

Acceptability and Practices of Mosquito Bed Net Use Among Hilly Tribes of North-east India

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INTRODUCTION

There is a growing recognition of various operational problems associated with widely practiced indoor residual spray (IRS) for malaria control. Moreover, in areas under the influence of exophilic vector mosquitoes, IRS strategy is of little value. Use of mosquito bed nets in reducing man-mosquito contact is the age-old effective method throughout the tropics and subtropics (Lindsay and Gibson, 1988). Recently, the development of insecticide treated bed nets (ITBNs) has proved very effective in curbing malaria mortality and morbidity world-wide (WHO, 1989). Because of its advantages ITBNs have been introduced in national malaria control programme of several countries (D'Alessandro et al., 1995; Cheng et al., 1995). In Assam state of India, deltamethrin impregnated mosquito bed nets provided excellent control of *An. minimus* transmitted malaria in Sonapur Primary Health Centre of Kamrup district (Jana-Kara et al., 1995) and is regarded as the suitable and effective intervention measure for malaria control in the North-east India (Vas Dev, 1998). Forested hilly and foot-hill areas of the north-eastern region of India, comprising of seven sister states namely, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura, are hard core malarious areas where control of malaria has become a challenging task due to a combination of factors (Mohapatra et al., 1998). Government of India is actively considering the large-scale introduction of insecticide treated mosquito bed nets in National Anti Malaria Programme (NAMP) in many malarious areas, including north-east India, as a selective vector control strategy. The north-eastern region of India is inhabited by many ethnic tribes and cultural sub-groups, each having its own living style, needs and socio-cultural preferences. Therefore, introduction of

ITBN programme in this region would demand adequate knowledge on demography, sleeping habits, attitude and practices towards use of bednets of different ethnic communities. In this communication we are reporting this information in respect of seven ethnic tribal communities of Nagaland and Arunachal Pradesh which may serve as the potential indicators for introducing insecticide treated mosquito bed net programme in these communities.

BACKGROUND AND METHODS

Indian National Anti Malaria Programme distributed about 0.1 million deltamethrin treated nylon single sized mosquito bed nets, during late 1995, in malaria ridden pockets of all seven states of the north-eastern region as a pilot project study (Vas Dev, 1998). In each state 1-3 districts; in each district 2-5 malarious Primary Health Centres (PHCs) and in each PHC few most malarious villages were selected to distribute treated mosquito nets to all households. In 1996, after about one year of bednets distribution, a beneficiary assessment of insecticide treated bed nets was carried out by Indian Council of Medical Research to evaluate the community response to ITBNs. wherein we were involved in carrying out the assessment surveys in the states of Nagaland and Arunachal Pradesh. Present study is the corollary of the beneficiary assessment surveys of ITBNs. After determining suitable sample size for both the states (minimum 500 households in Arunachal Pradesh and 300 household in Nagaland), on the basis of number of bed nets distributed, the list of beneficiary villages was obtained from the Medical Officer-in-charge of the respective PHCs and villages were randomly selected for the study. Two experienced field investigators visited the selected villages and contacted every household. The Head of the household was interviewed following a

prestructured proforma specially developed for this purpose. Help of the local health worker was taken for communicating whenever required. In the absence of the Head, any other adult member of the family was interviewed.

Study Area: Surveys were carried out in hilly and foothill areas of the district Kohima of Nagaland and East Siang, Tirap and Lohit districts of Arunachal Pradesh. In district Kohima, a total of nine villages in PHC Medziphema (six inhabited by Angami tribals, two by Sema tribals and one by Kuki tribe people) were covered. In East Siang district, six villages of Adi tribe in PHC Bilat; two villages of Nokte tribe in PHC Khonsa of Titap district and eight villages inhabited by Khamti tribals in two PHCs namely, Mahadevpur (2 villages) and Namsai (6 villages) of district Lohit in Arunachal Pradesh were surveyed. In addition, one village of Deori tribe people in Mahadevpur PHC was also covered. Thus, the present study encompassed a total of 1904 households in 26 villages of 5 PHCs in 4

districts of 2 north-eastern states covering 6 Hill's and 1 Plain's tribal (Deori) communities.

Data Analysis: Data was analysed using D-base 3.2 and Epi-info 6.0 version softwares.

RESULTS

Demography, Household and Sleeping Habits: Most of the study villages generally consisted of 50–100 households belonging to a single tribe. Houses were constructed with in a defined village area here and there, not too far off from their agricultural fields. The average size of the family in Arunachali tribes ranged from 6.6 to 6.9 members per family. In comparison, Semas of Nagaland had relatively smaller families averaging 5.3 members and Kukis had bigger families of 7.6 members on an average (Table 1). Tribals in Arunachal Pradesh traditionally lived in typical houses known as 'CHANGS' which were long thatched structures built on raised wooden platform having walls and floor of split

Table 1: Mosquito bed net use practices in ethnic tribes of North-east India

S. No.	Characteristics	Nagaland			Arunachal Pradesh			
		Hill's tribes			Plain's tribe			
		Angami	Kuki	Sema	Adi	Khamti	Nokte	Deori
1.	No. villages surveyed	06	01	02	06	08	02	01
2.	No. households surveyed	517	61	136	555	412	154	69
3.	Family size (mean $\pm$ sd)	6.1 $\pm$ 2.8	7.6 $\pm$ 3.7	5.3 $\pm$ 2.6	6.9 $\pm$ 2.7	6.6 $\pm$ 2.9	6.7 $\pm$ 2.7	6.6 $\pm$ 2.5
4.	% Households using bed nets	100.0	98.4	84.6	92.6	90.5	65.6	71.0
5.	No. bed nets owned/ household (mean $\pm$ sd)	2.4 $\pm$ 1.7	2.9 $\pm$ 2.3	1.5 $\pm$ 1.2	2.9 $\pm$ 1.9	2.5 $\pm$ 1.7	1.5 $\pm$ 1.5	1.5 $\pm$ 1.5
6.	% households using bed nets during -							
	a) Summers & monsoon only	21.5	23.0	39.0	16.6	15.5	40.9	33.3
	b) Winters only	0.2	0.0	0.0	0.7	1.9	1.9	1.4
	c) Round the year	78.3	77.0	61.0	82.7	82.5	57.1	65.2
7.	Washing frequency of bed nets in 6 months (% Households)							
	a) Nil	59.4	59.0	53.7	97.3	94.2	97.4	84.1
	b) Once	35.2	39.3	31.6	2.7	4.6	1.9	13.0
	c) Twice	3.1	0.0	6.6	0.0	0.7	0.0	2.9
	d) Thrice	2.1	1.6	3.7	0.0	0.5	0.6	0.0
	e) Four times	0.2	0.0	1.5	0.0	0.0	0.0	0.0
	f) Five times	0.0	0.0	2.2	0.0	0.0	0.0	0.0
	g) Seven times	0.0	0.0	0.7	0.0	0.0	0.0	0.0
8.	Persons/ household using bed nets regularly (mean $\pm$ sd)							
	a) Males (>15 Yrs.)	1.0 $\pm$ 0.9	0.7 $\pm$ 0.9	0.9 $\pm$ 1.0	1.2 $\pm$ 1.2	0.4 $\pm$ 0.7	0.6 $\pm$ 1.0	0.3 $\pm$ 0.8
	b) Females(>15 Yrs.)	1.3 $\pm$ 1.1	1.3 $\pm$ 0.9	1.0 $\pm$ 0.9	1.3 $\pm$ 1.3	0.4 $\pm$ 0.7	0.8 $\pm$ 0.7	0.4 $\pm$ 0.6
	c) Children(<15 Yrs.)	2.1 $\pm$ 2.1	1.8 $\pm$ 1.6	2.0 $\pm$ 2.1	1.6 $\pm$ 1.8	0.6 $\pm$ 0.9	1.1 $\pm$ 0.9	1.1 $\pm$ 1.2
9.	Persons/ household using bed nets occasionally (mean $\pm$ sd)	1.7 $\pm$ 2.3	3.8 $\pm$ 3.3	1.4 $\pm$ 1.9	1.9 $\pm$ 2.9	4.6 $\pm$ 2.9	2.3 $\pm$ 2.7	2.3 $\pm$ 2.6
10.	Persons/household not using any bednet (mean $\pm$ sd)	0.02 $\pm$ 0.3	0.0	0.09 $\pm$ 0.5	0.9 $\pm$ 2.2	0.6 $\pm$ 1.6	2.0 $\pm$ 2.6	2.4 $\pm$ 2.6

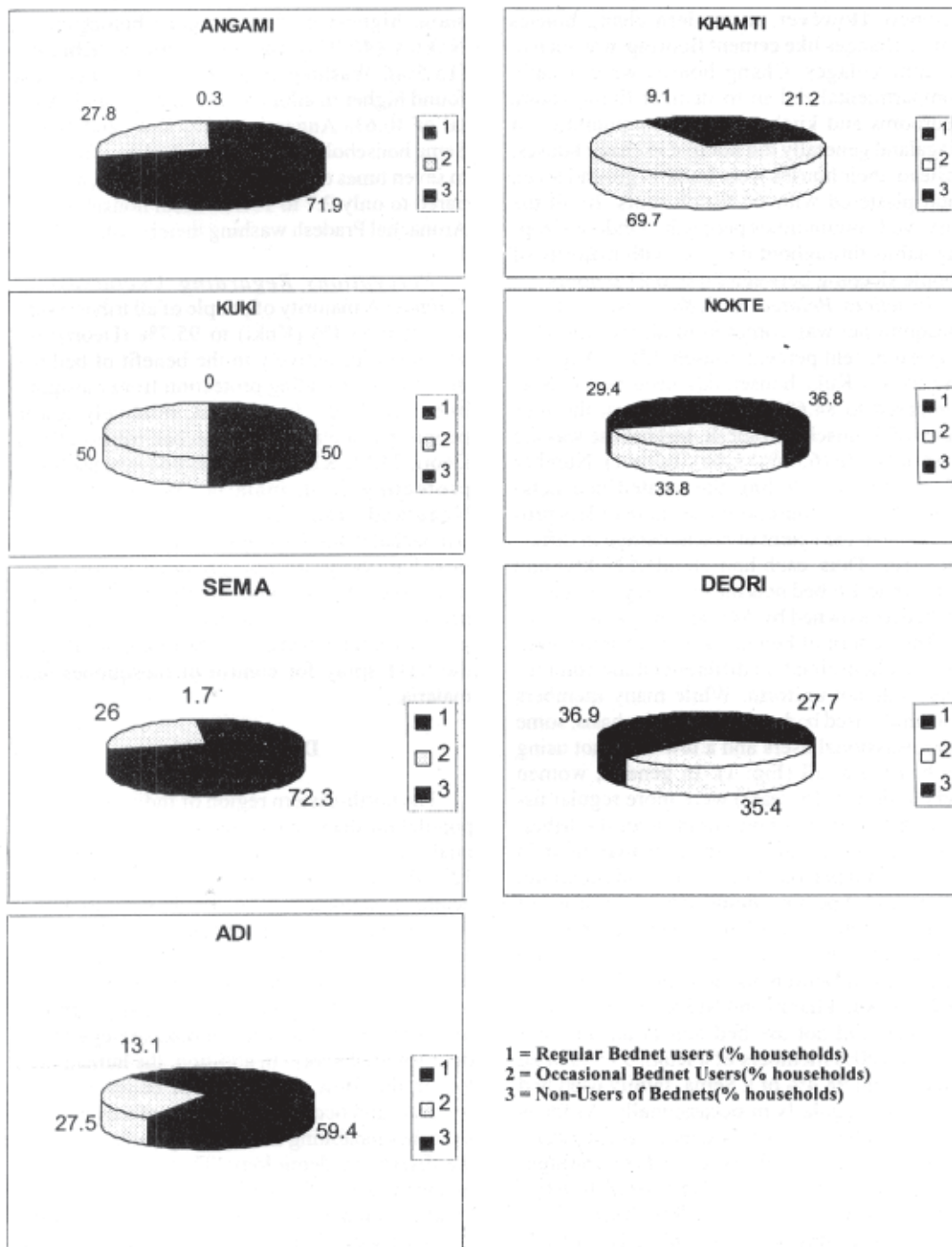


Fig. 1. Bednet use pattern in different tribal communities

bamboo. However, in modern chang houses minor changes like cement flooring was seen in Khamti villages. Chang houses were usually compartmentalized in to distinct living room, bedrooms and kitchen. Tribal communities of Nagaland generally did not live in chang houses. Instead, their houses were built on ground level, mud plastered with tin/thatch roofs. In all the surveyed communities people had indoor sleeping habits throughout the year with majority of people sleeping between 20 0 to 21 0 hours.

Practices Related to Bednet Use: Use of mosquito net was common in all the tribes. In Nagaland, cent percent households of Angamis and 98.4% Kuki households used bed nets as compared to 84.6% Semas. Amongst the four tribes of Arunachal Pradesh, bed net use was the least in Nokte (65.6%) tribe (Table 1). Number of bed nets (excluding the treated bed nets) owned by each household was more or less proportional to the extent of bed net usage in different tribes. Thus, each household of Noktes and Deoris had 1.5 bed nets on an average as against 2.9 bed nets owned by Adis and Angamis (Table 1). The pattern of bed net use by various members of a household in different ethnic communities was not uniform. While many members in a family used bed nets on a regular basis, some were occasional users and a few were not using the bed net at all (Fig. 1). In general, women and children (<15 years) were more regular users of bed nets in a household in all the tribes. Occasional users of bed nets were maximum in Khamtis (4.6 persons/household) and minimum in Semas (1.4 persons/household). Non-users of bed nets, at family level, were relatively more in Arunachali tribes. On an average, 37% family members in a Deori household and 13.1, 9.1 and 29.4% in Adi, khamti and Nokte households respectively did not use bed nets at all. In comparison, 100% members of a Kuki, 99.7% of an Angami and 98.4% of a Sema family used bed nets, either regularly or occasionally. As far as seasonal pattern of use is concerned, majority of households in all tribes used bed nets throughout the year, Adis with 82.7% households in this category ranked first and Noktes with 57.1% households in this category ranked last. (Table 1). However, many households in all the tribes used bed nets only during summers and mon-

soon, highest in this category belonging to Noktes (40.9%) and minimum to Khamtis (15.5%). Washing frequency of bed nets was found higher in ethnic tribes of Nagaland. A total of 40.6% Angami, 41.0% Kuki and 46.3% Sema households washed their bed nets from one to seven times during the last six months, as compared to only 2.7 to 15.9% tribal households of Arunachal Pradesh washing their bed nets (Table 1).

Perceptions Regarding Usefulness of Bednets: A majority of people of all tribes, ranging from 54.1% (Kuki) to 95.7% (Deori), responded affirmatively to the benefit of bed net in terms of providing protection from mosquito bites (Table 2). In contrast, relatively fewer people, particularly of Arunachali tribes (11.6% Deori, 23.5% Khamti), found bed nets useful in protecting from malaria. More tribals of Nagaland (ranging 36.8-59.0%) than of Arunachal Pradesh (ranging from 3.9-36.8%) believed in the protection provided by bed nets from fever. An overwhelmingly high number of people (>93.0%) in Nagaland, perceived insecticide treated bed nets to be more useful than the DDT spray for control of mosquitoes and malaria.

DISCUSSION

The north-eastern region of India, with 3.7% population share in the country, contributes annually about 8-10% of total malaria cases, 10-12% *P. falciparum* cases and 13-15% malarial deaths in national figures. Predominantly hilly, forested, relatively inaccessible terrain and presence of highly efficient exophilic mosquito vector like *Anopheles dirus* render control of malaria logistically as well as technically difficult in this region by the conventional strategy of indoor residual spray. In addition, the human factors in the form of diversity of belief, culture, life style and occupational needs of various ethnic tribes inhabiting the region, greatly influence the disease epidemiology. Therefore, for combating malaria in the north-eastern region, a technically sound technology in accordance with vector behaviour, local ground realities and most importantly a technology acceptable to the community is needed. Insecticide treated bed nets

Table 2: Usefulness of bed nets as perceived by ethnic tribes of North-east India

S. No.	Characteristics	Nagaland		Arunachal Pradesh				
		Hill's tribes			Plain's tribe			
		Angami	Kuki	Sema	Adi	Khamti	Nokte	Deori
1.	Bed net protects from mosquito bites (% response)							
	Yes	72.1	54.1	55.9	90.5	83.3	88.3	95.7
	No	16.6	42.6	30.9	6.7	0.7	9.1	1.4
	Do not know	11.2	3.3	13.2	2.9	16.0	2.6	2.9
2.	Bed net protects from malaria (% response)							
	Yes	67.3	67.2	57.4	70.1	23.5	72.1	11.6
	No	21.5	29.5	29.4	27.0	60.4	25.3	85.5
	Do not know	11.2	3.3	13.2	2.9	16.0	2.6	2.9
3.	Bed net protects from fever (% response)							
	Yes	42.7	59.0	36.8	36.8	3.9	14.9	10.1
	No	46.0	37.7	50.0	60.4	80.1	82.5	87.0
	Do not know	11.2	3.3	13.2	2.9	16.0	2.6	2.9
4.	Bed net protects from insect bites (% response)							
	Yes	1.0	0.0	2.2	16.2	27.4	3.2	47.8
	No	87.8	96.7	84.6	80.9	56.6	94.2	49.3
	Do not know	11.2	3.3	13.2	2.9	16.0	2.6	2.9
5.	ITBNs better than DDT (% response)							
	Yes	96.3	93.4	96.3	77.5	85.9	65.6	88.4
	No	2.1	1.6	0.7	11.2	7.6	14.9	8.7
	Do not know	1.5	4.9	2.9	11.4	6.6	19.5	2.9

fulfill these requirements and may prove a potent weapon for malaria control in this area. Present study noted the wide acceptance and popularity of bed nets in tribal communities of Nagaland and Arunachal Pradesh in complete contrast to the Gond tribals of Madhya Pradesh, India where in spite of continuous health education not more than 20.0% people could be motivated to use bed nets in a feasibility study of insecticide impregnated bed nets for malaria control in district Mandla (Neeru Singh et al., 1994). In such areas it is difficult to sustain the ITBN programme due to the low acceptance of mosquito bed nets as a result of socio-cultural habits of the population. In comparison, mosquito bed nets are commonly and routinely used by most of the tribal communities in North-east India and practically each household possesses them. This makes a strong point in favour of introduction of ITBNs in this part of the country. However, few observations that emerged from this study need to be considered before introducing ITBNs in the region for malaria control. Sleeping pattern of various ethnic groups and consequently the size of bed nets is important

from user's point of view. In Nagaland, tribal communities generally use big sized cots since the entire family of husband, wife and children below 15 years sleep together on one cot. Therefore, acceptance of small sized (single) bed nets will be poor by these people. Big sized bed nets (double), preferably matching to their cot size, will be more convenient and acceptable to them.

While introducing ITBNs in this region, besides distributing new treated bed nets, impregnation of the existing ones in the individual households should also be attempted since most of the tribal households possess a couple of bed nets. This will reduce the cost and increase the coverage. Cost of ITBNs introduction in the north-eastern states may perhaps further be reduced if treated mosquito bed nets, instead of supplying completely free of cost, be given on subsidized rates to the community. This proposition, however, needs to be weighed carefully since it may result in decreased coverage similar to what happened with the introduction of a fee on treated ITBNs in the second year of intervention in Gambian National Impregnated Bed

nets Programme (D' Alessandro et al., 1997). Another issue relates to the mode of impregnation and distribution of impregnated bed nets in the community. Generally, tribal people in North-east India have immense faith in their religious leaders, village headman and village councils. Therefore, bed nets may perhaps be distributed easily through village councils and/or with the help of social and religious leaders as was successfully done in tribal areas of Orissa (Yadav and Sampath, 1993). Initially, community level impregnation of the bed nets may be attempted through village volunteers after getting them trained at the PHC level. Subsequently, user-friendly packaging of the insecticide for impregnation such as sachets for single or double bed nets need to be made available for individual usage at the household level.

The duration of effective protection afforded by ITBNs against mosquitoes depend on factors like the type of fabric of the bed net, dose and formulation of the insecticide and washing frequency (Curtis et al., 1996 ; Jana-Kara et al., 1994). Generally, the persistency of residual action of synthetic pyrethroid treated mosquito bed nets last for six months, if remain unwashed, and thereafter, re-impregnation may be required (Vas Dev, 1998). Frequent washing of the bed nets, as practiced by tribal communities, particularly in Nagaland, will reduce the insecticidal strength, efficacy and span of the protection given by ITBNs. This point need to be emphasized while introducing ITBNs and as far as possible communities should be advised to co-ordinate their washing of treated bed nets at a time just before re-impregnation is due (Jana-Kara et al., 1994).

Use of mosquito bed nets depends on factors like cultural preferences, availability, affordability and knowledge on its protective effects (Yadav and Sharma, 1997). Surveyed communities of Nagaland and Arunachal Pradesh considered bed nets useful in protecting from mosquito bites and malaria and majority preferred impregnated bed nets over indoor residual spray. In district Kamrup of Assam also, deltamethrin impregnated bed nets were greatly welcomed by the local tribal people (Jana-Kara et al., 1995). Interestingly, it was predicted way back in 1984, that impregnated bed nets would

be more acceptable to Indian communities than house spraying (Curtis, 1984). Strategy of insecticide treated bed nets in the north-eastern region of India may perhaps provide answer to the malaria problem in remote, inaccessible, hilly, forested areas due to the overall community acceptance, practicability and suitability. However, necessary flexibility, keeping in view the requirement and preferences of targeted ethnic groups, aided with adequate IEC measures will ensure better compliance of the treated bed nets, whenever and wherever introduced.

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KEY WORDS Mosquito Bed Net. Insecticide Treated Bed Nets. Mosquitoes. Malaria. Ethnic Tribes. North-east India.

ABSTRACT Twenty six villages, having 1904 households, in five Primary Health Centres of four districts covering seven tribal communities of Arunachal Pradesh and Nagaland states of North-east India were surveyed and information on demography, sleeping habits, pattern and practices related to mosquito bed net use were elicited. Use of bed nets and washing frequency was more pronounced in ethnic tribes of Nagaland. Noktes of Arunachal Pradesh were the lowest (65.6 % households) and Angamis of Nagaland were the highest (100 % households) users of bed nets amongst the surveyed communities. Women and children below 15 years of age were more regular users of bed nets in all the communities. Majority, ranging from 93.4 to 96.3%, in Nagaland perceived insecticide treated bed nets better than indoor residual spray. Since mosquito bed nets are, by and large, culturally acceptable in the north-eastern region of India and one of the regional malaria mosquito vectors, *Anopheles dirus* is exophilic, the introduction of ITBNs in tribal areas of North-east India may prove as an useful strategy for malaria control.

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