

# **Challenges on Malaria Control in Afghanistan**

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## **Challenges on Malaria Control and Prevention in Afghanistan**

A thesis submitted in partial fulfilment of the requirement for the degree of  
Master of Public Health

By

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## **ABBREVIATIONS**

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<b>ACT</b>	Artesunate Combination Therapy
<b>ADB</b>	Asia Development Bank
<b>ANC</b>	Antenatal Care
<b>AS</b>	Artesunate
<b>BCH</b>	Basic Health Center
<b>BPHS</b>	Basic Package of Health Services
<b>CHC</b>	Comprehensive Health Center
<b>CHW</b>	Community Health Worker
<b>CQ</b>	Chloroquine
<b>DDT</b>	Dichloro-Diphenyl-Trichloroethane
<b>DH</b>	District Hospital
<b>EMRO</b>	Eastern Mediterranean Region
<b>EPHS</b>	Essential Package of Health Services
<b>EER</b>	Early Epidemic Response
<b>EU</b>	European Union
<b>GDP</b>	Growth Domestic Product
<b>HMIS</b>	Health Information System
<b>HNI</b>	Health Net International
<b>HP</b>	Health Post
<b>IEC</b>	Information Education and Communication
<b>IPT</b>	Intermittent Preventive Therapy
<b>IRS</b>	Indoor Residual Spraying
<b>ITN</b>	Insecticide Treated Net
<b>IVM</b>	Integrated Vector Control
<b>IWDI</b>	Intermittent Wet Dray Irrigation
<b>LLIN</b>	Long lasting Insecticide Net
<b>MCH</b>	Maternal and Child Health
<b>MCP</b>	Malaria Control Program
<b>MDG</b>	Millennium Development Goal
<b>MEWS</b>	Malaria Early Warning System
<b>MoPH</b>	Ministry of Public Health
<b>NGO</b>	Non Governmental Organization
<b>NMCLP</b>	National Malaria Control Program
<b>NMSP</b>	National Malaria Strategic Plan
<b>PF</b>	Plasmodium Falciparum
<b>PHCP</b>	Public Health Care Provider
<b>PQ</b>	Premaquine
<b>PV</b>	Plasmodium Vivax
<b>RBM</b>	Roll Back Malaria
<b>RDT</b>	Rapid Diagnostic Test
<b>SP</b>	Sulphadoxine-Pyrimethamine
<b>UNDP</b>	United Nations Development Program
<b>UNICEF</b>	United Nations Children's Fund
<b>USAID</b>	United State Agency for International Development
<b>WDCR</b>	Wet Dry Corp Rotation
<b>WHO</b>	World Health Organization

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## **ABSTRACT**

Afghanistan has the 4<sup>th</sup> largest malaria burden in the world. An estimated 1.5 million people suffer from malaria each year, and about 14.8 million people are now at risk of malaria infections. More than 80% of malaria morbidity is due to *Plasmodium vivax* while *Plasmodium falciparum* also causes a considerable number of deaths.

The Afghanistan Malaria control program started in 1947 and registered early successes. Although efforts to control malaria have increased dramatically there have been no gains because of the prevailing political instability. The aim of the thesis is to investigate the challenges in malaria control in Afghanistan in order to provide recommendations for better implementation in future.

The thesis was based on a review of malaria literature from Afghanistan and other countries. The adapted Roll Back Malaria Framework, was used to analyze effective malaria control and current interventions in Afghanistan so as to formulate recommendations

Findings reveal gaps in all malaria interventions in the country. The three major being, Insecticide Treated Nets where there is low accessibility, affordability and availability; malaria diagnosis where there is shortage of qualified personnel and lack of diagnostic centers, and treatment where there is presumptive treatment, drug resistance and low treatment knowledge.

It is therefore recommended that there should be free distribution of insecticide treated nets to pregnant women and children and offer highly subsidized nets to people in high endemic areas as a priority and those diagnosed malaria positive in public clinics. For diagnosis it is recommended to establish diagnostic centers at the Basic Health Centers and Health Posts. For treatment it is recommended to base treatment on parasitic based diagnosis and include *plasmodium vivax* relapse treatment in national treatment protocol.

In conclusion, for effective implementation of the National Malaria Strategic Plan it is important to increase the political commitment, strengthen the surveillance system, build the mechanisms to ensure program sustainability and improve the resource mobilization.

**Key Word: Malaria, Afghanistan, Control Program**

## **INTRODUCTION**

Afghanistan has been recognized as having the second highest Malaria burden in Eastern Mediterranean Region. Around 14.8 Million people are at risk for Malaria in the country. With estimated every year around 1.5 Million Malaria cases occur in Afghanistan. Majority of Malaria cases are due to Plasmodium Vivax, which is the main cause of morbidity and affect the major aspect of health and life of population. Children under 5 and pregnant women are most vulnerable for malaria and Plasmodium Falciparum is the cause of mortality in Afghanistan.

All though Ministry of Public health in Afghanistan has put effort for better control of Malaria, but still there is gap on the implementation of the program.

I am working with Ministry of Public Health in Afghanistan at National Malaria and Leishmaniasis Control program as Malaria technical coordinator for almost 5 years. I am medical graduate (MD) and have experience during my work with Health Net International in malaria control program.

My work with Malaria control program gave me the chance to go through all provincial Malaria control centre and rural remote area. From my observation, Malaria control interventions were not in good progress. Even it was deteriorating. Therefore I chose this topic for my thesis to identify the challenges on Malaria control in Afghanistan. And provide recommendation for National Malaria Control Program for improvement of the program in next coming years.



# **CHAPTER1: BACKGROUND INFORMATION ON AFGHANISTAN**

## **1.1. Country Overview**

Afghanistan is a land-locked country with high mountains, plateaus, rivers, and valleys with a population of 24.5 million (1). It is located in South Central Asia; in south east bordering with Pakistan, in west with Turkmenistan, Uzbekistan and Iran and in the north with Tajikistan and 76 km border with China. The average elevation of the country is 1,200 meters. The main and physical dominant mountain is Hindu Kush which has divided the Northern provinces from rest of the country. Four main rivers are, Amu to the north, Hari Rud to the west, Helmand in south and Kabul River in east. There are deserts in the south and south- west of the country.

Earthquakes often occur in Hindu Kush Mountains; drought and flooding in the south and south-west of the country. The climate is varying with hot and dry summers and cold winters. Some areas in the south-east, due to monsoonal summer rain, remain warm in winter. The average annual rainfall is less than 21cm, which mostly start from December to April. Most of the country is too dry and not suitable for forest growing which includes the southern slopes of the eastern Hindu Kush and Safed Koh, Sulaiman mountains in Paktia.

The forest cover in the border with Pakistan has severely reduced since the start of conflict in 1978. A small part of the country is covered with vegetation and bushes. Land available for agriculture is limited; because of the political instability the society continues to depend on agriculture as the primary source of income, but the land is not suitable for agriculture. So the economic growth is few and people are very poor.

Only 12-13% of the lands are arable and 27,200 km<sup>2</sup> (2003) lands are irrigated. In northeastern provinces of the country, rice mostly cultivated through snow-fed irrigation. This is the major contributor for *Anopheline* breeding sites (2).

### **1.1.1. Political condition**

After three decades of conflict and political instability and since the fall of the Taliban in 2001, the international society committed to undertake Afghanistan's security. First priority was given to help and to assess the health infrastructure. Since then Afghanistan has had considerable achievements in developmental sectors, the GDP growth rate in the first four years grew quickly, but after a few years of relative stability are started

becoming unstable again. It seems to be a major problem of economical growth in the country.

### 1.1.2. Economic situation

Afghanistan has very poor levels of socioeconomic indicators; annual income per capita is US\$ 200 (3). Poor health status in Afghanistan has put the country as one of the least developed countries in world. Almost 70% population of the country is living in severe poverty. The total expenditure on health is 5.2% of Gross Domestic Product (GDP). The Government expenditure on general population health is 5.3% of its total expenditure (1). Country Human Development Indicator is very poor. Human poverty index is 63.2 which is one of the worse countries in the world. The UN ranks Afghanistan at 173 of 178 countries (4).

### 1.1.3. General health profile

As Table 1 shows, Afghanistan is one the countries with very poor and devastating health statistics in the world. And the key problems the country is facing are: (i) high level of infant mortality, under five mortality and maternal deaths, (ii) high level of malnutrition in population, (iii) inequitable distribution of health facilities. All this is due to a large extent due to low capacity to implement health programs (3).

The table below shows the general health and demographic indicators of Afghanistan.

**Table 1 General Health and Demographic Indicators**

Indicators	Values
Life expectancy in years	Females 45, Men 47
Maternal mortality ratio	1600/100,000LB
Under five mortality rate	257/ 1000
Infant mortality rate	165/1000
Total fertility rate	6.3 Births/ Women
Annual growth rate	2.5% Per year
Malaria at risk population (Million)	14.8
Adult literacy rate >15 years ,male	43%
Adult literacy rate >15 years , female	20%

Source: Afghanistan country profile, WHO 2007

## 1.2. Health System

The new government in Afghanistan through the Ministry of Public health since 2002 has prioritized its focus on health. The main goal of the decision was providing equitable health services to all Afghans including underserved and remote areas (5).

In March 2003 the MoPH developed and issued strategic plan for Basic Package of Services (BPHS). Main supporting donors for BPHS are USAID, EU, The World Bank and ADB. After the BPHS establishment, in 2004, the MoPH drafted a strategy for tertiary level health services and a system to improve the referral. The strategy is based on the Essential Package of Health Services (EPHS). The BPHS it is largely contracted out to NGOs. BPHS has four standard levels of health facilities and malaria control activities which are included in each level as follows:

#### **1.2.1. Health Posts (HP)**

- **Staff:** Two Community Health Workers (CHW) including Male and Female.
- **Catchment coverage area:** 1,000-1,500 People or 100-150 Families
- **Malaria services:** IEC, Clinical diagnosis, first line treatment of suspected cases, Insecticide Treated Net (ITN) promotion, Reporting cases and referral.

#### **1.2.2. Basic Health Centers (BHC)**

- **Staff:** Nurse, midwife, vaccinators
- **Catchment coverage area:** 15,000-30,000 people
- **Malaria services:** in addition to service provided by HP, first and second line uncomplicated malaria treatment, rehydration therapy, treatment of anemia, supervision and monitoring of CHWs

#### **1.2.3. Comprehensive Health Centers (CHC)**

- **Staff:** Male and female doctors, male and female nurses, lab, technician, pharmacist
- **Catchment coverage area:** 30,000-60,000 people
- **Malaria services:** with including BHCs services, microscopic for to differential diagnosis and treatment for sever Plasmodium Falciparum malaria cases.

#### **1.2.4. District Hospitals (DH)**

- **Staff:** additional staff in DH is X-ray technicians, Female OBS/GYN, surgeon, anesthetists, and dentists.
- **Catchment coverage area:** 100,000-300,000 people
- **Malaria services:** It includes all CHC plus inpatient management for sever malaria. Also district and Provincial Hospital (PH) are supporting the BPHs in referral.

The health facilities are linked to each other as illustrated below.

**Figure 1 Link between the BPHS and Hospital Sector**

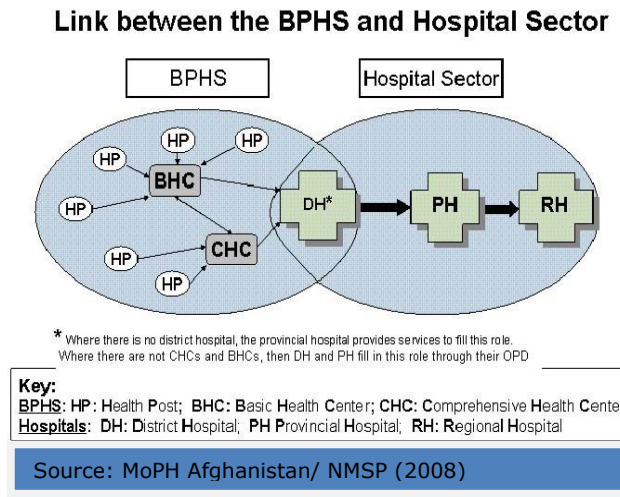


Figure 1 above shows the BPHS and Hospital services. As seen the BPHS includes HP, BHC, CHC, and DH. As mentioned, they differ in facility available. In district level the highest facility is DH. If necessary the patients can be referred to provincial and regional hospital to get further services.

## **CHAPTER 2. PROBLEM STATEMENT AND METHODOLOGY**

### **2.1. Problem Statement**

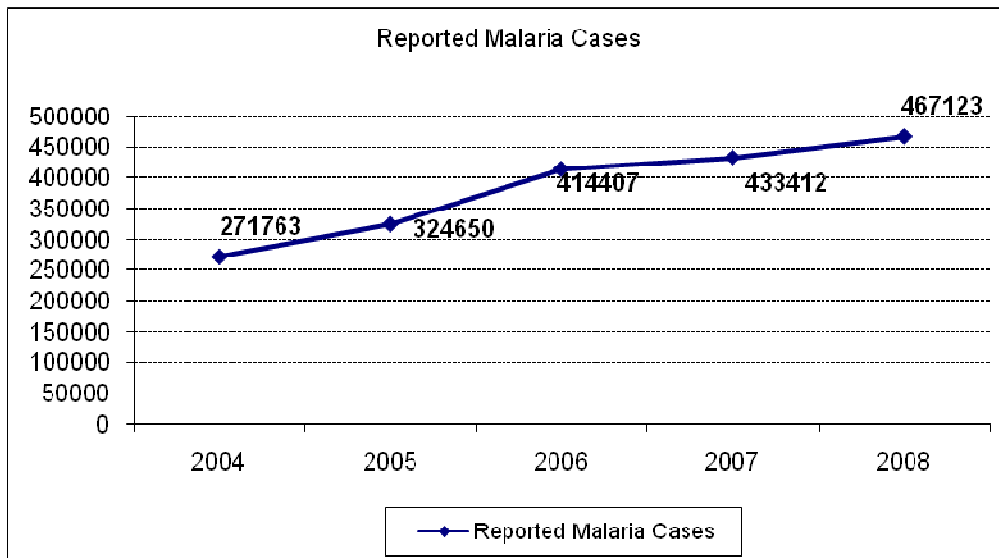
Malaria is an important problem in the world; and every year affects 300-500 million people. One to two million people die every year due to Malaria. Based on the estimation done by WHO in 2005 (6), 3.2 billion people are at risk of malaria. Reports shows that 109 countries are endemic for Malaria in the world and Afghanistan is one of these countries. Majority of deaths in the world occurs among children under 5 and pregnant women (7). Also it is a serious problem to socio economic growth in the world particularly in developing countries (8).

Afghanistan has been recognized as having the 4<sup>th</sup> largest Malaria burden after sub Saharan Africa and the second highest burden in Eastern Mediterranean Region (EMRO). In recent year Malaria has become a greater problem for the country (9). Two major causes of malaria in Afghanistan are *Plasmodium Falciparum* (PF) and *Plasmodium Vivax* (PV). Almost 80% of the incidence is due to PV. The estimated incidence of malaria by (PV) is 10-100/1000 per person years and for (PF) is 1-10/1000 person years (10). Although PV is not a fatal disease, it causes a high level of morbidity which affects major aspects of health and life in Afghanistan.

Around 14.8 million people are living in provinces in which malaria is endemic. Malaria in Afghanistan mostly occurs in rural areas (11). The transmission occurs in those provinces with altitude below 2,000 meters above the sea level. Out of 34 provinces in Afghanistan, 14 provinces are considered as high risk areas. The high prevalence of the disease mostly occurs in river valleys and rice cultivation areas (11).

The Malaria disease burden in Afghanistan is not clearly known. Various agencies have developed different estimates. WHO in 2005 estimated the number of Malaria cases in Afghanistan was about 2.5-3 million cases each year (6). However, in 2007 the estimated number is decreased to around 1.5 million cases per year (12). Figure 2 below is from the Afghanistan MoPH Annual Malaria Report year 2008. It shows that the trend of reported Malaria cases from the year 2004 to 2008 are constantly increases. However, compared to the number of estimated malaria cases, only 31% of them are reported. Of those reported malaria cases, 20% are children under 5 years old. In 2008, 46 people are reported death, and mostly due to PF.

**Figure 2: Trend of Malaria 2004-2008**



**Source Afghanistan malaria Journal 2008**

Another important factor related to the malaria epidemic is the seasonality of its transmission (11). From June to November the epidemic increases rapidly, while much less transmissions occur from December to April. The relapse and peak of PV usually happens during spring season and rises in July, while the peak of PF is in October (12).

Looking at the magnitude of the problems above, an effective malaria control program in Afghanistan is required. In fact such a program was initiated long time ago. The first malaria control program in Afghanistan was established on 1947 (13). During that period the annual Indoor Residual Spraying (IRS) by Dichloro-Diphenyle-Trichloroethane (DDT) and anti larva measure program was implemented throughout the country. As a result 1.2 million malaria cases were averted in 1954 and the number of malaria cases in those years was between 40,000-80,000 cases per year (13).

During the 1960s and 1970s the IRS, Diesel oil, Themphos, Gambusia fish as a larvacides were implemented as part of malaria control programs. Within that period of time the surveillance system, the diagnosis, mobilizing team and also the laboratory network were developed. However, in the 1980s the malaria incidence started to increase 5 to 10 fold. The situation kept getting worse in 1990s where the PF infections increased to 10 times compared to 1970s (13).

Malaria burden has worsened since the Soviet invasion and the internal conflicts in Afghanistan. This unstable situation has lead to various problems i.e. insufficient resources, large-scale population movement, poor access to

effective treatment, damaged irrigation system, insecurity and emigration of health staff (13).

Recently, the effort to halt the malaria-related problems has increased dramatically. The Malaria Strategic Plan 2008-2013 had been issued by the Ministry of Health to provide a malaria control program framework. However, the health effect seems to progress slowly due to various challenges in program implementation. In order to improve the Afghanistan malaria control program performance, addressing existing challenges behind malaria control program are very important. This thesis will investigate the challenges faced by the NMLCP in order to provide inputs for the NMLCP to better implement the malaria program performance.

## **2.2. Objectives**

### **2.2.1. General Objective**

To explore the factors challenging Malaria control activities in Afghanistan, in order to make recommendation for improving the implementation of Malaria control activities.

### **2.2.2. Specific Objective**

- To describe and analyze the key strategies for Malaria control.
- To describe and analyze situation with respect to Malaria control in Afghanistan
- To discuss the current Malaria control program in Afghanistan and identify gaps in its implementation
- To formulate necessary recommendation for Malaria control program in order for better implementations

### **2.2.3. Study Questions**

- What are the key elements of effective malaria control?
- What is malaria situation in Afghanistan?
- What problems exist behind the poor performance of Malaria control and prevention in Afghanistan?
- Which interventions would be necessary to improve the Malaria control program in Afghanistan?

## **2.3. Methodology**

A comprehensive literature review on malaria control and prevention was done using Pub med, Kit Library, Google, Google scholar, Scopus, WHO RBM, and Global Fund websites.

An extensive review on published and unpublished reports and other document is from the Ministry of Public Health are employed to obtain the

current situation of Malaria in Afghanistan. Email and phone contact with colleagues from Afghanistan and other places, who have experience in malaria control program in Afghanistan.

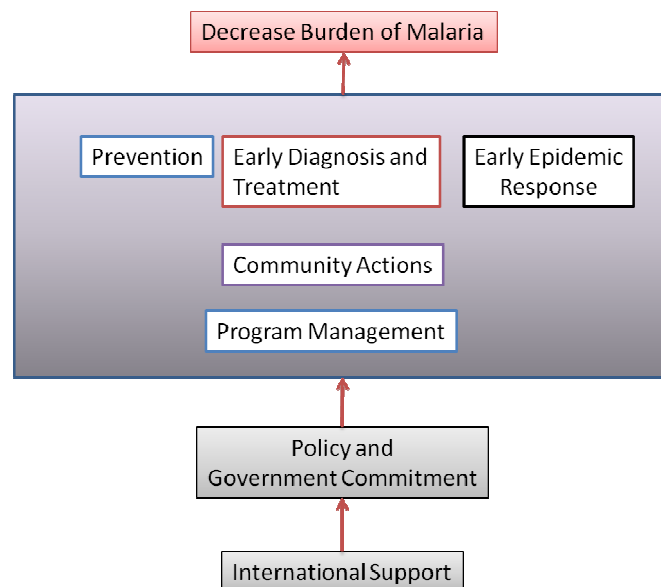
The study uses the framework adapted from the Roll Back Malaria Monitoring Framework. See Figure 3 (The original framework can be seen in Figure 6).

The framework was adapted because basically the original framework was built for monitoring purpose, while the framework needed for this thesis was more on the intervention side. The Early Epidemic Response is brought up as one of the main components because this component is very important especially in planning a longer term of interventions.

The community action is recognized as one of the important components to increase the malaria effective program. However, to date, due to the political instability the community actions in Afghanistan is limited.

The adapted framework was developed by taking into account the recommendations and good practices from articles on the effective Malaria control programs in other parts of the world. I also included my own experiences in implementing the malaria program in Afghanistan (2005-2008) into this framework.

**Figure 3 Study Framework**





The study result will be shared with the National Malaria and Leishmaniasis Control Program (NMLCP) and other related stakeholders. Recommendations and suggestions are provided to improve malaria control and prevention performance in Afghanistan.

**Key words: Malaria, Early diagnosis, RDT, Microscopic, Prevention, Insecticide Treated Nets (ITN), long lasting insecticide nets (LLN), Indoor Residual Spry (IRS), larvacidal, Repellent, RBM, Afghanistan, Strategy, Policy, Insecticide, treatment, health seeking behavior, Epidemic, access are used as key words for this study.**

#### **2.4. Limitations**

This study has some limitations. First, within the limited time available, the search on the sources was not exhaustive. Second, the lack of literatures about Afghanistan in general and malaria program in particular has restricted an extensive discussion on specific issues, such as pregnant women with Malaria. The information on effective malaria control program in Afghanistan and its neighboring countries were not all accessible, either from web-based sources or from KIT library.

## **CHAPTER 3. STUDY FINDING**

### **3.1 Effective malaria control**

Roll Back Malaria (RBM) is a global partnership of WHO, UNDP, UNICEF, and The World Bank with the objective to “halving the global burden of malaria by 2010” (14). RBM was introduced in 1998 with the declared objective to share the expertise and resources in an effort to overcome the malaria problem in the world (15). RBM initiative is a global partnership including multilateral and bilateral donors, Malaria endemic countries, NGOs and private sector in raising malaria awareness at global level, increasing resources, and achievement of agreement on the priority required intervention and tools to control the disease.

Four basic strategies are defined to ensure the effective malaria control by employing 4 areas of control measures. Those are prevention, early diagnosis and treatment, and Early Epidemic Response and Program Management.

In the Prevention section I will describe first, how ITN intervention, Environment control, Intermittent Preventive Therapy, Vector control and Awareness can effectively prevent new infections or morbidity in the community. The various community actions are discussed within these sections. Second, in the Early Diagnosis and Prompt treatment I will focus on the importance of the health provider to be able to identify the disease as early as possible. Those are possible by the function of good microscopic lab facility, RDT, and the ability to diagnose the signs and symptoms of the patient. I will also discuss about the community accessibility to get prompt diagnosis and treatment. Third, in the Treatment section I will explain about the drugs approved by WHO in terms of efficacy, including the drug resistance issues. Forth, in the Early Epidemic Response I will explain the importance of early epidemic response team and the availability of the materials and implementation of early epidemic chart in the health facility. Lastly, in Program Management section, I will emphasize on the importance to maintain a good management support in implementing the malaria program.

#### **3.1.1. Prevention**

##### ***3.1.1.1. Insecticide Treated Nets***

Insecticide treated nets are an important component of Roll back malaria strategy and widely use in malaria endemic areas as preventive tool against mosquito bite to reduce the morbidity and mortality associated with malaria (16). Recent strategy of WHO are to promote the use of Long Lasting Insecticide Nets (LLINs) because it does not need the re-treated or re-

impregnated process, and reduce the consumption of insecticide. Below the term ITN includes the LLINs.

In stable malaria areas ITN use has protective effect. Use of ITN can induce 50% reduction of uncomplicated PF malaria incidence and had protective effect on child mortality. In unstable malaria area ITN use brought 62% reduction on the incidence of uncomplicated malaria. It also had considerable impact on severe malaria through reduction of *parasitaemia*, *splenomegaly*, and prevalence of parasite. It is Important to note that ITN use improved the level of hemoglobin in mother and packed cell volume in children and lead to a reduction of low birth weight (16) (17).

Under-five children are the most vulnerable and at risk group. Improving coverage of ITN for infant and children is highly associated with increasing the survival rate especially of children aged from one month to four years. A study in a rural area of Tanzania shows that high coverage of children by ITN prevented 1 in 20 child deaths (18). Another study by Nevill in (1996) in Kenya among the rural area of the coast, found that the introduction of ITN had significantly reduced childhood mortality and severity of the disease (19). The above finding confirms that the use of ITN improves the child survival and have specific role in severe malaria morbidities reduction.

Improving the access of community for ITN in the rural area is very effective on malaria control. The major barrier on full coverage of ITN is unavailability of ITN. Study by Chase et al. in Mozambique (20), showed that even poorer households are fully interest to pay for bed net. However due to their low economic ability they were less likely to buy a bed net. A similar study in Afghanistan by Howard et al. (21) showed that the poorest people not only wish to own ITN, but they also prioritize the use of ITN. Highly subsidized program is necessary to encourage household to obtain and use bed net. Also subsidized ITN program has higher likelihood of being sustainable for longer time than free distribution. However, Howard et al. mentioned on his study in Afghanistan that it was not possible to estimate the monthly income of families, and many of his respondents could not afford the ITNs, even with subsidized cost (21).

Smithuis et al. (22) indicated that ITN reduces malaria morbidity and mortality consistently in Africa, but its benefits has been less consistent in Asia. His study in western Myanmar showed, that spleen rate, malaria infection, hemoglobin level and weight for height was not significantly different between villages with and without bed-nets during his study period. The inadequate effect of ITN may be due to biting behaviour of mosquito vector in this area where the peak of biting time is between 6-7 pm. Most of people are still in their activities during that time. Since it is difficult to avoid

mosquito biting in this situation, the suggestion is to put more attention on early diagnosis and prompt treatment. This suggestion has relation with the high cost of ITN and its distribution (22). However, Rowland in his study in Afghanistan found (23) that the local mosquito vectors *Anopheles Stephensi*, *A. nigerrimus* start its biting time early morning and in a moment after dusk, which mostly people are not in bed. However, ITN is still effective with combination of skin repellent use at the time before going to the bed.

ITN is effective as a personal protective measure but has also a wider effect in the community because of its usage as traps for mosquitoes and high coverage of people with ITN will protect more people who are sleeping nearby to ITN user (24).

### **3.1.1.2. ITN in combination with Artesunate Combination Therapy (ACT)**

As the Roll Back Malaria strategy recommends, combined interventions work better than single intervention. This has been proved by study in Zanzibar (25) from 2003-2006. The strategy was free distribution of Artesunate combination therapy (ACT) for uncomplicated malaria with Long lasting Insecticide treated net (LLINs).

Free distribution for pregnant women and under 5 children was highly effective in reduction of malaria incidence and child mortality. Introduction of ACT in 2003 dramatically reduced malaria mortality and morbidity. With introduction of free distribution of LLINs in 2006, there was 10-fold reduction on malaria parasite prevalence (25).

### **3.1.1.3. Environment Control**

Environmental malaria control measures are any efforts in relation with environmental manipulation to prevent mosquitoes to breed and to bite people. Environmental control should be an effective, non toxic and sustainable method (26). A three to five years study in Zambia found environmental control such as modification of river boundaries, removal of manmade obstructions and draining of swamp and stagnant water were found to have association with reduction of malaria morbidity, mortality and incidence rate (27).

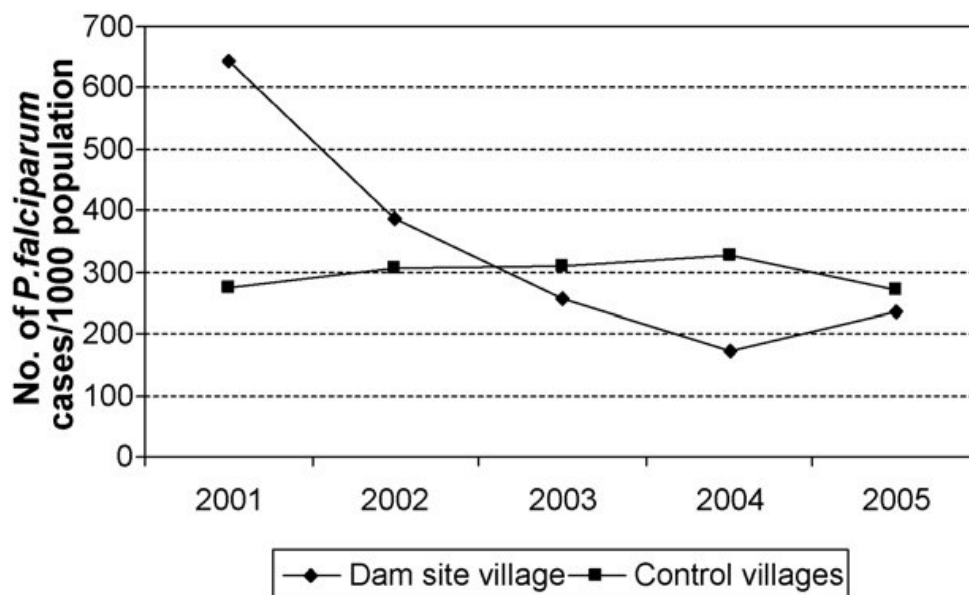
As mentioned above malaria transmission in Afghanistan is seasonal, and mostly occurs from June up to the end of November. The infections occur together with the rice growing season and pooling at river bank or ditches (28). Keiser, et al. (29) in their study mentioned that people who are living near the large dams and irrigation schemes have high malaria burden. The traditionally pooled water by farmers to keep the water through the years has given a suitable breeding place for mosquito. However, one study by

Qunhua et al. (30) proved that there is a system called Intermittent Wet/Dry Irrigation (IWDI) system that can increase water security and extension of irrigation network in arable land. The management of Wet and Dry Crop Rotation (WDCR) annually aimed to maximize the production, in one time also reduced the vector breeding that made vector populations fall below the level required to sustain malaria transmission. It means malaria can be controlled through the sufficient drainage of rice paddy field.

Proper sanitation measure helps to avoid from stagnation water is other method as environmental factor that contributes to reduce mosquito breeding sites in which the government should institute this measure (31)

Although most of the time pooled water is associated with increase of malaria burden, building dams for irrigation can also decrease the malaria transmission. A Study in India showed that building a small dam significantly reduced malaria incidence and parasite rate at all age groups (32). Study was conducted from 2001-2005, in two villages for study and control group with similar climate, altitudes, irrigation system and malaria seasonal transmission. The base line data were collected through cross-sectional survey each year during transmission seasons from 2001-2005. The Dam was built in 2002 in the study village. Malaria incidence was gradually decreased in this village, while increased in the control village during the period of study. See Figure 4 below.

**Figure 4 Annual Malaria Incidence during 2001-2005 in Sudargarh District, Orissa, India**



Source: ACTA TROPICA 2004

The all age groups annual malaria incidence mean was recorded in weekly base during the study period (2001-2005) in the study village (Dam constructed) and control village. The dam construction started in 2002 and baseline for comparison was 2001. Malaria incidence significantly reduced in dam constructed village and no significant change in control village.

The authors of the study conclude that for effective malaria control in relation to irrigation projects one needs to understand the breeding habits of the dominant vector in that region. This shows that different regions have different vectors that have different breeding habit, where the vector breeds in slow flowing water. To tackle with vectors which breed in slow flowing water, environmental control measure should insure that the breeding place (slow flowing water) is no longer available to the vector. Similarly, for vectors which breeds in stagnant water need to be tackled can be addressed by ensuring that water does not remain stagnant. This was the bases for the lower number of malaria cases in the dam area in this particular study (32).

#### **3.1.1.4. Intermittent Preventive Therapy (IPT)**

Pregnant women who are living in malarial areas are more likely at risk of infection with malaria. It is causing severe anaemia, tiredness, weakness for the mother and therefore causes high risk of maternal mortality and reduction of infant growth (33), (34).

Studies shows, that chemoprophylaxis or IPT has a significant positive effect on birth weight and reduce the aneamia, antenatal parasite prevalence, placental malaria and possible prenatal death of women (34) when implemented to all parity groups of women.

#### **3.1.1.5. Vector control (IRS, Repellent and Larvaciding)**

Malaria vector control can be achieved by different methods, selection of appropriate method to control the ecology of the mosquitoes, to control living condition of community population and to ensure the availability of resources. In the last 50 years malaria vector control had been focused on Dichloro-Diphenyl-Trichloroethane (DDT) spraying (35). Residual spraying of houses in many parts of the world has brought considerable reduction in Malaria morbidity and mortality. Actually, Promotion of indoor residual spraying (IRS) with DDT was declared safe by WHO for malaria control in endemic and epidemic area in 2006 (36). That article also mentioned that many international organizations were supporting this policy due to the high burden of disease and the low cost of DDT. However, further research on its effectiveness, training, regular monitoring and sustainable implementation are needed. Even though some malaria vectors are resistant against DDT, it still remains effective for house spraying because of its excitorepellency and insecticidal effect and its low cost in comparison with other insecticide (35).

Malathion is an alternative to DDT. Study in eastern Sudan found that the use of Malathion significantly reduced the mortality (37). However Malathion did not reduce the number of new infections, only reducing the

complications. Other alternative insecticide for IRS is the usage of *Alphacypermethrin* ('Fendona', Cyanamid, NJ, USA). A Study in Pakistan showed that single spray treatment was effective for the whole transmission season (38). Beside its effectiveness, the reduced smell of this IRS was acceptable for the people in Pakistan. In that case the *Alphacypermethrin* spraying has potential to be widely used in South Asia in general.

Although, IRS is a major component of malaria control programs; but it requires adequate fund, spray equipment and material, labor, transportation and good organization. Additionally, socio economic cost, environmental impact, long term possible effect on human health and resistance of vectors against insecticide, call in to question the long term sustainability of malaria control program through insecticide use by IRS (39).

The use of some other vector control methods may have valuable effects under specific transmission periods these are: larvaciding, Use of repellent, Sanitation to avoid stagnant water, Housing improvement like mosquitoes screening houses. Some of these methods have not been received enough attention in recent years (40). Mosquito control measures should target both the mosquito immature and adults to enhance maximum protection, especially during the rainy season (41).

A study in urban Dar Es Salaam in 2009 found that larvaciding was effective to reduce malaria prevalence and used as an integrated method with other malaria control measures (42). Modification of larval habitats as the method to malaria eradication had been done in the United States, Israel and Italy (43). Using Indigenous fish for larvaciding i.e. *Gambusia*, *Danio rerio*, *Esomus danricus*, *Badis badis*, *Chanda dama* *Gambusia* is important and effective to control mosquito breeding. This method is advantageous because it doesn't have adverse affect on carp production (44).

Study on topical application of insect repellent in South Africa had come to recommendation to use this method in outbreak-prone settings where infected mosquito bites are sporadic. This method is also suitable for unstable malaria endemicity (45). Even though this method is expensive, it is possible to reduce the operational cost of repellent by combining it with ITN social marketing. A strategy to address poor people is needed to ensure the equity and affordability (23).

### **3.1.1.6. Awareness**

A suitable and proper way to prevent diseases or keeping the diseases away from community is by improving the knowledge and awareness (46). Low knowledge about the disease, its transmission and health seeking behavior may affect the effective malaria control measure.

The knowledge of Malaria is influencing the use of ITN and results in reduction of risk of severe anemia during the pregnancy period (47). Preventing pregnant women from malaria infection is very important. Study by Akinleye et.al (48) showed that low knowledge of pregnant women about Intermittent Preventive Treatment (IPT) was associated with malaria morbidity. Maternal and Child Health (MCH) and Antenatal Care (ANC) are the common place to reach pregnant women and children. In this case, the use of MCH clinic as a place to distribute ITN which was done in Tanzania increases the uptake of ITN (47). The importance of knowing where to find the ITN was also found in Keating et al. works (49). They found that, among the village population in Haiti, the knowledge about malaria transmission was high but unfortunately the awareness about where to access the ITN was very low. This caused the increase of malaria infection. It means the role of health education to spread the information on where to access the ITN is as crucial as the awareness of the malaria itself.

A study in Tanzania showed that improvement of awareness in the community is an effective method of malaria control (50). In that study almost all of study population had enough knowledge about transmission and malaria control. They also participated in implementation of different preventive intervention methods like using bed nets, window screening, filling holes and pits, surrounding cleaning, stagnant water drainage and larvaciding activities. These activities were proved to be able to reduce malaria mortality and morbidity (50). This study indicates that community awareness is important as a contributing factor to community participation in malaria control. However, a study in Java Indonesia found that awareness alone is not enough to control Malaria. In that study 97% of the study population was aware of malaria transmission and preventing methods but around half of them were using self treatment without visiting health facilities (51). In this case improving behaviour change in the community is also important.

Leslie et al. (52) found in a study in Afghanistan that the high level of awareness relates directly to a large existing control program. Even when the level of illiteracy is very high among the people a continued public education campaign can result in high level of awareness. It shows that direct communication with community has an important role to improve the knowledge, attitude and practice of the people to increase the community participation in malaria control (53).



### **3.1.2. Early Diagnosis and Prompt Treatment**

#### **3.1.2.1. Early Diagnosis**

Prompt treatment and early diagnosis are the key elements of malaria control. Successful achievement of these elements is depending on provision of better quality of health services and health seeking behavior (54). Improving the health seeking behavior is very important for early diagnosis. Recognizing the Malaria sign and symptom can lead to seeking correct diagnosis, which can be achieved through appropriate information, education and communication system (55).

Low access to diagnosis of Malaria influences the timely treatment and care. This results in repeated Malaria episodes in highly malaria endemic area. Therefore it is important to establish a wide network of health services by responsible authorities (56).

A strategy to achieve early diagnosis is to concentrate the diagnosis at all levels of health system throughout the country. Correct diagnosis is very important for prescribing the correct drug for the PF and PV treatment. In contrast, misdiagnosis leads to the wrong treatment and it can result in treatment failure and wastage of ACT as a valuable drug (11). Over diagnosis of malaria cases is common, even when malaria diagnostic testing is available in the health facilities and hospital. Study by Chandler et al. (57) in Africa showed that malaria miss diagnosis lead to high costs in terms of mortality, morbidity and financial. The high cost of ACT stimulates the government or providers to insist on diagnostic centers to maximize correct diagnoses in order to reduce the cost (58). This action leads to prompt diagnosis and effective treatment.

Beside all of the existing ways for managing malaria, several factors are involved in the increase of malaria cases. Effective treatment and prompt diagnosis would be essential to manage and control malaria especially in emergency circumstances (59). Prompt diagnosis of malaria is not only good for treatment, but also can reduce transmission of malaria (60).

Prompt access to suitable malaria treatment is an important element in the Malaria Global Strategy (61). It is very important to start treatment within 24 hour from onset of symptoms, especially in life-threatening PF Malaria. Without treatment *falciparum* malaria it will directly and indirectly become contributing factor for death of non-immune population. Delays in diagnosis and treatment are the leading causes of death in many countries (62).

Microscopic blood examination and clinical diagnosis are two main methods currently used in most of developing countries.

Microscopic blood examination through provision of thick and thin smears remains the gold standard for malaria diagnosis. Smears are reliable and inexpensive; however specificity and sensitivity vary a lot in comparison with other technical advances and requires a qualified lab technician. In decision to use microscopic blood examination method, the country should assess the knowledge and effectiveness of health care worker, availability of resource, malaria endemicity and necessity and urgency of diagnosis (59).

In area with short period of endemicity, applying the microscopic diagnosis will raise problems for maintaining health care provider's capacity. Kyabayinze et al. (63) Warning about a major obstacle to reliable and prompt diagnosis: The lab technicians and clinician in a seasonally raise of malaria transmission will become unfamiliar with malaria or due to lack of experience. They will likely fail on detection of parasite in the blood smears under microscope, while the clinician may forget to assess patient as malaria and not order for malaria diagnostic test

Where the laboratory facilities are not available, Rapid Diagnostic Test (RDT) is an appropriate diagnostic test for field use by community health worker (CHW) and is a very effective diagnostic tool for malaria diagnosis especially in low resource countries (64). Introducing RDT and provision of radical treatment by CHW in operational malaria control program especially in remote area is beneficial on malaria mortality and morbidity reduction (54). On base of study and observation by Reetha (2007) in India, use of RDT and radical treatment by use of a blister package was well accepted by the community and paramedics (65).

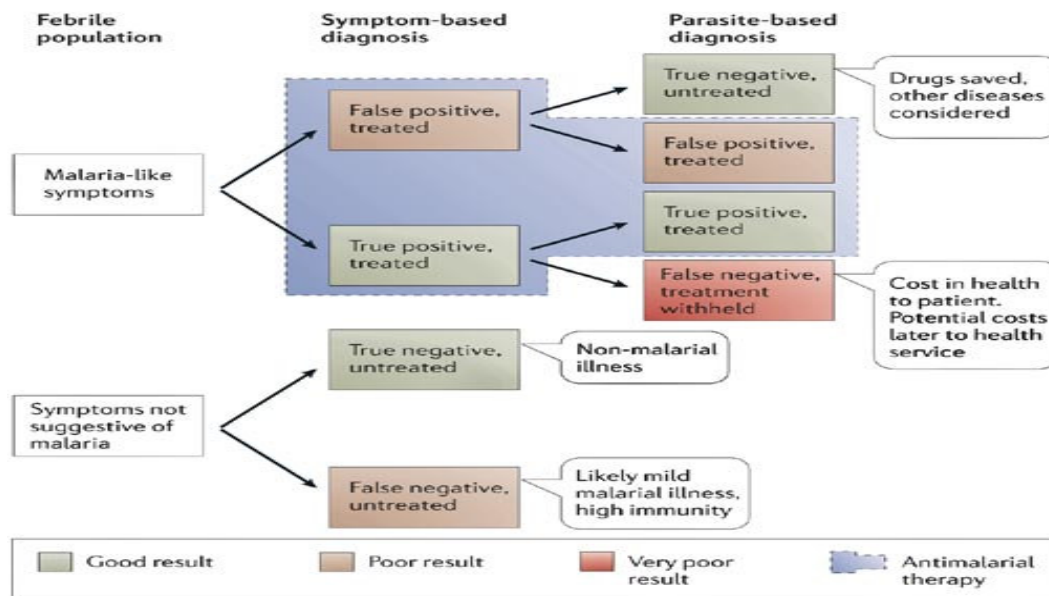
Clinical diagnosis of malaria cases is an accepted strategy in those areas where malaria is common and there is a lack of diagnostic centers. It helps to avoid progression to severe malaria cases. But for low transmission area, there is no strong reason to justify relying on clinical diagnosis (58). Clinical diagnosis of malaria based on patients sign and symptoms and physical finding may be difficult. It is inexpensive and the most extensively practiced because of few lab facilities in many regions (59).

Since the signs and symptoms are not always specific, it might overlap with the other fatal diseases and affect the specificity of diagnosis. This can lead to misuse of anti malaria drug that will lower the quality of care to the patients and increase the risk of resistance building of the parasite. In addition, patients who receive anti malaria drugs but have other fatal disease will remain without diagnosis due to this wrong treatment (60) (66).

Figure 5 illustrates four consequences of diagnosis based on (symptom-based and parasite-based) diagnosis. Good result diagnosis will cause saving of drugs and lead to proper treatment for other illness also; while poor result such as false negative untreated will likely cause mild illness or high

immunity. Very poor result diagnosis such as false negative will cause the severity of the disease.

**Figure 5 Effect of malaria diagnosis based on sign and symptom and laboratory**



Bell et al. *Nature Reviews Microbiology* 4, 682–695 (2006)

Due to these miss diagnosis explained above we should consider more on differential diagnosis of febrile diseases to provide proper treatment to needy people (67). This will be possible by improving the access to RDT and microscopic diagnosis.

### 3.1.2.2. Prompt and Effective Treatment

Malaria effective treatment is one of most important strategies of RBM that saving people's lives depends on the appropriate treatments (68). Resistance against anti malaria drug has caused considerable problems on malaria control and is the most important cause of malaria mortality and morbidity (69). One of the most prominent causes of death due to malaria is the drug resistance of PF malaria. WHO anticipates, that there is a threat in treatment of malaria due to this drug resistance, especially with *Chloroquine* (CQ) and Sulfadoxine-Pyremethamine (SP) (70) (69).

Also Plasmodium Vivax is the most important cause of malaria in subtropical countries with estimation every year, 70-80 million cases occur due to PV. More than 50% of all malaria cases are due to PV outside of Africa (71). Study by Hey et al. (72) shows the cause of majority of malaria morbidity in Asia is plasmodium Vivax. Therefore the steadiness of the disease needs treatment to avoid the relapse and decreasing the reservoir of the disease.

Since more than 5 decades Primaquine has been used as a PV anti relapse therapy in its liver stage. However, there is concern that it will cause hemolysis in patient with Glucose-6-Phosphate-Dehydrogenase (G6PD) deficient; it is still useful to use as presumptive anti relapse therapy for patient with confirmed PV (73). Leslie et al. (74) in Afghanistan found that practical radical PV treatment with Primaquine (PQ) once per week for 8 weeks are more effective on preventing relapse and reservoir reduction where G6PD testing is not available.

A Community based study, which was conducted in Senegal for 12 years from onset of Chloroquine resistance showed the child mortality due to malaria doubled as the result of Chloroquine resistance (75). Later by the introduction of SP resistance, the death and hospitalized rate increased rapidly (76).

Learning from the experience of Kenya where the CQ was replaced by SP, drug resistance reached to its dangerous level very soon. WHO decided to start treatment with Artemisinin class combination therapies (ACT) as the best treatment, to be highly effective with less chance of resistance and treatment failure (77).

International Artemisinin study group in their finding by application of ACT on 6000 patients' shows, significant reduction on infectious parasite and 75% reduction on risk of treatment failure (78). In worldwide studies, treatment by ACT was 90% successful (77) of the 5 priorities Malaria treatment recommendations by WHO, four of them are an Artemether based combination therapy.

In response to current drug resistance, WHO recommended that monotherapy should be changed to combination therapy as treatment policy for PF malaria treatment. The policy has been issued in 2000-2001 on basis of consultation and conclusion from international malaria chemotherapy experts (79).

Following are the therapeutic options currently recommended by WHO:

- ✓ Artemether/Lumefantrine
- ✓ Artesunate plus Amodiaquine
- ✓ Artesunate plus Sulfadoxine/Pyrimethamine (in areas where SP efficacy remains high)
- ✓ Amodiaquine plus Sulfadoxine/Pyrimethamine, in areas where efficacy of both Amodiaquine and Sulfadoxine/Pyrimethamine remains high (mainly limited to West Africa).
- ✓ Artesunate plus Mefloquine, an additional recommended combination treatment which is reserved for areas of low transmission.

**Source:** Position of WHO's Roll Back Malaria Department on malaria treatment policy

For PV Malaria treatment, WHO still recommends CQ. However close monitoring system to identify the sensitivity of PV to Chloroquine or CQ combination with other drug is needed (80). PQ is also recommended for PV treatment by WHO with exclusion of G6PD deficient.

### **Providers:**

Beside the availability of the drug it is necessary to consider the providers of treatment. Review study by Smith (81) investigated the role of different providers including mother, CHWs, formal and informal physician, and pharmacist. Training of mothers on presumptive treatment by prepackage (home package) of CQ/SP and actions if the child get worse was very effective. One day seminar on malaria treatment for public private physician was useful. Pharmacist and CHWs training can also be an important component to increase the capacity in provision of correct treatment.

Additionally, a study in Tigray, Northern Ethiopia emphasized the importance to ensure better access of the community, especially in rural area. It was mentioned that provision of malaria services through CHWs reduced significantly the death rate of children and decreased the patient's burden. (82). Additionally, provision of radical treatment by CHW in operational malaria control program especially in remote area in Vietnam was found beneficial on malaria mortality and morbidity reduction (54). Another study in central India, found that implementation of radical treatment blister was hundred percent without side effect and was accepted by clinician and patients (64).

A study in Vietnam was conducted to find the effect of early diagnosis, treatment and education through CHWs on the community. This study found that there were increase in self-diagnosis, decrease in self-treatment. It was also found that the delay in treatment seeking decreased from 23 days to 3 days (54). Simultaneously severe malaria and reported malaria mortality was significantly decreased.

### **3.1.3. Early Epidemic Response**

Malaria epidemics mostly are localized and frequently triggered by climate irregularity and often follow periods of drought. It is expected that Malaria cases will increase when the rains return to more "normal" level after the droughts. An improved early warning and early detection of malaria epidemics has been recognized as potentially useful tools for epidemic preparedness and response planning (83).

A Malaria Early Warning System (MEWS) was developed by RBM to serve this purpose (84). Three main groups of indicators to predict the timing and severity of a malaria epidemic are:

- ✓ Vulnerability indicators (such as low immunity, malnutrition, HIV, population movement, drug resistance etc.) which may be monitored continuously and are likely to predict the severity of impact, rather than the timing of, an increase in malaria transmission
- ✓ Transmission risk indicators (such as unusual increases in rainfall) that may predict the timing of an increase in malaria transmission 2-4 months before a malaria epidemic occurs. In some situations a higher than average seasonal rainfall may be predicted from seasonal climate forecasts 1-6 months in advance—giving a maximum warning of an epidemic situation developing with 10 months early warning.
- ✓ Early detection indicators from health facility malaria morbidity data (using epidemic thresholds) that may be used to confirm the onset of an epidemic situation and predict the magnitude of the epidemic 3-4 weeks in advance

(Source: Roll Back Malaria Technical Support Network For The Prevention And Control Of Malaria Epidemics, 2001).

The MEWS will work effectively with the support of strong surveillance system that gives lead time for effective prevention and control. This method also requires strong co-operative partnership among different stakeholders from district level to sub-regional level and national levels. Developing a common understanding about partnership among the communities from health office, meteorological and agricultural sectors will have to be the necessary first step for developing the Malaria early Warning System.

#### **3.1.4. Program Management**

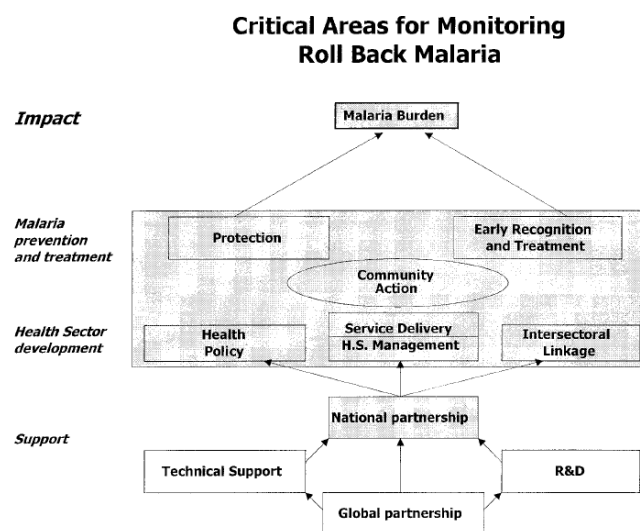
Implementing the malaria control program needs a good management system. The Roll Back Malaria team is striving to improve the management continuously, especially in resource mobilization and the partnership governance. This section will describe in brief the RBM Framework including the monitoring framework, funding needed, and improving the partnership.

#### **Roll Back Malaria Framework and the Monitoring system**

RBM Framework was developed to be used globally. However, adjustment is very much possible depending on the country situation, usually with the technical assistance from WHO support team, i.e. in Korea (85). The Framework was illustrated in some critical areas related directly to the objective of RBM that is to halve the malaria burden by the year 2010 and to monitoring purpose (See Figure 6 below).

Those critical areas are 1) the impact on malaria burden, 2) improvements in malaria prevention and treatment, 3) related health sector development, and 4) support and partnerships (86). The components inside the framework are the main components of RBM actions to be monitored, especially at country level. As mentioned that the ultimate objective of RBM is to halve the burden of malaria and "malaria burden" become one of the critical areas to monitor. The reduction in burden will be achieved through interventions that are initiated by the national RBM partnership, and this partnership is another critical area to monitor.

**Figure 6 Critical Areas for Monitoring Roll Back Malaria**



Source: Remme, JHF; Binka, F; Nabarro, D: Toward a framework and indicator for monitoring RBM.

As seen in this figure, critical areas of protection and of early diagnosis and treatment are two most malaria specific interventions. In order to enable the quality intervention, strengthening, and monitoring of other relevant components including health policy, health system management, and service delivery, especially at the first-line facility are required. As malaria intervention is not only health issue, involvement of other related sectors are also critical and to be monitored. International support and the technical support provided to countries are part of the monitoring framework. The last component as important as others is the effectiveness of research and development to continuing improvement of tools and strategies.

### **Resources Needed**

In order to reach the RBM goal after the movement in 1998, it is widely agreed that it requires major increase in international aid funding for malaria control was about \$1.5 – \$2.5 billion annually. However, a study by Narasumhan (87) found that the total amount of international aid given to malaria control, from the 23 richest donor countries plus the World Bank,

remains in the range of \$100 million annually – a number that is never changed since the start of RBM.

The problem is the resources needed are far exceeding the available international aid finances for malaria control. Consequently, the actual levels of international aid for malaria control were below the amount of agreements in order to achieve RBM's goal.

## **Partnership**

A history of RBM which was launched as Brundtland's "pathfinder" project had brought together the biggest players in health. It had been succeeded to bring together more than 90 multilateral, bilateral, non-governmental, and private organisations. It also has raised the profile of malaria to a global issue. However, it was found that the project which now applying loose governance structure had made the very concept of partnership unclear (88).

As partnership is one of the monitoring indicators, an analysis on RBM suggests that WHO could fulfill an important new role, helping to define the governance of partnerships and the responsibilities of each other. WHO has an advantageous position to support countries in the local implementation of new global health initiatives, and along with coordinating role will come also the strengthening of health system. However, the role to get the fund is remained unclear.

## **3.2. Current situation in Afghanistan**

### **3.2.1. Malaria Stratification in Afghanistan**

As mentioned in chapter one, altitude and agriculture are two main malaria determinants in the country. In order to better target the malaria control strategy in the country, Afghanistan MoPH and WHO divided the country in to three different stratifications: high, low and least potential for malaria transmission (11). The stratification was done on basis of available information and results from malaria risk mapping survey (89). Malaria transmission risk is different in each stratum province. Provinces with medium to high transmission considered as first stratum, second stratum provinces is considered as low transmission areas and provinces with very low transmission incorporated in the third stratum (90). Figure 6 shows the stratification of malaria problem in Afghanistan.



Figure 7 Stratification of Malaria problem in Afghanistan



Source: Afghanistan Malaria Strategic plan

To date, the current programs focus more on the first strata. However, basic capacity building intervention and early epidemic response were still involving all strata. Within these high risk regions malaria risk is still marked difference between provinces and their districts. And for strategic planning, this stratification has been done on the basis of potential epidemics.

According to Afghanistan National Health policy, Malaria control is integrated in to BPHS and emphasized as an essential component of decentralized integrated services (5). The diagnosis and treatment of malaria is completely integrated in to the BPHS. But the current integrated strategy of BPHS does not cover all malaria control program measures. Microscopic services are not incorporated at the BCH level and the other malaria services which are already integrated with BPHS are still insufficiently covered (91).

As Beals, pointed out, (92) poor infrastructure, low managerial capacity especially at the provincial level, insecurity and slow rollout of systems are significant challenges in the country. In addition as Ameli and Newbrander point out, low density of population in the many areas, socio political difficulties and problematic seasonal geographic access are major challenges for BPHS implementers to deliver services (93). Only 59% of the population has been covered by minimum health facilities by BPHS implementers (94). There has been large investment in the BPHS. However, it has not been able to improve access to health or improve the standard health services. As Safi et al. pointed it has not be able to make a difference (10).

### **3.2.2. Malaria Control Program**

#### **3.2.2.1. Insecticide Treated Nets**

As in other part of the world, in Afghanistan the major component of personal protection and vector control is use of ITN. In response to limitation associated with re-impregnation of ITNs, Afghanistan follows the recommendation of WHO to use LLINs. All the ITNs distributed in Afghanistan in these recent years are only LLINs. The term ITNs below refers to the LLINs type which is used in Afghanistan.

Although ITN has less effect against PV malaria because if its relapse due to reservoir of hypnozoite without biting with infective vector, the local effectiveness of ITN on PV was shown in a house hold randomized control trial by Rowland in his study (95), (96).

The ITN distribution through private sector outlets like (shops and clinics) was done in the past by Health net International (HNI). Even though there was much poverty (96) (21), the coverage was increased. But at present time, due to unavailability of policy and guideline for private sector and lack of proper monitoring and reporting mechanism to ensuring accountability of them it is not a sustainable intervention.

Although there will be problem for very poor people in access in an ITN because of its unaffordable cost (97) (52), free distribution will be a threat for sustainability of the program. It is difficult to rely on continuation of donor fund in the future. However observed form the current situation of malaria control in Afghanistan it is likely that the Global funds could provide assistance for long time ITN distribution.

Population from remote area have less access to the health care facilities including ITN, Study by Howard et al, (21) in Afghanistan shows the ITN was purchase a 4.5 times by rich quartile families than poor quartile families; and 2.3 times purchased by families more frequently from upper middle quartile (21). It means poor remote resident families have less access to protection against malaria vectors and they are less likely to pay for purchasing insecticide treated nets or afford treatment and transportation cost (98). In some areas ITN was available. However, even if the ITN is highly subsidized, the cost is still too expensive. High unemployment of Afghanistan people had caused about 30% poor population are not able to afford health care including ITN (99), (3).

ITN is distributed by only one NGO in Afghanistan through small a number distribution outlets and private sector. However, there was lack of ITN implementers to supply and distribute to all malaria high risk provinces. Therefore, the people who live in remote areas have low access to preventive measures. Creating demand for malaria prevention through the

regular use of insecticide-treated bed nets has been adversely affected by existing poverty, low awareness and civil disruption. Efforts to sustain social marketing approaches and re-impregnation at the community level with (ITNs) in the past have been challenging under these conditions, mainly in the most affected populations like returnees, IDPs and nomads

#### **3.2.2.2. Environment control**

While the aim of Roll Back Malaria is to halve the present burden of malaria through efficacious and cost effective control strategies by the year 2010, the missing element, environmental management is still under discussion due to lack evidence based information (27).

Based on the extensive study on published and unpublished reports on Afghanistan malaria control program implementation, there is no evidence that the environment control has been one of the significant control activities. Report on budget allocation and expenditure also confirms this finding (100).

At this time the role of community based organization and other Non Government Organization in malaria environmental control program is very limited.

#### **3.2.2.3. Intermittent Preventive Therapy (IPT)**

Malaria increases the risk of severe disease in pregnant women. Fatality in this stage is due to complication of disease which include severe hemolytic anemia, low birth delivery, Jaundice, hypo glycaemia, kidney failure, pulmonary oedema and neonatal death, which is associated with PF malaria. Congenital malaria is less common for PF but it is commonly associated with PV (33). However high rate of maternal anemia and low birth weight were found by study in Afghanistan, but other factor like poor diet and poor access to dietary supplement was also a contributor for it other than malaria (101). Leslie et al. (101) found that the pregnant women were not interested to take preventive drugs when they are pregnant. The perception was that the drug is harmful for them and their babies indicating gaps in awareness and knowledge about malaria preventive therapy. Also implementation of IPT still not incorporated in national malaria strategic plan (NMSP).

#### **3.2.2.4. Vector control (IRS, Repellent and Larvaciding)**

To date, no systematic vector control program is implemented in Afghanistan. The IRS using phyrithroed was done by personal request from the residents. The NMLCP, however, store a small amount of this pyrethoid for this reason. Other means of vector control like repellent and other spraying are commonly use in household and can be easily bought from the market. Larvaciding program is very limited in Afghanistan by using

chemical larvaciding and Gambusian fish. So far there is also no record on housing and sanitation program related to malaria.

Literature studies, though, found some vector control tools tested locally, including tent spraying in acute emergency, treating clothing and bedding (102), repellent (23; 21) (103), larvaciding (104), livestock sponging which is effective against zoophilic vectors.

Indeed, looking to the behaviour of Afghanistan people, who sleep outside especially in warmer season, the use of vector control is important.

### **3.2.2.5. Awareness**

#### ***Literacy***

As mention earlier, the level of illiteracy is very high among the women in Afghanistan. However in a study conducted by Lieslie et al. (52) found that the knowledge of illiterate women about malaria personal protection and transmission was found to be high. It would be the result of continued public education campaign in some high risk malaria area that government and NGOs has control program there, but almost all of pregnant women were not interest to take drug as IPT during their pregnancy to prevent malaria. The women were believed that preventive drug will cause the illness and will be harmful for them and their foetus (52).

#### ***Gender***

Major barrier to health care seeking of women in the country is, disallowed by their husbands, transportation problem and some of women and their husband belief that the ANCs during the pregnancy is not necessary and decision on seeking treatment mostly taken by the head of households (105), (52).

#### ***Socioeconomic***

Youssef et al. (105) has found that the wealth status had significant association with seeking treatment outside of home. Study showed that rich people was more likely to seek treatment for fever than poor people. He found that the disease incidence and exposure varied according to the socio economic level among the people in Afghanistan. Poor people and those who are living far from the health facility are less likely to have access for health care and health educations about malaria and other disease than rich (106). History of malaria was longer with poorer background population than rich. But uniform perception was found among all age and gender categories, the knowledge about malaria symptoms among the people was very low.

#### ***Perception of People***

Study by Youssef et al. showed that overall health seeking for fever in Afghanistan has found to be high. However, rather than visiting the health

facilities, most people prefer buying drugs directly from drug store, self management, visiting traditional healer and a few consulted *Mullah*( religious leader) (105). People who took action for fever treatment between 24- 48 hours, was nearly equal among urban and rural population. The most commonly perceived barriers on taken action to seek care is mild nature of fever and people belief that fever will recover without treatment. The second and third barrier is unavailability of health care facility and unaffordable cost of treatment and consultation. Even with more information about malaria symptom and recommended treatment, there is extensive utilization of unsuitable and wrong prescription. It is due to frequent consultation of people with inadequately trained private doctors and unqualified lab technicians and pharmacists.

As a result the delay would occur on reaching to the qualified doctors that could diagnose and manage the illness in proper time (107). The lack of ability in recognizing of malaria symptoms leads to delay in seeking diagnosis and treatment (52). In term of receiving treatment, antipyretic and antibiotic use is higher than anti malaria treatment (105).

### ***ITN Use***

Even though the knowledge of women about malaria personal protection was high in the high malaria transmission area, but in general the perception of people about ITN was low. Some of the people were belief that ITN is not effective in reducing mosquito bite and as well as malaria infection. And there is low knowledge about transmission of malaria by mosquito. There is also limited knowledge about other Malaria preventive measure (105) (107).

### **3.2.3. Malaria Diagnosis and Treatment**

Two types of diagnosis for malaria provided in current situation in Afghanistan are microscopic and clinical assessment. More than 80% of malaria reported cases are diagnosed through clinical assessment. Microscopic diagnosis provided by public and private clinics and hospitals and clinical diagnosis provided by health workers or informal in the household.

In the public sector microscopic diagnosis is only available at CHC and hospitals while BHCs and Health Post (HP) which are easy to access in some areas do not have microscopic services and diagnosis are most likely to be by clinical diagnosis without laboratory confirmation. In my observation during my work with NMLCP from BPHS implementer's clinics, there is only one lab technician for all kind of microscopic diagnosis. Due to workload and high number of febrile patient for malaria diagnosis, they cannot address all patients properly. Also Leslie et al. (108) in his study on the private sector in

Afghanistan found that more than 70% of health facilities have only one lab technician.

At the high level (CHC and Hospitals) which currently provide laboratory diagnosis, requires a high degree of training to identify malaria parasite species level (109). The private sector has a significant role in health care delivery in Afghanistan and the majority of people are using private sector services. Therefore efforts to improve standard diagnosis in the public sector will be with limited effect as high proportion usage is in the private sector (110). Even all estimation shows the high proportion use of private sector, but still there is no data about accuracy of diagnosis or adherence to the result. But 50% of lab technicians in Afghanistan never had formal training and willingness in participation in the training on malaria diagnosis and control was found high among public and private sectors providers (108). In endemic area, almost all private sectors are providing malaria microscopic diagnosis. RDT is hardly used (111). As Use of private sector for diagnosis and treatment of malaria is high, efforts are needed to strengthen both public and private sector.

Although there is no clear information about the percentage of home based diagnosis and treatment but it seems to be very low; on base of recent study high percentage of people seeking care in public and private sector than home base diagnosis (110).

After the first finding of anti malaria drug resistance in Afghanistan in 1989, treatment failure rate of Chloroquine and Amodiaquine on *P. Falciparum* (PF) has risen more than 60% in all over of the country and very high rate 90% in Nangarhar province (112).

Sulphadoxine-Pyrimethamine (SP) still remains effective against PF and Chloroquine is effective against plasmodium Vivax (PV) (113). Combination of Artesunate and SP is an effective drug on PF and this is a suitable choice for the first line treatment of uncomplicated PF malaria. Beside the clinical effect of SP+ Artesunate, it has potential to reduce the development of resistance against SP and decrease transmission of PF malaria (114).

According to National Malaria Treatment Guideline, confirmed PF malaria cases should be treated by ACT (SP/AS), suspected cases treated by CQ/SP, and confirmed PV cases by Chloroquine and severe malaria cases treated by Artemether or quinine. However evidence shows that these protocols are not followed universally.

The reason why Malaria Treatment Protocol is not being followed properly (90) (115) (108):

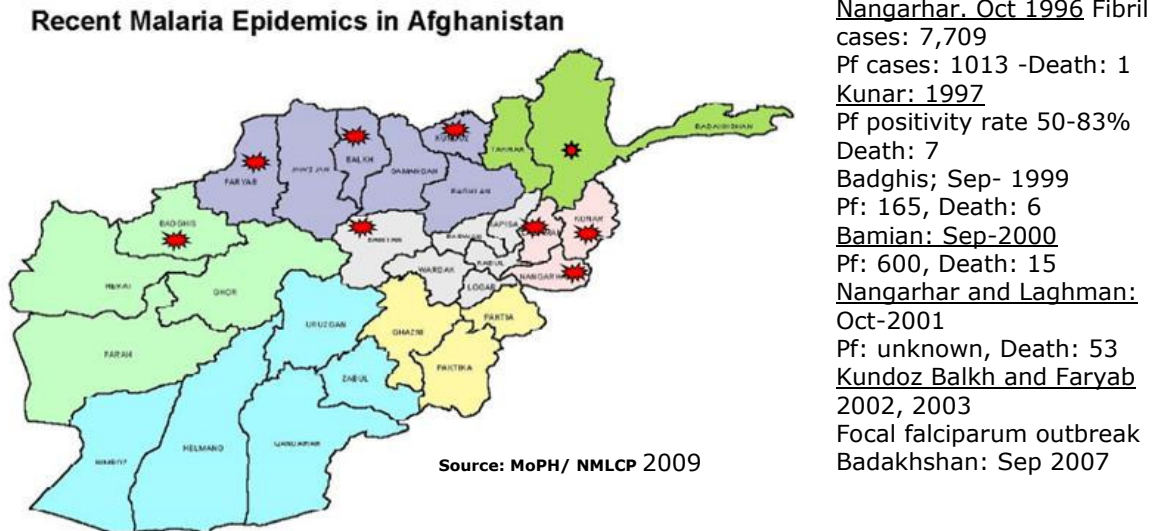
- Clinical diagnosis: in current situation in the country due to low availability of diagnostic centers at health facilities level, most of Malaria cases diagnosed presumptively and treat by SP and CQ which they may receive wrong treatment due to misdiagnosis.
- Low availability of lab facilities in public and private sector providers
- Incomplete knowledge of lab technician in correct diagnosis
- Low knowledge of provider about drug resistance in Afghanistan and National Treatment Protocol
- Some of the providers may know about treatment protocol, but they don't have access to drug (ACT).
- Low knowledge of people about Malaria, distribution of drug directly from pharmacy and seeking treatment outside health facilities.

All above problems like, gap in knowledge about malaria in private sector providers, unavailability of ACT ,Poor malaria treatment especially PF which is not adhered to policy guideline, treatment of suspected cases by SP/CQ according to treatment protocol, unregulated pharmaceuticals market through uncontrolled service provision is contributing to drug resistance in the country (108).

#### **3.2.4. Early Epidemic Response**

Malaria transmission in Afghanistan is seasonal and of mostly low endemicity; this is the cause for low level of immunity in population. Afghanistan is an epidemic prone country; poor accessibility of people to health care, weak health system, ecological change due to current drought and floods, frequent population movement due to past and current conflict is the major cause of it. As mentioned above, endemic areas are limited to areas below 2000 meters above sea-level, but it is possibly due to huge population movements ("imported") and conflict. Epidemics have been known to occur at higher altitudes and it is more likely to be a mix of PV and PF malaria, PF malaria being the main cause of mortality (91). In year 2000 malaria epidemic occurred in the high altitude (2250-2500m) in Bamian province which is the central highlands of the country; malaria mortality in this epidemic was associated with PF and 90.5% cases was confirmed PF (116). Also in recent years, an epidemic has occurred in Afghanistan in which PF was the main case of mortality. The epidemic occurred in below mentioned province of Afghanistan.

**Figure 8 Recent Malaria Epidemics in Afghanistan**



Malaria epidemic detection and control is included in National malaria control program strategy for all 3 strata (11). Surveillance system for malaria in collaboration with health management system is an important element of the strategy. While existing HMIS have not provided more information about malaria only there is some information about case management and principally designed for BPHS. It is due to lack of human recourse, weak system, limited capacity and expertise in human resource. The early warning system is not absorbed in HMIS (91). It must be known that, even though the sentinel system can give information about the trend of disease, it will not provide the information of a local outbreak, which could occur in the area beyond the sentinel site. Due to this reason it is necessary to have regular monitoring from health facilities. In Afghanistan, providing microscopy diagnosis to differentiate between PF and PV malaria is very difficult when outbreak is far from a health facility.

In this situation, use of RDT should be more under consideration. Unfortunately in current malaria control program still RDT is not available. Mostly those RDT, which is specific to differentiate between PF and PV, is less accessible. PF-specific RDT can be used during the course of outbreak.

During the outbreaks, reduction of Malaria positivity rate over time may indicate that outbreak is already under control. On the contrary, increase in positivity and proportion of malaria cases is an alarm of outbreaks.

To early detection of epidemic, information about Malaria positivity is very important. To collect this information, having active surveillance system, community access to health facilities and regular communication with health



facilities are necessary (117). In current situation of Afghanistan all of aforementioned factors are still weak (93) (91).

Implementation of IRS during the outbreak is recommended by WHO/ RBM by Early Epidemic Response (EER) team. Based on my observation, In Afghanistan still there is no proper EER team. Also, IRS is not incorporated in malaria strategy plan and still there is not enough stock of Insecticide for IRS to proper response in epidemics.

Although mostly outbreaks occurs in transmission season in the months of April to May and September to November, experience shows that epidemics mostly occur until mid December (118). Therefore outbreak response should be always a priority for provincial malaria control program.

Collaboration between the stakeholders to improve prior preparedness for response is necessary at any time of the year. All these above contributing factors need to be addressed by a functional and authorized epidemic response team and intersectoral collaboration which still weak or unavailable.

### **3.2.5. Program Management**

Due to very high burden of disease that affect the health and economic development of the nation, the MoPH and NMLCP have endorsed the Global and Regional WHO/ RBM strategies and Millennium Development Goals (MDGs).

The overall Goal established for the recently approved National Malaria Strategic Plan 2008–2013 (NMSP) is "To contribute to the improvement of the health status in Afghanistan through reduction of morbidity and mortality associated with malaria" (11).

#### ***Main components of National Malaria Strategic Plane (NMSP)***

- Case Management; prompt and reliable diagnosis and effective treatment
- Application of effective preventive measures in the framework of IVM with a focus on ITNs
- Detection and control of malaria epidemics
- Strengthening of the health system and malaria control program
- Malaria control and border areas
- Monitoring and evaluation
- Operational research

In 2008, there was US\$ 7,785,075 provided by Global Fund (GF). It was for malaria control program for strata first provinces and committed to provide US\$ 15,043,320 over next three years MCP for first strata province in

second phase of Round 5 project (12). Also collaboration between MoPH and RBM has been initiated to ensure the technical assistance provided.

Although program data management has been integrated to BPHS, a full implementation of the program is still in progress. Sustaining high quality of service is a challenge under the current condition.

Disease control program data management integrated into the MoPH health information system is still insufficient. There is the need for additional program specific data to adequately monitor and assess the performance of the program, particularly from NMLCP.

Even though malaria was included in the weekly report of Disease Early Warning System, on base of my observation during my working time with HNI and NMLCP, there is no routine malaria specific surveillance since 2003.

Population based survey has been conducted by the monitoring and evaluation department of MoPH, but malaria indicator is not included yet (11). Still there is a communication barrier at all levels and it is difficult to resolve it. Frequency and geographic coverage of quality assurance and supervision in the recent years are very limited. NMLCP mainly focuses on the Stratum 1 provinces health facilities while there are reports of cases increasing from strata 2 province also. Limited transport and low travel allowance for technical staff has made a significant problem to conduct supervisory visits and monitoring (91).

## **CHAPTER 4: DISCUSSION AND RECOMMENDATIONS**

### **4.1. The urgency to increase the ITN coverage**

ITN is the most important and effective component of malaria control in the world. It is proved to be effective in reducing the malaria incidence, anemia, morbidity and mortality in both stable endemic conditions and in seasonal malaria. It also has relation to reduction of the low birth weight and to increasing of the child survival. Improving access of the community to ITN is very important.

Currently the coverage of ITN in Afghanistan is low. This is one of the key contributing factors to current high malaria incidence in the country. The major barrier to low use of ITN is its limited availability, accessibility and low affordability due to low socio-economic conditions. Although the poor people are willing to buy ITN, a highly subsidized price is still too expensive for them to afford. However, if the free distribution policy is to be put in place, the sustainability of the program will be under question. Distribution of ITN through one NGOs and unavailability of policy to increase the role of the private sector is the reason for low access for ITN. As the studies found, social marketing of ITN was implemented by Heath net, and it worked well in the past. However in current situation of Afghanistan the management of the ITN distribution is no longer transparent.

Also the study found that some of the people are not being convinced about ITN. They are not sure that ITN is useful for Malaria prevention.

### ***Recommendations***

- Improving the ITN distribution and adaption of ITN as the main preventive measure is very important to increase the ITN coverage. It is important to utilize the private sector. Because they are wide spread and they are all over. It is needed to improve the Social marketing of subsidized ITN through private sector. That will lead for better access of people for ITN
- Ensuring the accountability and proper reporting system from private sectors, it is need to support the development of policy for them. This policy should support the strategy to distribute the ITN to remote area living inhabitants by expanding the role of distributor organizations.
- Planning a program which is affordable for poor people with highly subsidized program in order to achieve higher coverage. It can be done by targeting the most endemic area and the most at risk

- populations especially for malaria positive people who are diagnosed at the public health center.
- Expanding the ITN targeting pregnant women and under 5 years old children by the free distribution strategy through ANC and MCH clinics
  - Provision of community education programs to increase their knowledge about the prevention of Malaria by using ITN.

#### **4.2. Filling the gaps to achieve reliable diagnosis**

Studies showed that timely reliable diagnosis of malaria is a key element in malaria control program which mainly depends on provision of good quality service and improving the health seeking behaviour.

Correct and early diagnosis can lead to effective treatment and reduce the severity of malaria. It will also increase the diagnosis of other illness, which can be mistakenly diagnosed as malaria. In addition, correct diagnosis will reduce the cost of health and economic of people. Prompt and correct diagnosis will lead to better control of malaria in emergency circumstances. Correct diagnosis will increase the effectiveness of treatment, reduce the transmission and prevent the death due to PF malaria.

In Afghanistan the majority of the people use private sector for diagnosis. Lab technician in public and private health facilities are very limited, and those seem to be a major problem exists. To date, the system to monitor the accuracy of diagnosis is not available. Even though there is not enough data on the capacity of the lab technician in the country, the majority of lab technicians never attended the formal training. It reflects the low capacity to make a correct diagnosis among the lab technicians. Although the microscopic diagnosis in general has high sensitivity and specificity. However it was done by unqualified lab technicians in Afghanistan. Unavailability of diagnostic service at the BHC and HP and the lack of resource in the basic health facilities are the reasons for low access for diagnosis facility.

Studies on Rapid Diagnostic Test show that RDT is easy to use, has low cost, and well accepted by community and health workers. It is very effective on reducing delay for treatment. However, it is still not incorporated in Afghanistan Malaria strategic plan for BHC and HP.

Studies have shown that the clinical diagnosis is highly effective in high endemic areas (like Africa). It helps to avoid severity of the disease. However, in the low endemic areas this method is not as effective as those in the high endemic areas; there is a high chance to miss diagnose.

The majority of diagnosis method in Afghanistan is on clinical base. It was found that the number of lab technician in public and private sectors facilities were not enough to Malaria proper diagnosis. Study indicates that

diagnosis needs trained person in the endemic area. But in Afghanistan, the low knowledge of providers in low endemicity affects the quality of diagnosis.

### ***Recommendations***

- Development of private sector policy to improve the capacity of private sector on conducting the correct diagnosis as well as the reporting system.
- Improving the quality of diagnosis through basic and refresher training for public and private lab technicians.
- Development of private sector and establishment of reporting system at the private health facilities.
- Improving the access for diagnosis. It is needed to establish new diagnostic centers at BHC and HP level. This is to be incorporated in the next BPHS policy through NMLCP
- Increasing the number of trained lab technicians in health facilities and hospital to improve malaria diagnostic service
- Establishment of microscopic diagnostic centers at the BHC level
- Train the CHW on RDT use and to provide RDT at the HP level so that CHW will be able to use rapid diagnosis
- Establishment of regular quality control system through regular cross checking of examined slides done by public and private facilities
- Promote the use of parasite-based diagnosis than clinical diagnosis in the diagnostic guidelines
- Further investigation to increase the lab technical capacity in the public and private sectors.

### **4.3. Provision of correct treatment to reduce malaria burden**

Malaria treatment is an important part of the RBM strategy to save the people lives (68); drug resistance is a big threat on Malaria effective treatment in Afghanistan especially the resistance of PF Malaria against CQ and SP (69). PV Malaria has been a considerable problem in world in term of its mortality and relapse. More than 50% of PV cases occur out of Africa and majority of malaria morbidity in Asia is due to PV (71), (72). Application of 8 weeks PQ is effective to reduce the PV morbidity in Afghanistan. Those application will also reduce the reservoir of parasite and it is safe without having to test the G6PD (74), (73). To reduce the severity and mortality due to PF malaria WHO recommended ACT. Application of ACT is the best treatment with highly effective, with less chance of resistance and failure (77). Even though in some part of world anti malaria drug will be available, it is necessary to consider better delivery of drug to the patient (81). Improving the capacity of public private physician, CHW, pharmacist, and mothers is very effective on provision of correct treatment. It will reduce the burden of disease as well as child mortality (82). Study found that provision

of radical treatment through trained CHW especially in remote area was beneficial in reduction of malaria morbidity and mortality (54), (64), (119).

Although, Afghanistan NMLCP program is trying to provide better treatment, improve access for treatment, there is still a lot of problem exists like:

- Treatment failure by using *CQ* against *PF* is 60% in all over the country
- There is gap in malaria treatment guideline. Suspected Malaria cases have been treated by *CQ/SP* combination therapy. Since there is already *PF* resistance against *CQ*, application of *CQ/SP* combination will contribute to drug resistance against *SP*, because that combination application will work like a monotherapy. This is a threat because gradually the *PF* will develop resistance against *SP* too.
- Low knowledge of Public Health Care Provider (PHCP) about NMLCP treatment, diagnosis and malaria reporting guidelines, which are leading factor to wrong diagnosis, wrong treatment and finally drug resistance and other complication of malaria
- Unavailability of ACT in private and BPHS health facilities and low access of providers for existing treatment protocol
- No referral system in public and private health care providers
- No specific role of CHW in provision of radical treatment
- Treatment for *PV* relapse is not included in malaria treatment guideline

### **Recommendations**

- Development of private sector policy in terms of malaria control, by the MoPH
- Improving the access of health providers to National Malaria Treatment Protocol
- Improving Malaria diagnostic centers to be able to identify *PF* cases so that the treatment would be arranged as parasite-based diagnosis. In this case the chance of resistance will be reduced.
- Improving the capacity of public and private providers which included: physician, CHW, pharmacist through formal basic and refresher trainings regarding malaria case management and control
- Regular monitoring of availability of ACT and proper supply of anti malaria drug and ensuring the treatment unity.
- Development of comprehensive referral Malaria Guideline for public and private health care providers
- Incorporating *PV* relapse treatment in National Malaria Guideline
- Increase the capacity of CHWs
- Involvement of trained CHWs in Malaria diagnosis and treatment through provision of RDT and radical treatment

#### **4.4. Other gaps to improve the Afghanistan Malaria Control Program**

Beside the three major gaps I mentioned above, I found the gaps in most malaria control practice in Afghanistan. Those are:

1. **No active malaria awareness program.** The very limited awareness programs had lead to a very low level of knowledge among the people and affect the treatment seeking behavior. It was the main reason to low use of ITN, the low knowledge of women to use IPT and the low community participation to implement different kinds of preventive intervention measures.
2. **No active Early Epidemic Response Team and surveillance system in place.** Seasonal transmission of malaria in Afghanistan, low endemicity, poor immunity of people, poor access to health care, internal displaced population and migration, drought and flood, all together has made the country as epidemic area. Early epidemic response in Afghanistan is an important component of NMSP. However, there is no authorized and not well equipped epidemic response team. To respond the epidemic effectively, there is a need to have regular monitoring system to predict the severity of impact and transmission, the transmission time, and the trend of malaria morbidity. Those data can be collected from the health facilities. However, all these measures of epidemic control in Afghanistan are very weak.
3. **No special intervention included in strategic plan for environment control program.** Poor or not having environmental malaria control measure make the situation suitable for mosquitoes breeding and lead to high transmission and high mortality. Different methods of effective environmental control found to reduce malaria burden in the country. A study found the relationship between malaria and pooled water like rice land and existence of vegetation along the river and stream (27). Proper irrigation system and construction of specific water reservoir were found to be an effective environmental control measure. To address malaria problem by applying better environment control needs a clear strategy with strong support. But still there is no specific intervention strategy for environment control exists in Afghanistan; and the role of Government and community based organization is very limited in malaria environment control.
4. **Low capacity to manage the vector control program.** Vector control through IRS has shown it effectiveness on reduction of malaria morbidity and mortality. Fifty years spraying by DDT and its other alternatives is still effective in malaria control and still recommended by WHO (37). The policy is accepted by international organization due to burden of malaria. The effect and acceptably of IRS has been

studied in Afghanistan and Pakistan. It was very effective during the whole transmission season (38). Even though it is very effective method, in current situation of Afghanistan because of its requirements like; human resource, transportation, management, resources, and long term sustainability is not applicable in Afghanistan. Also it is not included in NMSP and Global Fund budget for Malaria. Other vector control measures like larvaciding and repellent effectiveness in Malaria control has been proved by lots of studies but the application of them are still questionable.

5. **Not include IPT in the Strategic Plan.** IPT is not implemented as malaria prevention method in Afghanistan yet. However, it is very good method for prevention on reduction of maternal death, low birth weight and anaemia which associated with PF malaria. It is also reduce the risk of congenital malaria due to PV (33). The perception of IPT among the pregnant women was found to be low and they were not interested to take medicine during their pregnancy period. It could be the result of not having IPT program at the health facilities especially in ANC clinics. The other reason for low visit of women from ANC was that they are disallowed by their husband, poor economy condition, and lack of transportation means.
6. **No regular systematic monitoring and evaluation in place.** This problem is due to lack of transportation available, insufficient resources, inadequate qualified staffs at the national and provincial level, low motivation and insecure condition.

The underlying common cause of the above mentioned gaps are the incomplete and poor implementation of malaria strategic plan. These gaps lead to conclusion to pay more attention toward monitoring of program implementation so that the NMSP targets can be achieved. It is necessary to employ participatory mid-term review which will be in year 2010. Further feasibility studies are necessary from other aspects of malaria control measures which still not included in NMSP.

### ***Recommendation for addressing other gaps of malaria control program***

- Development of health education strategy including Malaria to improve the knowledge of community
- As study result showed IPT use is not necessary in current situation in Afghanistan, because of its low acceptability and low relation of malaria with anemia among women (101). But the IPT can still be effective in the area with high prevalence of malaria and also during the epidemics especially during the PF season. More research needs to be done prior to implementation of IPT in the future NMSP



- ITN can be adopted as preventive measure for pregnant women and distribution through ANCs
- Increasing the awareness of pregnant women to use ITN as an important preventive tools
- Involvement of male participation in the community to increase their awareness on health problem and seeking behaviour. This is important because as the head of household they are the decision makers in relation to the health of their children and wives, especially in poor families
- Regular monitoring from trend of disease from health facility and beyond them to detect epidemic
- Establishment an authorized and functional EER team and provision of unified malaria epidemic threshold chart in all health facilities and beyond
- Recognition of sign and symptom of malaria is important in epidemic control that can be achieve through regular awareness program
- Strengthening and incorporation of malaria indicators in current HMIS system
- Even though studies show that implementation of IRS, Repellent and use Gambusia fishes and other environmental control measure was very effective, but in unstable political current situation is not possible to implement sufficiently. Feasibility studies are needed prior to the implementation of these control measures. Encouraging community and giving information about simple environmental control is possible to incorporate in the information education materials.
- It is necessary to address the existing difficulties on monitoring. To measure process indicators it should be carried out at all levels. It is very important to ensure the implementation of the program, including its accountability. A midterm evaluation is necessary to focus on the achievement of existing indicators so far.
- Building the close collaboration between MoPH and Ministry of Agriculture, Office of Meteorology and other related stakeholders to improve sanitation and irrigation system which consider Malaria control measures.

Malaria Control program in Afghanistan may still face the gaps. However those gaps can still be resolved to reach better health status. To reach this goal a political sustainability and harmonized strong surveillance system are required. Government initiatives and resource mobilization should be encouraged to establish financial support. Building the capacity of public and private providers as well as the national to malaria control program especially provincial NMLCP is very important. Intersectoral collaboration is important. It needs to share the importance of malaria control programs with all stakeholders. Regular communication and sharing information should be arranged through the NMCP.

## **CHAPTER 5: CONCLUSION**

This thesis aims to identify challenges in Afghanistan national Malaria control program implementation. Based on the discussion, the main conclusion is that there are gaps in all areas of implementation. Three most important findings are related to ITN, diagnosis capacity and provision of treatment. In order to improve the Malaria control program implementation, addressing those three findings should be prioritized.

Addressing the issue of low ITN coverage level is very important to prevent new infections and to suppress the reservoir of parasites. A policy to support expanded distribution is needed to improve the coverage over the country. The priority should be given to people living in highly endemic areas, pregnant women and children under 5. The role of the private sectors should be increased to improve the full access of ITN coverage through social marketing. A highly subsidized strategy has to be targeted to the people living in the endemic areas; while a free distribution strategy targeted to pregnant women and children under 5.

Low capacity to diagnose Malaria is one of the main gaps in delivering the correct diagnosis. The problem in human resources includes low capacity of lab technician, CHWs, Physician and Pharmacist. The lack of diagnostic centers especially in BHC and HP level reduce the accessibility of the community to access correct diagnoses. To address the existing problems, improve access through establishment of new diagnostic centers with qualified lab technician. To increase the accessibility of the community, capacity building has to involve both public and private sectors.

To increase the quality of treatment the availability of treatment and referral guideline is to be prioritized. As PV relapse cases are common in Afghanistan, there is a need to incorporate the relapse treatment in the national treatment protocol. In current treatment protocol, suspected Malaria cases are treated with SP and CQ. While 60% of Malaria PF cases are resistant against CQ, Malaria treatment protocol should focus on the parasite-based diagnosis than presumptive treatment.

In conclusion, in order to better implement the National Malaria Strategic Plan in a more effective manner, it is important to increase the political commitment, strengthen the surveillance system, build the mechanisms to insure program sustainability and improve the resource mobilization.

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