CHAPTER 2

Literature Review

There are many research articles and current documents of different countries relevant to this study. For adoption and adaptation of ideas and knowledge to facilitate this study, there will be general selection and critical reviewing of the original literature. This will be briefly mentioned as (i) burden of malaria (ii) costs and control(iii)rapid on-site diagnosis (iv) willingness to pay, and (v) treatment seeking for malaria.

2.1 Burden of Malaria

"Up to this moment, the story of control of malaria is still in mid chapter. After decades of what may be described as heroic international efforts to conquer the disease, the WHO dictated pathway of changing semantics each decade since 1930: from control to eradication to consolidation, then resurgence to chaos to hope. Whether the designation hope is justified at this juncture depends in large measure on how we tackle the underlying economic scene. Economics is on center stage in the drama"(Indaratna and Kidson,1995a).

Similar points are made by Pornchaiwiseskul(1993) that the number of cases and deaths prevented is the primary criterion of disease control effectiveness. An economic return on disease control has not been a key criterion in designing or planning a disease control program because of difficulties in valuing human life and human health in economic terms. The cost per case or per death prevented will get higher when mortality and morbidity rates are lower. His theoretical framework also demonstrates that disease control directly reduces the number of cases and the number of deaths which will, in turn, increase overall economic income. Labor loss is the direct consequence of morbidity and mortality. However, it is more than man-days of labor that will be lost. Human capital, such as labor skills, which have been accumulated over the years will also be lost.

2.2 Costs and Control

Carrin and Kodjo (1995) elucidated the crucial importance of macroeconomic parameters, such as the rate of depreciation, interest rate, changes in the exchange rate between the national currency and the currency rate of the country of origin in determining the wear and tear of the equipment and materials. They point out that as a result of this wear and tear, the life time of this equipment is finite and it must than be renewed. They focus on determination of the depreciation rate or amortization.

Mills (1993) has reported a study of malaria control in Nepal. In her study, she points out that cases prevented, deaths prevented, days of healthy life gained and discounted days of healthy life gained are appropriate effectiveness indicators. Regarding the costs of malaria control, the author elucidates two main categories: those falling on the government, and those falling on the patient. Creese and Parker(1994) mention five steps that are required for every cost-effectiveness analysis. They involve:(i)defining the program's objectives;(ii)identifying the possible ways of achieving those objectives;(iii) identifying and measuring the costs of each option;(iv)identifying and measuring the effectiveness of each option; and(v)calculating the cost-effectiveness of each option and interpreting the results. They also point out the need to make assumptions about some variables whose exact value is uncertain. To deal with this kind of uncertainty for a particular assumption, it is necessary to define a plausible range of values for the variable, or take the best estimate. The process of testing how changes in assumption affect changes in results is called sensitivity analysis.

According to Shepard and Ettling (1991), the total cost of malaria in Rwanda in 1989 is $:$0.63 in direct costs and $2.25 in indirect costs and per capita daily output is $0.83. Thus, the cost of malaria represents 3.5 days of individual production. Based upon their household survey, Sauerborn, Shepard and others (1991) mentioned that out-of-pocket expenses of $0.82 are required for mild episodes, of which $0.11 is travel cost and 0.71(87%) is the cost of drugs. Severe cases incur average costs of $4.21, of which $0.72 is travel and $3.49(83%) drug costs. They also pointed out that only 12.55 of mild episodes and 54.3% of severe cases are treated by professional services. The average cost to the health system of each of these 207 cases is $1.10. One of

their suggestions is that to shorten the duration of disease by administration of immediate and effective treatment will reduce the cost of malaria substantially.

Locally appropriate malaria control must be developed, with more emphasis placed on organizational, economic and cultural aspects. Innovative cost-effective malaria control measures should be sought by communities as part of a primary health care strategy (Kamolratanakul, 1993). Early diagnosis and prompt treatment(EDPT)of malaria may reduce the suffering of the patient and at the same time it may also reduce the chance of transmission of the disease to his family members, to his community, to his society and even to the nation as a whole. Thus EDPT for malaria not only benefits the patient but also the community as a whole, ie.positive externalities(VBDC, DOH, Myanmar, 1995).

2.3 Rapid On-site Diagnosis for Malaria

According to WHO (1995a), the recently developed rapid dipstick antigen capture assay can be completed in less than ten minutes and many can be done simultaneously, reducing the time required for the results to be made available to support the clinical diagnosis. Also the said test requires minimal training and can be carried out by relatively unskilled staff. Both the specificity and sensitivity of this test when measured against current *gold standards* are generally around 90%. A potential problem with this is that circulating antigen may be detected after elimination of viable parasites from the blood stream. Thus, WHO suggests that treatment should be based on clinical criteria supported by laboratory findings and not on laboratory results alone. The range of sensitivity and specificity of the dipstick assay is as shown in Table 2.1.

Table 2.1   Results of Field Trials of Rapid Dipstick Antigen Capture Assay

Site of test	% Sensitivity	% Specificity	%PPV*	%NPV**
Tanzania	87.7	88.8	89.0	87.5
Kenya	86.2	86.6	84.0	88.4
India	92.7	92.5	84.7	96.6
Sri Lanka	86.7	97.7	83.9	98.2
Thailand	93.4	98.2	95.5	97.6

Source: World Health Organization(1995)
Note: * Positive predictive value
        ** Negative predictive value

According to the findings of an adult field study and a child field study in Saradidi, western Kenya, and an experimental challenge study in the USA, Hoffman and others(1994) point out sensitivity of dipstick assay in relation to level of parasitaemia(Table2.2-2.4).

Table 2.2   Sensitivity of Dipstick Assay by Level of Parasitaemia in Adult Field Study

Parasites/μL	Sample positive by dipstick	Sample positive by blood film	(%) Sensitivity
1-10	3	27	11
11-60	63	86	73
61-100	3	3	100
101-500	5	5	100

Source: Hoffman et al (1994)

Table 2.3   Sensitivity of Dipstick Assay by Level of Parasitaemia in Child Field Study

Parasites/μL	Sample positive by dipstick	Sample positive by blood film	(%) Sensitivity
1-10	9	23	39
11-60	17	21	81
61-100	14	16	88
101-500	57	57	100
501-1000	12	12	100
1001-5000	17	18	94
>5000	11	12	92

Source: Hoffman et al(1994)

Table 2.4   Sensitivity of Dipstick Assay by Level of Parasitaemia in Experimental Challenge Study

Parasites/μL	Sample Positive by dipstick	Sample positive by blood film	(%) Sensitivity
1-10	2	3	67
11-20	2	3	67
21-40	4	6	67
41	1	1	100

<u>source</u>: Hoffman et al(1994)

Hoffman and others(1994) elucidated that when *P. falciparum* asexual parasitaemia is greater than 60 parasites/μL the dipstick test is 96.5-100%. At lower levels of parasitaemia the sensitivity decreases; however, at 11-60 parasites/μL the assay still detects 70-81% of infections, and at 10 parasitaemia/μL or less the assay detects 11-67% of infections. Since most individuals with symptomatic *P.falciparum* infections have greater than 60 parasites/μL, the dipstick assay will be of particular use in rapid diagnosis of febrile patients and in epidemiological field studies.

Indaratna and Kidson(1995a) point out, however that though there are some exciting technological advances in the wind, the key questions are economic ones: what cost is affordable for a simple, rapid on-site diagnostic kit that can be used at village or township level? How would the operation of such test kit compare costwise with current logistics of blood slide examination at a distance from the primary health care clinic? They also mention the many offsets including the reduced waiting time for the patient before definitive treatment, the reduced wastage of drugs currently used for presumptive treatment, the savings in morbidity and mortality reduction, the greater confidence of the community in the malaria control program, the reduced opportunity costs by way of work time lost for both patients and relatives. They highlight the point that the considerable barriers to the change from microscopy to immunotest will take time, the feeling of confidence in being able to see parasites under the microscope rather than a colored line on a paper strip is a trade off with attached uncertainty, the dependence on imported kits which require foreign exchange invokes macroeconomic policy.

2.4 Willingness to Pay

Ryan(1995) mentions that willingness to pay(WTP) technique is based on the premise that the maximum amount of money an individual is willing to pay for a commodity is an indicator of the value to him/her of that commodity. The approach has the advantage that it allows individuals to take account of all factors which are important to them in the provision of the service.

According to a study in Ghana by Lavy and Quigley (1993), the significant drop in utilization rate of health services after introduction user fees is a point to be considered. Oslen and Donaldson (1993) mention the relationship between community willingness to pay and demographic characteristics in the study in Northern Norway. They point out that the sex and education level have a significant affect on WTP for hip replacement and helicopter ambulance services but there is no significant support for the relationship between WTP and income.

A person who pays for health care is more likely to insist on value for money than one who receives it free. Reports from Zambia claim that providers of health care feel more accountable to clients who pay for their services, that this improves the quality of service and that this in turn encourages more people to use the service. In Kenya, on the other hand, it was found that the introduction of registration fees cut attendance at outpatient clinics and health centers by 38%. Evidence from Cote d'Ivoire, Dominican Republic and Peru shows that as the price of government health services goes up, the use of those services falls especially among the poor. Studies in Egypt and the Philippines point out that people are willing to pay for health services they consider to be worthwhile(WHO,1995b).

According to a study in Tanzania by Abel-Smith and Rawel(1992), outpatients are asked to assume that the waiting time is reduced to less than one hour and than asked whether they are willing to pay the charges . Their findings point out that the proportion willing to pay varied according to the level of the suggested charge. When the patients were asked whether they are willing to pay if a charge is introduced to consult a doctor, the proportion unwilling to pay increased. When the patients were asked if they will be willing to pay if the services are improved in general, about half the respondents were willing to pay. When the patients were asked whether they will be likely to choose an early morning or a late afternoon clinic for an non-emergency problem, if clinics at these times are introduced to improve the services, as many as 845 answered they will choose an early morning clinic and 165 a late afternoon clinic.

Donaldson and others(1995) mention two crucial points relevant to their study at Aberdeen Maternity. Firstly, the respondent may object to or misunderstanding of WTP questions. They suggest to be made clear to respondents that the valuation exercise is hypothetical. Secondly, the most important determinant of WTP is strength of preference rather than ability to pay.

2.5 Treatment Seeking for Malaria

According to a study in Thailand based on interviews with patients at malaria clinics and household surveys, health-seeking behavior in malaria is characterized by sequential use of multiple medical resorts including self-treatment, semi legal or illegal nonprofessional doctors (e.g.injectionists), private doctors, and government facilities including malaria clinics operated by the national malaria control program. Among the various medical resorts, self-treatment is the most preferred first treatment choice. A constellation of factors influences the treatment decisions and the pathway to the most effective facilities is variable. However, the correct symptom assessment by the sick person or his/her lay consultants has appeared to be the most fundamental(Hongvivatana, 1991).

Soe-Aung, Soe-Win and others(1994) point out that health services utilization is a multifaceted phenomenon, whereby the knowledge, attitude and practice(KAP)of the providers pertinent to diagnosis, treatment and referral and those of the consumers are of importance. In their study in Mudon township, Myanmar, they found that there was a need for re-orientation and refresher training of the basic health service staff and malaria control staff on diagnosis, initial management and referral of severe and complicated malaria, early diagnosis and treatment of uncomplicated cases malaria and logistics, requisition and management of supplies. They also highlight the importance of constantly monitoring parasite sensitivity to drugs available at the area.