were done by myself with the help of the intermediaries.

The intermediary in each village helped organised groups, prepared lunch, organised the venue, approached people and ask if they are interested in participating in the study, and provided information sheets, but did not participate in the group.

Data collection: Focus Groups and Individual Interviews

Data collection or the gathering of research data in interpretive description study method includes individual interview, participant observation, focus groups, documentary and other multiple data sources (Thorne, 2008). This project utilized four focus groups, and four individual interviews from key informants.
**Focus Groups**

For the focus groups, the participants with their intermediaries selected the time and venue and the interviews took place at their selected place. The facilitator and I went to the selected site at the given date and time. The venue was quiet and all participants were present. After meeting and greeting, the participants, the facilitator, and I sat in a circle. The interview was opened with a prayer in all the groups. Then participants were greeted individually by name and thanked for turning up. The atmosphere was free and everyone felt comfortable to express their views. Prior to the interview, the main purpose of the study was clarified. The issues of confidentiality were made known and participants were told to feel free to come and withdraw their data within two weeks. Also, I went through the consent forms to ensure everyone signed or made a mark to signify their verbal consent.

The interview was loosely structured with the use of guiding questions extracted from the main study objectives (See Appendix D). I was the main facilitator and began by restating the main aim of the interview and explained the interview process by stating “as you have been informed by the intermediary, we will discuss about malaria. “You will share your experiences and what you know and do about malaria”. “As we go through the discussion I will ask specific areas to talk about.” The opening question was,” Tell me what you know about malaria?” or “what you experienced about malaria.” This prompted the participants to state the cause of malaria bug, describe the signs and symptoms, transmission patterns, and mosquito as a vector and their related issues. When everyone felt they were done with a particular issue, the next question was asked. There were probing questions such as, “interesting, could you tell us a little bit more?” or “what happened next?” Time signals were also provided to ensure all questions were covered within the set timeframe. For example, “after this speaker, we will move to the next question,” or “that’s sufficient information for this part of the discussion, we will move to the next”. After discussing the final question participants were asked to provide some contributions of what they thought were most important. This was to identify what part of the discussion was valued most. Time was provided for anyone to withdraw any information should they want to so do or that they should feel free to do so within the three weeks of my stay in the community. But none of the
participants showed up to withdraw information or to withdraw from the study. When all participants felt comfortable and done with, farewell was done with the assurance that results will be made known to them after the study was completed. Participants also indicated keen interest in knowing the results of the study and were assured that it will be done. Each focus group session took approximately one hour and twenty minutes. All focus groups concluded with a meal and I thanked them for their contributions.

**Individual Interviews**

The individual participants as key informants were approached differently than the group participants. They were specifically asked to discuss about the community and how it was doing in terms of malaria prevention and control (See Appendix D for questions used). All key informants were notified of the issues of confidentiality as in focus groups. The key informants signed up their consent forms and had shown great interest in the study. For the two key informants who came to my house, interview took place in the main living room. There were no other people present.

After each individual interview time was briefly provided for key informants to say things. This was done for them to mention any relevant points if lost during the discussion and for anyone who wished to withdraw any information they regretted they should not have suggested. Some relevant points were added but no one withdrew any information. Also, they were told to state what was really important in the discussion to see what was valued to support the themes development and this was done as analysed in the next chapter. Individual interview took almost one hour. Most felt satisfied that they contributed what was valued and missing in the community. A meal was also shared with the key informants after the interview and I thanked them.

**Data Management**

Data for this study was gathered through digital recording. The non-verbal expressions and consensus were noted down in written form by the facilitator. The types of data gathered were personal experiences, views, attitudes, beliefs, perceptions, and descriptions of practices related to malaria prevention. The non-verbal information was also noted by the facilitator using pen and notebook.
For recording, a digital tape recorder was used for verbal responses while facilitators took note of non-verbal responses. We tried our best to provide a relaxed atmosphere with space for participants to sit in a circle for maintaining effective communication. The use of triangulation or multiple sources of data collection was considered beneficial, because it helps explain the richness and complexity of human behaviour from more than one standpoint, and adds to research validity (Cohen et al., 2007).

After each session the recorder was replayed and translation and transcription into English were made. This was time consuming due to the huge amount of data that was generated but was done successfully. Transcripts were made anonymous with the use of pseudonyms. The names of study locations were replaced as groups one, two, three and four. Some irrelevant points such as stories and examples and repetitions considered not important were omitted during analysis. The information felt strongly emphasized with tone of voice or stressed points were bolded. The most agreed points were underlined to see what and why it happened and its underlying purpose.

All transcriptions were done using Word Processor, printed out and stapled according to each focus group and individual participants.

Data Analysis

After the transcription and translation into English, data were analysed thematically. Data analysis is seen as a process that involves classifying, categorising and ordering data into units of meaning to enable exploration of deeper meanings (Cohen et al. 2007; Thorne, 2008). Interpretative description studies have thematic or integrative description of phenomena of clinical interest (Thorne, 2008). For this study, data gathered went through the process of visualizing structure and finding relationship before themes were formed and conceptually analysed (Thorne, 2008). Data was then categorised, and colour coded, and meanings were worked out.

This study using thematic analysis used data from both verbal and non-verbal communications for interpretation. Interpretative description designs focus not only on searching and exploring for features and common issues but also seeks to render the understanding of the inherent complexities such as the values of expressed perceptions,
and not perceptions as necessarily true (Thorne, 2008). This study noted inferential, stress points, and any illustrations used that had various meanings to interpret perceptions of culture and other implied information indicated in the data. This was done to interpret perceptions of culture, values, and other underpinnings that were seen as indicated in the data. The strategies applied were breaking down data, applying colour codes to data, and then finding relationship and themes.

**Pieces to Patterns**

Firstly, the transcribed data was organised from pieces to patterns using the words written, sounds heard and silent spaces with the storey lines as suggested by Thorne, (2008). Then, data from all focus groups were broken down and grouped alongside each research questions (See Appendix D). The individual interview data were also analysed in the same manner. The tape was replayed to recapture sounds for the purpose of noting emotions like stressed points, and main emphasis, and any issues participants mostly approved or disagreed. I also referred back to the written records of non-verbal notes. The emotions indicating most felt needs were then bolded while the main emphasis and values interpreted were underlined. The non-verbal communication provided rich data, and so was analysed alongside to what was being said to gain insights and understanding into aspects of the human experience of malaria (Cohen et al., 2007). The guiding questions for analyses were informed by Thorne et al. (1997). These were, ‘What is happening here?’ and ‘what is this telling me about perception, experiences and practice of malaria control and prevention strategies?’ Then meaning was worked out from different perspectives and listed beside each section. The related meanings interpreted were written beside each point to check relevance. Then questions asked; ‘is this referring to whom, what, and the reasons behind such emotion’.

Overall, I tried my best to put out my expectations and assumption of what their meanings might be and tried to work out what participants meant in both the verbal and non-verbal data (Thorne, 2008).
**Colour Coding**

The next step was the application of colour coding on the sorted data. According to Thorne (2008, p. 145), colour coding system is seen as derived from the methodological tradition of grounded theory and three distinct forms were seen as widely applied. This study used open coding which involved fracturing the data, taking it apart and examining each part for similarities and differences. This was done by applying various colours coding to each main idea. Good colour coding scheme is one that steers researchers toward gathering together data bits with similar properties and considering them in contrast to other groupings that have different properties (Thorne, 2008). With that, the colour coding was used and common colour based on frequencies were then sub-categorised to groups. The less common colours were further read, meanings understood and shifted to areas where they seemed to fit best. Other minor irrelevant points and unnecessary repetitions were disregarded.

**Finding Relationship**

After sorting the data into groups according to the colours, relationships were worked out. This was done by visiting each main group and each groups’ main point was worked out further and how this was related to other groups. Some data with meanings that needed to be shifted were moved to areas they seemed to fit well. The overall main meaning in each coloured group was seen as forming a theme. Other related points were sub-grouped and noted as sub-topics within the theme. The thematic analysis employed helped to identify and interpret the themes, associations, relationships, and patterns that arise from the focus group and interviews (Thorne, 2008).

Themes were then conceptualized and synthesized uniquely as they appeared in each coloured group. The group that contained huge amount of the most common colour coded data was noted as theme one. Then the data was re-examined to find related meanings. The meanings seen related from one to another was about knowledge of malaria and understanding of malaria transmission including both correct and incorrect views. This was named as ‘locals’ knowledge of malaria and its transmission, and gaps’. Any information seen relevant to knowledge of malaria was then shifted to this theme. The next group of data taken note of was the group that took upon the next most
colour coding. The meanings identified were seen relevant to seasonal happenings and climate change experiences. This was identified as theme two and named as ‘locals’ knowledge and experiences of climate change and seasonal malaria’. Its meaning was to seen in terms of low awareness of their vulnerability for malaria and the epidemics faced.

Further, the group of data interpreted as containing a lot of emotion was seen and grouped as group three. This group contained stresses and voice gaps and was third common in colour coding. This group of data showed both negative and positive experiences of current malaria control and prevention strategies. The voice variations and gaps were interpreted that locals were finding current malaria control strategies as not very effective and needed more efforts. Other activities like drugs, mosquito nets and others mentioned were sub-grouped under these main themes. This group was themed as the ‘negative and positive experiences of current malaria prevention and control strategies’.

The other group also containing common colour coding was stories of home remedies. The meaning of this group if data was seen relation to accessibility problems or that what health care system provided did not work well as to why locals went for home remedies. This group of data was named as ‘home remedies or alternative malaria treatment and prevention practices’.

The fifth group of data sorted were those mostly stressed with emotion of disagreements. Most mentioned data was relevant to problems of health care delivery system. Therefore, this group of data was identified as a theme and named as ‘problems faced by locals with health care system in malaria prevention and control’.

The six group of data sorted was mainly based on words and views of locals. Main emphasis seen was relevant to socio-economic needs causing ineffective prevention practices. This was interpreted that locals viewed malaria prevention not only from biomedical standpoint but on also on socio-economic status. This was noted as a theme.

The last group of data sorted was mostly based on my interpretations of the participants’ prevention practices, and experiences of spiritual healing. This was based
on statement of having capabilities of practicing prevention and not having capabilities. Or as having knowledge but were not able to transform information into practice. I asked myself why peoples’ individual dynamics contributed to malaria problems and tried my best to discover deeply of individual capabilities and competencies. This was themed as ‘health beliefs, values, and behavioural issues’.

All in all, I visited the data from time to time during discussion and even replayed the tape over again to immerse myself in the data as guided by Thorne (2008). This was done to ensure familiarity and main themes served participants’ views. At this stage documentation of analytic thinking was also done by writing out what meanings and other underpinnings may relate to each data (Thorne, 2008, p. 153). The negative and positive views expressed in each main point were written out and questions were asked for example, “these are the practices now,” “why is it happening?”, “how will it look in future?” Any memory that was recaptured during this time was written down as analytic notes to be referred to during thematic analysis (Thorne, 2008, p. 153).

This is basically how themes were found and analysed using the sorted and colour coded data. The seven themes are further discussed in chapters five and six.

**Maintaining Rigour**

The trustworthiness of this project was maintained through the use of purposeful and snowball sampling collecting realistic experiences, coding, extracting relevant points and grouping into each sections and then revisiting the transcripts as guided by Thorne (2008). The purposeful sampling was done by targeting and recruiting participants according realistic experiences of malaria to meet the study purpose and study question. The snowball sampling required people who have had malaria experiences to identify others of the similar experience to provide realistic experiences to strengthen the data according to Cohen et al., (2007).

My presumptions were based on personal lived experience within the community since childhood, a community member and a nurse from the nearby hospital for over fourteen years, and the literature review undertaken for a year for the purpose of this project. I went into the community with known facts through lived experiences and with my
The researcher did identify some limitations of current malaria control and prevention programs undertaken by Primary Health Care providers. These were noted as pressing issues and kept on the side for careful investigation to avoid conflicts. Some of the practices mentioned as new to the researcher were put to side for further investigation through literature before doing data analysis. Further literature search was done on issues that emerged. The reasons for doing this were to see what was linked to the current knowledge and practice perceived to be effective and how these were learnt and used. This was to avoid presumptions and to find good meanings for explaining what locals found and used as useful practice. My prepositions such as experiences and knowledge were put to side as much as possible to ensure findings represented the experiences of the participants, and not the self interest of the researcher. The theme formation took over months to read, revisit the data, analytic questions asked and further investigations of meanings to provide strength for research project. The original transcripts were used for themes formation after data analysis as the themes seem to be commonly present in all interviews. Themes were also considered in relation to the literature review which indicated verification of findings.

What I have provided in this chapter (and throughout the thesis) is a ‘reflexive account’ of the decisions made and processes used throughout the study. Koch and Harrington (1998) suggest that a reflexive account that is well signposted for the reader allows them to “decide for themselves whether the text is believable or plausible ([their] term for rigour” (p. 882).

Summary

This chapter described the process how the project was undertaken. It stated that ethical approval was sought and given, how participants were selected and how the focus groups and individual interviews were conducted. The management of data was stated and process of data analysis and themes identification were mentioned. The issue of rigour was also discussed. The next chapter discusses the themes further.
CHAPTER FIVE: THEMATIC FINDINGS

This chapter presents the findings of the study to answer the original question and aim of the study. The themes related to issues and meanings from across all four focus groups and the four individual interviews.

Introduction to Themes

The study focus of identifying knowledge gaps, perception, current practices and experiences of malaria within primary prevention remained the same throughout data collection process. Most participants indicated their knowledge about malaria as a disease by describing the signs and symptoms. The data indicate all participants as having full awareness of malaria as a problem in the community. Mosquitoes as the main vector were well understood with signs and symptoms by many locals. The knowledge gap identified was in the understanding of transmission of malaria. Despite the clear description of mosquito bites on the skin by many participants, the misconceptions that oral ingestion of mosquito larvae and eggs as a cause of malaria was commonly mentioned by participants throughout all focus group interviews and two of the individual interviews. The preventive practices mentioned were mostly attempted after an attack as a secondary prevention measure. This indicated no or lack of active primary malaria prevention practice in the study area. Most of the data collected referred to the perception of other factors such as socio-economic situations, and health management as main barriers of effective malaria control and prevention activities. The findings are presented as seven main themes. The related data were moved to the seven main themes and described with minor headings.

Theme one was named as *locals’ knowledge of malaria and its transmission, and gaps*. This theme illustrates the participants’ correct and incorrect views and perceptions of malaria transmission particularly the malaria parasite, and mosquito eggs and larval oral ingestion. Theme two was labelled as *locals’ knowledge and experiences of climate change and seasonal malaria*. This theme was named as it is because most experiences shared were relevant to climate change. Most participants expressed climate as a main trigger and nothing was done about this. Therefore, malaria
prevention strategies implemented by DOH prior to avoid epidemics not yet active in the Highlands were felt as vital components for discussion. Theme three was named as the negative and positive experiences of current malaria prevention and control strategies. This theme illustrates the different malaria control strategies currently in place. It describes how locals accessed it, and how they felt these strategies worked for them. This theme also discusses the locals’ former and present encounter with malaria control practices. It also highlights what locals stated as lacking with the current health prevention system. This is pertaining to management and leadership style in implementing malaria control activities. Theme four was named as home remedies or alternative malaria treatment and prevention practices. This theme emerged due to most colour coded data. Most participants mentioned herbal and thermal practices which were not anticipated and this stimulated the interest for further investigation. Theme five discusses problems faced by locals with health care system in malaria prevention and control activities. This theme emerged due to the common colour coding system applied. The colour identified that data pertaining to health care system was significant. The sixth theme is the locals’ voice and perception of socio-economic disempowerment and needs. This theme emphasizes the socio-economical barriers that contributed to malaria problem. It also gives space to discuss malaria prevention with knowledge alone as insufficient. But locals needed to be empowered with resource and the correct empowerment approaches to practice and sustain HP programs in order to prevent malaria. Finally, theme seven pertains to health believes, behavioural and psychological issues. This theme discusses most observed and interpreted information through the interview process, analysis of data, and the curiosity driven literature. Also, it answers the question of why some families were mostly affected while others from the same community were doing well. Also describes the attention mothers and children received within family structures in preventing malaria. It further identifies health locus of control, individual competency, values for health, and spiritual beliefs.

Theme One: The Locals’ Knowledge of Malaria and Prevention

This Highlands’ malaria prevention knowledge and the transforming of knowledge into practice information sought were obtained. The participants had good understanding and had excellent knowledge, while others had very limited knowledge. The examples
of quotes below from the study are related to knowledge and understanding of malaria causes, transmission and prevention practices.

**Malaria Cause and Transmission Vector**

These quotes indicate malaria as an infection transmitted by mosquitoes was well understood by locals.

* Malaria is not new, it is an ancient disease and most of us are familiar with it. (Rolar)
* It is the mosquito bites that give us malaria. (Fabi)
* Malaria is caused by mosquitoes. (Ambam)
* The mosquito bite the infectious person’s blood and then injects it into the body of other people in the people in the same house. (Mary)
* Most people in Tombil community do know about malaria and it is present in their community. (Ambelka)

As well as understanding that mosquitoes transmitted malaria many locals also knew that there was seasonal variation to malaria spread.

The following quote demonstrates that participants understood that malaria infects locals during both seasons and it is becoming endemic in the Highlands.

* I realise that mosquitoes infect humans during both wet and dry seasons and has links with seasons. It is the seasons that provokes malaria. (Pudi)

While some locals had sound knowledge of malaria while others did not. In some cases the knowledge is seems inaccurate or incomplete.

**Insufficient Knowledge About Malaria.**

The examples of insufficient knowledge of malaria are quoted below.

* With knowledge of malaria prevention strategies, the people in the coastal areas know well and practice these prevention strategies. But in the Highlands, we do not fully understand and practice prevention effectively. (Dikay)
For some people who go to the coast and return, they quickly identify malaria in terms of fever, chills and headache and quickly go seek malaria treatment. (Roller)

In the coast mosquito is common. When Highlands people go there, they do not keep indoor but wander about outside in the dark and get malaria. People also eat ripe bananas and pawpaws which contain mosquito parasites and they get sick. (Andi Koro)

I have heard from health workers that malaria causing mosquitoes live in stagnant water. Therefore, when I fetch water from wells and other sources I boil it first before drinking it. (Kupo Tai)

I was advised not to eat ripened fruits such as pawpaw, guava and bananas. Because these fruits contain malaria bugs and eggs. (Neomi)

I did not believe in malaria but believed in sorcery as the cause for malaria. I blamed sorcery as the cause of my son’s illness but the hospital workers told me that he had malaria. I blamed sorcery for nothing. The hospital medication healed my son. (Ali)

These quotes indicate knowledge gaps and misconceptions of malaria causes, and routes of malaria transmission. The signs and symptoms were noted as well understood but some participants still indicate unclear understanding of causes and transmissions. There are still beliefs of sorcery as causing symptoms similar to malaria symptoms.

**Reasons for Lack of Prevention Practice**

The effectiveness of malaria prevention measures undertaken by locals was also a curiosity. It was not known whether information was lacking or that people did not transform information into action. The quotes below illustrate information of malaria prevention practice undertaken by locals. Also, this indicates where the focus of malaria prevention awareness was like.

One of the key informants identified reasons for lack of malaria prevention practices:

*Some people lack the understanding of clearing their home environment and end up with malaria. In the community we do not emphasize a lot on malaria but focus on HIV-AIDS as an important disease. There are illnesses that cause death such as*
typhoid and malaria but HIV- AIDS awareness takes higher priority over other illnesses. Next, prevention is not really practiced and people are not fully aware of primary prevention of illnesses. We need health workers to come and give basic health teaching on malaria prevention. If there are outbreaks of chorea or malaria, our population will wipe out because majority do not understand primary prevention.

(Dikay)

**Community Health Supervision**

Malaria prevention practice was interpreted as depending on supervision and the type of PHC managers and leadership. The quotes below compare the former supervised PHC in the autocratic management system and the current leniency system with emphasis of empowerment.

*The former PHC system came also with a law system and this law system also covered safe use of water. This law was enforced by local village committees. (Kupo)*

*In my view, malaria in developed countries will be minimal due to strict discipline. During the Colonial days, The Whiteman enforced the community to keep toilets and homes clean and the village committees did the supervision. With this, approach we were fine had less malaria cases. With independence, the strict supervision has faded and we mind my own business. We do not care about having a good house, toilet. This careless attitude of locals contributes to malaria increase. (Macks)*

These two quotes indicate that most participants saw benefits from or preferred the autocratic PHC system which enforced community to practice preventive strategies.

These quotes are examples of knowledge related to malaria as an infection and its causes and understanding of its transmission and prevention means. The correctly mentioned ways of malaria transmission shows strength of knowledge while those indicating misconceptions show the need for knowledge enforcement through good malaria awareness and PHC management. Most participants explained clearly about their knowledge of malaria. They described malaria well by the signs and symptoms and identified correctly mosquito as the main vector for transmission.
Knowledge of malaria prevention measures varied largely depending on age, education and experiences. Most participants correctly identified mosquito as the main vector causing malaria but some had doubts about witchcraft as a cause. There were still some participants who understood malaria as entering their body through the oral ingestion of mosquito eggs and larva. Most denied witchcraft as a cause these days but did admit that this belief was still present in the community.

Pertaining to age, those who were in their early twenty and thirties and who did not have a formal education seem to have missed out information about basic sanitation and common disease-prevention measures. This was evident in focus group four. Most participants expressed surprise in being infected with malaria. The positive side of their experience was that getting sick prompted them to work harder in secondary prevention measures. For those who were in their late thirties and onwards, both with and without education, expressed malaria as an infection they knew about and avoided due to the former supervised PHC system.

Those who had experiences in malaria and knew about prevention blamed themselves for not practicing preventive measures. Some participants identified the lack of cooperation in the family and community in practicing preventive practices. Moreover, most blamed the cessations of the supervised PHC system as main factor hindering them from active primary prevention of malaria.

**Gaps in Knowledge of Malaria Transmission**

The gaps in knowledge of malaria transmission were interpreted in the way assumptive diagnosis was made based on signs and symptoms of malaria by naming it “malaria – typhoid”. A few participants also had mixed information of malaria transmission as faecal-oral contamination. This was in particular to identifying poor hygiene habits, and ingestion of mosquito larvae and eggs. This information indicates an unclear understanding of direct mosquito bites by local Highland population.

This theme identified two issues. One as good knowledge and understanding of malaria but lacked the transforming of this knowledge into prevention practice. These were due to individual competencies and health locus of control. Secondly, the knowledge gaps
and misconceptions of malaria prevention were evident. These were due to a no or a limited education, ineffective PHC system with no supervision on community disease prevention activities. Also, the leniency or low to no control approach with focus of empowerment and participation were not fully implemented. More discussions are made in the first part of the discussion chapter six.

**Theme Two: Locals’ Knowledge and Experiences of Climate Change**

The knowledge of climate change was included in this study to see what locals were doing to prevent seasonal malaria. Also to know their self awareness of vulnerability as Highlanders and see what was missing that led to epidemics. Literature also indicated locals’ vulnerability with no immunity and predicted subsequent malaria epidemic (Mueller et al., 2003).

**Experiences of Seasonal Malaria**

The climate in the Highlands is changing. In the past we normally have rain from November to April. Dry season normally starts from May til June. This pattern is now interrupted and we have dry season during wet season times. Malaria seems to affects us during both seasons. (Sam)

For me, it’s the seasonal changes that bring malaria. During the rainy seasons I get severe malaria attacks. During the dry seasons I seem do well without malaria but I still get an attack. I see that there are mosquitoes that infect humans during both seasons. (Andy)

Malaria follows wet seasons but malaria does affect us during both seasons and this confuses us. If someone finds a way of killing all the mosquitoes would really help our population but such people are not around. (Pudi)

Malaria affects us mostly during wet season. At night mosquitoes buzz a lot when the kids and I are asleep. We are powerless and have low social status and have difficulty in seeking help. I say that the government should be called to reconsider the DDT spraying program to come and spray our place. I am saying this, and I have been preaching about DDT most of the time at home. When I was small, I saw the malaria DDT spray team and this was an effective strategy. Now that DDT spray
program was ceased, I often get confused on who will really tell the government to revive this DDT spray team. Malaria is affecting me most times and I am stressed. (Gra)

The quotes above illustrates that the locals have found malaria as becoming common during both wet and dry seasons unlike the past. The DDT spray program is stated as an effective strategy during the past days but has ceased these days. Also, these indicate needs for environmental control strategies and locals vulnerability awareness.

**Experiences of Malaria in Relation to Seasonal Happenings**

Participants linked seasonal happenings as related to malaria. A few happenings have some relationship with malaria while others have no direct link.

*The seasons of bamboo sprouts and panda nuts ripening, we seem to get malaria attacks. At this time we have heavy rain and a get lot of worse malaria attack.* (Andalam) (Most agreed discussion among the group)

*I would like to talk about seasons and some changes that I have seen. In the past, when we had mushroom seasons, people were confused and talked nonsense from eating mushrooms. It was mosquitoes that caused it and now this problem is no longer experienced. I think mosquitoes laid their eggs in mushroom and when we ate mushrooms we got malaria.* (Jonathan)

*In May we normally get headache and see may flower and sprouts of bamboo and we start to cough and get headache and have fever. The cause could be malaria.* (Kongo)

The quotes above provide information that locals were aware of malaria seasons relating to seasonal happenings such as bamboo sprouts, mushrooms, and red pandanas.

In all focus group and individual interviews, most participants identified climate change and seasonal Highlands’ malaria epidemic. Some described it physically of feeling the warmer temperatures unlike in the 1970’s where the Highlands area was cooler. Others described climate changes by referring to changes seen in plants, fruits, and food production quality as poor due to heat. One participant said she heard it over the radio. In all the discussions done, participant’s general awareness of malaria present in the
Highlands was shown but serous self-awareness of their vulnerability was insufficient. Such are indicated in the quotes as “we did nothing but expected that malaria would infect us and it did.” Or “we did well in prevention measures during awareness time but we did nothing when awareness program ceased.” This shows a need for education and building multiple suitable malaria prevention strategies of avoiding mosquito bites.

Theme Three: The Locals’ Experiences of Current Malaria Prevention and Control Strategies.

The current malaria control practices commonly shared were both negative and positive experiences and had unique underlying meanings and reasons. Due to huge amount of information, the data was subcategorised as drug treatment, prevention measures and home remedies as commonly appeared.

Use of Anti-malarial Drugs

The use of anti-malarial drugs is the mainstay strategy and PNG spends a lot of health finances to improve accessibility of drugs. In the clinic, most out-patient clients and inpatients did not seem to recover well with drugs. Even when drugs were adequately administrated or correctly prescribed to take at home, patients often returned in worse situations or had a repeated attack. This prompted this study to identify why drugs were ineffective. The following quotes relate to participants experiences of anti-malarial drug use.

Negative Experiences

I went to the health centre and the HEO said I could be sick with malaria and told me to take chloroquine and gave me supply. This treatment helped me for a week or two but the symptoms reappeared. I did not get well and slept indoor for three days. People told me to take herbs and I did but this did not help. I went to the hospital the second time and chloroquine was given but I refused to take chloroquine because it was bitter and caused nausea. The HEO gave me a different type of medication and this helped me for three weeks but then I got sick again. I returned to the health centre and asked if the HEO had a medication which was not the same as the last two times he gave me. The HEO said I have arthemeter and gave me; and after three days I felt
well. After quite a while, malaria restarted again and I went back to the health centre and the HEO gave me some grey-brown medication and this helped for another 3-4 months. After that, I got reinfecced and went to hospital and the HEO asked me about my home environment like mosquito nets and if I had stagnant water nearby and the likes. I said yes that I had stagnant water or wells dug from the ground. He advised me to clear my bushes, sleep under mosquito nets and drain out the water wells. I did as I was told by clearing all the bushes and drained the well. After doing those things, I am doing fine without malaria and this is for a long time up till now. (Noel)

I got medication but was not healed. I was put on injection (quinine, arthemeter) for seven days but this did not help. Malaria was still inside me. I had constant headache and could not get over. (Sai)

When I took medication like chloroquine, I vomited everything and nothing was in my system to work because chloroquine caused excessive nausea. (Ross)

I threw medication away due to its bitter taste and went for herbs. (Kongo)

I went to hospital and got medicine and injection but this did not help. My body got weak and I was weak and slept most of the time. (Ria)

These quotes clearly highlight the participants’ negative experiences with the commonly used drugs malaria and that artemisinin based drugs were effective treatment. Locals also found that a combination of drugs with environmental management resulted in no further malaria infection.

**Experiences with Children**

I took my child to hospital and he was on medication for malaria but did not get cured. Malaria was still present until we were doing steam baths and other home remedies to make him feel better. (Eli)

I will share about my son’s sickness and how he had taken his medication. Firstly, he took the initial anti-malarial dose but later refused medication and complained that medication was bitter. He asked me to give him fruits, pawpaw leaves, and soup made of noodle with ginger, salt and chilli. He recovered with the home remedy but not the malaria medication. (Molina)
Kids do not complete their full course of medication due to bitterness and end up with recurrent malaria but we found it helpful with steam baths. (Kupo)

These three quotes exemplify experiences of mothers with children taking anti-malarials at home. The mothers also testify alternative practices found useful.

I would like to share my experiences. I was sick with malaria for 2 months. After many times of malaria medicine I got well and am doing fine. (Mary Ga)

The hospital and the general approach of curing illness seem inadequate. When we go to the hospital, health workers give us medication on trial basis at our first visit. Then, health workers advice us to review if necessary. Sometimes medicines are ineffective and we repeat treatment after treatment but the parasites still live inside us until the parasites kill us. (John Russ)

These quotes show medications given on trial basis or anti-malarials as ineffective and repeated treatments experienced as inconvenience.

When sick with malaria we go to the hospital. Sometimes our blood is checked to confirm malaria before medications are prescribed. Other times blood check is not done and medication is just given. (Pudi Bar)

This statement indicates some diagnosis as based on presumption and done without microscopic malaria smear at laboratory.

I was given medicine and was told that medicine was going to help me. I took medicine at home and the symptoms disappeared. But when the medication was finished, I was sick again and this on and off attack continued for some time. I was given medicine only but not injection. In my mind I wanted injection but this was not given. (Jan).

I took chloroquine and quinine but got no help. I tried several medications but did not get help too. One time, my blood was checked and an anti-malarial injection was given. Through this injection I recovered. Medication was given but due to bitterness, I threw them away but the injections cured my malaria infection. (Sam)
These quotes are examples of chloroquine ineffectiveness. The ineffectiveness was experienced after faithfully completing the dosages by some participants. This indicates chloroquine resistance malaria. Others have found chloroquine or other anti-malarials bitter in taste and threw the medications away or not completing the dosages. The nausea and vomiting feeling was also seen as preventing good intake and absorption of anti-malarial drugs. Such experiences indicate needs for effective drugs and coated chloroquine. Also, it indicates needs for good communication and decision making, and establishing understanding with patients before dispatching medication.

Health workers gave medicine by guess work and not by proper diagnosis. I refused chloroquine which did not work and insisted to take artemisinin. (Gurber)

This quote indicates the need for using effective drugs such as artemisinin and the need to build trust with health consumers. This participant lost trust for chloroquine as well as health workers when chloroquine did not work for him.

**Positive Experiences**

There were some positive experiences of anti-malarial drugs.

*I want to share my experience of going to the coast last year. Because of my experience in severe malaria attacks, I got prophylactic chloroquine and I have seen it as effective.* (Sat)

*For me, I take my children to the hospital and ensure that medicine dosage and medicine times are followed. I instruct children not to throw away medication because I belief medications totally cure the malaria infection. I remind the children that if they throw away any medication or do not complete their dosages, the parasites will still remain in your blood. I as a mother am very strict on completing medication dosages.* (Ambam)

This quote reflects an individual that had health values and faith in medication. Also being focused, believed and relied on modern medication for malaria cure.
The following quote reflects primary prevention practice with the use of prophylactic chloroquine. This was practiced by old women. Also, this indicates her health values.

*People have to take medications before going to the coast. I don’t know about others but I want to share my personal experience. I take medications a week or two weeks prior to my trip to the coast. I continue to take medication weekly in the coastal area and upon return I do not get malaria infection. But at times when I do not get prophylactic malaria tablets I get severe malaria attacks. (Gurbar)*

*I go to Port Moresby, Lae and other coastal areas with prophylactic chloroquine. With such practice I do not get sick with malaria. (Ma)*

These quotes are from two adult men using chloroquine as a prophylaxis. They analyse the effectiveness of taking chloroquine prophylaxis. Also indicate good malaria preventive practices.

**Experiences of Women**

*Pregnant women go to hospital and receive prophylactic chloroquine to prevent malaria. Their unborn babies are also protected from malaria. (Ambel ka)*

*My grandmother went to Lae to stay with her sons for one month. Before going she asked the health workers and got some medicine to take weekly. She then followed these instructions carefully. I taught she might be sick as she was exposed to mosquitoes of the coast but after observing her for some time she never got sick. (Jill)*

This statement reflects the routine antenatal clinics and prophylactic chloroquine use as primary prevention for malaria in pregnant women. This strategy protecting both the pregnant mothers and babies is seen as noted by study participants. The non pregnant mothers and children indicate needs for mosquito nets.

**Summary of Malaria Treatment Experiences with Drugs**

Almost all participants mentioned about the commonly used anti-malarial drugs demonstrating a good knowledge of anti-malarial drugs used in PNG. This is seen in the way participants named the drugs as chloroquine and quinine, and the prophylactic and the routine treatments. There were few participants who mentioned artemesunate and
artemether injection, primiquine, and fansidar as medications that worked best for them. The majority of the participants mentioned that chloroquine and quinine were ineffective even when they have been treated repeatedly.

The key informants Dikay, Macks and Roller also added that drugs were not effective, but yet people were curative focused. They further added that this was unlike the past years with emphasis on environmental control strategies such as keeping basic sanitation and environment clean for reducing mosquitoes. There were few quotes indicating that preferred effective drugs like artesunate and treatment in the forms of injections like artemether were not given.

There were some statements of dissatisfaction about health workers decisions toward treatment. About four participants in different groups emphasized that medication was given by health workers to check for effectiveness or to see how it would work but they were not purposely given to treat malaria. One participant thought health workers particularly new graduates were incompetent and inexperienced in prescribing medication, and stated that medications were given based on presumption as quoted below.

*Some health workers are new graduates and give us medications for other illness and confuse themselves (Kaka Mai)*

**Interpretations**

It is interpreted that both locals as health care consumers and health care workers as health service providers have contributed to malaria spread in the Highlands. With the locals, there is evidence of inconsistencies in taking medicine, and not completing dosages. With health workers, the treatment based on presumptive diagnosis and ineffective anti-malarials are seen as main factors leading to mistrust. Such experiences are noted as common among participants with chronic malaria and those with repeated attracts of malaria. The underlying reasons are seen in drug resistance, attitudes, bitterness of anti-malaria drugs, and the perceptions of health and illness. Those who were consistent in taking medications have also faced repeated attacks causing them to lose trust in anti-malarials. With the health care providers and health workers
ineffective drugs led to mistrust. Some either asked for more effective drugs but when
not served as demanded walked home to use home remedies. For those who tried
multiple strategies of drugs, and environmental strategy experienced such as effective.

These quotes also indicate participants’ values and competence for medicine and
health. It is seen that health teaching in drug resistance should be made as well as
making available drugs that are coated and flavoured for easy ingestion. This is
discussed further in the next chapter.

**Prevention Measures**

In the analysis malaria prevention methods apart from drugs were grouped into sections
as environmental control approach, use of bed nets, and mosquito coils as they were
discussed in the focus group. The data relates to the study objectives two and three.

1. To discover how effective locals used malaria control and preventive measures
   within the primary prevention focus.
2. What is their knowledge about mosquito breeding sites and their approach to
   environmental modifications?

**Environmental Modification**

Environmental modification is a strategy to control vector (malaria) population. Study
participants mentioned that keeping clean environment as a strategy to control mosquito
population was a practice they were aware of. The data collected related to four aspects
of environmental control. These included supervision and control of community PHC
programs, socio-economic barriers, Cessation of DDT spray program, and indicated
individual locus of control and competency. The former PHC supervision experience
was widely mentioned with DDT spray or residual sprays. These issues were seen as
management approach and discussed in theme five. Socio-economic barriers preventing
malaria prevention measures are discussed separately in theme six due to huge data and
a most stressed issue. The locus of control, health values and competency are analysed
in theme seven. These were ideas mostly interpreted from individual statement and
experiences.
Mosquito Nets or Impregnated Bed Nets

The bed nets was mentioned and identified as a major need in all focus groups and the individual interviews. Most participants expressed dissatisfaction both in words, facial expression, and had variations in tone of voice about unfair distribution of the donated mosquito nets by local distributors. Some stated that the limitations in supplies and not catering the total population were disappointing. The cost of mosquito nets was mentioned as expensive and participants could not easily afford it. With that, there was nothing mentioned about re-treatment of these nets with insecticides, demonstration of uses, or follow up evaluations by health workers. As one participant said: My family and I are very careful and up to date with the use of bed nets. (John) John demonstrates individual management of his own family and shows his competency and values for mosquito nets.

All of us do not have bed nets as to why mosquitoes bite us. Mosquitoes bite us when we are asleep. Sometimes the government gives us mosquito nets but the distributors redirect supplies and sell the bed nets for personal gain. The bed nets prices are high that the lower social class or poor people cannot afford it. For these reasons we are affected mostly. During the daytime we seem to avoid mosquito bites well but at night we easily get bitten because we are past asleep. Therefore, mosquito nets seem to be an important resource and should be distributed fairly. (Anda Lam)

In our community, malaria is a big risk and many people are getting sick. We have heard that there are many types of malaria species and when we drink medicine, some get cured while others are not. For me, I should have a mosquito net but I cannot afford it due to financial difficulty. From my observation many villages are also not able to afford it. The other means to control malaria is impossible. I think mosquito nets should be used by all. In the past residual spray as a strategy was effective but now this is replaced with mosquito net to be used by all. From my observation in the recent mosquito net donation, distribution was a problem. Some of us never got the bed nets and we missed out and it is a very big need. The weather season is changing and many mosquitoes are breeding. With this, I am afraid that I will be infected because the mosquito net I used to sleep under has been beggared up. The new bed
net donation was a good chance especially for kids but this was not possible. With
distribution problem we are under greater threat for infection. (Phil)

We will not hide issues, but this malaria problem is due to the health centre workers
not distributing the AUS-AID donated mosquito nets to the people. Most of the bed
nets were sold for money. (Sam)

These quotes indicate the local’s ability to purchase the bed nets in terms of socio-
conomic strength, and the knowledge and values. There are wide issues of unequal
distribution of the donated bed nets in all focus groups and three individual interviews.
This shows evidence of poor distribution and mismanagement of resources at health
centre level. Also, this raises needs for monitoring and evaluation of resources
distribution at peripheral areas by the DOH and donor agencies.

Experiences of Mothers

Most pregnant women receive mosquito nets from the clinic (Ambam)

My son and I often get malaria but cannot afford mosquito nets. I heard about the
health centre distribution but supply was insufficient and we did not get any. We are
powerless and have low social status and have difficulty in seeking help. (Gra)

I see most families give attention to mothers and children and they would often allow
mothers and small children to sleep under a mosquito net. (Ambel Ka)

These statements indicate attention received by mothers and children in the use of
mosquito nets. It would seem that most pregnant mothers had accessibility to mosquito
nets then non-pregnant mothers or women in general.

Residual Sprays

Residual spray as a main vector control strategy for managing the environment and
preventing malaria was mentioned as not done these days. All participants were
mentioned the former DDT spray, the spray teams and their activities. There was no
mention of any recent residual spray in this study area indicating that residual spray as a
strategy in the Highlands was not implemented in recent times. The residual spray data
mainly pertains to management and leadership changes. Therefore, this is analysed in theme five.

**Summary of Vector Control Strategies**

The study participants identified most strategies for managing the environment as listed above. It is seen that very few participants took courage and helped themselves while the majority put less into vector control strategies. The main issue raised was on management problems, indicating high expectation and dependency from external sources.

**Theme Four: Home Remedies-Alternative Malaria Practices**

This theme was identified due to most colour coded data and quotes below relate to these data. Most of the stated information was related to herbal, thermal and making smoke to avoid mosquito bites.

**Herbal Therapy**

Many participants use herbal therapy to prevent and treat malaria.

*I take a particular leaf which is effective on sores and scabies and it cures malaria totally. I always use this leaf as a medication to treat malaria and do not take hospital medication as chloroquine is bitter and I often throw it away.* (Kongo)

This refers to the leaves of a tree. This participant as a user had positive experiences in treating both malaria and ulcer sores. This was unique of this particular participant. Another commonly mentioned therapy was hot chilli soup.

*When I get anti-malarials, the smell causes nausea and I do not take it. Instead, I cook and eat hot chilli soup. With that, malaria disappeared and I got well.* (Eva)

This hot soup home remedy was also mentioned in two other groups.
I normally rub lemon juice on my skin. The reason is because, lemon is sour and when mosquitoes smell the lemon they do not bother to bite me. From this experience, I never got sick with malaria and I have been in good health. (Akpu)

This testimony is from an adult man who had found this method as an effective preventive strategy.

Because chloroquine was bitter, I went to herbal medication. As advised by other people, I collected leaves and flowers of pawpaw tree. I then boiled them and drank the juice. At the same time I did steam bath and with these practices malaria was cured from my body. (Par)

This quote shows a combination of both papaw tea and hot thermal practice.

I used to buy Aole Vera (herbal juice) from local brewers and spend a lot of money. The Aloe Vera juice helped treated my headache. I was fine for sometime but still experienced periodic attacks of malaria. (Sika)

This quote indicates a common practice using the herb Aole Vera juice. It is commonly grown, juice extracted and sold in containers. Also, this is commonly sold in the local markets. This experience indicates commercial sale as well as not being an effective treatment but kept symptoms of head ache as treated. Study participants’ statements of spending a lot of money on local herb practitioners’ needs good research and policy developments.

My son also gets malaria and we started eating ‘bek’ (a common weed) as treatment. Pawpaw is another remedy plus seeds with salt. This is our routine practice and we have avoided malaria. Although it has a disgusting feeling and fumes that comes through the nose, we ignore such feeling and still eat it due to its effectiveness. (Gra)

I got severe malaria due to not taking prophylactic medication and going to the coast. I found no help with medication and went for ‘bek’ (Herb). I eat a lot of ‘bek’ including seeds and leaves and found this as an effective remedy. (Eli)
The common herb identified and used commonly by some participants is called ‘Semin Bek; and has a bitter taste. This was mentioned by two focus group participants and found it beneficial in prevention and treatment of malaria. The avocado seeds were mentioned by one participant. Chilli soup was also mentioned by three participants as an effective remedy against malaria.

**Interpretations**

The herbs and fruits used by locals were as treatments and as prevention measures. Most participants contributed positive experiences of pawpaw, its leaves and young shoots. Both chilli and avocado seeds were mentioned, and their bitter taste is seen perceived to cure malaria.

These practices are interpreted that locals’ perception of malaria medication as being bitter, not effective or perceive that wrong medication had been given. Also, a common perception picked due to this practice is the bitter taste those alternative plants and fruits have. This causes locals to perceive the bitterness taste as chloroquine and would work similarly.

These wide practices also illustrate how locals learnt and applied knowledge into practice. Also, this indicates that locals found modes of communication among themselves as more effective which provides opportunity for using locals as village volunteers in disseminating health communication.

The commercial sale of herbs and locals finding it not effective treatment indicates further research and policy development. Other alternatives of treatment practices need further research for correct use and safety.

**Thermal Practice**

The hot and cold water therapies were two common practices mentioned by many participants as treatment practices. They are quoted below.
I was sick with malaria for one year and people advised me to submerge in the very cold water between 2am - 3am. After practicing this water therapy, I am well for three years and I do not have malaria. I got help especially from cold water. (Jan)

Hot steam baths were also mentioned but not as effective as the cold water therapy experienced. See quotes below.

My son was sick and was on medication but the infection did not get cured. Malaria was still present and we did steam baths and practiced other home remedies until he got well. (Eli)

I did steam bath using pawpaw leaves and guava leaves and got well (Ross).

Exposure to very cold water at midnight and in early mornings for several times was a common practice mentioned in 3 groups and reported of finding it as an effective cure for malaria. This therapy needs further research on temperature and malaria parasite if such therapies are found effective. They were possible cost effective strategies but the risk of cold injuries for old age and babies need to be considered. Also, the related complications like pneumonia or drowning are issues of concern for such practices.

**Making Fire and Smoke**

Making fire and smoke using organic leaves and woods inside the house was a common practice mentioned by some participants. This was done to prevent mosquitoes from entering dwelling houses. Certain leaves used for burning to make fumes were pawpaw leaves, gum tree leaves and some local tree leaves.

We make a big fire and smoke to remove the mosquitoes and its a routine practice. We see some effectiveness and therefore; we break a lot of firewood daily and keep the fire going every night because get help from this practice. We do not possess mosquito nets but are based on fire and smoke. (Ros)

Fire is very true as most of us make fire to protect ourselves. The heat and the smoke keep the mosquitoes out of our house. (Gra)
I used to be sick frequently with malaria and decided to change houses by coming and sleeping in my friend’s house. The reason is because he makes a big fire at night. We do not have mosquito nets but we chase the mosquitoes out by making a big fire. (Kongo)

These are examples of positive experience but some participants described a negative experience.

This negative experience indicates making excessive fire keeps mosquitoes away but is not a very effective malaria prevention practice. Local’s perception is interpreted as similar to the burning of mosquito coils. This indicates needs for providing information on dangers of smoke and risk for lung diseases.

Summary

The alternative practices are common due to the perception and experiences of ineffective malaria prevention and treatment strategies within the existing health system.

This also indicates that people value life and seek possible practices to keep healthy. Such alternative practices seen vital and beneficial and commonly used by locals need further research and policy developments to validate the use and practices and the safety measures.

Theme Five: Locals’ Views on Health Care System in Malaria Prevention and Control.

The main areas in this theme include DDT spray and team approach, public health policy, PHC village supervision, and disease priority. See quotes.

DDT Spray and Malaria Team

In the past we had malaria spray teams who came and sprayed insecticides around and inside our dwelling house. With this program we never had malaria and many people were healthy. Now, this team has ceased and malaria is becoming very popular. We have seen the effectiveness of DDT sprays. (Ambam)
I think the malaria team should be revived as mosquito nets are costly and only DDT sprays will help save a lot of lives of adults and children. The malaria team and DDT sprays program should be revived. (Kupo)

I strongly think the DDT spray program should be revived to function. Talking about bed nets and buying it is not very effective because such involves money and people have no money. I think reviving the DDT spray program and having teams to come to villages to spray routinely will greatly help the community. The government should fund DDT program to spray our homes. With such, it will really help. (Sam)

This is very true we need to do this. One other thing we see is that insecticides should be made available at the local health centre and we should buy it and spray our houses. (Akpu)

These quotes indicate the experiences of the former DDT residual sprays, its organisation, and supervision. Also, it can be seen that locals perceived effective strategy of malaria control as DDT residual sprays. This perception can be a factor preventing locals from practicing other alternative environmental strategies with their own efforts. It also indicates participants’ beliefs and strong values for DDT residual spray due to their former experience of this strategy.

PNG had good malaria prevention strategy with residual spray team back then. I wonder who the health minister that made the decision to stop this strategy. It is a question now as to how safe was it that spray program was abolished? This is a big mistake and a contributing factor to malaria problems in our country. (Jonathan)

This quote refers to public health policy changes causing cessation of effective prevention programs such as the use of DDT. Also, this indicates no other alternative environmental management strategy provided as a solution. The local participation and effort toward controlling mosquito population is indicated as insufficient. This also indicates locals’ lack of knowledge of reason for abolishing DDT spray programs.
Malaria as a Speciality Care

The participants indicated a felt need of having malaria treatment and prevention programs and activities to operate as a separate or speciality care apart from other medical conditions. This was emphasized particularly by focus group one and two key informants. The quotes are listed below.

*I see that malaria care needs to operate as a speciality care. We would like to see a separate building for malaria so that we will just go there, get treated, and come back. The reason is because most health workers seem to confuse themselves with malaria medication.* (Andy)

*If we start a malaria care program based in the community and visited people from village to village and conducted awareness; this would be helpful. In the past when we visited a community, we held meetings first and did awareness about living environment in the first day and conducted residual sprays the next day. With this approach, people were doing fine. These days we are not doing this because there is no one to control and direct us. Some are just lazy people. You are aggressive against tribal enemy with your bush knives and shouting but do not know when your enemies; the mosquitoes are going to attack you. Mosquitoes silently attack and the situation is getting worse. We appreciate that a malaria program needs to operate locally. There has to be people to supervise the community. In the village court system, there are village magistrates to solve problems. In the health field we need to have committees to supervise the community. This includes government officials to come to the community and help supervise the local people too. From this, people will have a good healthy life. Without such supervision and order people are facing multiple problems. Some people do not have money to go to the hospital. Prevention is important but it needs leaders to talk, lead, and supervise locals. In this case locals will do it. White men put their knowledge into practical application but for us local people we do not practically apply our knowledge or some even do not have prevention knowledge. There are only few people who realise important things.* (Macks)
The following quote demonstrates distrust with malaria diagnosis and treatment done in health centres and hospitals. It also indicates a perception that malaria was not adequately addressed.

There are three groups of people that help us and this includes the government, NGOS, and the churches. They should discuss and make a decision for one to take a serious role in setting malaria care centre and address malaria specifically. This will really help the community. (Jonathan)

The government is doing a good job. For example, HIV-AIDS care centres where people go for special counselling about fruits and diets and this is to help them. Another example is the malnutrition building beside the hospital where people treat malnutrition cases separately. Women who are pregnant or are in labour have their own buildings. How about malaria and where is malaria’s building. We have a strong feeling and suggestion that the government should start a separate malaria team or building or system to deal with malaria issues separately. When we get infected we have a great fear of dying. However, if we went to malaria’s own section we will have the faith that we will be cured and we will get cured. Malaria will be eradicated and this is the locals main thought. (Pudi)

Pudi compares malaria with other diseases and expresses that malaria was not receiving adequate attention. This is interpreted as related to a physical building, malaria specific clinics, blood screening services at health centres, and treatment and prevention resources at local centres. Also, may include specific programs and human resources for advice, coordination and treatment services.

The help and services that come through existing care centres has distribution problem. If we have a mechanism that supplies were distributed directly to the community would really help us. The services provided by the hospital and health centres are not so good at times. Some people own services and we do not access it. Services should be owned and accessed easily by community but there are people who are always bosses and we have to pay all the time. When we have no money to pay we die. (Kongo)
This statement shows accessibility problems with some locals who cannot meet the minimum fees imposed in health centres and hospitals.

The study participants mostly identified the need for malaria care to operate as a separate system (or as a speciality care) from other general infections. They also mentioned village blood screening to be done and malaria teams or village malaria committees. This was strongly emphasized by males particularly as community leaders and mostly agreed with non-verbal expressions like nodding of head, and by saying ‘yes and ‘that’s it.’

**PHC Supervision and Public Health Policy Enforcement**

The lack of community health supervision and lack of enforcing public health laws was mentioned in the study. See quotes below.

*Primary Health Care system came with a law system and this law system also covered the use of water. The law was enforced by local health committees that the main river was not to be contaminated by humans or animals but to be used for drinking only. After this law system ceased, water is polluted and many people are drinking the polluted water and are getting sick. We also had our homes, toilets, pig houses, and bushes sprayed. This approach kept mosquitoes away and as a result many people were malaria free. (Kupo Tai)*

*I think that the village elders and councillors have to make a strong rule for every house to have a toilet, a rubbish pit for proper disposal of tins and cans, and generally a clean living environment. (Ambel)*

These two statements refer to enforcement of public health policy by village health committees, and residual spray programs to be implemented. Locals have expressed the good outcome with close supervision as beneficial.

*I would like to talk about government health workers and their supervisors in health centre. PHC supervisors’ who closely monitor workers help them to do a good job in helping people resulting in good health. But some supervisors’ do not supervise*
workers closely to help locals and as a result locals face problems with diseases.

(Rolla)

This statement refers to supervision of PHC workers in local areas as not effective. It is seen that effective supervision will improve health workers performance resulting in improved locals’ health prevention behaviours. Overall, these three quotes refer to the former PHC supervision and law enforcement by village health committees. It also compares the outcomes of a supervised/ forced or controlled system and the current insufficient supervision, or the current leniency system with inefficient direction. All key informants and all groups asked for reviving the former routine insecticides spraying program, and the supervised PHC with trained village volunteers. Local have also observed that lack of supervision in rural health centres as causing poor work performance. These statements indicate management effort in providing good supervision of malaria prevention programs, and activities implemented by health workers as not effective.

Suggestions for Improving Community Health

Participants also made suggestions of how community health will improve. See quotes.

One suggestion for future is proper government budget. A real government who wants to serve the community must enforce community government and foster community self- reliance. If we start now we will be alright. We need to ensure that each family has a toilet, rubbish pit, drain stagnant water and other malaria prevention measures. This will help and increase our population. If we do not do it then we will face epidemic such as the one in 2007 epidemic. In the past there was malaria team and people had good sanitation and there were health committees and community was strictly supervised. (Ma)

Another way of helping locals is that councillors have to write letters to the local members to get mosquito nets for distribution to the local people. (Molina)

The village head men and councillors who have the knowledge must seek help for needed resources and should provide good services for the people to prevent
themselves and the community from malaria. Good leaders provide good services and village councillors need to help people. (Ambel)

Women groups were successful, stronger and lasted longer while community development programs failed due to lack of participation. (Macks)

These quotes indicate self-reliance, strict supervision of PHC activities, and using women as a gender based approach. Also these indicate a mixed understanding of the two separate approaches. Most participants who were older and educated mentioned about prevention measures. Their knowledge was based on previous experiences of the supervised PHC system that existed during colonial time up to the early 1980. The women groups is mentioned as currently successful strategy and seen as a suitable context for PHC village activities.

Health awareness on malaria and the supervised PHC that fostered community participation was expresses as a need now by several participants. Two participants mentioned that community laws and standards were lacking. They viewed setting standards for everyone to follow as a community with village supervisors as committees will enforce participation in malaria prevention measures. These indicate that control and supervised PHC enabled good health outcomes. But with the current trend in self-reliance is experienced as not effective. This indicates CD and PHC current empowerment concepts of participation and self-reliance as yet to be implemented effectively.

Focus of Disease

Four participants expressed concerns that supervisions and follow up were not done on malaria patients. Participants perceived health systems had programs and supervision for other diseases such as TB, leprosy and HIV-AIDS patients in the community but malaria was not given enough attention. An example is quoted below.

The health system viewed HIV-AIDS as an important disease and not typhoid and malaria. HIV-AIDS is taking higher priority and not malaria. (Dikay)
All four key informants stated clearly that districts and local health centres had poor relationship with people. They did not have a shared vision to reduce malaria problems. Health workers only gave medication but have not followed up, checked locals’ living environment, and did not conduct awareness.

_The elected leaders and those in management were focused in their pockets only and not the lives of people. They put local people’s health as second priority. When locals perceived this, they did not cooperate which led to poor relationship with community development managers and coordinators, and village leaders. (Rola)_

This quote refers to lack of political support particularly, village councillors, and elected members of parliament as not supporting locals in their health activities.

These experiences and views can be analysed as PHC and CD programs as weak, ineffective and the lacked resources. Such issues also indicate management of current PHC programs, focus of care and values need to be examined.

_The strength in community programs was seen effective in women groups (Macks)_

This quote indicates sustainability of village based programs as effective with women. The gender approach particularly done with women in their context in transforming illness prevention information into action was seen as making programs not only successful but also locally sustainable.

**Theme Six: Locals’ Voice and Perception of Socio-Economic Barriers**

The locals’ perceptions of socio-economic situations as factors for malaria problems appeared as a theme in this study. This was due to the statements quoted below and interpretations from voice variance and stress points. These issues were much stressed and indicated deeply as a perceived need for preventing and controlling malaria. This theme also tried to answer study objective five; ‘to discover if socio-economic status and social disparities contributed to malaria problems.’ The quotes from the transcript are grouped in different areas of socio-economic situations mentioned. They were housing and standard of living, money or income, social structure, community
participation, social network or ‘wantok system’ based on relationship, and power issues.

**Housing and Standard of Living**

The need for good housing to prevent mosquito bites and for preventing malaria was commonly mentioned by study participants.

*In PNG three quarters of the population are subsistence farmers and about one quarter are income earners, who sleep in good houses and have a good standard of living. These people seem to be doing well. For those of us who live in the villages do not have good housing. Most of us live in house made of grass and have no proper toilets and rubbish pits. Due to these reasons we get infected with malaria so easily. (Kaka Mai)*

Most of us live in bush material houses and need good housing. If we live in good housing our health will improve and we will not be sick. In addition, we were told by the Governor that there are funds for people. But most of us are illiterate and do not know the procedures for obtaining funds. In addition, good water supply, good housing are things we desire to have but knowing how to obtain these funds is our problem due to our own lack of knowledge. (Molina)

Molina and Kaka indicate good housing as a pre-requisite for malaria prevention but their huts of grass contributed to malaria. Participants also estimated that more than three quarter of the population in the community had traditional bush material houses and they were prone to mosquito bites. Molina also states locals lacked knowledge on how to obtain funds from government to help themselves. This also indicates disempowerment.

**Money**

Money was named by participants as an important need to buy resources to prevent malaria and to seek health care treatment.

*People who have money find transport easily and are able to access hospital services on time. For those who do not have money ask friends to help to seek health care. But*
those who do not ask friends sleep at home while their infection gets worse and they die. (Rola)

With that, some people who do not have money just sleep at home and die. (Kongo)

We cannot easily afford hospital bills as hospital bills these days were raising. (John Russ)

Most people live in subsistence living and do not work for money. The cost for things like mosquito nets and mosquito coils are increasing. People see such high cost as too much and are not able to afford them. (Ambel Ka)

These quotes indicate lack of money or no income as disempowering locals from accessing health care. This is in meeting transport cost to go to hospital, paying hospital fees, or buying malaria prevention utilities like bed nets and coils. People with money easily accessed health care and got cured. But those who did not have much money slept at home until someone helped them out or they died. Also, health values and values for other basic living are compared. These indicate hospital fees need reviewing. Or, locals’ general goods and services tax, and school fees need to be checked. Such are seen as causing difficulty for poor people to meet needed services like hospital fees.

**Social Structures**

Social structures also played some roles in locals’ behaviour of seeking health care when sick with malaria.

*The people who have high status in the community are respected and known culturally as “big men system.” These people are valued and benefit from services but the low social class people or people not classified in this group often miss out. The upper class get their share such as mosquito nets and distribute to those who they favour and sometimes bed nets for money. But for the poor and the needy, they just get left out in the community. (Ambel)*

People with some status and recognition were easily served with mosquito nets while those of low status not recognised as much and received such attention during distribution. Such views pertains to the cultural way called “big men system” or the
“give and take system” as well as resource power, and money perceived to be given back in return. This system allowed people in the upper social structure to receive attention and contribution for hospital faster than others of the low social hierarchy. Bed nets distributors are also seen as selling bed nets for money.

*I share my house and food with my friend and her children. When anyone gets sick we also get infected because we share the facilities and houses. It is seen that due to lack of protection and over crowdedness we get easily infected. This is a mistake. (SK)*

This quote indicates multiple families sometimes living in one house sharing common essentials including the house. Also, it is an indication of lack of barrier between the sick and the healthy members of the family. Locals seem to get cross-infection due to no barriers when one got sick with malaria.

**Social Safety Net: ‘Wantok System’**

The ‘Wantok System’ was mentioned as contributing to health or illness when sick. See quotes.

*When family members did not care much when we were sick, we only slept and died at home. But when they cared and help donated money we were able to get treatment. (Kongo)*

*When I was sick, I had to wait until my son came and took me to hospital. (Gra)*

These statements refer to a social network called ‘Wantok System’ in PNG. In the “wantok system” way a friend or relative will always help you out when you are in need (Renzio, 2000). It is good in helping one another but also has disadvantages of dependency and stresses on employed or working people. Sometimes when ‘Wantok System’ does not work out, people who wait often die from complicated malaria.

*Most people who seem to be in the upper social class or those who have resources, and who think about God seem to have mercy for other people and help others. That is for people who speak out and make their needs known to others. But, for those who do not make their needs known to others face worse situations. (Tisa)*
This statement indicates that locals got help from generous individuals, particularly people who had good income and resources. Also, Christians were more likely to help others due to their faith in helping people.

**Power Difference**

Power Imbalance and disempowerment were mentioned as contributing to malaria.

*We heard mosquito nets were donated to our community but they have no power to trace those accountable for unfair delivery.* (Molina)

*We feel stressed with repeated attacks of malaria and wished for malaria spray programs to be revived but did not know how and who to approach.* (Gra)

These quotes were the voices of a minority group and these two were women indicating need for empowerment. Empowerment in terms of opportunity, to look for resources, check bed nets distributors’ attitude problems, and having little information or how to deal with accountability issues. Also, the stress associated with poor distribution of services and needs good service delivery mechanism through good evaluation.

**Political Views**

There were political factors contributing to malaria according to the participants’ perspective.

*The leaders and elected members do not have love and passion for people, and do not help local people to live a sustainable live.* (Rola)

*Our national government in its budget allocation of funds for locals at the ‘grass root’ level should be different from general electoral funds. Because the budget goes with the districts’ budgets, workers mismanage funds and make a gain for themselves and that’s how the local community is affected. Therefore, services are to be directed to the community. The needy things such mosquito nets and mosquito coils should be made available at the village by government, NGOs and Aid Post. The funds for local grassroots budgeted separately from the electoral funds and having a direct delivery system to the people will be an effective strategy.* (Tisa)
These quotes pertain to locals not receiving their electoral funds, or the goods and supplies needed for improving their lives. This indicates political manipulations and greed, or mismanagement by those in power in the higher government levels as well as those involved with funds distribution at the district levels.

With this, most people in power do not realise the risk of malaria in the community and their involvement in prevention activities. Many times the village headmen give school talks or counselling to the community but they rarely discuss about malaria prevention. Few village leaders with some concern for health seem to mention malaria prevention at times but not all. It is seen that healthy people make strong community but many times community headmen fail and do not give the right information. (Ambel)

This statement indicates malaria as a priority disease not receiving attention. Also, these indicate the need for political intervention by both national and local leaders.

**Lack of Participation**

Participants mentioned locals’ participation as lacking and contributed to malaria.

*Many people did not cooperate in community work and instructions because they perceive that the services to be delivered to the people were not being delivered correctly. (Rola)*

This quote is interpreted as community participation problem toward environmental cleanliness. In particularly, the PHC and CD programs were seen as not effective. Rola stated that locals withdrew efforts due to goods and services delivery problems.

This theme outlines socio-economic determinants of health that are seen in external factors. Such are politics, policy and structure and control of decisions and resource distributions. Also, the locals’ own social structures, limited income and participation problem. These are discussed further in the health management component in chapter six.
Theme Seven: Individual Perceptions and Behaviour Change Patterns

It is seen that participants had unique psychological processes that determined their behaviour toward health and illness. Such were health locus of control and efficacy, faith beliefs, values, and individual competencies. The quotes were sub-categorised into four main groups as external locus of control and low self-efficacy, High internal locus of control and high efficacy levels, health values, and beliefs and faith.

**External Health Locus of Control and Low Self-Efficacy**

Data interpreted as low self-efficacy or participants that viewed others as contributing to malaria situation were noted as having external health locus of control. See quotes listed below.

*Many people do not cooperate as they perceive that the services to be delivered to the people are not being delivered accordingly. (Roller)*

*Leaders and elected members do not have love and passion for people and do not help the people to live good lives. (Rola)*

*Other family members did not care much when we were sick. (Kongo)*

These quotes indicate low self-efficacy and external locus of control, and the dependency on external factors for good health.

**High Internal Locus of Control and High Self-Efficacy Levels**

Data interpreted as pertaining to high internal locus of control indicating individual own effort in preventing malaria were noted as participants with high self-efficacy levels. The quotes are listed below.

*I have heard from health workers that malaria causing mosquitoes live in stagnant water. Therefore, I make sure that water is clean and I am often careful with drinking water. (Molina)*

*What I do is; cut bush and prune all tree branches around my house. This is to avoid mosquitoes and to prevent my family from getting malaria. (Tisa)*
I instruct my family about malaria and most have their own bed nets. I also tell kids to keep in-door from dust to dawn. I warn them to keep in-door after dark to prevent mosquito bites and malaria infection. This is because we cannot afford hospital bills as these days hospital fees are raising. (Andalam)

To prevent malaria, our home environment should be clean. These include clean cooking utensils, covering of food, and clean toilets. I check my water tank frequently and wash out dirt. With such practices, my kids and I seldom get malaria. For other people who do not practice such hygiene habits, I see often see them in hospital. (Neomi)

It is seen that people with competence, high internal control were able to take positive approach in malaria prevention behaviour as indicated above. They seem to be in control of the situations that contributed to good health. Also, these statements indicate individuals’ competence levels.

**Health Values**

The health values were indicated in the data. Some participants were interpreted as having high health values while others had and low health values.

**High Health Values**

*When kids were small I encouraged them to take medicine and never caused fear in kids about doctor or nurses as other mothers do. I believe in medicine. I do not believe in other things because I have never been to school or learnt anything but I believe in nurses, doctors and medication. My family and I always take medicine and complete dosages. I do a good job in this.* (Ambam)

*I took my wife frequently to hospital because she was infected with both typhoid and malaria and we visited the hospital for nine years. From my experience, I have seen effectiveness in the brown medication* [primiquine as it is often small and brown in colour and given with chloroquine] *and I believe and value it.* (Akpu)

These two quotes indicate high values and believe in anti-malarial drugs and health care and health advice.
**Low or No Health Values**

Primary prevention is not really practiced. They do nothing about prevention and when infected seek curative practices. Locals are not very clear about this, we need health workers to come and give basic health teaching on sanitation, clean toilets, hand washing. If a chorea or malaria epidemic occurs, we will be depopulated because many locals do not understand primary prevention. (Dikay)

Few people in the community practice prevention but most do not value and practice preventive measures. (Ambel)

I do not practice or consider health prevention activities. (Kongo)

These three quotes indicate no health values and no primary prevention practices. Strong believes and values in medication and prevention measures caused them to take active roles and participation in prevention activities. For those who did not value their health did nothing.

**Faith Beliefs**

The data that referred to faith healing and religious beliefs were noted..

We could not get over as we got on and off malaria and it was a worse experience. The only thing I did was believe in the lord and I received help from Jesus. Through this we are helped out and we as a family are alive now. My family and I were infected with malaria on and off for 7 months. We visited the health centre and also God has helped and now we are fine.

I see that God has helped the Berepka Community and we seem to be doing fine with God’s help. (Tisa)

God almighty has helped the Berepka community and most are doing well after the epidemic. (Roller)

These statements are seen referring to religious beliefs in spirituality and super powers. Participants have shared their individual experiences and from observing others generally as a community.
This grouping system was used to indicate the locals’ individual uniqueness and capabilities, competency levels, locus of control and efficacy, values, and faith beliefs about health. With the locus of control, it is evident where individuals with high internal locus of control believe that events result primarily from their own behaviour and actions. These individuals seem to be in better control of their behaviour, believe that their effort will be successful, were more active in seeking information and knowledge concerning their situations. However, those with high external locus of control believing that powerful others, fate or change primarily determine events were seen mostly in blaming others and government and others systems. More of the analysis made was made in the discussion.

**Findings Summary**

From the data analysis, there were four main findings contributing to knowledge gaps and preventing effective malaria prevention practices. All six study objectives were also met. Firstly, this study identified knowledge gaps and misconceptions of malaria meeting the research question. The reasons were due lack of education at primary level and the ineffective health education programs within PHC/HP system in the local communities. Secondly, practices of malaria prevention measures explored according to objective two indicated that approximately one quarter of the Tombil community group practiced malaria prevention measures. The remaining three quarters did not actively practice primary prevention. The needs identified were supportive supervision, and understanding of empowerment processes that contributed to malaria prevention practices. These concepts needed to be addressed adequately through the PHC and CD approaches, and a good preventive health focus with an adequate workforce. Thirdly, objectives three and four pertaining to prevention strategies of environmental and vector control strategies indicated environmental factors of socio-economic, policy, resource distributions and politics determinants as main impediments. These factors were shown as having a greater impact on malaria prevention and control measures that needed to be minimised. Locals view on most effective strategy was residual spray as their first priority and fair distribution of mosquito nets as next. The women and children as high risk population did receive some attention within family structures in the use of mosquito nets and prophylactic chloroquine. This was especially pregnant
mothers and babies to small children. But the socio-economic barriers prevented most non-pregnant mothers in accessing mosquito nets. This met study objective five. Fourthly, socio-economic status and social disparities contributed to malaria problems were seen as due to PNG’s general socio-economic impacts as well as the locals own socio-cultural background. Fifth, the unexpected results that surfaced in this study were behavioural and psychological processes of health locus of control and efficacy, and faith beliefs and values for health. These abstracts contributed to their health and wellbeing and their unhealthy and risk related behaviour. These were seen that emphasis placed on behaviour change programs, motivating development of health values, and helping to develop skills and competencies will help locals in malaria prevention practice.

This chapter presented the seven themes that emerged in this study. It covered the stated data, interpretations done and other underpinnings for each of the seven themes and the sub-themes. From these findings discussions are made in the next chapter.
CHAPTER SIX: DISCUSSION OF FINDINGS

This chapter discusses further the study findings and the relevant literature searched. The findings are discussed individually and collectively using the disease triangle model. The emphases are made on issues seen as important by participants and interpreted as vital. Others factors found in the literature as relevant to malaria prevention are also discussed. For the discussion guide, the disease triangle model formulated by McNew (1960, cited in Scholthof, 2007) that is often used in studying interrelationship of various factors in disease epidemics and controls is used. It will highlight the Highlands people as susceptible host for inoculation for malaria parasites, the agent or parasite as dependent on environmental conditions including, climate change, social factors and the cultural surroundings (Scholthof, 2007). See Figure 5.

Figure 5. The Epidemiological Disease Triangle Model: Malaria
(Source: Adapted from McNew, 1960, cited in Scholthof, 2007).

The themes presented in Chapter Five are discussed using the disease triangle. Themes One and Two are discussed together as the Highlands’ knowledge gaps and experiences of malaria including climate change experiences. Themes Three and Four are discussed collectively as locals’ experiences of current malaria control strategies and their alternative herbal and thermal practices. Theme Five is discussed individually as locals’ voices of health care system while theme six is discussed as socio-economic determinants and locals’ disempowerment. Lastly, Theme Seven discusses...
psychological and behavioural determinants including individual locus of control and religious believes. This chapter is concluded with a summary.

There are four main reasons for the failure of health education in malaria control. The first reason is the type of populations that suffer from endemic malaria in poor countries or in depressed areas with low educational standard and poor housing, hygiene and general environmental conditions. Accessibility to these populations is often difficult, and the medical facilities available to them are, to say the least, scarce. … A second reason is that malaria is part of a socioeconomic depression complex from which people have difficulty singling out malaria for particular concern. The people cannot understand why malaria should be selected for elimination rather than poverty, hunger, or other diseases or conditions. The multiplicity of afflictions from which the people suffer takes away a good part of the motivation they might have for self-help in controlling malaria. … A third difficulty is the nature of the disease itself, specifically the complexity of its epidemiology. ... The fourth reason for failure of health education in malaria control is the methods currently employed. Generally speaking, they have not been well adapted to local situations. (Gramiccia, 1981, p. 386-387, cited by Heggenhougen et al., 2003, p. 9)

**Themes One and Two: Environmental Factors and Seasonal Changes**

The disease triangle model demonstrates that malaria parasites as causative organisms when inoculated into a susceptible human host triggers malaria infection. But a break in this cycle can prevent or control infection (McNew, 1960, cited in Scholthof, 2007). The WHO (2010) indicates locals’ low self-awareness to their environment and social life. The DOH (2003) states there are insufficient HE or HP positions, and HE and HP responsibilities were not effectively implemented. Themes One and Two discussed in Chapter Five indicated some knowledge gaps, low awareness of vulnerability. These are discussed with locals’ perceptions and practices of seasonal malaria. Also, locals’ way of learning and practicing malaria prevention knowledge identified are discussed with the emphasis of creating more HE/HP positions in local areas to address locals’ knowledge gaps. This is for the purpose of increasing their capacity for self-awareness and prevention practices.

**Knowledge Gaps and Misconceptions of Malaria**

This study of the Highlands’ locals’ knowledge and practice of malaria, Theme One reveals that participants had good knowledge about parasite and vector mosquitoes. But
information regarding effective prevention against mosquito bites and inoculation of parasites and transmission modes were inaccurate. The examples stated included malaria transmission by faecal oral route, involvement of flies carrying malaria parasites, the naming of malaria as ‘typhoid-malaria’, and perceptions of oral ingestion of mosquito larvae and mosquito eggs. These knowledge gaps and misconceptions are interpreted as contributing to ineffective malaria specific prevention efforts by locals.

Malaria studies indicate all four plasmodium types as present in the Highlands (Mueller et al., 2002; Mueller et. al. 2003; Peters, 2004). The environmental conditions causing favourable conditions for mosquito breeding, and causing greater spread such as the global warming increasing temperature is alerted by Sorensen (2008). The Highlands’ local’s vulnerability for infection is seen as increased by seasonal increases and the lack of immunity (Kasehagen et al., 2006). With these, it is seen that enhancing locals with information of malaria parasites and their increased vulnerabilities will obtain their compliance and further enhance control strategies.

The findings show the majority of the participants demonstrated a clear understanding of mosquitoes, and the signs and symptoms of malaria as described by Davis (2010). The participants’ description of the causative organism as a ‘malaria bug’ indicated good evidence of malaria parasites. The knowledge gaps and misconceptions identified were mainly in transmission routes. Some participants mentioned oral ingestion of mosquito eggs and larvae through ingestion of contaminated water and fruits. This misconception was seen as common in both the focus groups and the individual interviews. The scientific studies conducted to test this assumption revealed that mosquito larvae’s were killed in less than five minutes in artificial gastric juice (Gwadz & Chernin, 2004). Because infected mosquitoes transmitted malaria, larvae bite, and egg and larvae ingestion are less likely to transmit malaria infection (Davis, 2010). These assumptions are not true and indicate the need for proper health teaching about malaria as due to direct mosquito bites.

Another knowledge gap identified in this study as a misconception was an understanding that malaria transmission occurred through faecal-oral routes. Few participants directly mentioned flies as vectors for transmission. Another misconception
was also interpreted on how participants named and diagnosed malaria by calling it ‘typhoid-malaria’. This way of diagnosing either typhoid or malaria is seen as based on the similar signs and symptoms experienced. It is a commonly used name in the Asia-Pacific region (Keong & Sulaiman, 2006). Participants indicated it as either diagnosed by their families and friends or were told by health workers. The combination of such naming is both helpful and not. Its helpful view is seen in the sense that it triggered locals into applying additional efforts into activities for basic sanitation and hygiene, targeting typhoid prevention and other faecal-oral transmitted infections. But this is seen not helpful when such understanding isolate locals from practicing malaria specific practices such as sleeping in the mosquito nets, or using mosquito repellent creams. A significant survey conducted countrywide indicated that almost 90% of PNG’s population had mosquito nets but never used them (Miae, 2010 b). Also, from a bio-medical standpoint, typhoid and malaria were separate infections and had separate specific prevention measures despite similar signs and symptoms (Keong & Sulaiman, 2006). Therefore, good malaria specific information is seen as needing to be disseminated to build locals’ knowledge capacity of their vulnerabilities.

Locals Experiences of Seasonal Malaria

The environmental factors and its changes having impacts on the humans and increasing their vulnerability for infection were explored in this study. This was done to identify what Highlands’s locals understood and their self-awareness of the unpredictable weather patterns causing an increase in temperature resulting in the increase in vector or mosquito population (Mueller et al., 2008). The participants’ experiences and perception of seasonal malaria studied indicated sound knowledge of climate change. However, their vulnerability as Highlanders, their self-awareness, and their coping strategies were identified as insufficient. Locals’ perception both stated and interpreted of effective malaria control was DDT or indoor insecticidal spray as an effective strategy but were not done effectively.

The common perception noted was that malaria came about with wet seasonal happenings and will clear off spontaneously as these seasons passed. Some participants identified malaria as affecting them during both wet and dry seasons and had confusion
and stress of dealing with it as outlined in Theme Two. An example is quoted here. “There are mosquitoes that affect us in wet seasons and there are mosquitoes that affect us during dry seasons and this confuses us”. (Pudi)

This statement indicates malaria as endemic now. Also, season changes are a routine happening. The important practice seen missing was their preventive precautionary practice during these malaria peak times. These precautions were interpreted as not actively done due to lack of resource and individual’s low competence and their external efficacy levels as analysed. Participants stated that they were weak or helpless when nearing such seasons and they knew in advance that they would get malaria and they normally get it. Most participants’ experiences were associated with wet season-triggered events. This was when the mosquito population increased but all participants agreed that malaria did attack them at anytime. This indicates more efforts to combat vectors.

The seasonal happenings identified by study participants were such as ripening of mushrooms, coffee, bamboo sprouts and few others are seen related to wet seasons. These happenings do not have a direct influence on malaria but indirectly, as people picked coffee in lowland gardens that are usually dense, dark and with a high mosquito population. They had multiple mosquito bites leading to malaria due to not using barrier methods such as repellent. Mueller et al. (2003) also report of seasonal migration to low lying food gardens and coffee plantations as a factor for malaria infection.

The mushroom mentioned commonly by participants as triggering or having a link to malaria is seen due to two main reasons. Mushrooms are a fungus and growing in damp wet conditions during wet seasons is perceived by locals in relation to seasonal happenings (The Wet Tropics Management Authority, 2002). Participants particularly referred a rise of psychotic behaviour among local populations during mushroom seasons as caused by malaria. The AFM Basics (2005) reveals that mushroom toxins cause psychosis too. Participants in this study were noted as linking these behaviours to the similar signs and symptoms of cerebral malaria that triggers psychological and behavioural disturbances. Also, the wet season increased breeding conditions increasing
the mosquito population. It is seen that locally generated information is important for increasing self-awareness of their malaria vulnerability during wet seasons. It is also important to emphasize the importance of using barrier methods such as mosquito repellents, and long sleeved clothes to avoid bites. The locals’ identification of peak malaria transmission time as between May and June is also relevant to research findings by Mueller et al. (2003). Such findings indicate the importance of implementing correct coping strategies such as residual sprays.

**Locals understanding of Primary and Secondary Prevention**

The participant’s description of the difference between primary prevention and secondary prevention of malaria indicated huge gaps. This indicated insufficient malaria primary prevention knowledge and practice. The WHO (2008) states that PNG peoples’ perceptions of illness and health, lack of awareness regarding behaviour and environment risk-related, and health promoting behaviour, little involvement by local communities in health promoting activities contributed to disease vulnerabilities. This study noted that individuals and communities’ own initiatives and competencies in practising prevention measures were weak. An example of this is quoted below.

"Primary prevention is not really practised now. People just stay around and when sick, they realise it but they do not realise how infection comes to them. They are not very clear about this, we need health workers to come and give basic health teaching on basic sanitation, clean toilets, hand washing. If a cholera or malaria epidemic strikes, our population will wipe out because many do not understand primary prevention." (Dikay)

This quote further illustrates a lack of knowledge as well as an attitude of not practising what others generally practised to live healthily or to avoid malaria.

**Factors Impacting Locals’ Knowledge**

This study aiming to discover malaria prevention knowledge and practice identified two factors. The first one was insufficient or lack of prevention knowledge due to not attending education at primary school and insufficient health teaching due to insufficient health promotion or education workers within rural PHC settings. The
second factor indicated that locals understood and practiced malaria prevention better from prior experience of malaria infection, or when emphasized by their own family members and friends.

As presented in Theme One and Theme Two, limited education or no basic education at primary level was seen as a barrier for knowing and practising primary prevention. For example, a few youths (Focus Group Four) demonstrated this clearly by stating that they did not know nor take such primary precautionary measures until they got the malaria infection. A strength identified was their active involvement in secondary prevention after being told at the health centre when sick. By then, they did well for some years and did not get infected in subsequent malaria epidemics. This also indicates that locals learn and apply skills well after having a bad experience. Niven (2000) indicates attitude formation as acquired in different ways and the youth experiences resemble direct exposure and that attitudes acquired in this way are stronger and more vivid than attitudes acquired ‘second hand’.

This study found locals’ main information intake and their ability to transform health information into practical realities was based on three main factors. One was seen as problem based or after an infection episode. Two was when locals sought health advice at the health centre when sick or when they felt the need. Three, locals applied knowledge well through verbal communication from relatives and friends and their experiences. Therefore, with malaria exposure, building information need by alerting vulnerabilities and using local volunteers would enhance most locals’ learning abilities to practice malaria prevention measures better.

In PNG, mass awareness of health issues is conducted through television, newspapers and radios which are accessible for local people with such media technology. But for the rural based people without such technology, awareness including verbal means, use of village volunteers as well as through pamphlets is required as needs were not adequately met. This indicates a no or an ineffective malaria prevention awareness program for local communities. It is further seen that successful local health education depends on multiple sessions and sufficient time for positive impacts (Chirdan, Zoakah & Ejembi, 2008).
The positive behaviour change toward health and environment depends on a community health educator. Niven (2000) further indicates the absence of a community health educator and health education processes results in lack of appropriate behaviour change toward health and environment. With that, it can be said that PNG’s lack of sufficient HP and health educators as stated by DOH (2003) as contributing to locals’ knowledge gaps. Health education is a process of educating people about health including, environmental health, physical health, social health, emotional health, intellectual health and spiritual health and defined as the principle by which individual and group of people learn to live in a manner conducive to the promotion, maintenance and restoration of health (Denehy, 2001). However, in most rural Highlands communities such roles are not fully implemented. Thomason and Kolehmainen-Aitken (2002) indicate the main reasons as inequitable distribution of staff in rural facilities, different categories of health workers and priority programs of prevention were not receiving attention. Alto (1996) specifically states that abolishing the health educator positions claiming that all health workers performed this role can be another factor. Also, PNG’s current health worker shortage prevents active implementation of preventive health and awareness as attention was routed to urgent curative activities (Alto, 1996). With such situations, the functions of a health promoter and a health educator may not be fully implemented. “A health educator is a professionally prepared individual who uses educational strategies and method to facilitate the development of policies, procedures, interventions, and systems conducive to the health of individuals, groups, and communities for the purpose of enhancing the health of others (Joint Committee on Terminology, 2001, p. 100, cited in Wikipedia, 2009). Figure 6 outlines specific roles.
Figure 6 above shows the main responsibilities of a health educator. It is seen as a profession of educating people about the areas of holistic health. It is a consciously constructed opportunity for learning, using communication designed to improve literacy, for improving knowledge and developing life skills conducive to make health decisions important for individual and communities (WHO, cited in Wikipedia, 2009). Queensland Government (2008) states that health promotion officers works in partnership with communities as well as government and non-government sectors to design, coordinate, implement and evaluate a range of population health interventions, and strategies to improve the wellbeing of individuals, communities and the populations as a whole. In my belief these concepts are well taught in the Health Extension Officers training and Nurses Training in PNG. However, such roles and specific responsibilities are not effectively implemented due to insufficient designated positions (DOH, 2003). The ineffective awareness programs and responsibilities indicated above not adequately implemented results in the locals’ knowledge gaps, loss of prevention focus and disease outbreaks at times. Therefore, attention directed to HE and HP and village volunteers’ positions and developing attractive employment packages will improve locals’ knowledge of disease vulnerabilities.
Themes Three and Four - Behavioural Determinants

Host - Highlands Locals’ Vulnerability

The host or human determinants of low self-awareness and behavioural factors were noted as contributing to the Highlanders’ vulnerability for malaria problems. This study identified host vulnerability within their behavioural patterns toward the malaria control strategies put in place by the DOH as outlined in Theme Three. Theme Four further discusses alternative practices of malaria treatment due to their perception of malaria treatment not working and the cultural contexts.

The Highlanders’ vulnerability to malaria is firstly noted in terms of not generally having immunity against malaria (Mueller et al., 2003). Theme Three outlines their mobility to malaria endemic areas without using barrier methods, not consistent or reliable in completing courses of anti-malarial drugs, seeking alternative treatment with no direct effect of cure, not sleeping in the mosquito nets, and not keeping a clean environment. The use of anti-malarial drugs and mosquito nets are mainstay strategies for breaking the cycle of malaria infection (WHO, 2006; DOH, 2003), while other strategies still remain as important for individuals. In this study, it was identified that locals’ own attitudes and behaviours and some health care workers’ decisions in drug treatment have contributed to the Highlands malaria problems. These factors are discussed individually according to each of the strategies.

Locals’ Behaviour toward Anti-malarial Drugs

Most participants in each group demonstrated good understanding of the different types of anti-malarial drugs by naming the medications that worked best and the ones that did not work for them. In the participants’ view artemisinin based drugs and primiquine were effective. But drugs like chloroquine and quinine were experienced as ineffective. These experiences also relate to medical research findings that most malaria causing plasmodiums have developed resistance to the commonly used anti-malarial or first line treatment such as chloroquine, quinine and fansidar (Mueller et al., 2003; Joshua, 2003). It is seen that artemisinin combination drugs as currently effective therapy and are standard treatment (Schoepflin et al., 2010; Mueller et al., 2003). As a stated
treatment protocol, practical application in rural areas may be ineffective due to the cost of such drugs.

The locals’ negative experiences in drugs were also related to health workers decisions in anti-malarial drug prescriptions. Participants stated that health workers gave first-line anti-malarial drugs like chloroquine and fansidar that were no longer effective. Also stated they were commenced treatment on a trial basis before actually being given artesunate or arthemeter (artemisinin based drugs). Other participants even mentioned that they argued with health workers to get effective drugs such as artemeter, primiquine or artemeter injections that worked best. A few participants mentioned that health workers were incompetent and locals lost trust in treatment decisions made. These experiences caused stress, disappointment, and mistrust in anti-malaria drugs. It is not known why this happened but Davis (2008) and Mwenesi (2005) highlight the cost of obtaining these drugs makes effective treatment difficult. Foster et al. (2009) highlight insufficient stock of essential drugs contributed to these problems. Also, the bitter taste of drugs, especially chloroquine, caused locals not to complete the doses and ended up using herbal treatment. Such experiences indicate the need for increasing health workers’ competencies. This also alerts health providers’ need for increasing artemisinin based drugs supply to meet the health care consumers demand.

The health workers needs for competencies in anti-malarial drug prescription needs can be met by conducting in-service training for those in practice. Also, the blood screening facilities for accurate diagnosis and treatment need to be provided. This is important because most diagnosis and treatment prescription in PNG rural are mainly based on presumption (Genton et al., 1994). Also, as a standard practice chloroquine and amodiaquine as first line treatments are usually prescribed but malaria parasites have developed resistance to these drugs (Mueller, et al. 2003). It is seen that the standard treatment books should be updated with latest malaria treatment information and made available for use in rural areas. Blood screening facilities for accurate diagnosis and proper treatments must also be used.

Health workers attitude when prescribing drugs need more emphasis. Niven (2000) elaborates that patients’ compliance to drug prescriptions depends on how well they
understand instructions and the quality of interactions between the health professionals and them. It has been noted that no one can comply with instructions if he or she misunderstands them. According to research 60% of patients misunderstand instructions and sometimes it’s the fault of health professionals in providing incomplete instructions (Niven, 2000). Therefore provision of clear and explicit information is particularly important when prescribing anti-malarial drugs. Kaneko et al. (2000) further highlight that high involvement and interaction of the community resulted in increased drug compliance and was seen to reduce malaria. Therefore, improving the quality of interaction of interpersonal interaction of showing interest and empathy can result in compliance with drug use (Niven, 2000).

The positive comments made by participants of drug effectiveness were artemisinin based drugs, treatment in the form of injection, and chloroquine prophylaxis. These were interpreted that locals valued anti-malarial in injection form and valued effective drugs like artesunate. With the values and demands in injection, it is seen that patient’s involvement in decision making for the treatment process is important. Niven (2000) says discovering patients’ expectations, concerns and taking appropriate actions are likely to result in treatment compliance. If these study participants as patients were informed or made known of injections and effective drugs limitations as matters pertaining to cost or a supply issue then they would make an informed decision in accepting the prescribed treatment. This will then result in compliance with any anti-malaria drugs. However, such issues not made known caused locals to lose trust for anti-malarial drugs and health workers’ practise.

The chloroquine prophylaxis malaria treatments were discussed as a positive experience. However this was taken by only few participants when intending to travel to the coast. This is seen as strength to base emphasis on regular use of prophylactics because malaria is now becoming endemic as indicated by Mueller et al. (2003). Other research trials done to use caregivers in administering artesunate suppositories showed unsuccessful results. Hinton et al. (2007) state some caregivers of children who had malaria were reluctant to administer artesunate suppositories at home, and indicated the need for health worker supervision and needs for family decision. It is seen that increasing community involvement in discussions, education, and increasing
interpersonal interaction and making available artemisinin based drugs will make drugs compliance effective.

**Experiences of Malaria Prevention Strategies**

Within the disease triangle model, prevention or activities aimed at breaking the transmission pattern prevents malaria from the vector to the host (McNew, 1960, cited in Scholthof, 2007). The participants’ experiences of these strategies with their behavioural patterns interpreted were mostly in mosquito nets use and distribution and residual sprays not actively implemented. The efforts in environmental cleanliness were mentioned and interpreted as more toward program approaches within socio-political spheres of supervision and policy and program changes. These experiences were seen relevant to the former controlled PHC activities and DDT sprays teams which have been abundant (Clements et al., 2007) and these are further elaborated below.

**Mosquito Nets/Insecticide Treated Bed Nets**

The use of insecticide treated mosquito nets seems to be the main-stay in most coastal areas to prevent malaria from vectors to host (Mueller et al., 2003). Bed nets are distributed widely in the Highlands through the PHC system (Reddish, 2008) and available in health centres and commercial retail centres. The participants’ knowledge and experiences examined in this study revealed that mosquito nets use was limited and low as analysed in Theme Three. The reasons mentioned were insufficient supply, unfair distributions and locals had affordability problems due to price. Participants also mentioned they went to the health centre to collect or buy bed nets but did not have the opportunity for demonstration and re-treatment place, and processes done at their homes. The recent country wide survey conducted by the PNG institute of medical research published on the local newspaper (“The National 16th April, 2010”) stated that almost 90% of households nationwide owned ITNs but never used them (Miae, 2010b). Some of the reasons identified for not actually sleeping in the mosquito nets were feeling too hot, over-crowding, and uncomfortable, unpleasant smell of treated nets, fear of poison to kids, poor air circulation and cost as many people could not afford them (Agale & Yaipupu, 2001; Miae, 2010b). This indicates that health care consumers’ compliance to bed nets was low.
On the other hand, it is vital to note factors of effective service delivery mechanisms that caused tribal communities’ high compliance to bed nets. Prakash et al. (2008) state that effective service delivery mechanisms that resulted in locals high compliance to bed nets were such as treating community owned bed nets, scaling up ITNS coverage, identifying treatment locations, and improving accessibility and timely re-treatments. The ITNs as a strategy by improving accessibility through wide distribution in PNG is seen now as vital, but this will be made effective by further efforts in service delivery and with interpersonal skills (Prakash et al., 2008). Also, through efforts such as enhancing local people with adequate knowledge about vector control measures, and enhancing their behavioural patterns to sleep in the bed nets (Schoepflin et al., 2010) will make this strategy effective.

**Attention for Women and Children**

The pregnant mothers, babies and smaller children were seen as receiving more attention for prompt and careful anti-malarial drugs administration as treatment or for prophylaxis. The non-pregnant women and older children were seen as receiving less or no attention in the distribution and use of mosquito nets. Their socio-economic situation influenced their ability to obtain a mosquito net for malaria prevention. Fitzpatrick and Ako (2007) indicate that families in rural Highlands cannot easily access a mosquito net themselves due to price tags attached and often wait for a donation from friend and relatives or from donor agencies. This indicates that improvements to socio-economic situation will increase locals’ accessibility for obtaining mosquito nets. Also, mass distribution of mosquito nets per head or family will be a big help not only for non-pregnant mothers and the older children but also for the socio-economic disadvantaged population.

**Residual Insecticides Sprays**

The residual insecticide sprays is another strategy for breaking transmission and preventing malaria and controlling epidemics. It is well stated in the PNG national health policy for Highlands communities (DOH, 2003). According to the participants of this study, this has not been done in their village in recent times. Participants were more concerned and remembered the former DDT sprays of the 1960s to the early 1980s.
Participants also mentioned that the cessation of DDT residual sprays has made the community approach to prevention of illnesses difficult. They reflected the former malaria control system (DDT sprays) with the former supervised PHC system as very effective. DDT was banned in PNG since 1970s to the early 1980s (Stockholm Convention May 23rd, 2001) due to its effects on the environment and effects on humans (Mueller et al., 2008). It is seen that DDT as an effective environmental control strategy was changed to other vector control measures, but such were experienced as not effective by study participants.

In the study, most participants have expressed the ineffectiveness of anti-malarial drugs, ineffective distribution of bed nets and socio-economic problems. In the participants’ view, the former DDT sprays done routinely with the supervised PHC system worked best for them in the local community and were not replaced adequately. Participants viewed that malaria has become a big problem due to the changes in leadership and decision made in ceasing DDT spray programs. DDT is seen to have positively impacted the locals; for example, 70% of the Highlands population were protected in the 1960s to the 1980s and there were no epidemic (Mueller et al., 2008; Mueller, et al., 2003). But the DDT malaria control program was abandoned due to environmental, financial and logistical constrains in the late 1970s, and not a longer term legacy (Mueller et al., 2008).

On the other hand literature indicates limitations of Insecticide Residual Sprays (IRS s). Alto (1996) states that some Highlands locals’ negative attitude toward residual spray programs by charging fees caused the residual spray strategy to be ineffective. (Miae, 2010b), states that residual spray was viewed as expensive and needing an army of people to implement it. However, this study indicated communities’ high values for residual sprays and perceived this strategy as an answer for malaria problems in the Highlands. With that, it can be said that residual spray can be successfully implemented using locals through good use of communication, supportive relationship through the CD and community based programs and processes as highlighted by Unage (2009) and Fitzpatrick and Ako (2006). With well established community networks, effective PHC and CD approaches, this strategy would be effective. The visions and strategies originally viewed as replacement alternatives for DDT should be tailored to locals
needs. It is seen that annual or biannual residual sprays with community engagement will be effective because this study noted communities’ needs and values for residual spray as high.

**Locals’ Alternative Practices in Malaria Control**

This study discovered wide use of alternative malaria treatments by locals as vulnerable hosts in trying to either treat or prevent malaria. This indicated not only benefits of alternative cost effective practices, but also needs for research and policy development for safe practices. The data analysis in theme four show these practices falling into three main areas as herbal practices, thermal of hot and cold practices, and faith believes practices. The reasons interpreted in this study for alternative practices were threefold. One, locals used those as a result of experiencing drugs particularly chloroquine as ineffective. Two, malaria prevention resources became less accessible and locals could not afford the minimum fees set at the health care facility for medical treatment or pay for transport to the nearest hospital. Three, the knowledge spread by words among friends caused interested for self-testing and exploring. The herbal and thermal practices are discussed here while practices identified due to beliefs are further discussed in psychological determinants of malaria.

**Herbal Practice**

Herbal treatment was a way of life for 86% of the rural Papua New Guineans (Sasa Zibe, cited by UNAIDS, 2010). Herbal treatments as analysed in Theme Four were seen as practiced both locally and few plants globally. The pawpaw plant including pawpaw leaves, fruits and seeds, and guava leaves were noted as universally used and found effective by those who had experienced it. For example, pawpaw leaves mixed with other plants and used for treating chloroquine resistance malaria showed positive results (Muanya, 2009). Other local leaves seen effective by the study participants need to be researched for medical purpose and safety.

A significant practice done and experienced as effective by one participant was rubbing of lemon juice over the face and extremities regularly. The particular participant in Focus Group Three expressed that when his wife was sick for nine years with both
typhoid and malaria, he neither was sick, nor even took other malaria precautionary measures. But he was kept free from malaria by rubbing lemon juice daily. Ayurvedic-Medicines, (2009) also highlight lemon juice as an effective herbal treatment for fever in malaria. Lemon juice seems to have worked as mosquito repellent preventing malaria according to the experience of this participant.

There were other plants that were widely mentioned by most participants as effective. The commonly used herb was called “Semin Bek” (Jiwaka local language, also called Karakap in Pidgin) a local common herb and is usually bitter in taste (Appendix E). Of the herbs and leaves mentioned, it was noted that locals perceived anything bitter such as semin bek, avocado seeds, and chilli would kill the malaria parasites or prevent malaria from causing symptoms. The Aloe Vera plant was noted as commonly used (Appendix E). These practices are also common in some parts of Africa (Muanya, 2009). If locals experienced such herbs and fruits more effective than further research needs to be done.

The significant issue identified in this study was that locals were growing herbs and selling them commercially. This includes the Aloe Vera plant and its juice having high market value. While few showed some confidence in buying and using Aloe Vera juice, most indicated confusion. The Aloe Vera plant and its juice only relieved symptoms temporarily but did not treat malaria. See quote below:

*I bought aloe vera juice grown and sold locally and have been spending a lot of money and never got cured. My headache was relieved for some time but malaria was not cured totally. (Sika)*

This experience was interpreted that locals were spending large sums on local herbal products that did not directly have a cure for malaria and even other conditions like HIV-AIDS. These experiences need good research and policy development to encourage safe use and practice.

In the literature, the WHO (2005) states that PNG currently has no national regulation on registration, sale and distribution of herbal medications but is undergoing developments. Alto (1996) highlights the social distance between the traditional healers...
and the PHC workers in PNG. There was little effort made to integrate traditional healers and they remain marginalized from PHC. It is further vital to note that decision-making for diagnosis and treatment of illnesses were still traditionally based (Alto, 1996). With that, locals were likely to perceive and accept what was practiced locally. The PNG national health policy states that alternative traditional practices are recognised (DOH, 2001). It promotes uses of safe and effective traditional medicine and practices as complementary to the health care system (DOH, 2001). With this, home herbal products were widely produced and sold locally. However, it was difficult to justify safe practices and the value of the market price. Participants mentioned they spent about six-twelve Kina, (almost 3-6 NZ dollars) for a 250mls container of Aloe Vera juice. These practices done with or without good manufacturing practices and quality control are questionable. Such practices need good assessment and issuing of licence for safer practice.

The other herbal medicines used and experienced by locals as beneficial can be tested for safety and regulated for public use. It is felt that safe and market regulations need to be speeded up. This is because sick people with conditions not only of malaria, but others such as HIV seem to be paying a large sum of money for herbal medications without a real cure.

**Thermal Practice**

The thermal practices as analysed in Theme Four include both hot and cold therapies. Participants mentioned those as great relief measures for the malaria symptoms. The practice of submerging in cold water between 2am and 3am were experienced as more effective. Few participants perceived this as a healing technique for malaria. In the literatures, cold submersion is an effective home remedy for fever in general data bases, but there were no articles which identified this as a form of effective treatment. However, the dangers of hypothermia and drowning were noted especially for infants and older people. It is seen that an awareness of risk can be made in these areas.

The application of warm sponges and having a warm bath was also mentioned to relieve symptoms of fever and headache. Such cost effective home remedies experienced by locals as effective and beneficial cannot be discouraged but they need to
be warned of the dangers. At the same time holders of such views and knowledge can be alerted of the importance of malaria parasites and scientifically proven treatments.

**Making Fire and Smoke in Dwelling Houses**

Participants also contributed that making their house warmer by making a big fire, and burning pawpaw and gum tree leaves prevented mosquitoes from entering their house. Making of fire inside dwelling houses is a common practice in the Highlands due to the cold, but making excessive smoke with so many organic leaves is seen as a potential risk for lung diseases (Government of United States of America, 1997). This practice is interpreted as a similar perception of burning mosquito coils since locals find difficult to buy mosquito coils. This practice is seen as a temporary relieve measure to remove mosquitoes from the house.

However, the risk of breathing wood smoke containing carcinogenic agents that have potentials for lung cancer and other lung diseases is apparent (Government of United States of America, 2007). Moreover, studies indicated inhalation of wood smoke as causing chronic bronchitis, chronic lung disease, pulmonary arterial hypertension, and altered pulmonary defence mechanism (Government of United States of America, 2007). Therefore, the locals’ practice of burning wood and leaves needs to be discouraged through good HP awareness.

The locals’ behavioural determinants were seen as playing major roles in contributing to malaria. Anti-malaria drugs compliance was low and improvements to approaches to drugs decisions and prescription are seen as needs. The indoor residual sprays was noted as not done but emphasis on routine sprays with community efforts centred in participatory approach within CD and PHC approaches would help. With the wide alternative herbal and thermal practices, more education and counselling are seen as needs. Also, the need for research and policy development for safe practices was discussed.
Theme Five - Views of Malaria Control and Prevention

This study revealed other factors as barriers for effective malaria prevention. These include public health policy not being effectively implemented by PHC managers and local leaders, needs for including women health volunteers and malaria as not receiving sufficient attention.

Policy and Program Approach and Leadership:

This study revealed that locals’ participation in ensuring a clean environment depended on effective implementation of public health policy. The participants stated that most locals were not participating in ensuring a clean home environment. Participants viewed that this was due to village leaders and councillors’ failure to strictly implement public health policy. Participants indicated some concerns on changes in leadership contributing to leniency and poor participation. They indicated that the former health committees enforced community cleanliness in a directive manner which improved living conditions. Temu and Danaya (2000) say that emphasis placed on public health programs during the 1950-1970s showed meaningful health outcomes like the significant decrease in infant mortality rates. However, participants viewed the current leaders were more lenient causing community participation to be low. It is seen that the PNG health department has fundamentally sound National Health Policy but its implementation has fallen short of the mark (Bolger, et al., 2005).

The former autocratic leadership was noted as outcome and structure based and not the human relation components which ceased as policy and leadership style changed (Clements, et al., 2007; Page & Czuba, 1999). The participants’ concerns of laziness and lack of participation by community members with the liberal system were seen due to two main reasons. The first one is seen due to insufficient empowerment and participatory approaches with the current PHC and CD systems (Unage, 2009; Fitzpatrick & Ako, 2006). The second factor was seen due to lack of motivation, support and commitment from local leaders and elected leaders. Labonte and Laverack (2008) highlight that the empowerment domains of participation, leadership, and others when adequately addressed will increase motivation and trigger participation.
This study participants’ view of re-enforcing the public health polices like the former controlled system to increase participation is not seen currently as a workable strategy. The DOH (2003) states that health policy is not enforceable through legislation, but it is implemented through the social science based concepts of participation and self-reliance through the Healthy Village or Island concepts.

From my observations in the Highlands, communities who have been reached by NGOs and churches with strong leaders, effective village based education and good governance, the healthy island or healthy village concepts seem to be successful. These observations are also highlighted by Unage (2009), and Fitzpatrick and Ako (2006). Moreover, the study area had a community development program which had high participation initially but due to insufficient empowerment and self-reliance concepts and processes, participation ceased.

With the current liberal system of supervision, motivation, good leadership, with empowered locals, and effective CD or PHC program management will make malaria prevention activities effective. The evaluations throughout PNG showed that factors influencing success were motivated by a person acting as a catalyst for change, empowered leadership through new community governance structures, effective visual tool and village health volunteers and rural health workers (Ashwell & Barclay, 2009; Unage, 2009; Fitzpatrick & Ako, 2006). The study also highlighted failures which are poor understanding of CD, limited information sharing, a top down approach to CD and weak community leadership, and concludes that sustainable improvements in health can be achieved through community led and maintained activity workers (Ashwell & Barclay 2009).

The type of leadership within the political sphere is also seen critical here. The former authoritarian regime which was considered stressful was done away with as democracy was introduced with its liberal system of less control (Clements, et al., 2007; Page & Czuba, 1999). However, study participants have expressed that there has been absolutely no control and people cared little about keeping themselves or the community environment clean and there seems to be neither policy implementers nor supportive supervision. It is true that PNG is a democratic country since its
independence in 1975 with a low control system but participants stated that the attitudes of locals were getting worse. Participants stated that the local councillors and village leaders had difficulty in convincing the young generation to participate, and upholding sanitation standards and keep clean environments.

Moreover, lack of motivation tools is seen to have decreased participation. Participants indicated further that interest and participation ceased when the government promised services such as electricity, and market opportunities for vegetables were not provided by leaders. Also, verbal commitments made by their local member of parliament to bring needed services like electricity were not fulfilled. With these reasons community efforts were withdrawn. Such experiences indicate that anticipated government services and resources rightfully belonging to the locals and also viewed as good reinforcement tools were missing. The local and elected leaders with control in decisions and resource distributions were seen at fault for ceasing interest and participation. Literature also indicates that the main reasons why health education for malaria control often failed were depressed standards of education with poor housing and environmental conditions, and socio-economic depression complexes (Heggenhougen et al., 2003). This is further quoted as; “People cannot understand why malaria should be selected for elimination rather than poverty, hunger or other disease conditions (Heggenhougen et al., 2003). It can be said that motivation for self-help such as the CD services expressed by locals when removed or not provided by leaders caused locals not to participate actively (Heggenhougen et al., 2003).

In contrast, communities that had effective community based programs have used motivation, education and proper delegation that enhanced empowerment, ownership and participation, as well as good outside (NGO) links and support (Selve et al, 2000; Unage, 2009; Fitzpatrick & Ako, 2006). Within the locals’ current attitudes, it is felt that supportive supervision, facilitation and more efforts into socio-economic empowerment and political support will increase the community’s participation toward disease prevention activities.

In addition, HP programs working in collaboration with social development programs will be meaningful. It is seen that locals’ necessity to live and sustain a healthy life is
rooted in money decided items. Such are good housing, soap for hygiene, clean safe water and good food. In my view, information dissemination alone seems insufficient, but addressing sustainable needs by creating good markets, building local resources that generate an income, and having good political support will empower locals with needed resources that enhance sustainability. Also, appropriately motivating village volunteers and HP workers with both financial and non-financial incentives will result in sustainability of HP programs. Therefore, locals’ needs have to be identified from bottom up to see what locals considered and defined as missing for sustaining healthy living (Talbot & Verrinder, 2005).

**Gendered Approach**

Another positive view expressed by key informant Ma was that womens’ group activities were successful and sustainable than the CD done as a whole community. Literature supports this idea where community changes developed quickly within matrilineal regions due to women having more influence in initiating changes while patrilineal regions were less likely due to their traditional ways (Ashwell & Barcley, 2009). It is also so significant that more women tend to care for other family members when sick. Chirdan et al., (2008) further supports that health education done through a female context resulted in high compliance rates for malaria strategies such as anti-malarial drugs. It is further acknowledged that the involvement of women in planning and implementing of developmental processes was essential for transforming policy, concepts and concerns into practical realities (Overhalt et al., 1992). However, the studied community has a patriarchal society and women participation was not given enough consideration as to why their CD program became ineffective. If women roles were considered for participation in future, their CD project is likely to be sustainable. This will also transform locals’ attitudes toward participation for healthy environment and living that should decrease malaria problem and enhance disease prevention practices.

**Diseases Focus - Malaria Needing Attention**

In Theme Five locals’ perception of the current health focus by health providers, implementers and consumers are grouped. The study participants viewed focus of care
on curative activities and more focus on other diseases such as HIV-AIDS. The curative focus and HIV-AIDS programs distracted attention from malaria problem and programs as indicated in Theme Five. Key informant Dikay strongly emphasized that despite malaria being a killer disease in the community, emphasis was concentrated on HIV-AIDS and malaria awareness received little attention. However, their risk factors were not same and were not given consideration by the health department.

Participants observed and reported that HIV-AIDS care centres were opened in many local settings for care, treatment and counselling and more awareness has been done. For malaria, specific centres, programs, and awareness were insufficient or not available in the community leading to malaria problems. Such experiences shared indicate that some diseases such as HIV-AIDS as receiving more attention than malaria even though they both fall under the first priority diseases category (DOH, 2003). Foster et al. (2009) also says that there is disconnection between hospitals and public health programs and between priority programs. It is seen that malaria programs in local communities need attention.

The participants also indicated the lack of motivation and participation among their own family members and the interaction with health workers as missing. Participants compared the interaction of the former malaria team field workers who went to the communities, slept with the local people, sat with the people and conducted education awareness and did the residual sprayings. This approach was seen as appropriate and motivated the locals to take proactive roles. When contrasted with the health centre system these days, participants stated that locals have to go the health centre when sick to be given medicine.

With such experiences shared, it is seen that despite good health promotion programs, it is not effectively implemented as health centre workers were busy with curative activities. Also the emerging issues of HIV-AIDS. Outcalt, (2005) and Temu and Danaya (2000) also supports that the former focus of preventive health or public health did well with improved health despite geographical, cultural and logistic challenges. But these days malaria still causes mortality and morbidity and this is seen mainly due to the differences in the provisions of preventive services as stated by (Outcalt, 2005).
The focus of health care based on curative or concentrated on curative activities was also noted by Thomason and Kolehmainen-Aitken (2002).

The change in program strategies from environment control to drug control due to resources (Mueller et al., 2003) is also a factor for malaria problem. This is particularly now that drugs are also becoming ineffective, and the effective drugs becoming expensive. The current emphasis is on drugs use and infrastructure development for increasing accessibility is vital (WHO, 2010). However, the needs identified in this study indicate more attention for malaria awareness and prevention programs. This is especially the process of implementing and coordinating prevention programs and activities in local villages in the Highlands.

Also, malaria and HIV should receive similar attention within prevention approaches as both affected productivity. Precisely, a yearly residual spray and bed nets treatment resources just provided and labour put in by locals themselves does more for the entire community. When compared with cost of drugs and the duplication of multiple HIV-AIDS awareness and programs directing resources, and finances creating the imbalance as expressed by the participants.

Critically, malaria prevention has more environmental factors and mosquitoes as insects are difficult to control and needed effort but less emphasis is made of this. In contrast, HIV-AIDS is more associated with human mind and behaviour that has total control despite what factors caused them but it was receiving more attention than malaria in the participant’s perspective. It was further emphasized that similar focus and similar resources should be directed to malaria prevention programs.

Theme Six - Voice of the Local People

Socio-economic and Political Environment

There has been little written about social factors in the modern resurgence of malaria. This is because the focus of public health and malariology in particular, has been narrowly fixed on the parasite and the mosquito vector. The bigger picture has been neglected – namely that increased rates of malaria morbidity, although directly influenced by changes in the parasite and vector, are more directly caused by human behaviours. Those behaviours are both
related to individual culturally coded patterns and larger scale sociological phenomena including the political-economic level. (Brown, 1997a, p. 130, cited by Heggenhougen et al., 2003, p. 5)

The malaria spread from vectors to the human is not only caused by biophysical conditions, but also the social worlds the host lives, and interacts with (Scholthof, 2007; Heggenhougen et al., 2003). The social factors quote at the beginning of this chapter, and the quote above provide insights to social issues raised in this study. The study participants mostly expressed current health care approach, health care management and sustainability of malaria control programs. These experiences were grouped and discussed as policy approaches, program approaches, and disease focus approach for discussion.

_The government is doing a good job. For example, the set up of HIV-AIDS care centres where people can go for special counselling about diets that helps them. Another example is the malnutrition building beside hospitals. Women in labour or pregnant have their own building too. How about malaria and where is malaria building. We have a strong feeling and suggestion that the government should start a separate malaria team, a building, or system to deal with malaria separately. So that when we get sick, our blood can be checked and malaria be treated promptly. We will be so pleased if things were done this way because malaria is our major risk. (Pudi Bar)_

This study indicated socio-economic factors as such as politics, policy, structure, and resource distributions, as having a greater impact on malaria prevention. Locals’ main concerns for malaria care and control in all focus groups and individual participants indicated malaria control activities to operate as a speciality care. These concerns were seen as related to the former malaria control programs. Particularly the way other diseases such as HIV-AIDS and Maternal Health were organised with their own management system.

While such remain as complex processes, an inter-organisational or inter-agency integration of malaria control and prevention activities is seen as a possible strategy to meet this need. Integration is defined as structures and processes that tie the various
units of an organisation together so as to increase coordination and collaboration (Shortell & Kaluzny, 2006). This includes PHC workers, CD workers, local leaders, church workers and community councillors, and donor agencies to work to gather sharing the common vision of malaria control. If such focus was put into place then community focus and activities for malaria prevention would be motivated in prevention activities.

**Cultural Determinants**

In Theme Six data gathered indicates both beneficial and non-beneficial social systems and structures which existed within the culture contributing to ill-health and HP ineffectiveness; and increasing malaria problems. Participants contributed their experiences of the lack of money for health fees and how the social network helped out in contributing toward meeting health. The cultural believes were mentioned as existed in the past and not existing now while literature indicates the impediments of witchcraft beliefs and tribal fights.

**Cultural Perception of Wantok System**

Accessibility to and opportunities for health seeking behaviour are strongly linked to available money and the cultural process of ‘wantok system’.

*Yes, people who have money find transport and are able to access hospital on time. For those who do not have money ask friends to help to seek health care. But those who do not ask friends sleep at home while their infection gets worse. But for people who have money pay for transport, meet health care expenses and are able to save their life’s but the people who do not cannot help themselves.* (Roller)

The above quote indicates a social system in PNG called ‘wantok system’ where friends and relatives wait for or contribute a donation for meeting medical expenses. This system is deeply rooted in culture where there is a common egalitarian sharing of wealth and responsibilities when someone is sick (Renzio, 2000). It is described as a safety net, not a social security but a strong community obligation that procures advantages for the clan (Renzio, 2000). When a person from the clan gets sick they would often wait for a clansman to make decisions and contribute money for the
hospital. Such a response can be beneficial and life saving, in one sense showing an indication of love, kindness and caring attitude of culture. Its disadvantage is that it is done at the expense of others particularly working people within the formal sector where sometimes it goes beyond family boundaries (Renzio, 2000). Most sick people wait for family donations to meet cost for specialised services and referrals (Alto, 1996).

With the existence of such practices within the culture, individual and family initiatives in health promotion activities are seen as not practised effectively nor is early malaria treatment sought when early signs and symptoms appear. When locals fall sick dependency develops where people decide to use their safety net of ‘wantok system’ by either sleeping in bed and waiting for a donation. Sometimes words are sent to working relatives ‘wantoks’ within the formal system, and those that have a small income-generating business. If a ‘wantok’ turns up or a donation made, they are lucky but when no one turns up, the malaria parasites advance to complicated stages making treatment more difficult.

In my experiences, few people make individual decisions and help themselves in meeting hospital expenses. Also, some people who had money to go to hospital but due to the existence of this ‘Wantok System’, they often waited to go through the family discussion and contributions processes. Consequently, malaria often advanced to complicated stages like cerebral malaria with fits, and unconsciousness or treatment-failure malaria. This cultural perception is seen as both beneficial and non-beneficial. The emphasis seen as need for awareness is to help locals to prioritize the importance of behaviour changes toward health promotion and early treatment options.

**Beliefs of Sorcery**

The sorcery beliefs related to causes of illnesses mentioned by few participants in Theme Six as things of the past and no longer practiced. This is from this particular group studied where sorcery beliefs were done away with due to the multiple churches and spread of the gospel. However, from practical experience and from literature the thoughts of witchcraft and sorcery are very common throughout PNG Highlands. The WHO (2010) states that PNG is a society with unique cultural believes, and with
resource constrains risk awareness in behaviour to environment and social life is insufficient.

These contribute greatly to knowledge gaps in prevention measures. The local beliefs of sorcery and witchcraft within the cultural diversity is built up and sustained and causes confusion to values of health care developments (Tsey, 2003; McLeod, 2004; McIntosh, 2000). When someone dies of an infection, the common causes are perceived to be related to witchcraft and the suspects are usually beaten to death (Tsey, 2003; McLeod, 2004). In many parts of the Highlands, tribesmen often come together to plot deaths for unexplained deaths such as HIV-AIDS and heart attack (Nalu, 2009). Such beliefs and practices make understanding and taking ownership in disease prevention difficult. It is seen that emphasis on strengthening the law and order, spirituality counselling, and building values of preventive health within cultural settings will contribute meaningfully to prevention of malaria. Also this will do away with sorcery beliefs.

**Community/Tribal Shared Value for Health**

Despite the complicated cultural believes, an important shared health value seen as beneficial emerged in Theme Six. Two key informants (Tisa and Roller) stated that Tombil community had a shared value system for illness prevention among its tribal population. The existence of such value is worth taking note of when planning health promotion activities. These values are interpreted as social structures that helped with knowledge awareness. Roller and Tisa mentioned that during the epidemic, locals held a meeting and made a secret promise (‘Tok promis’ or ‘pasim tok’) to avoid getting infected by malaria. With that they perceived that they were doing well. (‘Tok promise’ is a pidgin word referring to strong shared value expressed in the form of words for avoiding danger).

The shared values made in powerful words whether in the mind, speeches or put to practice are important for the purpose of building HP programs into the cultural norms and values. Words or the power of words can influence behaviour change (Russell, 2004) It is seen that words create impressions, images and expectations and build psychological connections and influence how people think in processing information
and providing results (Russell, 2004). In the study participants stated that community members who shared the value or listened to what was shared in the cultural way were doing fine. Others who did not have such values faced more complications with malaria. It is seen that use of carefully chosen words motivated, offered hope, created vision, impacted thinking and altered results (Russell, 2004). Therefore, HP programs built with genuine interest and affirmation of local culture can foster positive outcomes (Fitzpatrick & Ako, 2007).

Therefore, to work with rural local people, health HP workers need to give attention to community norms of sharing information, identify best information deliverers, and what kind of leaders’ locals listened to. This is not only for best delivery of HP and HE messages but also for transforming information into practical realities. This is further supported by the quote below:

> By ignoring the socio-cultural context, biomedicine failed (and continues to fail) to provide people with images which reflected what their everyday experience continued to assert - the essential inter-connection of physical, social and moral being, both in health and illness. Given the linguistic and diversity within PNG, it is both wise and necessary to gain an elementary understanding of existing beliefs and practices. (Byford, 1999, cited in Agale & Yaipupu, 2001, p. iii)

Themes Three and Four discussed issues within the locals’ behavioural and the socio-cultural and economical conditions of the environment contributing to malaria. Malaria cannot be minimised without good behaviour change programs and the socio-economic impediments. But considering all components will make malaria prevention and control effective.

**Socio-Economic Determinants**

*With the infection of malaria, many are sick and die and they do know about health care but money is the need. The cost is high and sometimes health workers say money, pay money and you will get medication. For some people who do not have money just sleep at home and die. Some who do not have money just live on herbs and die. For people with money, they pay for health services and got saved. Some people die due to no money and money is the real setback. Many people die due to no money. (Kongo)*
The socio-economical factors as noted as contributing factors for malaria were education and employment barriers. The malaria prevention knowledge strength varied between those who attended the formal education, had resources particularly money and those who did not. The participants who were educated to some levels and had some form of income also had good housing and mosquito nets. They also helped others with hospital expenses and bought mosquito nets for them. But those with low socio-economic background were limited in opportunities for sustaining malaria prevention resources and had poor house and living conditions. Of the participants who knew primary prevention mentioned that they knew how to practice primary prevention, but were limited to implement it due to lack of adequate resources, and money. Also, mosquitoes were plentiful and participants felt that their efforts alone were limited. An example is quoted above and refers to the minimum fees set by hospital where locals had difficulty paying. This includes outpatient treatment as well as inpatient admission fees and blood screening laboratory fees. In the area studied area, locals viewed efforts in prevention of malaria and health promotion in terms of socio-economic situations. For example a statement is quoted below:

_In PNG three quarters of the population are subsistence farmers and about one quarter of the people are employees, who sleep in good houses and have a good standard of living who seem to be doing well. For those of us who live in the villages do not have good housing. Most of us live in house made of grass and with no proper toilets and rubbish pits. For these reasons we normally get malaria. We have limited sources to seek help to improve our living condition. When there is awareness done by doctors at our place then we will try to improve and have a reasonable life. When there is no malaria awareness, we do nothing about prevention. Then go for medical treatment for medicine but we have been infected badly and parasites live in us. With that the working people are about one quarter and the rest of the three quarter people are villagers and substance farmers and we have limits to knowing such information and there is a need for people to do this. (Kaka Mai)_

_For some of us, we have understanding and high awareness about such things like mosquito nets and coils and we try our best to buy them. For others with little_
understanding and little money they do nothing about it, when they get sick they get worse. (Ambam)

The above quotes when compared with the health promotion definition by WHO (1998) indicates the big difference. The WHO (2008) defines health promotion as the process of enabling people to increase control over and improve their health. It is further seen according to the WHO (2008) that HP represents a comprehensives social and political process. It does not only embraces actions directed at strengthening the skills and capabilities of individuals, but also actions directed toward changing social, environment, and economical conditions as to alleviate their impact on public and individual health (WHO, 2008). With that, it is important to direct funds into locals’ socio-economic needs to booster health promotion rather than spending millions on foreign consultants working in PNG (Abal, 2010).

Such findings also indicate that health promotion and disease prevention programs built within biomedical models are felt insufficient to implement in a society with socio-economic limitations. It is seen that considering biomedical with good emphasis of socio-economical processes into planning health promotion programs may enhance malaria control and prevention in the Highlands. Therefore, emphasis on empowerment process and finding sustainable development opportunities such as education, employment and other income generating opportunities will help locals in malaria prevention.

The malaria control activities and resource distributions facilitated by various parties seem to lack the main purpose of addressing local’s needs. Politically driven resource distribution such as bed nets served their own purpose of gaining favours. The PHC and CD program distributors charging fees of handling has been seen to cause accessibility problems for locals. It is unclear how monitoring and accountability checks were done for resources at peripheral ends. Also, how mainstay strategies such as bed nets not used (Miae, 2010b) was seen as caused by lack of mechanisms such as awareness, coordination and evaluation. Therefore, PHC and CD program implementers, donor agencies, local politicians, and other concerned NGOS like the RAM setting up a taskforce at each district level, and monitored malaria control activity in each tribal
community will result in effective malaria prevention programs. The use of a combination of malaria control in an integrated fashion used was identified as reducing malaria cases (Okech et al., 2008). It is seen that PNG’s current restructure of health care services to districts paves way for effective collaboration and networking between locals, and the decision and resource distribution personnel. Through the taskforce, with community support, communication will also improve, specific needs assessments can be done accurately, followed by strategic planning, implementation and good evaluation leading to control of malaria activities.

Supportive Supervision and Empowerment Processes

This study revealed 60-70% of the locals were not practicing malaria prevention measures due to lack of self-awareness or the incomplete empowerment processes. Temu and Danaya, (2000) stated that community participation or taking care of their own health needs as a pre-requisite for improving health is still unmet in PNG. In this study, some participants urged for re-introduction of autocratic PHC supervision. Participants’ main reasons explored were their socio-economical and psycho-social issues with no supportive supervision. Ashwell and Barclay, (2009) indicated the incomplete empowerment processes undertaken by the CD and PHC approaches as main factors. The PHC supervision done in the autocratic way in the early development times was not empowering. Page and Czuba (1999) define empowering people as focusing on strength of people, providing opportunities, and resources for people to gain experiences and skills while they gained control of their lives. Such were based on collaboration, sharing and mutuality with grassroots people. However, Ashwell and Barclay (2009) and Welsch (1988) identified inconsistencies in funding ceased community empowerment processes. Alto (1996) identifies community norms and attitudes not considered and lack of full participation caused ineffective PHC practice. Empowerment as the process of enabling people to increase control over and to improve their health, or health created and lived by people in their everyday life (Labonate & Laverack, 2008) were noted as not effective. For HP programs to run effectively, all approaches should share a holistic view based on health outcomes, interpersonal skills while incorporating health promotion strategies into the community.
norms and attitudes. This should be done with the aim of stimulating full participation to enable community ownership (Alto, 1996).

For empowerment and HP sustainability, it is seen that PHC and CD programs have to be funded sufficiently, implemented timely, monitored and evaluated well using correct empowerment tools. Also, having government funded PHC or social development workers initially for local activities are seen beneficial. Labonte and Lavarack (2008) provide useful evaluative tools from the nine domains of empowerment that can be used to evaluate empowerment before allowing locally owned programs to function independently.

With community participation, government CD workers and AID agency workers should ensure that participation and decision making has been maintained. For problem assessment capacities, communities are seen continuously identifying their needs, becoming owners of problems, solution and actions. The local leadership are seen taking full initiatives, giving full support and work with outside groups to gain resources.

Pertaining to structures, communities have links in and out and have active involvement with other organisations. With resource distribution, communities raise resource issues and decide on distribution and are done fairly. Communities also have links with others generating resources, finances and make decisions resulting in improvements for the community.

In the domain of having the ability to ask why, community groups have the ability to self-analyse and improve its efforts overtime which leads to collective change. For program management, the community self manages with accountability. With the relationship with the outside, agents facilitate change at request of community which makes the decision and agents act on behalf of the community to build capacity (Labonte & Laverack, 2008). It is noted that supportive supervision and addressing empowerment process will lead to empowerment of knowledge, resource and enhance HP programs preventing diseases such as malaria.
Theme Seven - Psychological Determinants

Psychological factors are seen as contributing to health behaviour. The local people’s perception is a theme interpreted in this project and originates from psycho-social issues. These were issues of individual efficacy in self-management, issues of beliefs and spirituality, and issues of behaviour change to comply with malaria control strategies. Such were locus of control, power and reasons for practicing primary prevention measures and not doing so. The control issues are viewed as emerging from individual perspective and their beliefs and values, society norms and values and their competencies due to lived experiences. The examples were grouped as high external locus of control and low efficacy, high internal locus of control and high efficacy, health values and health beliefs and faith power in God in Theme Seven for examining their underpinnings.

Locus of control and efficacy are psychological terms that refer to persons’ beliefs that their actions will result in the desired outcome (Bennett & Murphy, 1997). It is seen that individuals who had high internal locus of control and believed that events result primarily from their own behaviour and actions, and were in better control of their behaviour. They stated that their approach to life and living were successful in terms of disease prevention measures which also signifies their values for health. Bennett and Murphy (1997) highlight that people are motivated to engage in healthy behaviours according to health values and this can be seen with participants with high internal locus of control. It is seen that even there was no motivation these group of people had health values and also demonstrated competency.

For those in other groups, most have been informed but have not developed strong values for health or have not been motivated sufficiently through empowerment processes in the CD approaches. It is also seen that due to no role models to pave the way for interest and behaviour change process to occur such as the lack of health educators in rural areas (DOH, 2003). On the other hand, participant that had high external locus of control believed that powerful others determine events (Bennett & Murphy, 1997). As a result, they contributed blaming statements about the government, health centre workers and family members.
It is also seen that those with high internal locus of control who indicated competence were also seen as good health promotion advocates that can be recruited as community health advocates and volunteers in health promotion activities. This concept of health locus of control and self-efficacy and competency are seen vital for rural people with limited resources as it enhances self care within their home and living environment. Therefore, PHC and CD workers in local areas need to equip themselves with such awareness and enable locals with such psycho-social skills to change their attitudes and take upon healthy behaviours.

**Health Values**

The locals’ values for malaria prevention practices analysed indicate that few locals do have prevention of illness values while the many do not.

> Few people in the community practice prevention but most do not value and practice preventive measures. Ambel.

There were also few that valued the medications that worked best for them. These values were seen as triggering them to take control of their lives. Bennett and Murphy (1997) state that good health is valued and can be seen in individual’s behaviour and there are different cognitive processes including behaviour. This study indicated locals’ good health values in different forms. These include drug preferences, alternative practices, and some indicated as taking control of their families in drinking medicine on time, completing doses or ensuring that kids sleep in the bed nets or to keep in-door between dusk and dawn. However, primary prevention values were noted as low and needs to be built with good awareness. The community shared value such as ‘tok promis’ indicated above is seen vital and can be used for prevention approaches using local leaders.

**Faith Beliefs**

The participants experienced a divine miracle as an intervention from God by having faith in the power for healing. Literature indicates faith healing as a concept of religion that (faith) can bring about healing- either through prayers or ritual. While some people believed in witchcraft and superstition, Christians believed in God and Jesus for
intervention in health crisis situation. Studies revealed that people who were active in religion lived healthier lives and experienced miracles in terms of their health. This belief enhances the benefit of medicine in both prevention and treatment (Keong & Sulaiman, 2006). With that, religious history should be done and health workers should be open to discuss spiritual beliefs as well as medical concerns. Also, putting affords into helping locals integrate modern science with deep personal faith and see how faith and medicine work together to help the patients (Keong & Sulaiman, 2006).

**Locals’ Low Compliance with Malaria Control Strategies**

One of the main psychological factors of malaria problems noted in this study was non-compliance or low compliance to strategies including drugs, mosquito nets and health education in PNG. The Global Fund (2010) highlights behavioural change communication through community outreach and through media as strategies to improve knowledge, behaviour and participation of communities in the national malaria control efforts. The reasons for non-compliance in this study indicated three main reasons. One was due to the local’s values of socio-economic depression as expressed by locals and the quotes from Heggenhougen et al., (2003). Two locals’ experiences of ineffective drugs cause them to turn to alternative practices. Thirdly, some health professional’s approaches in resource distributions such as bed nets and decisions of anti-malarial drug prescription were done without good consultation with locals. Locals own cultural values and context make malaria control activities difficult too (Heggenhougen et al., 2003).

The factors that affect non-compliance and factors that reduce non-compliance for malaria control activities are important for health workers to take note of. Niven, (2000) highlights three main factors affecting non-compliance. The first factor is the misunderstanding of instructions including poor quality of instructions lacking interpersonal skills, not discovering local’s needs and expectations (Niven, 2000). The second factor is the family and social isolation. Since families influence individuals health believes and values, isolation of families and social networks have the possibility of affecting compliance (Niven, 2000). Thirdly, the beliefs, attitudes and personality of both locals and health professionals contribute to compliance. A good health
professional-patient relationship, family, friend, and patients’ health belief and personality all contribute to determine patient behaviour in response to medical advice (Niven, 2000). The low compliance of malaria control activities by PNG locals can be addressed by clarifying misunderstanding, improving interpersonal skills, and identifying social networks and values that existed within communities (Niven, 2000).

This theme discussed psychological determinants interpreted. Locals’ individual dynamics, health believes and health values determined their malaria prevention behaviour. Locals’ compliance to malaria control and preventing strategies can be achieved with suitable supportive approaches using psychosocial skills and communication.

**Summary**

This chapter discussed themes and related meanings and interpretations of this study. Malaria as an infection in the Highlands spread by mosquito was not only aided by the vector and climate change factors within biophysical dimensions. It was noted that there were many factors of the socio-cultural and political environments. The health programs, management capacities and leadership styles and political views also had impacts on locals’ capabilities of preventing malaria. Each theme was discussed using the disease triangle and the current literature. The next chapter makes some suggestions of recommendations of this study.
CHAPTER SEVEN: RECOMMENDATIONS

Chapter Six provided discussions of themes. This chapter covers the recommendations made from this study. From the literature, themes analysed and discussions done the following recommendations are made. These include recommendations for increasing HP and HE officers, focus of rural health prevention activities should include both PHC/CD and empowerment processes, strategies for obtaining locals’ compliance to malaria control and prevention activities, integration of malaria control activities, making residual spray as a routine in the Highlands.

Health Promotion - Health Educators Positions

This study identified Highlands locals’ knowledge gaps as due to insufficient health promotion and health education activities due to insufficient health promoters. Also it discovered that the mass awareness on the news papers, radio, and television due to disease outbreaks are less accessible for local village people who are limited by media technology. It was seen that creating more positions within the PHC and increasing social workers in CD activities will help to implement malaria prevention activities. When adequate professionals are put in focus for preventive health then accurate information dissemination can be successfully done. The locals’ knowledge capacity and locals’ active participation and self-awareness needs will be met. Through these, good needs assessment, planning, implementation and evaluation can be done (Talbot & Verrinder, 2005, p. 137). The health promoter functions such as an educator or watchdog will then be effectively implemented for increasing public awareness of health determining behaviour, social and environmental conditions, and will monitor effects on health status (Labonte & Laverack, 2008). Other HP roles such as a resource broker, community developer, partnership development and advocacy for policy changes and the likes can then be meaningfully implemented and monitored (Labonte & Laverack, 2008) if positions and responsibilities are designated.

It is seen that with more health promoters or health education officers, they will disseminate information and implement responsibilities, empower locals with malaria prevention knowledge and to increase the awareness of their vulnerability. Also, more
village health volunteers and leaders should be trained specifically for focusing on disease prevention and behavioural change processes through both CD and PHC approaches. This will help increase their chances of active malaria control and prevention activities. In addition, all school age children should be encouraged to go to school to learn the basic principles of sanitation and prevention of common illnesses like malaria which is built into educational programs (DOH, 2003). Education also improves or provides opportunities for healthy living conditions that sustaining good health like good housing and environment (Heghenhougen et al., 2003; Talbot & Verrinder, 2005).

Further, it can be said that improvements to health education and HP profession in PNG by updating through credentialing, licensure, and setting standards will help enhance HE/HP programs and enhance prevention focus (Wikipedia, 2009). Also, HE/HP operating as a national organisation with certification and viewing the profession as a speciality practice will improve health education concepts and practice. Consequently, it will improve locals’ knowledge of disease risk and vulnerability and enhance malaria preventive measures.

**Improving Service Delivery**

**Anti-malarial Drug Treatment**

This study identified drug compliance as low, experiences of ineffective anti-malarial drugs and locals turned into alternative home remedies. Therefore, the updating of anti-malaria treatment information in both course information in training schools such as CHW and the nurses training colleges, and the standard treatment books are important. The last update of the standard treatment book was in 2005 (Malau, 2008) and updating it with researched-based malaria treatment information is seen helpful. This is because most anti-malarial prescriptions were based on this.

The locals as health care consumers demands can be met by the health department by increasing the supply of current effective artemisinin based drug. Further it is noted that more emphasis should be made on the importance of completing treatment dosages to avoid complications of drug resistance with artemisinin based drugs. Chirdan, Zoakah
and Ejembi, (2008) further support that information about the importance drugs and involvement of caregivers resulted in positive results. Therefore, both malaria information and caregivers when integrated into malaria treatment activities will make drugs compliance effective according to Chirdan, et al. (2008).

For locals who turn to herbs due to the bitterness of anti-malarial drugs particularly children be given consideration and provided with coated and flavoured anti-malarial tablets or seek alternative means of treatment such as injection. Other local herbal and thermal practices identified can be further tested for medical purposes. The local practitioners manufacturing and selling procedures need to be checked for quality, safe production and safety measures.

**Bed Nets**

The locals’ accessibility problems of bed nets especially non-pregnant mothers and children with socio-economical limitations was discovered in this study while literature indicated bed nets compliance as low generally in PNG (Miae, 2010b). It is suggested that trustworthy distributors within peripheral PHC delivery systems will make this strategy effective, or a local malaria taskforce as seen in the interest of the participants can be formed in the community through self-reliance. Also, this activity can be implemented through the established CBHC and CD programs that have community sense, ownership and participation (Unage, 2009; Fitzpatrick & Ako, 2006). It is further noted that implementation of such malaria prevention activities with civil society for service delivery combined with technical and operational support from agencies like WHO are meaningful. These efforts will improve service delivery, prevent distribution problems, enhance proper care, increase bed nets compliance, and make ITNs as a strategy more effective for reducing malaria.

**Residual Sprays**

The WHO’s action plan for implementing residual sprays in the five Highlands provinces is seen beneficial for the local people (Miae, 2010a). However, the previous failures of locals’ negative attitude according to Alto, (1996) should be learnt from, and such activities and resources should be directed to the locals for ownership and
participation. Also, making the residual spray as a routine on an annual or bi-annual basis now that malaria has become endemic in the Highlands (Mueller et al., 2008) will decrease malaria problems and prevent epidemic.

**Improving Prevention Focus**

It was further noted that malaria prevention and control success depends on multiple factors. These factors when considered at both management and within work processes will improve its effectiveness. Within work processes, PHC workers and CD workers as health advocates with awareness of these multiple factors can be able to bring about changes not only physical health changes but with an holistic view. The health and malaria risks were are determined by multiple factors. The efforts to effect behavioural, environmental, and social change must be multidimensional or multi-sectoral, and participatory. The Green and Kreuter Proceed-Precede model below (Figure 7) provides a good framework in which PHC and CD workers can use in planning and to work in collaboration in health promotion activities.

*Figure 7. Health Promotion Model. (Green & Kreuter, 2005)*

Secondly, disease prevention focus needs can be shared and met by participatory approaches by both hospital and public health system at both National and Provincial
levels, and with other NGO and churches implementing CD and PHC services (Foster et al., 2009). The newly adopted 2007 Provincial Health Authority Act as framework is seen as a possible option for solving malaria and other health problems. Its aims of bringing together hospitals and rural health services and integrating Government and Non-Government health services providers with a coherent health care system (Foster et al. 2009, p. 45) is seen as a strength for prevention activities. This can be further considered with good transparency and management of resources, and fair distributions of health budgets among the stakeholders involved health services delivery (Smith, 1997).

Thirdly, the stated Healthy Island/Village Concepts (DOH, 2003; Galea et al., 2000) should be implemented in each tribal community in the Highlands, supportive supervision provided through and monitored and coordinated.

**Obtaining Locals’ Compliance**

Of the different malaria control and prevention strategies implemented in PNG, locals’ compliance rates were seen low. It is seen that reducing non-compliance attitudes of locals important for preventing malaria. Two psycho-social processes seen suitable for use in obtaining locals compliance are recommended here. The five point plan proposed by DiNicola and DiMatteo (1984, cited in Niven, 2000) can be used by health professionals and significant others in malaria prevention and control programs. Firstly, locals can be encouraged to develop an intension or plan to comply with a particular prevention or multiple prevention measures. It has to be reasoned, and self-initiated but not coerced by health professionals. This can be in the form of a public statement or a written contract form which may be effective.

Secondly, health behaviour is strongly influenced by habit and strategies cannot change habits but will maintain change, and behavioural self-control requires the patient to self-monitor, and locals can be encouraged to self-evaluate, and self-reinforce any new behaviour and self-reward for results and develop adherences (Niven, 2000). Thirdly, locals can be alerted of cognitive factors that ruin behaviour change programs like self defeating statements like “I am not fit”, “This is too difficult”. Professionals can help locals to develop sense of competence, self-control and believe in themselves and as
advocates provide re-enforcements and encouragements. Fourth, emotional support from family and friends are seen important and they can be involved to provide this (Niven, 2000).

Lastly, support from health professionals in influencing behaviour by transmitting enthusiasm for a particular course of action and providing re-enforcements. According to Feuerstein (1986, cited in Niven, 2000), the elements health professional can further foster compliance are: using education to help compliance by providing self-help booklets, tapes, accommodation as autonomous agents, providing interaction to care and treatment approaches, modifying environment of social factors and enhancing integration can facilitate compliances (Niven, 2000).

Summary

This chapter provided recommendations for practice from this study. It stated that development of locals’ knowledge of malaria and its prevention can be met by increasing health educators. The prevention focus can be improved by considering all factors causing malaria within planning and within work processes. It identified three possible models that health planners and health managers can use. Then it recommended that locals’ low compliance to malaria prevention strategies can be improved by improving service delivery mechanism, and through the use of psychosocial skills for health promotion.
CHAPTER EIGHT: CONCLUSION

This chapter summaries this study’s main findings, and limitations and proposes topic for future research for malaria prevention in rural communities.

The study did achieve its main purpose of exploring local Highlanders knowledge, perception and experiences of malaria prevention. The main findings were thematically discussed within the disease triangle of pathogens, the environmental factors including physical and socio-cultural spheres and individual participants’ psychological and behavioural spheres.

Findings

The Highlands locals’ knowledge and understanding of malaria control and prevention sought in this study revealed sound knowledge of malaria signs and symptoms and correctly identified the vector as mosquito. The knowledge gaps and misconceptions noted were the transmission routes such oral ingestion of mosquito eggs and larvae. The confusion of locals in diagnosing malaria and typhoid collectively indicated specific prevention activities of malaria as inadequate. Generally, locals’ self-awareness of vulnerability and primary prevention were identified as low. This is particularly the presence of malaria parasites and the increase aided by global warming and the increase in temperature. The primary prevention activities were noted as not given much attention to by locals but this behaviour developed after and infection episode.

Main causes of the knowledge and misconception were identified as related to insufficient literacy, and ineffective health promotion and community health education. This further indicated need for awareness as well as increasing health educators and health promotion workers. It was noted that malaria parasites and mosquitoes were not the only main factors for the malaria spread. But there were many factors associated with the host including immunity, and vulnerability with risky behaviours and attitudes of not using effective prevention measures. The environmental factors causing malaria spread are not only physical features of geography and climate; but also greater
influences of the social world, political, economical, cultural beliefs and practices. The health management and resource distributions and disease focus were other factors. The pregnant mothers did receive attention in bed nets distribution while non-pregnant women and children still remain as vulnerable population. The disease triangle model provided framework and helped throughout the discussions of main themes identified in Theme Five.

The recommendations seen appropriate were made for each area in the Themes and stated in Chapter Seven.

**Limitations**

There were three limitations that surfaced in this study. The first one was due to cross-disciplinary theories and concepts. I had a background of nursing with bio-medical theories and concepts. Later in the project I discovered issues generated in the data and literature as related deeply in social science theories and concepts. I did not have a very good social science background neither psychology. However, I did have some knowledge of holistic health views and cares. The literature search, use of text, and chatting with social science professionals helped me to gain sufficient information on this phenomenon.

Secondly, the discussions are limited due to the required size of this thesis. The issues that emerged in the data collected were plentiful, and the theme grouping had bulk of issues including both verbal and non-verbal responses. With that, major issues relevant to literature were addressed and discussed while some minor or important issues to some readers may have been left.

Thirdly, the discussion of cultural beliefs and practices many not generally cover all the Highlands provinces in PNG and sub-clans due to the dynamic nature of languages, cultural beliefs, and practices among the general Highlands population.
**Future Research**

Future research that needs to be conducted includes investigations into health promotion and disease prevention programs and it focus in rural PNG.

Research into the health workforce to check whether local’s awareness and behaviour change programs needed positions to be created within health department or not. Further community cultural studies can be conducted on how well locals can be involved in malaria control activities within their cultural contexts using community based concepts. The alternative practices of herbal and thermal therapies can be investigated for medical purposes and for policy and control.

**Concluding Statement**

The Highlands locals’ active participation in malaria prevention activities is possible to achieve with good knowledge dissemination and by making their vulnerabilities known to them. Also, strengthening the PHC and CD programs in each local area to operate competently will enhance malaria prevention activities. The removal of obstacles from the social and cultural structures that prevent locals’ opportunity to acquire needed resources for malaria prevention needs to be addressed now. This would help control malaria in the Highlands of PNG.
REFERENCES


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Muanya, C. (2009). Herbal cures for malaria show promise in treating resistant strains. Retrieved 14th May from


Back Malaria. Retrieved 20th May 2010 from

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APPENDICES

Appendix A: Ethical Approval Letter

Kolly Bang
2/83 Carrington Road
Mt Albert
Auckland

10 December 2009

Dear Kolly

Your file number for this application: 2009-1031
Title: Exploring the perception and practice of malaria prevention and control by Tombil Community in Minj District, Western Highlands Province, Papua New Guinea

Your application for ethics approval has been reviewed by the Unitec Research Ethics Committee (UREC) and has been approved for the following period:

Start date: 9 December 2009
Finish date: 9 December 2010

Please note that:
1. the above dates must be referred to on the information AND consent forms given to all participants
2. you must inform UREC, in advance, of any ethically-relevant deviation in the project. This may require additional approval.

You may now commence your research according to the protocols approved by UREC. We wish you every success with your project.

Yours sincerely

[Signature]

Frances Ward
Deputy Chair, UREC

cc: Elizabeth Niven
Cynthia Almeida
Appendix B: Community Acceptance Letter

Acceptance Letter of Permission for community entry (1)

Cr Dickson Kaming

Tombil Community Minj,
Mount Hagen, Western Highlands Province,
Papua New Guinea

To whom it may concern:

Dear Sir/ Madam,

Acceptance Letter to Conduct Research Interview in Tombil Community.

I councillor Dickson Kaming, from Tombil community, Minj in Papua New Guinea have received Kolly Bangs letter seeking permission to conduct an interview about malaria in my community. I understand that it is for her educational purpose and agree to allow excess and offer support with organisation of groups.

I hereby sign to allow for her excess and to collect information.

Yours Sincerely,

Signature: [signature]

Cr Dickson Kaming
Cr Dau Karap

Tombil Community Minj,
Mount Hagen, Western Highlands Province,
Papua New Guinea

To whom it may concern:

Dear Sir/ Madam,

Acceptance Letter to Conduct Research Interview in Tombil Community.

I councillor "... Dau Karap (name)" from Tombil community, Minj in Papua New Guinea have received Kolly Bangs letter seeking permission to conduct an interview about malaria in my community. I understand that it is for her educational purpose and agree to allow excess and offer support with organisation of groups.

I hereby sign to allow for her excess and to collect information.

Yours Sincerely,

Signature: [Signature]

Cr Dau Karap
PARTICIPANT INFORMATION SHEET

Title: Exploring the perception and experiences of malaria control and prevention by Tombil community of Minj district in the Western Highlands Province of Papua New Guinea.

My name is Kolly Bang; I am a student at Unitec New Zealand, enrolled in a Master of Health Science through the School of Health Science. I am conducting this research for my Masters programme, and have chosen my topic because malaria is becoming common in the Highlands of PNG, a once malaria free region.

For this research I am undertaking a focus group study on malaria prevention and control by local communities in the Highlands of PNG. This project will examine the perceptions, experiences and practice of malaria prevention. It aims to seek underlying reasons and knowledge gaps and other impediments to the effective control and prevention of malaria.

I would like to conduct a one hour focus group interviews with 6-10 community members. While I would appreciate any assistance you can offer me, you are under no obligation to participate. With your consent I would like to audiotape the interview, however all information you provide in the interviews will be confidential and your name will not be used. The non-verbal communication will be noted to seek for consensus and disagreements among the group.

The risk involved is exposure of your place and personal views. The benefits is being aware of malaria problem and taking care of yourselves, I will also let you know of the results of this study. Everyone is encouraged to participate and discuss equally. If you would like to leave during the discussion, you may do so at any time. If you disagree to participate, you may withdraw from your participation at any time during the interview without giving a reason.

If you agree to participate in this study, I will invite you to sign a separate Consent Form or you may agree verbally and I will list your names as willing to participate.

Lunch will be shared after the interview as a means of thanking you for your participation.

Thank you very much for your time and help in making this study possible. If you have any queries or wish to know more, please phone me at the number given below, or write to me at:

Kolly Bang
2/83 Carrington Road, Mr Albert
Auckland, 1063
New Zealand
Phone: 09 0212356241

Kolly Bang
Nazarene College of Nursing
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Western Highlands Province
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Phone: 64 9 815 4321 ext 8307
droy@unitec.ac.nz

For any queries regarding ethical concerns please contact:
Deputy Chair, The Unitec Research Ethics Committee
Unitec New Zealand
Private Bag 92025
AUCKLAND
Phone: 815 4321 ext. 8688
CONSENT FORM

Consent to Participate In Masters Research Project

Title of Project: Exploring the perception and experiences of malaria control and prevention by Tombil community of Minj district in the Western Highlands Province of Papua New Guinea.

Researcher: Kolly Bang

I have been given and have understood an explanation of this research project. I have had an opportunity to ask questions and have them answered. I understand that I may withdraw myself or any information traceable to me at any time up to the end of January 2010 without giving a reason.

I agree to being audio-taped during the focus group or interview.

I agree to take part in this research.

Signed: ___________________________

Name: ____________________________ (Please print clearly)

Date: ______________________________

This study has been approved by the Unitec Research Ethics Committee from (9th Dec 2009) to (9TH Dec 2010). If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the Deputy Chair Ph: 09 815-4321 Ext 8688). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.
CONSENT FORM - FOR FACILITATORS

Consent to Participate In Masters Research Project

Title of Project: Exploring the perception and experiences of malaria control and prevention by Tombil community of Minj district in the Western Highlands Province of Papua New Guinea.

Researcher: Kolly Bang

I as a facilitator for this malaria research project was given information about maintaining confidentiality. I understand that I will have access to information during the interview and during transcription and translation. I was informed prior about the issues of confidentiality and understand very well that I am not suppose to give any information to any individuals or any organisations.

I agree to participate as a facilitator and will maintain confidentiality.

Signed: ____________________________

Name: ____________________________ (Please print clearly)

Date: ______________________________

This study has been approved by the Unitec Research Ethics Committee from (9th Dec 2009) to (9TH Dec 2010). If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the Deputy Chair Ph: 09 815-4321 Ext 8688). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.
Focus Group listing of names and Signatures as a sign of Agreement to participate

**Focus Group One**

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Key Informants

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Appendix D: Interview Guides

Focus Groups

1. Explain what you know and experience about malaria, its causes and spread.
2. Can you please tell me about your experiences of malaria in relation to?
   a) Weather
   b) Home Environment
   c) Lifestyle
   d) Health care
   e) Hospital
   f) Medication
   g) Travelling to coastal areas
   h) Visitors
3. What are your past experiences of malaria compared with the present situation?
4. How do you see malaria prevention and control might be in the future?
5. What are some of the things you are doing to avoid malaria?
6. What are some things you would like the government and Non Government Organisations (NGOs) to do about malaria control and prevention?
Individual Interview

Could you share about your experiences and observation about what Tombil people were doing to avoid malaria?

How do the locals cooperate with the government health centres and NGO’s in addressing malaria control and prevention?

Could you share about locals’ accessibility and problems for obtaining malaria prevention resources from health care?

What are some of the cultural practices and beliefs systems used by Tombil locals?

Do you think locals were more likely to access health care or witchcraft?

Do you think Tombil locals were of primary prevention?

What tribal or family efforts existed in avoiding malaria?

Since malaria affects mothers and children mostly, how are they taken care of in the family?

What needs do you see as most important for malaria control and prevention.

What specific ways do you think malaria programs and providers need to do more about?

Do you think most locals realise climate change as a factor triggering malaria in the Highlands?

What form of malaria awareness you think will work best for locals in prevention?
Appendix E: Home Remedies

Common Herbs & Fruits used by the Tombil local people

Bek     Pawpaw

Chilli     Aole Vera

Pawpaw Leaves     Avocado Seed