Chapter-5

Discussion

Sonapur PHC is a typical malaria endemic area located on the south bank of the Brahmaputra river bordering Meghalaya. It contributes more than 50% of the malaria cases of the Kamrup district and is known for persistent transmission of the disease associated with enhanced morbidity and mortality Rabha *et al.,* 2011; Yadav *et al*., 2012; Dev *et al.,* 2004; Dev *et al*., 2006 and Das *et al.* 2007, reported various studies on malaria endemicity in Northeast including Assam, where it was mentioned that Sonapur Block of Kamrup metropolitan district is also one of the major area contributing malaria cases since decades to the state for its geographical locations.

According to the Annual report of District Vector Borne Disease Control Program (Annual report, 2017), Kamrup Metropolitan district reported that in 1986 the annual parasitic incidence (API) was 76, where *falciparum* (P*f*) was 90%. Here, in the study also proved that though malaria incidence reduced due to vector control programs various activities like the introduction of long-lasting insecticidal nets (LLIN), insecticidal treated nets (ITN), DDT and due to health delivery system, still there is persistence of cases. In this present study since 2014 to 2017 showed most of the cases which were asymptomatic in nature and they were the active carrier for malaria transmission in other localities which showed symptomatic malaria. Due to various reasons still, people are carrying malaria parasites and few are tolerating malaria with no symptoms. So, prevalence is still been noticed. To control and eliminate malaria, people must be more aware of preventive measures, availability of treatment and health delivery should be more strengthened. Guerra *et al.,* 2006; Achard *et al*., 2002; Mayaux *et al.*, 2005 and Erhart *et al.*, 2005 reported on the role of the forest, the important ecosystem of malaria. Trung *et al*., 2005, Walker *et al.*, 2013 and Alias *et al.,* 2014 reported the relation of mosquito vectors forest locality and behavior.

The Study Village is situated inside of forest ecosystem and forest plays an important ecosystem in the transmission of malaria and it contributes to the global disease burden (Achard *et al*., 2002; Mayaux *et al*., 2005; Guerra *et al*., 2006; Achard *et al.*, 2002 and Mayaux *et al*., 2005. Controlling malaria in these forested regions of the world has been a major challenge (Erhart *et al.*, 2005).

Findings on the socio-economic profile of the respondents

Age wise distribution: Result showed that the highest proportion, 42.50% was in the age group is 36-45 years in Study Village and 44% in 25-35 years in Control Village. The lowest frequency came from the group of 56-65 years of age in both the villages. The proportion of females is slightly higher than the males in the age groups of 46-55 years in the Study and 25-35, 56-above in Control Village.

Educational qualification: The highest proportion of elected members have studied up to elementary 75.4% and 30% in Study and Control Village respectively. Least '0' and 2.5% in graduate and above in Study and Control Village respectively. The proportion of females is considerably higher than the males in the Primary level but lower in other categories.

The Occupational pattern of the respondents: It was that general occupational pattern of the different categories of respondents. Only the primary occupations have been considered. Among the category of respondents, 65.2% and 40% of cultivation were found to be more common followed by 42.5% and 25% of students and 22.5% and 20% were housewives in Study and Control Village. 5% of each are retired, business and service in Control Village.

ST/non-ST status: The proportion of ST is higher than the non-ST respondents in both the villages. It may be mentioned that the study was mainly confined to villages that have ST population only. However, it was observed that many villages are in fact not homogeneous and in some cases, therefore non-ST are found to represent.

Income Level: The monthly income of the groups of respondents showed "0'' to 10% in the highest income category up to Rs 12000/ and above) to 57.5% and 30% in the lowest income category of Rs 3000/ in Study and Control Village respectively.

Marital Status: The highest proportions, 57.5% of members are married in Control Village while 45.5% are unmarried in Study Village. The proportion of widow is comparatively more among the men compared to women in Study Village.

Family Type: The highest proportion 54% of nuclear families in Study Village and 51.5% of members come from joint families in Control Village. There was two male members whose information was not known. The proportion of women members coming from joint families is higher than male members. Conversely, the proportion of women members is lesser from nuclear families compared to men.

Findings on Knowledge, Awareness of the Respondents

Heard of Malaria: All the respondents said they had heard of malaria. There was on significant relationship between gender and knowledge of malaria. The gender analysis shows that 42.5% and 50% of men, 38% and 48.5% of women had heard of malaria in the Study and Control Village.

Knowledge of Malaria: The knowledge of malaria existed at the local level, how it varies across village and person to person. Control village persons were found more knowledge regarding malaria in compared to Study village. They had found more awareness like source of infections, signs and symptoms, availability of treatment and preventive measures.

Gender differences in knowledge of Malaria: There was a significant relationship between gender and knowledge of malaria A gender analysis showed that the higher percentage of men than women had heard of malaria. The fact that more men had heard of malaria may be due to their higher mobility within and outside their villages and therefore their wider interactions with people in other locations.

Knowledge regarding Signs and symptoms of Malaria: 30% and 42.5% men while 15% and 37.5% in the Study and Control village respectively. Women have the knowledge of prevention of malaria. About 80% of the respondents in the whole sample identified the body becoming hot or fever as a sign and symptom of malaria. There is a significant difference between gender and signs and symptoms of malaria. Of the women, nearly 75% reported a hot body or fever as a sign or symptom of malaria and nearly 85% of men reported a hot body or fever as a sign and symptom of malaria.

Awareness of Cause of Malaria: There was a significant difference ($P<0.05$) in gender and knowledge of the cause of malaria in Study and Control Village. More men, 45% than women, 40% in Control Village and 29%, men than 22.5%, women of Study Village attributed malaria to the mosquito bite.

Awareness Knowledge on prevention of Malaria: The analysis revealed that a significant difference ($P<0.05$) between village and knowledge of prevention of malaria. Male has more knowledge of preventive measures than females.

Preventive measures adopted by villagers to cope with Malaria: It was seen that compare to Study Village, in Control Village, people are well known to the preventive measures and they accept more Govt. Services, help of health provider. The traditional method is not popular among them only negligible people go for it. They are concerned about cleanliness, health and hygiene. Male people are more conscious about government activities.

The analysis showed that people are much aware of the health delivery system in the locality. But still few of them neglect and they remain untreated or choose traditional medico's, we can observe a gap which to be rectified by available health delivery program through awareness and people's participation.

Causes of Malaria Persistence: The studied area is which favors the transmission of malaria. Tea garden, forest, foothills are the surrounds the area. The people living in

those area are especially tea tribes and tribal. Their socio-economic conditions are too poor for which they are more affected.

i. The community people are aware of malaria but ignore its preventive measures especially sleeping habits.

ii. They involve in the free distribution of LLIN and less interested in insecticide-treated nets but no proper use of LLIN.

iii. The resurgence of malaria occurs due to incomplete doses of anti-malarial medicines.

iv. Refusal of Indoor Residual Spray is another main reason. People are more interested in outside spray and cattle.

v. Surveillance is not sufficient, and they are reluctant to their duties and proper information does not reach to the community on time.

vii. Many health workers are more interested in immunization program rather than malaria, for which control parts are overlooked. Treatment guidelines are still not properly understood at every level.

The finding of the research proved that the Study Village is comparatively low socio-economic status than Control Village in term of Education, Income, and Awareness about Malaria. The relationship between malaria and poverty directly proportional. Poorer and marginalized communities might be more likely to suffer from malaria than less poor communities. Due to low-income poor households' people are prevented from consuming goods and services that otherwise would protect them against the risks of malaria (WHO, 2006). Rabha *et al.*, 2011; Yadav *et al.,* 2012; Dev *et al.,* 2004; Dev *et al.*, 2006; Das *et al*., 2007 and Kreuels *et al*., 2008, reported on role of socio-economic factors and Yadav *et al*. 2014, reported the rich factors which influence malaria occurrence among community.

The reports on Study and Control Village also showed that male have better knowledge than female, and we know that in all societies men and women play different roles. They have different needs and face different constraints. Gender roles differ from the biological roles of men and women in that they are socially and culturally constructed, although they may overlap. Women's in childbearing may

extend their gender responsibilities of child rearing, food preparation, and household maintenance. Thus, it is gender that segregate responsibilities between men and women in social and economic activities, access to resources, and decision-making and authority. But these roles can and do shift with social, economic, and technological change.

Agueldo, 1983 has defined a community as a group of people living in a particular area shares different values, cultural patterns, and social problems. Reiter, 2001, reported the transmission patterns of these diseases and may be affected by ambient temperature. IOM, 1992 reported that the disease incidence has increased greatly over the past two decades because of a variety of demographic, political, societal, and public health changes.

People live under low socioeconomic conditions and have high levels of immunity enabling them to serve as reservoirs for malaria transmission (Dev *et al*., 2003). Poor socioeconomic conditions, knowledge, and perception about malaria and antimalarial policies play an important role in widespread malaria throughout the region (Rabha *et al*., 2011; Yadav *et al*., 2012; Dev *et al*., 2004; Dev *et al.,* 2006 and Das *et al.,* 2007). The main strategies against malaria in India are personal protection using ITNs and with effective antimalarial. Socio-demographic factors like ethnic groups, family living standards are important risk factors for malaria transmission and epidemics (Kreuels *et al.,* 2008). The risk factors that influence vulnerability to malaria including proper knowledge about malaria transmission, prevention, demography and socioeconomic status of different population groups (Yadav *et al.,* 2012).

The studies also proved that 0-5 years of children are healthier than other groups, which is in agreement with the previous studies as breastfeeding is the most protective methods for children for diarrhea and many respiratory diseases and provides better nutritional status (Ellestad-Sayed *et al*., 1979) and the association of increased incidence of malaria with stunting, indicative of chronic malnutrition (Arinaitwe *et al*., 2012). Despite socio-economic conditions, educational status and

number of family members, breastfeeding as the independent role (Niehaus *et al*., 2002). Birth weight is a growth indicator index and many studies show the association of growth, development, morbidity, and mortality (Ho, 2001; Lima *et al.*, 2004 and Victora *et al.*, 1988). So, it can be suggested to adopt the habit of breastfeeding and also to has better income source, education and awareness about health facilities so that the mother can take care of their children.

The findings of the study showed that in the Study Village more children belong to normal BMI with malaria than without malaria and greater numbers of children were found with normal status of BMI than lower status BMI(<BMI). According to the previous reports the host resistance to infection and morbidity disease is based on nutritional status of the children (Keusch, 1979; Gershwin *et al*., 1985; Pinstrup Andersen *et al*., 1993 and Rice *et al*., 2000). The increasing risk of mortality increases with the decrease in nutritional status (Van den Broek *et al*., 1993; Garenne *et al*., 2000 and Rice *et al*., 2000). In the Study village all the cases are asymptomatic in nature. According to WHO, 2005 high parasitemia with or without fever or sign of malaria, are more infectious and vulnerable to severe malaria and fatal.

It was also seen that the relationship between BMI status and malaria infection is not much clear as it was seen that in the Control Village both normal and lesser BMI is almost equal with malaria infection. Children are more healthy (normal BMI) than Study Village and that may be because of their better socio-economic conditions (Rabha *et al*., 2011; Yadav *et al*., 2012 and Dev *et al*., 2015) and more awareness of preventive measures of health delivery. As the Control Village is under district administration and the all facilities are more easily available to them than Study Village.

So, both the village showed controversial results. Earlier reports also reflected similar kind of results that association of malaria and malnutrition is always controversial and proactive effect against malaria (Fillol *et al.*, 2009; Snow *et al.*, 1991 and Deribew *et al.*, 2010 or no association (Carswell *et al.*, 1981, and Muller *et.*

al., 2003) or an increased risk of malaria among stunted (Deen *et al*., 2002). Other reports reflected (Carswell *et al.*, 1981) an increased risk of malaria among stunted (Deen *et al*., 2002) and underweight children (Ehrhardt *et al.*, 2006).

The present study indicates that in the Study Village, villagers consumed the vegetables which were ecologically available that included plants like the families of Araceae, papaya, taro, cassava as their staple food. These green vegetables have a higher amount of moisture as well as ash and the lesser amount of carbohydrate, fat, and protein, which is supported by the literature. The study also indicates that the villagers of study area consume more amounts of moisture and ash contents and the lesser amount of protein, fat and energy derived from them. It also supports having antimalarial properties of these foods. On the other hand, in the Control Village, people tend to modernize and eat food which are available in the market. They consume more animal protein than vegetables. The vegetable leaves are very high in moisture which is in agreement with the range values reported for fresh vegetables and are generally the poor source of protein. They are low in carbohydrate and gross energy, but fairly high in crude fiber and ash. The low gross energy values of the leaves could have resulted from their low crude protein, lipid and carbohydrate contents.

Haitely *et al.*, 1999 and Ponka *et al*., 2005 reported similar methods of preparation and determination of the nutritional potential of dishes consumed in the rural areas of a malaria endemic zone and revealed the quantifications of macronutrients as well as phytochemicals. Earlier Lowé *et al*., 1993 and Latham, 1997 reported that the higher prevalence of nutritional pathology in the vulnerable groups especially in protein calorie malnutrition and micronutrient deficiencies. These leads to morbidity. Well-nourished groups of population has resistance power to fight against tropical endemic diseases such as malaria (Dupin, 1984). In fact, previous reports like those of Tanner *et al.*, 1987 in Tanzania, Pereira *et al.*, 1995. Protein–calorie malnutrition studies (Razanamparany *et al*., 1995 in Madagascar, Man *et al.*, 1998 in Gambia and Tonglet *et al*., 1999 in Central Africa) favored the

evolution of malaria. High moisture contains in the food and dishes were due to the addition of water and higher contains water in the vegetables. To fight against any disease the nutritional value of prepared dishes that are ready for consumption is important.

Studies showed that there are many plants which are considered and studied as medicinal plants used for malaria therapy in Nigeria, Cameroon, and Ghana. Its use against malaria is justified by the presence of high concentrations of active compounds which has a minimal antimalarial activity and minimal toxicity. Secondary metabolites, like flavonoids (Kaplan *et al.*, 2004 and Wang, 2005) are increasingly synthesized under heat and drought stress. The large quantity of flavonoid-rich leaves and bitter fruits as *Balanitesaegyptiaca*, in the diet of Savanna monkeys, have the possibilities of reduction or elimination of simian malaria (Maranz, 2012). The potential for reducing the severity of malaria infections and facilitating parasite clearance via immune response (Maranz, 2010) reported that in many traditional African malaria therapies it was found that the human endothelial system at normal dietary plasma concentrations had the strong effect by flavonoid. Secondary metabolites elicit bioactivity wholly or in combination with other plants (Shigemori *et al.*,2003). The alkaloids, saponins, and flavonoids have been implicated to be responsible for antimalarial activity (Inga *et al.,* 2002 and Ettebong *et al.*, 2015). Malaria parasites by wreaking havoc synthesize protein. The vices of free radicals produced by malaria parasites are corrected in the presence of alkaloids and block protein-synthesis of *Plasmodium* species. Flavonoid, saponin, and tannin are involved in primary anti-oxidation of free radicals and other reactive oxygen species (David *et al.,* 2004). Reports also confined that many plants have anti-plasmodial activity due to the presence of total polyphenols, flavonoids, and alkaloids (Kaur *et al*., 2009 and Evans, 2002). Plants are also known to have anti-cancer, anti-aging and antiviral properties with marked physiological actions on man and animals due to the presence of alkaloids and terpenoids (Ibukunoluwa, 2017). The present study shows that all the plant species daily use as diet by the community shows the presence of alkaloids and tannin (*Capsicum*) and are higher in the study than control village might be

responsible for the anti-plasmodial activity. Previous reports also brought to light that various vital pharmacological activities have anti-malarial, inhibition of cholesterol synthesis, anti-viral and anti-bacterial activities (Mojab *et al.*, 2003).

From all the plants which are locally available and frequently consumed by the communities in the study area and which possesses an antimalarial capacity might have indirectly provided tolerance to the malaria parasite. The reports also showed that good numbers of respondents still rely on traditional herbal remedies. The reports also identified many different plant species usually consumed in either raw or cooked form. *Araceae* species are traditionally used for malaria, fevers, headaches, and liver disorders were reviewed (Frausin *et al*., 2015) and revealed the antimalarial potential of extracts and isolated compounds including median inhibitory concentrations (IC50) against *Plasmodium falciparum* (Frausin *et al*., 2015). Relevant literature revealed the antimalarial potential in those plant materials.