I

INTRODUCTION

1.1 General Background

Malaria and other vector borne diseases are among the main causes of illness and death and constitute a major public health problem in the countries of the south Asian regions. Bangladesh, Bhutan, India and Nepal are found to be endemic in malaria, kala-azar and Japanese Encephalitis. Malaria is the most common of all these diseases, is transmitted through anopheline mosquitoes (vectors). In all, there are twelve *Anopheles* species that spread malaria in these countries. Of these *Anopheles annularis, An. fauviatilis, An. maculatus and An. minimus* are the four anopheline species that have been reported as malaria vectors in Nepal. However, Kondrashin (1992) has included *An. aconitus and An. culicifacies* also included in the list (EHP, March 2004).

The parasites are usually transmitted from infected to non-infected people via the bite of female *Anopheles* mosquitoes, about 60 species of which serve as vector. Filariasis and other vector borne diseases are endemic in India, Northern Bangladesh, Indonesia, Myanmar, Nepal and Thailand. *Culex quinquefasciatus* is the major vector of *Wuchereria bancrofti* in the region and *Mansonia annuliferauniformis* mosquitoes transmit *Brugia malayi* infection, although the latter parasite has a limited distribution. Japanese encephalitis (JE) is transmitted by *Culex tritaeniorhynchus* and *Culex vishnui* group of mosquitoes. JE vectors breed infields and stagnant water ponds. JE has completely entrenched in Thailand and carved out some permanent foci in India and Nepal. Sporadic cases have been reported from Myanmar, Indonesia, Bhutan and Sri Lanka. Dengue Fever is transmitted mainly by *Aedes aegypti* due to its wide spread distribution in the urban areas. The other vector *Aedes albopictus* is primarily a forest species and therefore affects low populations and not considered a major problem in this region. Associated high morbidity and mortality is mainly confined to Thailand, Myanmar, Indonesia and now reported from India. Bhutan,

Nepal and Sri Lanka have recorded sporadic cases. Kala-azar is also endemic in fourteen districts of Nepal.

Malaria is one of the world's most important public health concerns. It is the infectious disease caused by protozoan parasite belonging to the genus *Plasmodium.* Malarial parasites infecting humans belong to 4 species, *Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae and Plasmodium ovale* (Arora & Arora 2005).

Most malaria cases are concentrated in the areas poorly served by the health system such as in the socio-economically deprived and geographically unreachable areas. Malaria alone causes an economic loss of about 3 billion USD annually.

The current need is to develop plan and implement the evidence based on integrated vector management (IVM) strategy using arrange of interventions selectively to control vector borne diseases. Use of long lasting insecticidal net (LLIN) can form a major tool in the over all context of an IVM approach for individual and community wide protection against disease (WHO, ROSEA, June 2005).

Insecticide-treated nets (ITNs) are becoming increasingly available to vulnerable populations at risk for malaria. Their appropriate and consistent use is essential to preventing malaria, but ITN use often lags behind ITN ownership. In order to increase ITN use, it is necessary to devise strategies that accurately identify, differentiate and target the reasons and types of non-use.

A simple method based on the end-user as the denominator was employed to classify each individual into one of four ITN use categories: 1) living in households not owning an ITN; 2) living in households owning, but not hanging an ITN; 3) living in households owning and hanging an ITN, but who are not sleeping under one; and 4) sleeping under an ITN (http//www.ncbintmnihgov/pmc/articles/pmc2890673/).

A mosquito net offers protection against mosquitoes, flies, and other insects, and thus against diseases such as malaria. Its fine, see-through, mesh construction stops many insects from biting and disturbing the person. The mesh is fine enough to exclude these insects, but it does not completely impede the flow of air.

Mosquito nets are often used where malaria or other insect-borne diseases are common, especially as a tent-like covering over a bed. For effectiveness, it is important that the netting not have holes or gaps large enough to allow insects to enter. Because insects can bite through the net, the net must not rest directly on the skin.

Mosquito nets treated with insecticides - known as insecticide treated nets (ITNs) - were developed in the 1980s for malaria prevention. These nets, impregnated with a pyrethroid insecticide like deltamethrin or permethrin, kill and repel mosquitoes. Unfortunately, standard ITNs must be replaced or re-treated with insecticide after six washes and, therefore, are not seen as a convenient, effective long-term solution to the malaria problem.

As a result, the mosquito netting and pesticide industries teamed up to develop so-called long-lasting insecticidal mosquito nets (LLINs), which also use pyrethroid insecticides, but are also treated with a chemical binder that allows the nets to be washed at least 20 times, allowing use for three or more years (Word Net 2006).

LLINs are net that are treated at a factory level by a process that binds or incorporates insecticide into the fibers they are desigrated to maintain their biological efficacy against vector mosquito for at least 3 years under recommended conditions of use in the field; obviating the need for regular insecticide re-treatment. When tested in laboratory the insecticidal efficacy of the net should persist through at least 20 WHO standard washes.

In general 5.5 lives could be saved per year for every 1,000 children less than 5 years of age are protected by the use of LLIN. It is also concluded that ITNs reduce clinical episodes of uncomplicated malaria causes by *Plasmodium falciparum and P. vivex* by 50% (range 29-62%). One study showed a 45% reduction in the incidence of severe malaria. Protection against forest malaria has recently been demonstrated in the Amazon region and in Cambodia, which confirms that personal protection against malaria is an important aspect of the action of INTs (WHO, GMP, 2007).

In the South East area region, mosquito nets are traditionally used widely. Based on the scientific evidence on ITN efficacy, some countries in the region are

implementing the ITN program over 10 years. Since, re-treatment of the nets has always remained a problem, the LLINs that do not require re-treatment offer a good option. Overall it appears that INTs or LLINs have an important role to play against vector borne diseases in endemic areas and their use needs to be scale up.

1.2 Significance of the Study

In Nepal, Nepal Government with the support of Global Fund (an international organization to fight against Aids, Tuberculosis and Malaria) is running programme in thirteen districts to control malaria. Free LLIN distribution is one of the tools to control malaria. Dhanusa district lies in one of those thirteen districts and the study area that is two VDCs (Naktajhij and Dhalkebar) are among the sites where the LLINs have been distributed. During distribution of LLINs people are made aware about its use and maintenance.

The present study of LLIN with regard to impact evaluation in the study area will be significant in the following ways:

- The present study is an attempt to assess the knowledge and practice of using LLINs and also to make them well aware about it.
- The study also aims to identify and communicate knowledge and information about the effectiveness of LLINs.
- The study will be helpful to view the people's opinion regarding LLIN.
- The study will assess the impact of LLIN against the other insects.
- The present study of LLIN in two VDCs of Dhanusha districts is also an aim to convince the people and create the awareness program against the disease like malaria and vector borne diseases which can be very beneficial for our society specially in rural areas.

This study will also help the malaria control programme run by Epidemiology and Disease Control Division (EDCD), Nepal Government, to assess the use of LLINs against the disease like malaria and other vector borne diseases.

II

OBJECTIVES

2.1 General Objectives

- To find out the knowledge and practice of using Long Lasting Insecticide Treated Nets (LLINs) of the people in the research area (two VDCs of Dhanusha district).

2.2 Specific Objective

- To find out the ways of using and maintaining of LLIN.
- To compare the prevalence of malaria in the study area for the last three years before LLIN distribution and after LLIN distribution.
- To view the people's opinion regarding LLIN.
- To assess the effect of LLIN against the other insects.

III
LITERATURE REVIEW

People use medicines and nets to protect themselves from the mosquitoes and other insects. People in the village make fire to protect themselves or animals; various mosquito coils, liquid and other medicines to safe guard from mosquito borne diseases in the city. People use medicated creams and gel on the body to keep safe from the mosquito. Similarly, people use net on the window to prohibit entering the mosquito. Indoor residual spraying (IRS) is the practice of spraying insecticides on the interior walls of homes in malaria affected areas. Moreover, they use nets to protect from the mosquito. There can be seen medicated net which is commonly known as “Supa net”. Malaria is one of dangerous disease caused by mosquitoes. It is the infectious disease caused by protozoan parasite belonging to the genus *Plasmodium.* Mosquito is one of the very common ecto-parasite which is known from the ancient time, belongs to a special field of biology known as parasitology. One should be aware of the possible disease of mosquito and be careful about the protective measures. Use of net is one of the measures to protect from mosquito borne disease.

3.1 In Global Context

Borne et al., (2003) : Prior to implementation of a randomized controlled trial of insecticide (permethrin)-treated bed nets (ITNs) in western Kenya, ethnographic studies were conducted to understand local perceptions of disease, sleeping patterns, and other factors that might affect use of ITNs. Educational activities took place prior to distribution, but immediately after distribution in Asembo only approximately half of the ITNs were in use. A qualitative study was then conducted to identify the community's perceptions about ITNs and the ITN project. While participants ranked malaria as important and recognized that malaria prevention could be beneficial, they believed ITNs would be only partly effective due to the perception that malaria has multiple causes. Concerns expressed; included fear of the insecticide, thought by some to be a toxic family planning aid, the taking of blood during clinical studies, and the mixing up of family ITNs during net re-treatment, which would violate cultural

taboos. Attempts were made to allay fears by improved communication on these subjects and modification of the study design.

Meltzer et al., (2003) measured the two-week household-level economic impact of insecticide (permethrin)-treated bed nets (ITNs) used to prevent malaria among children less than five years of age in Asembo, Kenya. The ITNs induced a two-week reduction of 15 Kenyan shillings (KSH) (0.25 U.S. dollars; $P < 0.0001$) in health care expenditures, but a statistically insignificant 0.5 day ($P = 0.280$) reduction in household time lost due to caring for sick children. The equivalent annual threshold cost was estimated at 6.50 U.S. dollars (95% confidence interval = 3.12-9.86). If the actual purchase price and maintenance costs of ITNs were greater than this threshold, then households would pay more than they would save (and vice-versa). Both seasonal effects and number of children per household had larger impacts than ITNs on health care expenditures and time lost from household activities. Health care expenditures by a household without ITNs and one child were only 32 KSH per two weeks (0.50 U.S. dollars; $P = 0.002$), leaving little opportunity for household-level, ITN-induced direct savings. The widespread adoption of the ITNs will therefore probably require a subsidy.

Nahlen et al., (2003) tested the effect of ITNs on all-cause mortality in children 1-59 months of age in western Kenya. Child deaths were monitored over a two-year period by biannual household census in Asembo (1997-1998) and in Gem (1998-1999). Overall, 1,722 deaths occurred in children 1-59 months followed for 35,932 child-years. Crude mortality rates/1,000 child-years were 51.9 versus 43.9 in control and ITN villages in children 1-59 months old. The protective efficacy (PE) (95% confidence interval) adjusted for age, study year, study site, and season was 16% (6-25%). Corresponding figures in 1-11- and 12-59-month-old children in control and ITN villages were 133.3 versus 102.3, PE = 23 % (11-34%) and 31.1 versus 28.7, PE = 7% (-6-19%). The numbers of lives saved/1,000 child-years were 8, 31, and 2 for the groups 1-59, 1-11, and 12-59 months old, respectively. Stratified analysis by time to insecticide re-treatment showed that the PE of ITNs re-treated per study protocol (every six months) was 20% (10-29%), overall and 26% (12-37%) and 14% (-1-26%) in 1-11- and 12-59-month-old children, respectively. ITNs prevent approximately one

in four infant deaths in areas of intense perennial malaria transmission, but their efficacy is compromised if re-treatment is delayed beyond six months.

Lindblade et al., (2003) studied adherence to bed net use in children younger than 5 years increased from 65.9% in phase 1 to 82.5% in phase 2 (P<.001). After 3 to 4 years of bed net use, the mean number of Anopheles mosquitoes per house in the study area was 77% lower than in a neighboring area without bed nets (risk ratio, 0.23; 95% confidence interval [CI], 0.15-0.35). All-cause mortality rates in infants aged 1 to 11 months were significantly reduced in intervention villages during phase 1 (hazard ratio [HR], 0.78; 95% CI, 0.67-0.90); low rates were maintained during phase 2. Mortality rates did not differ during 2002 (after up to 6 years of bed net use) between children from former intervention and former control households born during phase 1 (HR, 1.01; 95% CI, 0.86-1.19).

Hawley et al., (2003) observed trial to define pregnant women and infants as target groups for this intervention in high transmission settings. High population coverage with ITNs in both target and non-target groups may be critical to enhance health and survival in pregnant women and infants. The proportion of households with ITNs (coverage), the proportion of individuals properly deploying ITNs each night (adherence), and the proportion of nets properly treated with insecticide (treatment) are the three key determinants of effectiveness of large-scale ITN programs. These three simple outcomes should serve as the basis for program objectives and monitoring and evaluation efforts. Coverage effects and economic analysis support the proposition that ITNs may be viewed as a public good, worthy of public support. Research should continue to improve the intervention tools (the net, the insecticide, and methods for durable treatment and re-treatment) and their deployment.

Kolczak et al., (2003) directly observed in 2,178 individuals (784 households) participating in a large-scale trial of ITNs on child mortality in western Kenya. The ITNs were distributed free of charge to ensure high coverage, resulting in a ratio of 1.46 persons per ITN. Approximately 30% of ITNs present were unused. The overall percentage adherence was 72.3%. The probability of adherence by individuals depended strongly on age (relative risk [RR]= 0.86, 95% confidence limit [CL]= 0.78-0.94), in which children less than five years of age were less likely to use ITNs than

older individuals, and temperature, in which ITNs were more likely to be used in periods of cooler weather. A marginally significant diminution in adherence during the second year of the project was also observed (RR = 0.83, 95% CL = 0.68-1.01).

Kuile et al.,(2003) randomized controlled trials in sub-Saharan Africa have shown that permethrin-treated bed nets and curtains reduce all-cause child mortality by 15-33% in areas with low or high but seasonal malaria transmission. This report describes the study site for a community-based, group-randomized, controlled trial in an area of high and year-round malaria transmission in western Kenya. We outline the development of the human and physical infrastructure required to conduct this trial and discuss some of the difficulties encountered and lessons learned in conducting it.

Curtis et al., (2003) insecticidal treated nets impact on vector population and relevance of initial intensity of transmission and pyrethroid resistance. Insecticide treated bed nets iocate a deposit of a quick acting insecticide of low human toxicity between a sleeper and host seeking mosquitoes. Thus, a clinical barrier is added to the often incomplete physical barrier by the net. Treated nets may be considered as mosquito trap baited by the odour of sleeping. Trails in Assam, Tanzania and elsewhere have shown that when a whole community is provided with ITNs, so many mosquitoes of Anthropopophilic species are killed by contact with the nets that the density and sporozoite rate of the vector population reduced. In Tanzania, pyrethroid resistance has not been detected in malaria vectors, but it has emerged in bedbugs after seven years use of treated nets.

Guyatt et al., (2004) stated that in 2001, UNICEF produced 70,000 bed nets and insecticidal treated bed nets to be distributed to pregnant women attaining antenatal clinics in 35 (of 69) districts in Kenya. One year later they investigated 294 pregnant women who have received a free net. In a district with high malaria transmission, 93 (84%) of 111 women who had not previously sleeping under a bed net had used the net while pregnant and 97 (91%) of the 107 surviving babies were also protected. This data suggest that bed nets given free to pregnant women are used by recipients and their new borne children, and should be regarded as an important delivery system in increasing access to and use of insecticidal treated bed nets in vulnerable groups.

Mbonye et al., (2004) studied the efficacy of insecticide-treated nets (ITNs) in malaria prevention is well documented; the low coverage of ITNs in malaria endemic countries necessitates investigation on factors that limit access to this intervention. An exploratory study was conducted in Mukono district, Uganda, to assess perceptions and use of ITNs. Results show that malaria is perceived as a serious illness among pregnant women and children, and there is high awareness on the benefits of ITNs. However, ITNs are used by few people, mainly because of their high cost and the perception that the chemicals used to treat them have dangerous effects on pregnancy and the foetus. Other factors that influence the use of ITNs include low utilization of antenatal care, husband's lack of interest in malaria prevention and the perception that adolescent girls and primigravidae are at a low risk of getting malaria. The policy implications of these findings include demystifying the negative perceptions on the chemicals used to treat nets and subsidizing the cost of ITNs in order to increase access to them. These findings provide important lessons for malaria control programmes that aim at increasing access to ITNs by pregnant women in developing countries.

Kuile et al., (2004) described the study design and methods used in a large community-based, group-randomized, controlled trial of permethrin-treated bed nets (ITNs) in an area with intense, perennial malaria transmission in western Kenya conducted between 1996 and 1999. A multi-disciplinary framework was used to explore the efficacy of ITNs in the reduction of all-cause mortality in children less than five years old, the clinical, entomologic, immunologic, and economic impact of ITNs, the social and behavioral determinants of ITN use, and the use of a geographic information system to allow for spatial analyses of these outcomes. Methodologic difficulties encountered in such large-scale field trials are discussed.

Seyi et al., (2004) in tropical medicine and International health stated that insecticide treated net have proved successful in the prevention of malaria as a result of both personal protection with which they provide the sleeper and also the mass effect on the local mosquito population when they are used on a community wide basis.

WHO, ROSEA (2005) use of insecticidal treated nets (INTs) can form a major tool in the overall context of an IVM approach for individual and community wide protection

against malaria and vector borne diseases Use of ITNs has shown 20% reduction in child mortality from malaria in Africa south of sahara.

Hill et al., (2005) Insecticide-treated nets (ITNs) are the most powerful malaria control tool to be developed since the advent of indoor residual spraying (IRS) and chloroquine in the 1940s, and as such they have been an important component of global and national malaria control policies since the mid-1990s. Yet a decade later, coverage is still unacceptably low: only 3% of African children are currently sleeping under an ITN, and only about 20% are sleeping under any kind of net. This review charts the scientific, policy and programmatic progress of ITNs over the last 10 years. Available evidence for the range of programmatic delivery mechanisms used at country level is presented alongside the key policy debates that together have contributed to the evolution of ITN delivery strategies over the past decade. There is now global consensus around a strategic framework for scaling up ITN usage in Africa, which recognizes a role for both the public sector (targeting vulnerable groups to promote equity) and the private sector (sustainable supply). So, while progress with increasing coverage to date has been slow, there is now global support for the rapid scale-up of ITNs among vulnerable groups by integrating ITN delivery with maternal and child health programmes (and immunization in particular), at the same time working with the private sector in a complementary and supportive manner to ensure that coverage can be maintained for future generations of African children.

Lengeler (2006) given the part played by *Plasmodium falciparum* malaria as a direct and indirect cause of death in African children, the main public health question for ITNs is whether they reduce mortality in children. One observational study of impregnated bed nets in The Gambia reported a 42% reduction in all mortality in children aged1 to 59 months in 1991 (Alonso 1991). This dramatic result from the _rst mortality trial prompted the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR) to collaborate with around 20 agencies to launch four additional large-scale trials to measure the impact of ITNs on overall child mortality in different endemic areas of Africa (Burkina Faso, The Gambia, Ghana, and Kenya). Since this time, several trial shave been conducted including a large-scale trial completed in2000 in Western Kenya in an area of high perennial transmission.

Ndyomugyonyi et al., (2007) using school children's reports of bed net use monitored by school teachers as a proxy of community coverage in malaria endemic areas of Uganda, objective community based information on the delivery and use of health interventions is important to monitor the effectiveness of the roll back malaria programme. However, community survey to determine coverage for insecticide treated bed nets (ITNs) are time consuming and costly. They wanted to assess whether school children's reports of household ownership of a bed nets and coverage among high risk group monitored by school teachers through a questionnaire.

Miller et al., (2007) estimating the number of insecticide treated nets required by African households to reach continent wide malaria coverage target context African countries are scaling up malaria interventions, specially insecticidal treated net (ITNs), for which ambitious coverage targets have been set. Objectives to estimate how many INTs are available in African households that are at risk of malaria and how many ITNs are needed to targets for use by children younger than 5 years and pregnant women, data extraction from 42 household surveys between 1999 and 2006 on net and ITNs per households at risk. Data are included for 43 Sub-Saharan African countries. Data analysis for the median survey year 2003, the population weighted mean proportion for households; possessing at least 1 ITN was 6.7% and was 23.8%for any type of net.

Akpan (2007) reported that the popularity of insecticide treated nets as a preventative method if malaria control among residents of caliber municipality, cross river state Nigeria, among 612 residences between June and September 2004. A questionnaire was administrated to the respondents, majority of whom (88.9%) claimed that they were aware of the use of net (ITNs) for preventing mosquito bites. Only 13.2% of the respondents owned ITNs at the time of filling questionnaire.

Grabwosky et al., (2007) reported that insecticide treated bed nets was free distributed during measles vaccination campaign achieves immediate high and equitable coverage for both ITN and measles vaccination. In December 2002, ITNs were distributed to all children attending a measles vaccination campaign in a rural district of Ghana.

WHO, GMP (2007) concluded that ITNs reduce clinical epicodes of uncomplicated malaria caused by *Plasmodium falciparum* and Plasmodium *vivax* by 50 % (range 39-62%) as well as reducing the prevalence of high density parasitaemia. One study showed 45% reduction in the incidence of severe malaria. The use of ITNs, specially LLINs, is one of the cheapest and most effective interventions against malaria.

Ayi et al., (2009) after the intervention, the misperception that malaria has multiple causes were significantly improved, both among children and community adults. Moreover, the community adults who treated a bed net with insecticide in the past six months, increased from 21.5% to 50.0% ($p<0.001$). Parasite prevalence in school children decreased from 30.9% to 10.3% ($p=0.003$). These positive changes were observed only in the intervention group.

Yamamoto et al., (2009) found in Nouna, Burkina Faso, the main types of reported mosquito control measures used included sleeping under bed nets (insecticide-treated and untreated) and burning mosquito coils. Most of the study households kept animals within the compound or house at night. Insecticide house sprays, donkeys, rabbits and pigs were significantly associated with a reduced risk of malaria only in univariate analyses.

Mueller et al., (2009): insecticidal impregnated bed nets have been shown to be a highly effective tool against malaria in the endemic regions of Sub Saharan Africa (SSA). There is however different opinions about the role of ITN social marketing and ITN free distribution in the roll out of ITN programmes. The objective of the study was to evaluate the effect of free ITN distribution through antenatal care service in addition to an ITN social marketing programme in an area typical for rural SSA.

Chukwuocha et al., (2009): This study aimed at assessing perceptions on use of ITNs in parts of the Imo River Basin, Nigeria and its implications in preventing malaria in pregnancy. Data was collected using focus group discussions, key informant interviews and structured questionnaires. Results showed high awareness on the benefits of ITNs. Factors affecting use of ITNs included its high cost, perceptions of chemicals used to treat them as having dangerous effects on pregnancy, low

utilization of antenatal care, husband's lack of interest in malaria prevention and perceptions that adolescent girls are at low risk of getting malaria. The implications of these findings include demystifying the negative perceptions on the chemicals used for net treatment and subsidizing the cost of ITNs to increase access. These findings provide important lessons for malaria programmes that aim at increasing access to ITNs by pregnant women in developing countries.

Njoroge et al., (2010): Knowledge on malaria illness and ITNs were high with majority of pregnant women having adequate level of knowledge (86.9%). There was significant association between level of education and adequate knowledge (P-value = 0.010). Good attitude on ITNs use was low. There was no association between good attitude and any of the socio-demographic variables. The majority of pregnant women attending ANC owned ITNs (75.4%). ITNs usage was high (70.5%). There was significant association between religion and good practice (p-value = 0.050). Although adequate level of knowledge on malaria and protective role of ITNs was high, there was no association between knowledge with practice and attitude.

Alaii et al., (2010) study of mothers' perceptions regarding bed nets and malaria was conducted before and after a randomized controlled trial of insecticide (permethrin)-treated bed nets (ITNs) in western Kenya, awareness about the trial and the rationale for bed net use increased by the end of the trial. Knowledge that mosquitoes caused malaria also increased; however, a higher proportion of mothers from control, rather than intervention villages, cited this (44.4% versus 27.9%; P<0.001). Mothers from intervention villages were more knowledgeable about the use and maintenance of bed nets and re-treatment with insecticide. Both groups specified advantages of ITNs. Mothers from intervention villages noted practical advantages such as protection against bedbugs and falling roof debris. Few (<1%) mothers indicated that ITNs protected children against malaria. Intervention homes used significantly fewer mosquito coils, insect spray, medicines, and burned cow dung less often compared with those in control villages.

Comfort et al., (2010) studied that at baseline, 8.5% of households owned an ITN and 6% were observed to have a net mounted over a bed in the household. At one month, there were no differences in ownership between the intervention and control groups

(99.5% vs. 99.4%), but net use was substantially higher in the intervention group (99%vs.78%), with an adjusted risk ratio of 1.24 (95% CI: 1.10 to 1.40; p<0.001). After six months, net ownership had decreased in the intervention compared to the control group (96.7% vs. 99.7%), with an adjusted risk ratio of 0.97 (p<0.01). There was no difference between the groups in terms of ITN use at six months; however, intervention households were more likely to use a net that they owned (96% vs. 90%; p<0.001).

Iwashita et al., (2010) studied bed net use by children between five and 15 years of age was lower than that among the other age classes. However, age was dropped from the final model, and sleeping arrangement was significantly associated with net use. Net use was significantly associated with bed availability, number of rooms and their interaction.

3.2 In Nepal context

Nepal being developing country is facing many health problems and in case of disease transmitted by mosquitoes, malaria is one of the major problems in the country. Nepal Government with the support of Global Fund (an international organization to fight against Aids, Tuberculosis and Malaria) is running programme in thirteen districts to control malaria. Free LLIN distribution is one of the tools to control malaria. There are 13 districts which lie at highly malaria endemic area. They are Jhapa, Kailali, Kanchanpur, Morang, Dhanusa, Bardiya, Mahottari, Sindhuli, Kavre, Nawalparasi, Dadeldhura and Banke and 6.6 millions of people come under this region. Similarly there are 52 district which are malaria endemic district, among which 18 districts (Surkhet, Dang, Rupandhei, Kapilbastu, Chitwan, Makwanpur, Parsa, Bara, Rupandehi, Sarlahi, Udaypur, Siraha, Saptari, Sunsari, Panchthar, Dhankuta, Sindhupalchok and Doti) are at moderate risk and 34 districts are at low or minimal risk. There are 10 districts which are at no risk.

National Malaria Control Strategic Plan (2007/008-2011/012)

- Overall incidence of (probable and confirmed) malaria in ‘population at risk brought below 2 cases per 1,000 by 2011 (2005 baseline 4.1cases per 1,000).

- Hospital based severe malaria cases fatality rate reduced to below 15%by 2010.
- By 2010, weekly incidence of malaria (probable and confirmed) in all out break wards has been brought below outbreak threshold level within 6 weeks of detection.

Coverage Level:

- 80% of people in high risk areas sleeping under LLIN by 2011.
- By 2008, the annual routine IRS camping will cover 80% of households in target VDCs.
- 80% of malaria cases reported by public sector health facilities in high risk areas confirmed by microscopy by 2011.
- 80% of care provides at rural public sector health facilities providing appropriate treatment for malaria by 2011.

The National Malaria Control Programme has four strategic priorities

- Early diagnosis and appropriate treatment,
- Multiple prevention,
- Epidemic preparedness and
- Behavioural change communication

Two conditional priorities:

Programme Management and Operational research.

Distribution of insecticidal net (LLIN)

- In 2005 – 3 districts, Jhapa, Kailali and Kanchanpur.
- In 2006 – 6 districts, Bardia, Dhanusa, Jhapa, Kailali, Kanchanpur and Morang.
- In 2007 – 5 districts, Bardia, Jhapa, Kanchanpur, Kavre, Mahottart and Sindhuli.
- In 2008 – 5 districts, Bardia, Dadeldhura, Ilam, Kailali,and Nawalparasi.
- In 2009 – 13 districts, 12 districts above and Banke.

Malaria Trend before 5 years and after 5 years from 2004

Year	Population	Slides Examined	Positives Detected	P.f. Cases	BER%	SPR%	API	% Pf	Clinical malaria
1999	15,961,989	132,044	8,959	642	0.83	6.31	0.56	6.94	47092
2000	15,295,571	156,370	7,981	836	1.02	5.1	0.32	10.47	48686
2001	13,215,972	126,962	6,396	428	0.96	5	0.5	6.7	62172
2002	16,167,782	183,519	12,750	2,165	1.14	6.93	0.8	17	51364
2003	17,004,436	196,223	9,506	1,195	1.15	4.85	0.56	12.87	57419
2004	18,344,639	158,044	4,895	743	0.87	3.08	0.27	15.2	46087
2005	18,917,813	188,930	5050	1,181	0.97	2.81	0.36	25.6	74745
2006	19,447,631	166,476	4,969	1,358	0.86	2.98	0.26	27.3	65252
2007	19883258	135809	4220	1391	0.68	3.87	0.26	32.9	62836
2008	20328643	153,331	3,888	792	0.75	2.54	0.19	20.4	106100
2009	20784005	123903	3335	575	0.60	2.69	0.16	17.2	103475

Number of LLINs distribution during 2008/09 and2009/10

Particulars	Year1 (16 July 2008-15 July 2009)	Year2 (16 July 2009-15 July 2010)
Number of LLIN distributed through NGO's, CBO's and community groups-PR2	348,544	356,385
Number of LLIN distributed through ANC clinics. PR1	36,640 (additional 71, 360 nets available with no cost extension of Round 2 – The Global Fund, Malaria program)	37,465(gap in LLINs for pregnant women will be addressed through the savings from life term of the Round 7 Malaria program)

Mittal et al., (2004) hoped that the document on vector control will serve a useful purpose not only in the Bangladesh, Bhutan, India and Nepal (BBIN) countries; but also in the South Asian (SEA). In the overall Planning of vector control through insecticide use and in considerations for the use of insecticide treated mosquito net.

Thakur (2008) stated that contact poisoning is mixed on the thread of the net, so mosquitoes dies which comes in contact to the net and mosquitoes goes far from the net due to the smell which comes from the net (ITN) which people cannot feel. He also reported that from the next year the net should be distributed as one net for two persons.

Joshi et al., (2008) reported that the questionnaire was prepared to access the knowledge, practice and malaria related behavior in different selected malaria endemic district. Availability of free treatment, bed nets using practices and the different preventive and control activities was conducted by different institutions.

Joshi et al., (2009) studied IRS, and to a lesser extent EVM and LLINs, significantly reduced sand fly densities for at least 5 months in the study households irrespective of type of walls or whether or not people shared their house with cattle. IRS was effective in all sites but LLINs were only effective in Bangladesh and India. Mud plastering did not reduce sand fly density (Bangladesh study); lime plastering in India and one Nepali site, resulted in a significant reduction of sand fly density but not in the second Nepali site.

Udghosh Daily (2009) : 3000 insecticidal net were distributed on April- 4, 2009 in Urlabari Morang. Insecticidal net was distributed in six wards and the distribution was as one net for two persons.

The Kathmandu Post (2011) : in a bid to meet the national pre-elimination target of reducing incidence and containing transmission of malaria disease, the Ministry of health and population (MoHP) has revealed a new strategy. Under the new plan, MoHP is distributing about 1.1 million mosquito nets to people in 31 malaria bit districts across the country, said officials. MoHP, with the financial assistance from the Global Fund, had been implementing Malaria Control Programme (MCP) in 12

districts till March 2004. The programme included Banke district from 2008 and has been extended to 18 new districts from this year. Altogether 65 districts are regarded as mosquito-hit and 20.8 million people are at risk of the disease said officials."We have aimed to meet our national target of pre-elimination by 2015, a complete control of local transmission and global goal of malaria elimination by 2020," Dr. Saroj Prashad Rajendra, Director of Epidemiology and Disease Control Division said. According to her, the five year strategy (2011-2016) focuses to map out the most affected areas and launch a special programme, which integrates distribution of mosquito nets with indoor residual spray, among other things. According to EDCD data, there are around 3,400 cases of malaria in Nepal. The statistics show malaria cases have considerably declined over the years- from 12,750 cases in 2002 to 3,400 now.

IV
METHODS

4.1 Study Area

The study area includes two VDCs of Dhanausa District- Naktajhij and Dhalkebar. Naktajhij and Dhalkebar are VDCs in Terai Region of Nepal.

Dhanusa District, a part of Janakpur Zone, is one of the seventy-five districts of Nepal. The district, with Janakpur as its district headquarters, covers an area of 1,180 km² and has a population (2001) of 671,364. It lies in the Central Development Region of Nepal. Also famous as a cultural center, the city attracts many Hindu pilgrims during festivals from both Nepal and India.The total house hold is 1162 and population is 7190 (Male-3706 and Female-3484) of Naktajhij village and the total house hold is 1772 and population is 9912 (Male-5132 and Female-4780) of Dhalkebar village. (Source- Central Bureau of Statistics HMG 2001).

Study area experiences tropical/ sub-tropical climate with a monsoon rainfall pattern i.e. summer is hot and wet while winter is cold and dry. There are several small rivers and ponds in the region. The ethnic group includes Brahman, Chhetri, Rajput, Yadav, Muslim, Teli, Sudi, Khatbe, Tharu, Dhanuk, Malah, Sahu, Kayasth, Koiri, Sonar, Chamar, Magar, Newar and Others.

Both nuclear as well as joint families are equally found in the study area. Subsistence pattern of farming and pursuing of traditional life are the main factors, which play the significant role for existing joint families in study area.

Gender, caste, religion and ethnicity based social stratification is more prominent than that of class and occupational division. Most of the people were found with the belief of Hinduism and it was followed by Buddhism as well as Muslim, So, majority people in the study area follow Hindu rite of passage and also play their respective role in different religious ceremonies.

Majority of the people in study area depend upon agriculture for a livelihood. Varieties of crops such as rice, maize, wheat, vegetables and fruits are cultivated. Besides agriculture and animal husbandry people of study area were also found to have involved in various income earning activities such as wage laboring, job in outside of the country or foreign employment, trade and business in local market centers, security force, government job, etc.

People of the region are mostly farmers and human habitation is surrounded by poor sanitation. They use common canal to throw wastage of house and they never clean canal which causes environmental pollution in the communities.

Rationale of the Selection of the Study Area

Two VDCs – Naktaghij and Dhalkebar of the Dhanusa District of Janakpur zone are selected as the study area in order to study "the knowledge and Practice of using LLIN". Naktaghij and Dhalkebar of the Dhanusa District have been selected as sample for the study. Both villages are rural area of Nepal where poor people live who are financially poor and they lack education Hence, people have no enough access to basic health services.

- These VDCs are among the malarious area of Dhanusa district. Hence, both VDCs lies in malaria control programme of Nepal. And government has distributed LLINs in both villages.
- Previously, study/research by any one in such activities in the study area was not found. So, this is the first endeavor for the study of this phenomenon.

4.2 Nature of Data

The sources of primary data are based on interview with the people of the villages. Direct interview with the peasants and village dwellers is taken by door to door visit. However, observation, key information, data collection etc. during the field work period- March 2009 to September 2010 are very much integral part of the study. Interview is major basis for the study. Moreover, secondary data have been obtained from earlier published books, reports, journals, articles, government policy etc. Both

qualitative and quantitative data required for the study have been obtained from the primary and secondary sources.

4.3 Sampling Procedure

Dhanusa is one district out of 75 districts of Nepal which is located at central development region of Nepal. The district lies in Terai region. However, this district is quite close to hill/mountains (north side of the Dhanusa). In the selected district, two villages (Naktajhij and Dhalkebar) have been selected as sample VDCs for the study. Hence, Both VDCs of the Dhanusa district which have been selected as samples for the research is supposed to be good sample to represent major issues for the study. The sample taken for the study covers at least 10% people of each VDC. During the field work, priority has been given to main person (parents) of family people who could provide adequate and reliable information to achieve the objectives of the research.

4.4 Research Design

Descriptive and exploratory research designs have been used for the present study. Descriptive research design is also employed to describe usages of LLIN.

4.5 Technique of the Data Collection

Both qualitative and quantitative data have been collected by the following techniques:

4.5.1 Interview

Structured and constructed interview method is applied to the study as it allows greater flexibility in the form of interview. Interview was conducted to only one person of the family member. Generally, father or mothers of the family who are the chief person of the family have been concentrated for the interview. Mostly, females (mothers) were available as female stay at home. Interviews were conducted with the common people who provided effective and reliable information.

Data on the uses, effects of LLIN have been gathered through interviews.

4.5.2 Observation

Observation is probably one of the most effective techniques of data collection used over the decades in the field of both natural and social sciences.
In this present study, researcher used direct observation technique to find out uses and effects of LLIN among the villagers of study area.

4.6 Data Analysis and Presentation

Data analysis is the most critical constituent of any research work. Data do not speak themselves unless the researcher categories or classifies, manipulates and deposits them in certain orders so as to make them easily comprehensible.

Both descriptive and statistical methods of data analysis are used because of the qualitative nature of the study. Information on the physical setting, uses of net, effects of net etc are analyzed by classifying them in different categories. Similarly, data on demographic features, educational status, age structure, distribution of nets, etc. are analyzed both statistically and descriptively. Analysis of data is also involved statistical distribution, construction of diagram and calculating simple measures like percentage.

4.7 Limitation of the Study

This small scale study confines itself to the two VDCs - Naktajhij and Dhakebar of Dhanusa District. Hence, finding of the study may not be generalized or the generalization based on the study needs more care if they are to be applied to other context.

This research has been carried out for the partial fulfillment of the requirement for the Degree of Master of Science and Technology in Zoology. Therefore, intensive research could not be possible because of the lack of resource with in short span of time. The replies of the different households are basis for the entire research. Questions were asked to them regarding nets received, effects of net, side effects etc.

V
RESULTS

This study was carried out among the people of two villages of Dhanusa District-Naktjhij and Dhalkebar. The facts and figures regarding the uses of Long-Lasting Insecticidal Nets (LLINs) from respondents were collected with the help of questionnaire survey by personal visit to the people of villages. Altogether 180 households out of 1772 were taken in Dhalkebar and 200 households out of 1162 were taken as sample size in Naktajhij.

Nepal Government with the support of Global Fund (an international organization to fight against Aids, Tuberculosis and Malaria) has been distributing long-lasting insecticidal nets (LLIN) free in malaria high risk areas from 2005 A.D. in Nepal. In the study area (two VDCs -Naktajhij and Dhalkebar) the LLINs have been distributed from 2006 A.D. In the beginning of the program, one net per family was distributed but from 2009 A.D. onwards one net for two persons has been provided. This study is carried out from March to September 2010 that is, the second phase of the program, or after the distribution of one net for two persons.

The observations are presented here under given headings:

5.1 Family Size and LLIN received

In the study area most of the families were found to be joint families whereas a few were nuclear families. On the basis of study, the families have been classified into three categories. The first category is the household with family members up to 4 and this was found among the 47 households in Naktajhij and 43 households in Dhalkebar. Like wise household with family members from 5 to 8 persons is second category and this was found among 117 house holds in Naktajhij and 107 house holds in Dhalkebar, and the category is households having more than 8 persons and this was found among 36 households in Naktajhij and 30 households in Dhalkebar (Table 5.1).

Table 5.1 Household's category and LLIN received households

VDC	Naktajhij					Dhalkebar				
Category (houshold's size)	**No. of house holds**	**Households that received nets**		**Net received**		**No. of house-holds**	**Household that received nets**		**Net received**	
		No.	**(% out of 199)**	**No.**	**(% out of 420)**		**No.**	**(% out of 138)**	**No.**	**(% out of 324)**
family members up to 4	47	46	23.1	86	20	43	25	18.1	39	12
family members 5-8	117	117	58.8	254	60	107	86	62.3	205	63.3
family members 9 and above	36	36	18.1	42	20	30	27	19.6	80	24.7
Total	**200**	**199**	**100**	**420**	**100**	**180**	**138**	**100**	**324**	**100**

(Source: Field Survey 2010)

According to the provision of the program i.e., one net for two persons in a house hold, out of 200 households, 199/200 of them have received the nets and only 1/200 has not got it in Naktajhij. Similarly, out of 180 household, 138/180 of them have received the nets and 42/180 has not got the nets in Dhalkebar. According to the finding of the study, one family out of 200 in Naktajhij is not using LLIN and 8 families out of 180 are not using LLINs in Dhalkebar and the remaining 34 families in Dhalkebar are using ordinary nets. All the respondents who have received the net informed that they are using it.

5.2 Age wise Use of LLINs by the Study Population

One person from each household of the total surveyed (200 households) of Naktaghij village and (180 households) of Dhalkebar village was carried out for the survey of the use and practice of LLINs. For this the whole surveyed population was categorized into three groups such as in first group people from 10 years to 19 years , in second from 20 years to 60 years and in third category people above 60 years of age. Males and females have also been identified. According to the field study, out of the total users (199), 15.58% people from 10 years to 19 years of age, 75.38% people from 20 years to 60 years of age and 9.04% people above 60 years of age are using LLINs in Naktaghij. Like wise out of the total (138), 6.52% people from 10 years to 19 years of age, 86.23% people from 20 years to 60 years of age and 7.24% people above 60 years of age are using LLINs in Dhalkebar.

Table 5.2: Age wise Use of LLINs

VDC	**Naktajhij**					**Dhalkebar**				
Age Category	**Male**	**Female**	**Total**	**LLIN users**		**Male**	**Female**	**Total**	**LLIN users**	
				No.	**(%)**				**No.**	**(%)**
10-19 years	8	23	31	31	15.58	7	7	14	9	6.52
20-60 years	61	90	151	150	75.38	99	54	153	119	86.23
above 60 years	7	11	18	18	9.04	9	4	13	10	7.25
Grand Total	**76**	**124**	**200**	**199**	**100**	**115**	**65**	**180**	**138**	**100**

(Source: Field Survey 2010)

5.3 LLINs Users according to Educational Status

For the analysis of educational status and the LLIN users in the study area, six categories have been made as represented in the Table 5.3. According to the survey there is no significant variation between the literate and illiterate people for using LLIN in the study area.

Table 5.3: Education wise LLIN users

VDC	**Naktajhij**					**Dhalkebar**				
Category(p-opulation)	**Male**	**Female**	**Total**	**LLIN users**		**Male**	**Female**	**Total**	**LLIN users**	
				No.	**(% out of 199)**				**No.**	**(% out of 138)**
Primary	12	5	17	17	8.54	23	9	32	19	13.77
Lower Secondary	4	10	14	14	7.03	4	7	11	8	5.8
Secondary/ Higher secondary	19	11	30	29	14.57	25	5	30	30	21.74
Graduate/ Post graduate	-	-	-	-	-	3	-	3	1	0.72
Literate by non-formal education	11	15	26	26	13.06	26	5	31	23	16.67
Illiterate	30	83	113	113	56.8	32	41	73	57	41.30
Grand Total	**76**	**124**	**200**	**199**	**100**	**113**	**67**	**180**	**138**	**100**

(Source: Field Survey 2010)

According to the survey, the LLIN users in Naktaghij was observed as 8.54% (17/199), 7.03% (14/199), 14.5% (29/199), and 13.0% (26/199) in primary, lower secondary, secondary/ higher secondary education, and literate through non formal education respectively are using LLIN. Similarly in Dhalkebar, 13.77% (19/138), 5.8% (8/138), 21.74% (30/138), 0.72% (1/138) and 16.67% (23/138) have completed Primary, lower secondary, secondary/higher secondary, graduate/post graduate education, and literate through non formal education respectively. Whereas 56.8% (113/199) and 41.3% (57/138) illiterate people of Naktaghij and Dhalkebar are respectively using the LLIN. This shows that the illiterate are more interested for using the LLIN.

5.4 Occupational Status of head of the family and LLIN users

Both the villages- Naktaghij and Dhalkebar are situated in terai region of Nepal so that, there is a large scale of fertile land and that is why people are mostly engaged in cultivation of cash and food crops. As Dhalkebar is located at north to Naktaghij at the adjacent of highway, people of this region have moved to different cities and capital Kathmandu, as a result people are getting more conscious for education and a good job/profession. Obviously, most people were peasants. However, there are some people engaged in business, teaching, social service, industrial works, foreign employment, etc. The table 5.4 shows occupation-wise population distribution of the study area who was also the respondents during the study period. According to findings, the LLIN users are 48.24% (96/199), 9.54% (19/199), 17.6% (35/199), 3.01% (6/199), 1.50% (3/199), 17.6% (35/199) and 2.51% (5/199) in the people engaged in agriculture, labor, businessmen, civil servant, teachers, others and idle/no work respectively. Similarly in Dhalkebar 34.8% (48/138), 31.9% (44/138), 13.76% (19/138), 0.72% (1/138), 2.89% (4/138), 12.31% (17/138) and 3.62% (5/138) were LLIN users in agriculture, labor, businessmen, civil servant, teachers, others and idle/no work respectively.

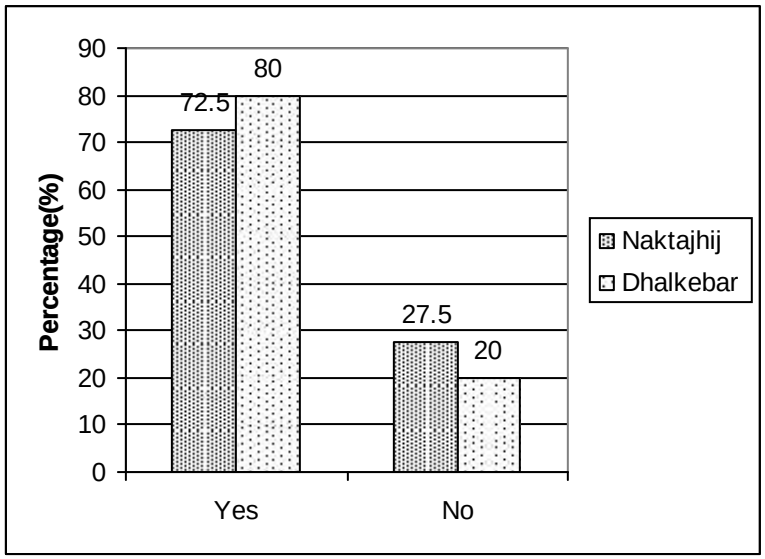
Table 5.4 Occupation of main person of family and LLIN users

VDC	**Naktajhij**				**Dhalkebar**			
Category(Occ-upation)	**Total**	**Percent-age (%)**	**LLIN users**		**Total**	**Percentage (%)**	**LLIN users**	
			No.	**%**			**No.**	**%**
1. Agriculture	96	48.00	96	48.24	55	31	48	34.8
2. Labor	19	9.50	19	9.54	72	40	44	31.9
3.Businessmen	35	17.50	35	17.6	22	12	19	13.76
4.Civil Servant	6	3.00	6	3.01	1	1	1	0.72
5. Teachers	4	2.00	3	1.50	5	3	4	2.89
6. Others	35	17.50	35	17.6	18	10	17	12.31
7. Idle/no work	5	2.50	5	2.51	7	3	5	3.62
Grand Total	**200**	**100.00**	**199**	**100**	**180**	**100.00**	**138**	**100**

(Source: Field Survey 2010)

5.5 Knowledge about malaria

During interview questions regarding malaria were asked with the respondents whether they had heard or suffered from malaria fever. Most of the respondents i.e., 72.5% (145 out of 200) in Naktajhij and 80% (144 out 180) in Dhalkebar replied that they have known malaria through radio, television and other people, whereas 27.5 percent and 20 percent of the total respondents have no idea about of malaria in Naktajhij and Dhalkebar respectively. Similarly, 23 families in Naktajhij and 39 families in Dhalkebar informed that their family members suffered from malaria fever. People of both the villages could not answer about death of people due to mosquito bites. However, some females reported that the death of children but they were not sure whether it was due to malaria.



(Source: Field Survey 2010)

Figure 5.1: Knowledge about malaria

5.6 Malaria Trend before Three Years and After Three Years of LLIN Distribution

Table 5.5 shows the malaria trend before and after the LLIN distribution in both the VDCs of Dhanusa district. After the distribution of nets (from 2006) at Naktajhij the malaria cases have become nil as diagnosed by the slide examination at Naktajhij health post. And in Dhalkebar just after the net distribution i.e., from 2006 malaria cases have been reduced tremendously 27.90% (798/2860) from 84.04% (2260/2689) within one year from 2005 to 2006. From then malaria cases are reducing in Dhalkebar also. So, according to the data malaria cases have been highly reduced in both the villages. One of the prime factors reducing malaria may be the use of LLINs by the people of this area.

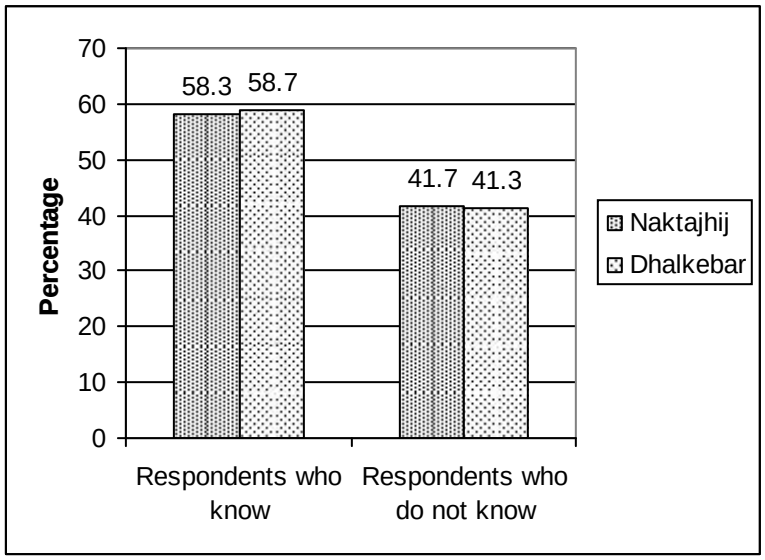
Table 5.5: Malaria trend before 3 years and after 3years from 2006

Naktajhij								
Year	**Population**	**Slides examined**	***P.f.***	**%**	***P.v.***	**%**	**C.M.**	**%**
2003	8168	51	0	0	0	0	17	33.33
2004	8168	71	0	0	10	14.08	7	9.85
2005	8168	386	0	0	0	0	134	34.71
2006	**8168**	**191**	**0**	**0**	**0**	**0**	**149**	**78.01**
2007	8329	210	0	0	0	0	0	0
2008	8329	278	0	0	0	0	0	0
2009	8329	345	0	0	0	0	0	0
Dhalkebar								
2003	11261	2280	9	0.39	11	0.48	2259	99.07
2004	11261	1272	9	0.70	6	0.47	1072	84.27
2005	11261	2689	1	0.03	1	0.03	2260	84.04
2006	**11261**	**2860**	**77**	**2.69**	**64**	**2.23**	**798**	**27.90**
2007	11261	2534	0	0	0	0	0	0
2008	11513	2954	2	0.06	44	1.48	2340	79.21
2009	11513	2646	1	0.03	59	2.22	1088	40.81

(Source: EDCD,Teku)

5.7 Use and Maintenance of LLIN by the users

Use of nets is the integral part of the malaria control. Moreover, there is need of proper care of the nets for the effective and long lasting result. At the time of the distribution of the net the stake holder of EDCD, Teku who is involved in the net distribution provides orientation regarding use and maintenance of nets. The proper way of washing and drying is very necessary for the effectiveness of the net. Out of 199 respondents in Naktajhij, 58.3% (116/199) have known to use and maintain the nets and whereas 41.7 % (83/199) have not known to use and maintain the net properly. Similarly, out of 138 respondents in Dhalkebar, 58.7% (81/138) have known to use and maintain the nets and 41.3 % (57/138) have not known to use and maintain the net properly.



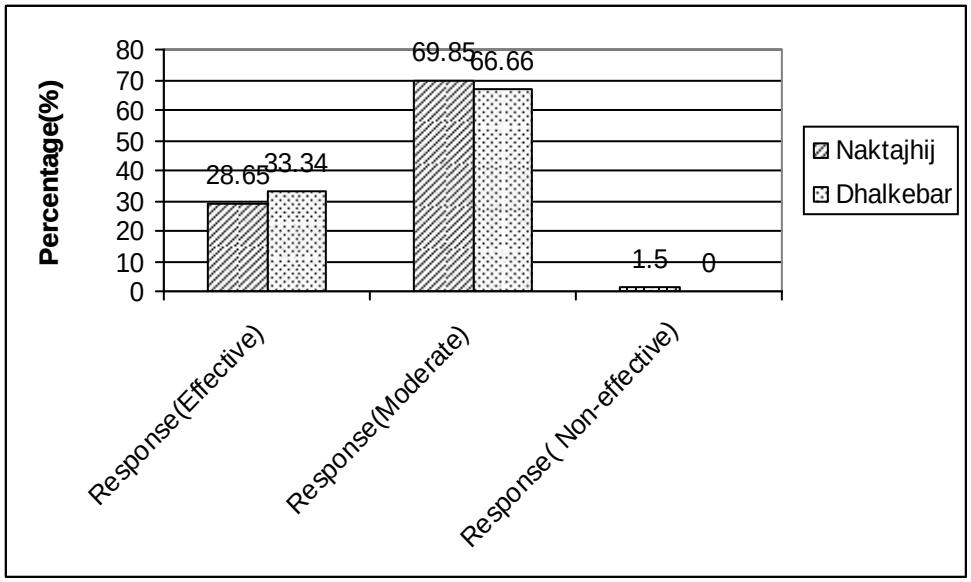
(Source: Field Survey 2010)

Figure 5.2: Use and Maintenance of LLIN

5.8 Effectiveness of LLINs According to Respondents

In the course of analysis, in Naktajhij, respondents from 199 house holds were asked about the effectiveness of the medicated net/LLIN. Among them 28.65% (57/199) family replied that they were well benefited and satisfied from the LLINs, while 69.85% (139/199) said that they get moderate benefit. Similarly, 1.50% (3/199) households replied that they have not got any good effect and could not get protection from mosquitoes and its related diseases.

Similarly, in Dhalkebar 138 households were asked about the effectiveness of the medicated net/LLIN. Among them 33.34% (46/138) family replied that they were benefited very much from the LLINs while 66.66 % (92/138) said that they get moderate benefit.

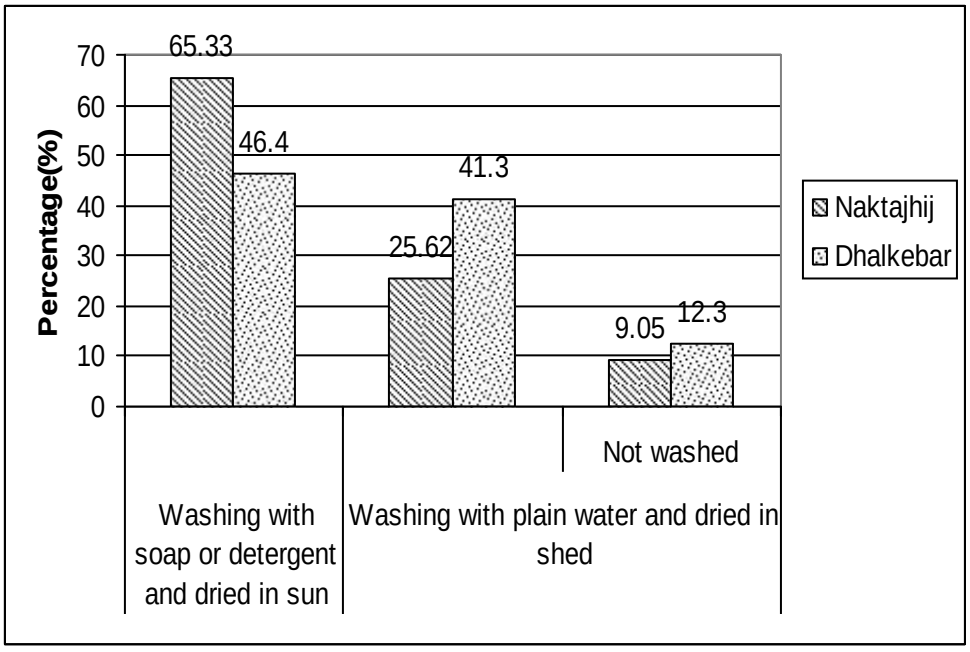


(Source: Field Survey 2010)

Figure 5.3: Effectiveness of LLINs according to respondents

5.9 Way of washing net/LLIN by Respondents

Figure 5.4 shows that 65.33% (130/199) respondents have washed net with soap or detergent and dried in sun and 25.62% (51/199) have washed net with plain water and dried in shed and 9.04% (18/199) have not washed the net in Naktajhij. Similarly, in Dhalkebar 46.4% (64/138) respondents have washed net with soap or detergent and dried in sun and 41.3% (57/138) have washed net with plain water and dried in shade and 12.3% (17/138) have not washed the net. At the time of the distribution of the net the persons who were involved in the distribution of the net gives the orientation about the way of washing of net and for the long life of net. It should be washed with plain water and dried in shade. But from the table it can be concluded that most of the respondents have washed net with soap or detergent and dried in sun.



(Source: Field Survey 2010)

Figure 5.4: Way of washing LLIN

5.10 Effectiveness of LLIN after Washing

Table 5.6 shows that 36.3% (72/199), 32.7% (65/199), 14% (28/199), 6% (12/199), 2% (4/199) and 9% (18/199) respondents from 199 house hold have washed the net once, twice, thrice, four times, five times and not washed respectively in Naktajhij and similarly, 27.5% (38/138), 38.4% (53/138), 15.2% (21/138), 3.6% (5/138), 3% (4/138) and 12.3% (17/138) in Dhalkebar. Similarly, 78.0% (141/181), 15.5% (28/181), 4.9% (9/181) and 1.6% (3/181) respondents replied that the effectiveness of net was lost after washing once, twice, thrice and four times respectively in Naktajhij. Likewise, 60.3% (73/121), 29.0% (35/121) and 10.7% (13/121) respondents said effectiveness of net was lost after washing once, twice and thrice respectively in Dhalkebar. Maximum respondents from both the villages told that effectiveness of net was lost after a single wash because most of the respondents from both the villages have washed the net with soap or detergent and dried in sun light except washing with plain water and drying in shade.

Table 5.6: Effectiveness of LLIN after washing

VDC	Naktajhij Respondents				Dhalkebar Respondents			
No. of washes	Households who have washed nets		Respondents who replied non-effective after wash		Households who have washed nets		Respondents who replied non-effective after wash	
	No.	(% out of 199)	No.	(% out of 181)	No.	(% out of 199)	No.	(% out of 181)
1	72	36.3	141	78.0	38	27.5	73	60.3
2	65	32.7	28	15.5	53	38.4	35	29.0
3	28	14.0	9	4.9	21	15.2	13	10.7
4	12	6.0	3	1.6	5	3.6	-	-
5	4	2.0	-	-	4	3.0	-	-
Not washed	18	9.0	-	-	17	12.3	-	-
Total	**199**	**100**	**181**	**100**	**138**	**100**	**121**	**100**

(Source: Field Survey 2010)

5.11 Impact of LLIN on other Insects

During the field study, respondents were also asked whether they have an idea that the LLIN also kills other insects like bedbugs, ants, cockroaches, spiders, etc. in addition to mosquitoes. In this regard, people from both the villages i.e., Naktajhij 55% (109/199) and Dhalkebar 72% (99/138) replied that they have seen death of such insects after use of LLIN, while 13% (27/199) in Naktajhij and 2% (3/138) in Dhalkebar said that they have not noticed it. Similarly, 32% (63/199) in Naktajhij and 26% (36/138) in Dhalkebar have not found the death of insects due to LLIN**.**

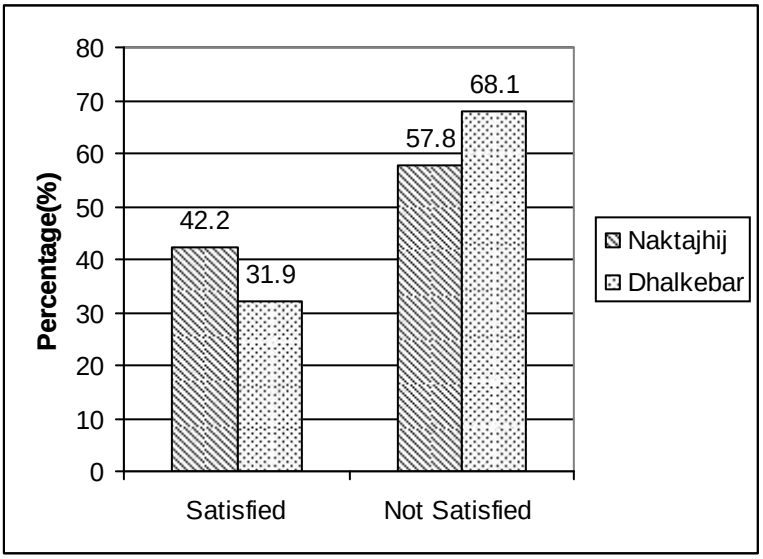
Table 5.7: Impact of LLIN

VDC	**Naktajhij Respondents**		**Dhalkebar Respondents**	
Impact of LLIN	**No.**	**Percentage (%)**	**No.**	**Percentage (%)**
Effective	109	55	99	72
Non-effective	63	32	36	26
Not seen	27	13	3	2
Grand Total	**199**	**100**	**138**	**100**

(Source: Field Survey 2010)

5.12 Satisfaction on LLIN Distribution

Questions were asked whether people are satisfied with the net distribution policy and practice in the village. In the inquiry, 42.2% (84/199) who received the net in Naaktajhij and 31.9% (44/138) who received the net in Dhalkebar informed that they are satisfied with the net distribution. Similarly, 57.8% (115/199) who received the net in Naktajhij and 68.1% (94/138) who received the nets in Dhalkebar informed that they are not satisfied with the net distribution. Most of them said that they have got less number of nets than required.



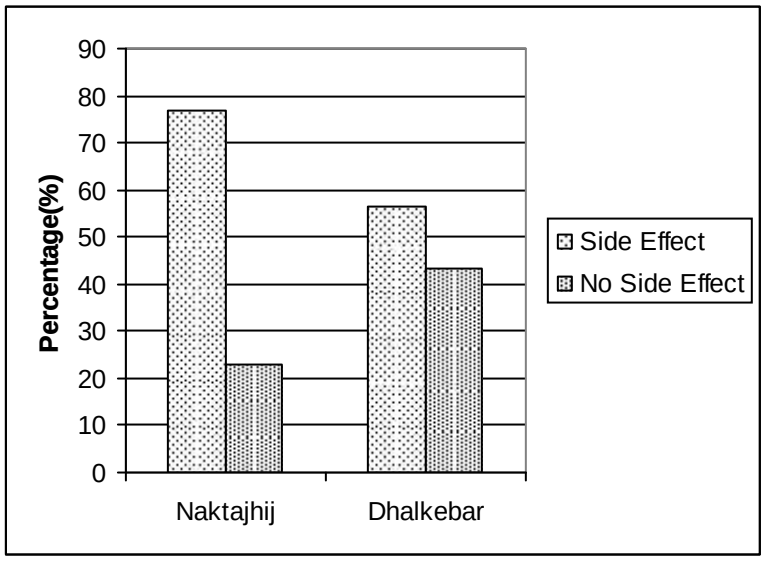
(Source: Field Survey 2010)

Figure 5.5: Satisfaction on LLIN Distribution

5.13 Side Effects of the LLIN

In the queries about any side effect of the nets, most respondents (153/199) of Naktajhij informed that they have faced itching, burning on the faces, hands and legs after use of the medicated (Supa) net. After the use of nets 76.9% (153/199) have seen swollen exposed parts of the body where as 23.1% (46/199) families informed that they have not found any side effects.

Similarly, people of Dhalkebar also replied that they have faced side effects like burning, swelling, itches at external parts of body. Out of the total surveyed families, 78/138 (56.5%) families have faced such side effects while 60/138 (43.5%) families informed that they have not got any side effects.



(Source: Field Survey 2010)

Figure 5.6: Side effects of the LLINs

VI
DISCUSSION AND CONCLUSION

In the study area, majority of the respondents were female. Since female stay in the house taking care of their children as well as entire family hence the study concentrated them. They were quite interested to know effect of mosquito bites and ways to protect from various diseases. Villagers preferred to use net as it is simple to use and probably suitable to them in terms of cost. They were unaware about gel to use over external parts of body, liquid to use with the help of mosquito bite. Despite all these, there is rare practice to purchase even ordinary net. The respondents informed that distribution of medicated nets have, really, made them conscious over mosquito bites and its effect. Learned people informed that most people of the village are making comment on insufficiency of net distribution and they would purchase net either medicated net or simple net specially for their children.

In the survey, people replied that since most people are illiterate, awareness of various disease that are transferred from mosquito and even other insects should be made and people should be encouraged for use of net or other measures. One old person who attended on discussion informed that villagers did not face any problem from mosquito when he was young. As per him, there were no mosquito two three decades ago. Similarly, one farmer said that village people have to work hard and become tired which make indifferent whether mosquito bite or not. People have sound sleep due to hard work.

By the field study, the researcher came to know that people in the village are not still so serious to purchase and use simple net. But, people want to get net if distributed free. People are knowing use of medicated mosquito nets wherever mosquitoes and other biting insects spread diseases such as malaria and dengue these days. The health benefits are greatest among young children, pregnant women and other people (such as visitors).

Studies conducted by the Global Fund (an international organization to fight against Aids, Tuberculosis and Malaria) confirm that special (medicated) mosquito nets can reduce childhood mortality by as much as one-third in malaria-ridden parts. In Nepal, Nepal Government with the support of Global Fund is distributing medicated nets in

thirteen malaria high risk district to control malaria. Very recently eighteen more districts are included for distribution of LLINs.

Akpan (2007) surveyed among 612 residents of caliber municipality, cross river state Nigeria, between June and September 2004. In a questionnaire, majority of them (88.9%) claimed that they were aware of the use of net (ITNs) for preventing mosquito bites. Only 13.2% of the respondents owned ITNs at the time of filling questionnaire. In the present study, people were asked about the distribution of medicated net. It was found that 99.50% (199/200) household received the medicated net in Naktajhij. However, in Dhalkewar 138 out of 180 got net which comes 76.67%.

In the present study, interview was conducted to the families of different sizes. There were 47 families out of 200 who consisted up to four members in Naktajhij. This is 23.5% of total members. Similarly, the percentages of middle family and large family were 53.5% (117/200) and 18% (36/200) respectively in the region among which 46 families who belonged to small family received nets and in middle and large category all interviewed families got nets i.e. only one family in Naktajhij did not get it. In this regard, small families have got 86 nets out of 420 which constitute 20%. Similarly, Middle families have received 60% (254/420) and large families have received 20% (42/420) of total net in Naktajhij. It is worth mentioning the distribution is not as logical as small family is getting huge numbers of net while large family is not getting sufficient nets in Naktajhij.

In Dhalkebar, first category of the family which is known as small family there were (43/180) families which covers 23.9% of total population. Similarly, middle family covers 59.44% (107/180) while large family 16.66% (30/180) respectively in the region among which 25 families who belonged to small family, 86 families in middle and 27 families in large category received net i.e. 42 interviewed family in Dhalkebar have not received net. In this regard, small family got 39 nets out of 324 which constitute 12%. Similarly, Middle family has received 63.3% (205/324) and large family has received 24.7% (80/324) of total net in Dhalkebar.

Different people from children to old were asked about use of net. Most of participants in Naktajhij were adult. The adults were female who were quite curious about the present study as well as about the net. Similarly, the involvements of adults

were quite high in Dhalkebar. But, male seemed to be more interested to reply and participate in the survey. 15.58% (31/199) people from 10 years to 19 years of age, 75.38% (150/199) people from 20 years to 60 years of age and 9.04% (18/199) people above 60 years of age are using LLINs in Naktaghij. Like wise 6.52% (9/138) people from 10 years to 19 years of age, 86.23 % (119/1138) people from 20 years to 60 years of age and 7.25% (10/138) people beyond 60 years of age are using LLINs in Dhalkebar.

The participated people in the survey were people from different back ground and most of them were illiterate both in Naktajhij and Dhalkebar. In case of Dhalkebar, people were more educated including graduate and post graduate persons, too. According to the survey there is no significant variation between the literate and illiterate people for using LLIN in the study area and the LLIN users in Naktaghij was observed as 8.54% (17/199), 7.03% (14/199), 14.57% (29/199), and 13.06% (26/199) in primary, lower secondary, secondary/ higher secondary education, and literate through non formal education respectively are using LLIN. Similarly in Dhalkebar, 13.77% (19/138), 5.8% (8/138), 21.74% (30/138), 0.72% (1/138) and 16.67% (23/138) have completed Primary, lower secondary, secondary/higher secondary, graduate/post graduate education, and literate through non formal education respectively. Whereas 56.8% (113/199) and 41.3% (57/138) illiterate people of Naktaghij and Dhalkebar are respectively using the LLIN. This shows that the illiterate are more interesting for using the LLIN.

There were people involved in different profession. In the survey of Naktaghij, 48%, 9.50%, 17.50%, 3.00%, 2.00%, 17.50% and 2.50% of total people were involved in occupation of agriculture, labor, business, civil servant, teachers, others and idle respectively. In case of Dhalkebar, 31%, 40%, 12%, 1%, 3%, 10% and 3% of total people were involved in occupation of agriculture, labor, business, civil servant, teachers, others and idle. According to findings, 48.24% (96/199), 9.54% (19/199), 17.6% (35/199), 3.01% (6/199), 1.50% (3/199), 17.6% (35/199) and 2.51% (5/199) people were engaged in agriculture, labor, businessmen, civil Servant, teachers, others and idle/no work respectively have been using LLIN; and similarly in Dhalkebar 34.8% (48/138), 31.9% (44/138), 13.76% (19/138), 0.72% (1/138), 2.89% (4/138), 12.31% (17/138) and 3.62% (5/138) were LLIN users in agriculture, labor,

businessmen, civil Servant, teachers, others and idle/no work respectively have been using LLIN.

When asked whether the respondents have heard or suffered from malaria fever, most of the respondents i.e. 72.5% (145 out of 200) families in Naktajhij and 80% (144 out 180) families in Dhalkebar replied that they know malaria through radio, television and other people. Similarly, 11.50% (23/200) families in Naktajhij and 27.66% (39/180) families in Dhalkebar informed that their family members suffered from malaria fever. However, no one confirmed the death of people due to mosquito bites or malaria. Hence, it can be observed that there is least chances of death toll from malaria probably because of location of these two villages being close to cities and people get more to hospitals. Lindblade et al., (2003) found that after 3 to 4 years of bed net use, the mean number of *Anopheles* mosquitoes per house in the study area was 77% lower. WHO, GMP, (2007) in one study showed 45% reduction in the incidence of severe malaria, the use of ITNs, especially LLINs, is one of the cheapest and most effective interventions against malaria. In this regard, most families in the study area informed that there is reduction of malaria after use of Supa net in both villages. They further added that there was frequent spread out of malaria and after use of net there is massive decrease in malaria cases in both places. People of village inform that no insecticidal spray has been done from more than one year in both places.

The data collected from EDCD Teku, the malaria trend before and after the LLIN distribution in both the VDCs of Dhanusa district shows a significant impact for the reduction of malaria. After the distribution of nets (from 2006) at Naktajhij the malaria have become nil by the slide examination. And in Dhalkebar just after the net distribution i.e., from 2006 malaria cases have been reduced tremendously 27.90% (798/2860) from 84.04% (2260/2689) within one year from 2005 to 2006. From then malaria cases are reducing in Dhalkebar also. One of the reducing factors is may be the use of LLINs by the people of this area.

Alaii et al., (2010) reported that mothers from intervention villages were more knowledgeable about the use and maintenance of bed nets and re-treatment with insecticide. In the study area it was found that respondents out of 199 respondents in Naktajhij, 58.3% (116/199) have known to use and maintain the nets and whereas

41.7% (83/199) have not known to use and maintain the net properly. Similarly, out of 138 respondents in Dhalkebar, 58.7% (81/138) have known to use and maintain the nets and 41.3% (57/138) have not known to use and maintain the net properly.

In the course of analysis, 199 house holds were asked about the effectiveness of the medicated net/LLIN in Naktajhij among them 28.65% (57/199) family replied that they were benefited very much from the LLIN while 69.85% (139/199) said that they get moderate benefit. Similarly, 1.50% (3/199) household said that they have not got any good result and could not get protection from mosquito and its related diseases. Similarly, 138 housed holds were asked about the effectiveness of the medicated net/LLIN in Dhalkebar among them 33.34% (46/138) family replied that they were benefited very much from the LLIN while 66.66% (92/138) said that they get moderate benefit.

According to the survey, 65.33% (130/199) respondents have washed net with soap or detergent and dried in sun and 25.62% (51/199) have washed net with plain water and dried in shed and 9.04% (18/199) have not washed the net in Naktajhij. Similarly, in Dhalkebar 46.4% (64/138) respondents have washed net with soap or detergent and dried in sun and 41.3% (57/138) have washed net with plain water and dried in shed and 12.3% (17/138) have not washed the net. At the time of the distribution of the net the persons who were involved in the distribution of the net gives the orientation about the way of washing of net and for the long life of net; it should be washed with plain water and dried in shed. But from the table it can be concluded that most of the respondents have washed net with soap or detergent and dried in sun.

In the survey, 36.3% (72/199), 32.7% (65/199), 14% (28/199), 6% (12/199), 2% (4/199) and 9% (18/199) household in Naktajhij respectively and 27.5% (38/138), 38.4% (53/138), 15.2% (21/138), 3.6% (5/138), 3% (4/138) and 12.3% (17/138) household in Dhalkebar respectively have washed the nets once, twice, thrice, four times, five times and not washed respectively. Similarly, 78% (141/181), 15.5% (28/181), 4.9% (9/181) and 1.6% (3/181) household replied that the effectiveness of net was lost after washing once, twice, thrice and four times in Naktajhij. Likewise, 60.3% (73/121), 29% (35/121) and 10.7% (13/121) respondents said effectiveness of net was lost after washing once, twice and thrice in Dhalkebar. LLINs are net that are treated at a factory level by a process that binds or incorporates insecticide into the

fibers they are desigrated to maintain their biological efficacy against vector mosquito for at least 3 years under recommended conditions of use in the field; obviating the need for regular insecticide re-treatment. When tested in laboratory the insecticidal efficacy of the net should persist through at least 20 WHO standard washes (WHO, GMP, 2007). The mosquito netting and pesticide industries teamed up to develop so-called long-lasting insecticidal mosquito nets (LLINs), which also use pyrethroid insecticides, but are also treated with a chemical binder that allows the nets to be washed at least 20 times, allowing use for three or more years (Word Net 2006). Effectiveness of the net was lost after washing once or twice because the interviewed people from both the villages did not know the proper method of washing. Instead of washing with cold water and drying they use soap or detergent for washing the net and dried in sunlight.

Curtis et al., (2003) studied Trails in Assam, Tanzania and elsewhere have shown that when a whole community is provided with ITNs, so many mosquitoes of *Anthropopophilic* species are killed by contact with the nets. In Tanzania, pyrethroid resistance has not been detected in malaria vectors, but it has emerged in bedbugs after seven years use of treated nets. Alaii et al., (2010) found that mothers from intervention villages noted practical advantages such as protection against bedbugs and falling roof debris. In the inquiry, whether people found any death of insects, in Naktajhij 55% (109/199) and Dhalkebar 72% (99/138) replied that they have seen death of such insects after use of LLIN, while 13% (27/199) in Naktajhij and 2% (3/138) in Dhalkebar said that they have not noticed it. Similarly, 32% (63/199) in Naktajhij and 26% (36/138) in Dhalkebar have not found the death of insects due to LLIN.

People in both regions were not satisfied about net distribution. Questions were also asked whether respondents are satisfied with the net distribution policy and practice in the village. In the inquiry, 42.2% (84/199) household who received the net in Naktajhij and 31.9% (44/138) household who received the net in Dhalkebar informed that they are satisfied with the net distribution. Similarly, 57.8% (115/199) household who received the net in Naktajhij and 68.1% (94/138) household who received the net in Dhalkebar informed that they are not satisfied with the net distribution. Most of them said that they had got less no of nets than required.

Medicated nets stop the mosquito and other insects to bite people and prevents from various diseases. People prefer to use such nets to decrease the mosquito bite. However, in the interview, most informed that they found side effect in the external parts of body after the use of Supa-net (Medicated net). In this regard, most respondents (153/199) of Naktajhij informed that they have faced itching, burning on the faces, hands and legs after use of the medicated (Supa) net. After the use of nets 76.9% have seen swollen exposed parts of the body where as 23.1% (46/199) families informed that they have not found any side effects. Similarly, people of Dhalkebar also replied that they have faced side effects like burning, swelling, itching at external parts of body. Out of the total surveyed families, 78 (56.5%) families have faced such side effects while 60 (43.5%) families informed that they have not got any side effects. People also said that as they found these effects, they washed the nets with soap and dried in the sun light which reduced the problem.

By performing the survey it can be concluded that illiteracy is responsible for the lack of awareness towards health and hygiene and hence is the major contributing factor for the lack of knowledge about use and maintaining the insecticidal net. Hence, extensive study should be taken by the Government to make the people aware about mosquito and diseases caused by mosquito.

VII
RECOMMENDATION

Use of long lasting insecticidal net (LLIN) has been proved to be the best measure to prevent people from mosquito bites. Since people of the village are mostly less educated and aware they should be well communicated about health as well as the preventive measures such as using of the nets to control the diseases. Governmental bodies and the concern authorities should also emphasize in education and awareness along with proper distribution of the nets with special focus to the target groups.

From the overall research following suggestion can be illustrated.

- Since most people are complaining about the improper distribution of the nets there should be proper monitoring, supervision and analysis regarding the need and use of nets as well its distribution as per government policy.
- Orientation programme about use and maintenance of net should be given to the users or beneficiaries before distribution of nets.
- Proper guidance for the use of net should be given along with its distribution and time to time feed back should be collected.
- Public health education should be spread out among the people.
- People should be made aware of Malaria and other mosquito borne diseases.
- There should be proper analysis on side effects and people should be informed about common side effects of the net if any and also its mitigation.

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ANNEX 1

PHOTOGRAPHS

Photo 1: Folded and company labelled Supanet

Photo 2: Pamplet provided to the people through Government

Photo 3: Interviewing the respondents

Photo 4: Interviewing the respondents

Photo5: An old man sleeping inside ITN

Photo 6: A child sleeping inside ITN

Photo 7: ITN net used for protection against mosquito

Photo 8: ITN net used for protection against mosquito

Photo 9: Children sleeping inside ITN

Photo 10: A postnatal mother sleeping inside ITN

ANNEX 2

QUESTIONNAIRE

The example of format for structured interviews is made below to ask with the volunteers, patients and other key informants of Naktaghij and Dhalkewor, Dhanusa District, Janakpur Zone, Nepal

1) Head of the Household Name:

Age: Sex: M/F

2) Family type

a) Small family (below 4)

b) Medium family (5-8)

c) Large family (9 and above)

3) Education of head of family

a) Literate b) Illiterate

4) If literate

a) .Primary b) Lower Secondary

c) Secondary/Higher secondary d) Graduate/Post graduate

5) Occupation of head of family

a) Agriculture b) Labor c) Businessmen

d) Civil Servant e) Teachers f) Others

g) Idle/no

6) Do you use net while sleeping?

a) Yes b) No

7) Did you get Supa-net?

a) Yes b) No

8) How many (supa-net)?

9) Was mosquito insecticide sprayed in your house, if yes when?

10) Do you know any thing about malaria fever?

a) Yes b) No

11) Do you or any of your family member have ever experienced about malaria fever?

a) Yes b) No

12) What do you do to prevent mosquito bite?

a) Burns fire b) Burns coil c) Uses net

13) Have you ever heard the death case from malaria?

a) Yes b) No

14) Do you use net while sleeping?

a) Yes b) No

15) Do you use insecticidal net or simple net?

a) Insecticidal b) Simple

16) How much you have been benefited from medicated net if you are using it?

a) Very much b) Normal c) Not

17) Do you get mosquito bite even if you are in the mosquito net?

a) Yes b) No

18) Do you know the method of washing net?

a) Yes b) No

19) With what do you wash your net?

a) Soap b) Detergent c) Only water

20) How many times have you washed the net?

a) 1 b) 2 c) 3

d) 4 e) 5

21) How do you make the net dry after washing it?

a) Direct sunlight b) In shade c) First in sunlight then in shade

22) What happens when mosquito stick on the net?

a) Flies b) Dies

c) Sits for some times d) Not observed

23) After how many wash have you found that the mosquito dies or repel by the LLIN?

a) 1 b) 2 c) 3

d) 4 e) 5

24) Have you found any problems, uncomforting or uneasiness after using the Medicated net?

a) Yes b) No

25) If yes, then what sort of problems you are facing?

26) Have you purchased the medicated net from market or donated from government?

a) Purchased b) Donated from government

27) Have you found only mosquito dies on the insecticidal treated net or other insects also dies on sticking the net?

a) Only mosquito b) Other insects also

28) What is your opinion about the effectiveness of the medicated net?

a) Excellent b) So, so c) Not good

29) At last any opinion.