CHAPTER 1

INTRODUCTION

Malaria is a communicable disease caused by unicellular-parasitic-protozoans, belonging to the genus Plasmodium. Four species of Plasmodium namely, Plasmodium falciparum (P.falciparum), P.vivax, P.malariae and P.ovale are responsible for human malaria. The disease is transmitted from one person to another by female mosquitoes belonging to genus Anopheles.

The classical clinical features of malaria are fever, headache, malaise, muscular pain, nausea, and dizziness. The fever is accompanied by cold, shivering and rigors, and fever subsides after two to three hours with a bout of profuse sweating.

Malaria remains among the four most prevalent and devastating diseases in the tropics, threatening about 40% of the world's population. It undermines the health and welfare of families, endangers the survival of children, debilitates the active population and strains both country's and people's scarce resources by excessive public health costs, low productivity and impaired growth (WHO 1993).

At present malaria control is becoming more difficult for various reasons. Among them the increasing number of new foci of intense malaria transmission as a result of changing environmental conditions due to economic development, population movement, and continuous intensification and spread of resistance to antimalarial drugs among parasites are of great importance. Intensification and spread of drug resistant malaria poses a serious threat to malaria control by resulting increased severity of disease and death, and demanding less effective, expensive drugs in place of cheaper effective drugs.

During the late 1960s, chloroquine resistance became establish in most of South-East Asia and South America and during the 1980s in most of Africa. Chloroquine resistant P.falciparum has now spread to almost all the areas with P.falciparum malaria. Resistance to sulfadoxine-pyrimethamine was reported in the late 1970s in Thailand. By 1980, drug failure rates were upto 90% and sulfadoxine-pyrimethamine was largely replaced by quinine-tetracycline for clinical purposes. Resistance to sulfadoxine-pyrimethamine has been reported from Myanmar, Bangladesh, Bhutan, Indonesia, Philippines, Malaysia and Vietnam. At present, there is an increasing trend of P.falciparum resistance to mefloquine on the Thai-Cambodian border and Thai-Myanmar border.

The resistance of a parasite population to a particular drug develops due to mutation, and the resistant parasite strains are

selected by drug pressure, mainly as a result of inappropriate treatment. Among the many factors affecting inappropriate treatment self-medication, treating the malaria cases without definitive diagnosis are of major importance.

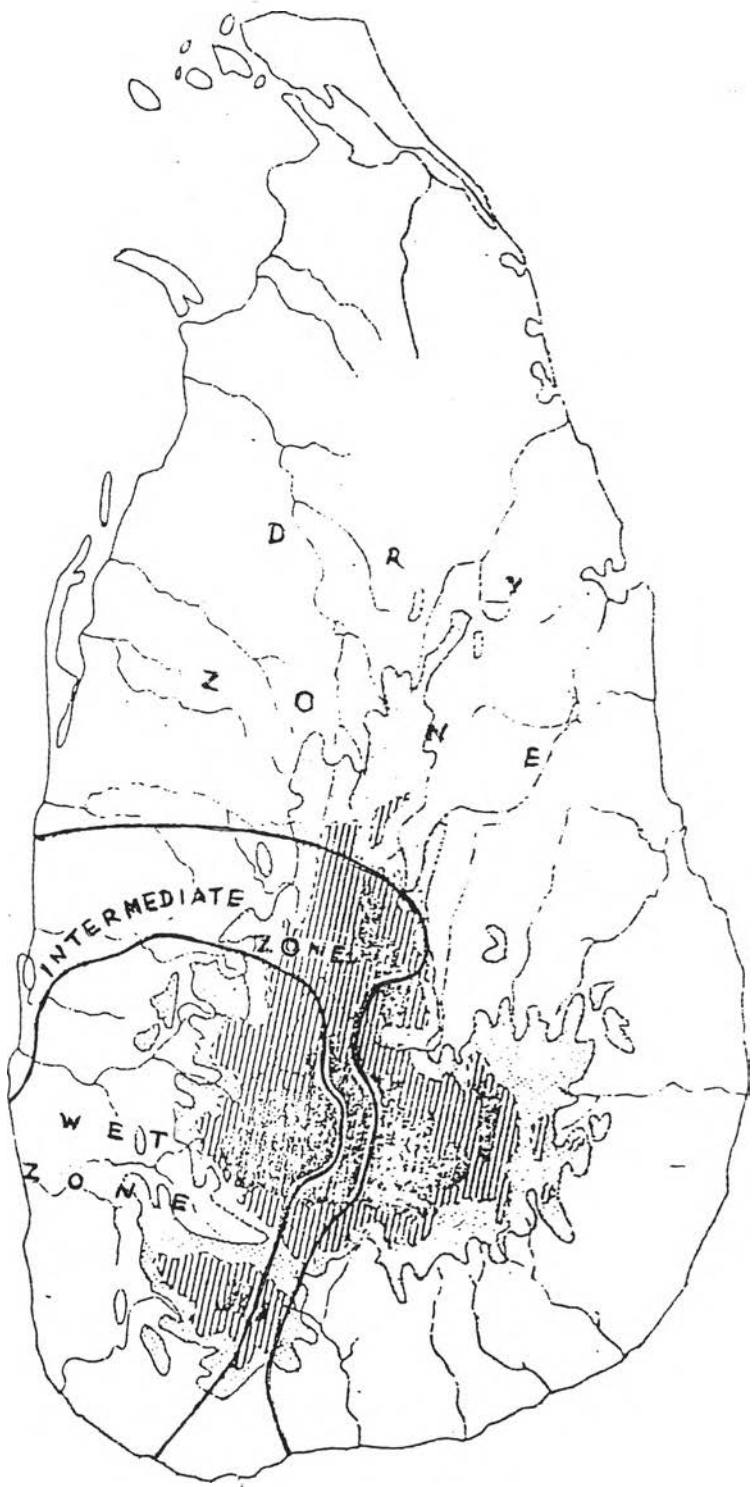
The spread of malaria to areas which were previously non malarious, and the spread and intensification of drug resistant malaria can be controlled or prevented by providing appropriate treatment. The appropriate treatment helps a great deal to control of malaria epidemics at an early stage and/or to prevent the malaria epidemics. Therefore, early diagnosis and appropriate treatment of malaria cases is of utmost importance in the control of malaria. Early diagnosis and prompt appropriate treatment is one of the four basic technical elements of the global strategy for malaria control which was implemented in 1993 (WHO 1993).

At present, the malaria control programmes in the world use microscopy for definitive diagnosis of malaria. The procedure of microscopy is given in Appendix A. Although the malaria control programmes use microscopy to diagnose malaria, a considerable proportion of malaria cases do not get on-site diagnosis by microscopy. Some of the reasons for this are insufficient resources with the provider to cover all the population with microscopy, long waiting time for the test, and the behaviour of patients in seeking care at private health facilities that rarely use microscopy. Recently, a new diagnostic test, Becton-Dickinson paraSight F test- a rapid dipstick antigen capture assay has been developed for diagnosis of malaria. The procedure of dipstick is given in Appendix B. In this test an antigen called PfHRP-II, synthesised by Plasmodium is used to detect the parasites. The differences in the two technologies are that microscopy requires well trained manpower, i.e. with about one year training, needs electricity, good quality staining procedures and microscopes and takes about 30 minutes per test. Compared to microscopy, the dipstick requires minimal training, i.e. less than one hour, uses simple procedures and equipment, requires no electricity and the test takes only about seven minutes.

By the nature of the dipstick test, it may help to improve early diagnosis and appropriate treatment. But in order to consider implementation of dipstick in a malaria control programme it is necessary to study the cost-effectiveness as compared to that of microscopy. The present study is designed to analyse the cost-effectiveness of microscopy and dipstick under the conditions in Sri Lanka, in order to see the possibilities of implementing dipstick in that country. Such type of analysis is encouraged by the fact that the island Sri Lanka also faces the similar problems of malaria control as in other malarious countries that have been mentioned earlier. The malaria epidemiology and the specific problems in malaria control in Sri Lanka are mentioned below.

The country can be divided into three malarious zones namely malaria endemic (dry zone), intermediate and traditionally non-malarious (wet zone) as shown in Figure 1.1. But the traditionally non-

Figure 1.1 Malarious Zones in Sri Lanka



malarious zone too is subjected to periodic outbreaks/epidemics of malaria during drought periods with the introduction of malaria parasite to this area through migrants (Wijesundera 1988; Wijesundera 1992; Kusumawathie 1995).

Despite the considerable efforts to control malaria, malaria is a major public health problem in Sri Lanka and is one of the major causes of hospitalization (MOH 1993). The slide positivity rate (SPR) is between 28.6% and 19.9% and the annual parasite incidence (API) is between 23.2 and 15.3 per thousand population for the years from 1991 to 1994 (see Table 1.1). A considerable portion of the health budget is spent on malaria control annually as shown in Table 1.2.

There are only two parasite species, i.e. P.vivax and P.falciparum present in Sri Lanka. The percentage species prevalence is P.vivax 80%, and P.falciparum 20%. The only proven vector of malaria in Sri Lanka is Anopheles culicifacies (James and Gunasekera 1913). According to recent studies several other anopheline species have been incriminated as vectors of malaria in Sri Lanka (Amarasinghe and others 1991, 1992; Ramasamy and others 1994). However, the importance of the role played by them in the epidemiology of malaria in the country is yet to be established.

Chloroquine resistance among P.falciparum infections was first detected in Sri Lanka in 1984 (Ratnapala and others 1984). At present, there is a growing population of P.falciparum malaria at RI, RII and RIII resistance to chloroquine (Kodisinghe and Mendis 1993; AMC records). In 1992, a P.falciparum case resistant to chloroquine and to sulfadoxine-pyrimethamine was detected in Sri Lanka (Handunnetti and others 1994). The emergence of drug resistant malaria will be a serious threat to malaria control.

The National Malaria Control Programme (NMCP) in Sri Lanka uses microscopy for definitive diagnosis of malaria cases. There are two types of services providing microscopy. (1) There is a microscopist at the point of service (government hospitals and dispensaries). In this case, the blood slides collected from suspected malaria patients at these institutions are examined at the point of service and the patient get the appropriate treatment. (2) In the second case, there is no microscopist at the point of service. The blood slides are collected from suspected malaria cases and sent to the respective regional laboratory for examination. The blood slides and the results of blood slides are delivered by post. It takes about two weeks to receive the result of blood slides by the blood filming agent. In this case the patient is treated on clinical grounds. Therefore, the patient may or may not treated appropriately for malaria at this type of service. Many of the public hospitals and dispensaries in malaria endemic areas and some selected medical institutions in the intermediate and traditionally non-malarious zones are provided with microscopy at the point of service as type 1. The rest of the medical institutions have no microscopy at the point of service due to non availability of sufficient resources with the malaria control programme or due to low output of blood slides at these medical institutions.

Table 1.1 Incidence of Malaria in Sri Lanka 1991-1994

Year	No.of malaria cases (thousands)	SPR[a] (%)	API[b] (per 1000)
1991	400.2	28.6	23.2
1992	399.3	25.6	22.8
1993	363.1	24.2	20.6
1994	273.4	19.9	15.3

Source: Administration report of Anti Malaria Campaign, Sri Lanka (1991).
Director, National Malaria Control Programme, Sri Lanka (1995). Personal communication.

a. SPR = Slide positivity rate
b. API = Annual parasite incidence

Table 1.2 Total Anti Malaria Budget and the Percentage of Total Health Budget Spent on Malaria in Sri Lanka for the Years 1985-1991

Year	Total budget (millions, Rupees)	Percentage of total health budget
1985	323.7	17.9
1986	326.3	15.0
1987	282.1	9.7
1988	425.8	14.8
1989	434.6	11.6
1990	269.3	7.9
1991	319.9	8.0

Source: Administration Report of Anti Malaria Campaign, Sri Lanka (1985-1991).

As a result of non availability of microscopy at the point of service in a considerable proportion of medical services where that service is needed, a significant proportion of malaria cases may not receive accurate on-site diagnosis in order to provide appropriate treatment. Apart from this, a considerable number of malaria patients seek treatment at private health facilities irrespective of free public health facilities (Mills 1995; MOH 1993; MOH 1995; Kusumawathie 1995). Since only a few of the private health facilities use microscopy in order to diagnose malaria, the majority of these malaria cases are not diagnosed accurately and not treated appropriately. The inappropriate treatment of malaria cases may result in drug wastage, acceleration of development and spread of drug resistant malaria, repeated attacks of malaria and malaria outbreaks in traditionally non malarious areas (Wijesundera 1988; Fernando 1994; Kusumawathie 1995).

These facts stimulated consideration of the use of dipstick for diagnosis of malaria in Sri Lanka. In order to make decisions for implementing dipstick in Sri Lanka as a supplement to microscopy or in place of microscopy both within public and private sectors, the cost-effectiveness of dipstick as compared to microscopy will be very useful to the policy makers and the private health sector. Therefore, this study is designed to assess the cost-effectiveness of microscopy and dipstick in diagnosis of malaria in Sri Lanka. In order to achieve this objective, four research questions have been constructed. The research questions, general and specific objectives of the study are mentioned below.

Research Questions

1 What is the treatment seeking pattern of malaria cases? Where do they go for treatment? What proportion of population use a particular service? Why do they prefer a particular service? How much do they pay for service?

2 What would be the effectiveness of microscopy and dipstick in diagnosis of malaria?

3 What would be the total cost to the public and private provider and to the patient for microscopy and dipstick?

4 What would be the cost-effectiveness of microscopy and dipstick in accurate on-site diagnosis of malaria in both public and private provider and the patient perspective?

General Objective

To determine the cost-effectiveness of microscopy and dipstick in diagnosis of malaria in Sri Lanka.

Specific objectives

1 To determine the treatment seeking pattern of malaria cases: who? where? why? what proportion? how much do they pay for service?

2 To determine the effectiveness of microscopy and dipstick in accurate on-site diagnosis of malaria.

3 To determine the total cost for diagnosis of malaria by microscopy and dipstick (public and private provider and patient perspective).

4 To determine the cost-effectiveness of microscopy and dipstick in accurate on-site diagnosis of malaria

5 To consider policy implications of the above.

Information on treatment seeking pattern of malaria cases is necessary to determine the effectiveness of microscopy and dipstick. Therefore, the treatment seeking pattern of malaria cases is to be analysed in this study.

The study covers both public and private health sectors and the malaria patients in Sri Lanka during the year 1997.

The study uses primary data, secondary data, and estimated data. The primary data are collected by surveys, questionnaires, and by personal interviews. The secondary data are collected from the records maintained at central and peripheral health offices. Since dipstick has not yet been implemented in Sri Lanka, the data on dipstick are estimated on the basis of the previous research findings. The data is analysed to see the cost-effectiveness of microscopy and dipstick under three scenarios i.e. accuracy, percentage of on-site diagnosis of malaria and percentage of accurate on-site diagnosis of malaria.

The results of this study will be helpful to the public and private sector in order to make decisions on implementing dipstick. Information of involvement of private sector for diagnostic technologies and malaria treatment, and cost incurred by patients for diagnosis and treatment of malaria both prior and during visit to public services is useful for policy makers in order to implement appropriate policies for malaria diagnosis, treatment, and financing scheme.