

AWARENESS ABOUT KALA-AZAR DISEASE AND RELATED PREVENTIVE ATTITUDES AND PRACTICES IN A HIGHLY ENDEMIC RURAL AREA OF INDIA

NA Siddiqui, Narendra Kumar, A Ranjan, K Pandey, VNR Das, RB Verma and P Das

Rajendra Memorial Research Institute of Medical Sciences (ICMR), Agam-Kuan,
Patna, Bihar, India

Abstract. This study was undertaken to assess the extent of community awareness and related practices about kala-azar undertaken by them to control the disease, in an highly endemic focus of Bihar, India. A household-based cross-sectional knowledge, attitude, and practices (KAP) survey consisting of quantitative components on knowledge, attitude, and practices concerning kala-azar was administered to heads-of-household through a semi-structured questionnaire. Data indicated that 61% respondents were illiterate, 4% had correct knowledge that sandfly bites caused kala-azar, 26% do not know any specific transmission agents for kala-azar. A majority (72%) of respondents were not able to recognize sandfly, 33% had no specific knowledge about the symptoms. All of them (100%) believed that this disease could affect his or her family income. Nearly all (95%) were positive that the kala-azar cases could be reduced with implementation of proper health measures. A few (11%) suggested isolation of patients to avoid contacting kala-azar while a high proportion (93%) of respondents favored specific allopathic medicine, and a majority (72%) favored the utilization of the services offered by primary health centers or government hospitals. Just over half (66%) of the respondents were not using any prevention measures to avoid contacting disease. These results could prove to be useful for health planners in developing suitable control strategies.

Key words: kala-azar, visceral leishmaniasis, KAP, rural India

INTRODUCTION

Visceral leishmaniasis (VL, kala-azar) is a parasitic disease caused by *Leishmania donovani* and transmitted by the bite of

sandfly vector *Phlebotomus argentipes*. Worldwide, 200 million people are at risk, and an estimated 500,000 new cases occur annually (Guerin *et al*, 2002). An estimated 150 million people are at risk of VL in 109 districts. More than 90% of kala-azar cases reported worldwide occurs in Bangladesh, Northeast India, Nepal, Sudan and Northeast Brazil and more than 60% of the world's VL cases are reported from India, Nepal and Bangladesh alone (WHO, 2005). Approximately 100,000-300,000 new cases of VL occur annually in India (Singh,

Correspondence: Dr NA Siddiqui, Division of Social Sciences, Rajendra Memorial Research Institute of Medical Sciences (Indian Council of Medical Research), Agam-Kuan, Patna 800 007, Bihar, India.

Tel: +91 612 631561; Fax +91 612 263437-9

E-mail: niyamatalisiddiqui@yahoo.com;
dirrmris@sancharnet.in

2006a). But these official figures are likely to seriously underestimate the real burden of VL in India (Desjeux, 1996; Singh *et al*, 2006b), which results in an estimated loss of 400,000 disability-adjusted life years (DALYs) annually (Joshi, 2008). Out of the total cases of kala-azar reported annually in India, 90% of the cases are reported from Bihar alone (Sunder *et al*, 2000). Focal and sporadic cases of kala-azar have been occurring regularly in many districts of Bihar since 1977. Presently, 33 out of 37 districts in Bihar are endemic at various level and nearly 67.5 million people are at risk of this disease that pose a major public health concern in Bihar, India (Ranjan *et al*, 2005). It affects both children and adults for many decades and remains a significant public health problem in Bihar. Because most affected populations are poor and rural, the impact of VL may not be apparent to national health policy makers; hence, treatment and control of the disease are not usually accorded high priority (Boelaert *et al*, 2000). Kala-azar is a fatal disease if left untreated. Worldwide, an estimated 51,000 deaths occur annually due to kala-azar (WHO, 2003). A majority of the population living in the endemic areas of kala-azar have low levels of education, income, and poor quality of housing (Boelaert *et al*, 2000; Ahluwalia *et al*, 2003).

The Government of India aspires to eliminate VL from India by 2010. But, despite government control efforts in terms of diagnosis, treatment, insecticide (IRS) spraying, and IEC (information, education, and communication) activities, the general public still have misconceptions concerning kala-azar in the state. Community participation is the most important prerequisite for the success of prevention and control programs of any disease, and cooperation of the affected population is essential for the implementation and use

of program activities. Program managers need to understand the extent of the awareness about kala-azar and its related preventive attitude and practices of the community, because these are the important determinants of community participation.

Little is known about how individuals and communities in rural areas of Bihar perceive the disease and its management (Thakur, 2000; Kumar *et al*, 2002; Singh *et al*, 2006a). The present study was therefore undertaken with the objective to acquire information on community awareness about kala-azar and its related preventive attitudes, and practices to control the disease in a highly endemic focus in Muzaffarpur District, Bihar, India.

MATERIALS AND METHODS

Study area and study population

This study was conducted during the year 2005. The study was carried out in Kurhani Block of Muzaffarpur District, Bihar State, India. The total population of the district was 3.7 million, with 3.4 million living as the rural population. There are 14 Block Primary Health Centers (PHCs) in the district. The population of the selected Block was 317,245. There were 42 sub-centers in this Block PHC, each covering a population ranging from 5,000 to 9,000. The selected two sub-centers covered 8 villages with a total population of 9,448 in 1,574 households. This block is situated 20 km from Muzaffarpur town, 50 km from Patna, the state capital, and is on the state highway making it freely accessible and suitable for frequent visits. The study area is situated at an altitude of 55 m from sea level and receives rainfall of about 200-250 cm annually. The temperature and humidity range from 8-37°C and 40-95%, respectively. The natural

habitats and vegetation of all the villages were almost same, that is, stretches of agricultural land separating it from other endemic villages. About 60% of the houses had mud-plastered walls with a tiled or thatched roof. The remainder were brick, made with either cement plaster or without cement plaster. Almost all the houses had a *kutch*a (mud) floor. The floors and walls are usually smeared with mud and cow dung. The houses were built on agricultural land. About 65% of houses had cattle shed inside their houses or in the courtyard, which was near to their seating and sleeping areas. The majority of the population were indigenous inhabitants with some in-migrants from near-by districts, such as Vaishali and Samastipur. Approximately 20% of the population had migrated to other states like Punjab, West Bengal, Assam for employment. The population was of different socio-economic strata, comprised mainly of casual, skilled, and laborers engaged in subsistence farming. The overall literacy level was very low; males had higher levels than females.

Study design

The design of the study was descriptive cross-sectional. A household-based (house-to-house) survey with quantitative components was carried out in the study area. A multistage sampling technique was adopted for the selection of households.

The study district and block were selected because of the previous five years of continuously high incidence of kala-azar, which represents a typically high endemic area of kala-azar for last two decades. This was done to collect information from kala-azar focus areas to observe the effect of IEC activities running under control program concerning kala-azar awareness, and its related preventive attitudes and practices for control of kala-azar

in the community. Sub-centers were listed in accordance with their kala-azar incidence, and two highly endemic sub-centers were selected. Similarly, within each sub-center, four villages were selected following a similar pattern. Complete enumerations of households were done in eight selected villages of Kurhani Block, Muzaffarpur District, Bihar State, India.

The head of each household (preferably male heads) was interviewed through a semi-structured questionnaire by a trained interviewer with a sociological background. If no male was available for the survey, a female head of household was interviewed on the basis that decision about health and other related activities were, in any case mostly taken by head of household in Indian sub-continent. If the house was found to be locked or the head of household could not be contacted on two consecutive visits, another adult member of the household was interviewed. A pre-tested semi-structured interview schedule was prepared in English and was translated into Hindi. The interview schedule consisted of various questions divided into four sections: demographic profile, knowledge about kala-azar, attitude related to kala-azar control, and practices related to kala-azar control. The interview schedule was pre-tested in another Block not included in the study and accordingly modified. In addition to the above instrument, an observation checklist was also used to collect background information of the selected villages, such as type of house/roof/floor, presence of cattle shed, literacy level, migration, and occupation. Written informed consent for the interviewee was obtained after explaining the objectives and methodology of the study in detail. The study was approved by the Scientific Advisory Committee as well as the Ethics Committee of

the Institute. A total of 1,574 respondents were interviewed, taking one respondent from each household

Data from structured questionnaire were transferred using dbase IV plus programs developed by the statistician of the institute. Simple data analysis methods were used and included calculations of percentages, accordingly.

RESULTS

A total of 1,574 respondents were interviewed, of which 1,057 (67%) were male, while females accounted for 33%. The majority of the respondents (26.7%) were 25-34 years, followed by (24.3%) in the age group of 35-44 years. A possible explanation for young and middle age respondents are mostly the nuclear structure of the family. More than half respondents were male head of household and 31.6% were their spouses. A majority of the respondents (70%) lived in thatched/mud-plastered houses. Assessment of level of education indicated that 60% of them were illiterate, and only 2.6 % had graduated. The respondents were of different occupational strata; with 41.5 % engaged in agricultural laboring followed by 16.4 % in their own agriculture. Only 8.6% were the skilled category of laborer such as carpenters, masons, mechanics, tailors, plumber, and so forth (Table 1).

The majority of the respondents (96%) had heard about kala-azar. The most common cause of kala-azar was cited as "mosquito bite" (62.8%), while only a negligible proportion (4.3%) stated "the bite of sandfly." Responses as to what transmits kala-azar indicated that 62.8% associate it with a mosquito bite. However, 32.9% had no idea at all, and only 4.3% associated it with the bite of the sandfly. With regard to clinical presentation, fever with

Table 1
Distribution of socio-demographic characteristics of respondents ($n = 1,574$).

| Characteristics | <i>n</i> | % |
|------------------------------|----------|------|
| Sex | | |
| Male | 1,057 | 67.0 |
| Female | 517 | 33.0 |
| Age (years) | | |
| 15-24 | 277 | 17.6 |
| 25-34 | 420 | 26.7 |
| 35-44 | 382 | 24.3 |
| 45-54 | 292 | 18.6 |
| ≥55 | 203 | 12.8 |
| Household status | | |
| Head | 881 | 56.0 |
| Spouse | 498 | 31.6 |
| Others ^a | 195 | 12.4 |
| Occupational status | | |
| Agricultural labor | 654 | 41.5 |
| Own agriculture | 258 | 16.4 |
| Skilled laborer | 135 | 8.6 |
| Business | 102 | 6.5 |
| Services | 132 | 8.4 |
| Others ^b | 293 | 18.6 |
| Literacy status | | |
| Illiterate | 948 | 60.2 |
| Can read and write | 50 | 3.2 |
| Primary, middle, high school | 491 | 31.1 |
| Intermediate | 44 | 2.8 |
| Graduate | 41 | 2.6 |

^aDependent parents and children

^bJobless dependants

chills and shivering were the most frequently mentioned signs and symptoms of kala-azar reported by 54.5%. Other symptoms that featured prominently were loss of appetite (13.5%), enlargement of spleen/liver (9.3%), and blackening of skin (6.5%). A significant proportion of the respondents (32.3%) had no idea about signs and symptoms of the disease. A highly significant statistical association was found between literacy status and awareness about "fever" and "enlargement of

Table 2
Distribution of respondents according to their knowledge about kala-azar ($n = 1,574$).

| Awareness | <i>n</i> | % |
|----------------------------------------------------------------------------|----------|------|
| Awareness about kala-azar | | |
| Yes | 1,511 | 96.0 |
| No | 63 | 4.0 |
| Awareness about causes of kala-azar | | |
| Mosquito bites | 988 | 62.8 |
| Sandfly bites | 68 | 4.3 |
| Do not know | 416 | 32.9 |
| Awareness about recognition of vector | | |
| Yes | 227 | 14.4 |
| No | 1,143 | 72.6 |
| Do not know | 204 | 13.0 |
| Awareness about breeding place of vector | | |
| Dirty place | 362 | 23.0 |
| Cervices in the house | 257 | 16.3 |
| Thatched roof | 208 | 13.2 |
| Damp and dark places | 151 | 9.6 |
| Do not know | 596 | 37.9 |
| Awareness about signs and symptoms ^a | | |
| Fever | 857 | 54.5 |
| Loss of appetite | 212 | 13.5 |
| Enlargement of spleen/liver | 146 | 9.3 |
| Change of complexion | 102 | 6.5 |
| Pain in abdomen | 50 | 3.2 |
| Do not know | 508 | 32.3 |
| Kala-azar is an infectious disease, transmitted from one person to another | | |
| Yes | 261 | 16.6 |
| No | 905 | 57.5 |
| Do not know | 408 | 25.9 |

^aMultiple responses

the spleen and liver" as a symptom of kala-azar ($p < 0.001$).

Regarding awareness of the breeding place of vector, 37.9% of respondents did not have any idea at all, while 23% responded "dirty places" as the most probable breeding site for vector, followed by cervices in the houses (16.3%). When the respondents were asked about the iden-

tification or recognition of the vector (sandfly), the majority (72.6%) were not able to identify the sandfly as the vector, while only a small number (14.4%) recognized the sandfly. The fact that kala-azar is a contagious disease and can be transmitted from one person to another was reported by only 16.6% of respondents, and significantly, 57.5% responded that kala-azar is not a contagious disease, while about one-fourth (25.9%) had no idea (Table 2).

Concerning attitudes about control of the disease, nearly all (99.1%) said they viewed kala-azar as a very important problem for them. On being asked about the seriousness of the disease, 80% of respondents termed that kala-azar is a very serious disease compared to malaria; whereas, 11.8% thought it to be an equally serious disease. Kala-azar was thought to be a preventable disease by 95% of the respondents. Attitudes about community participation were very encouraging, as nearly all (99.7%) felt that this problem could be overcome through community participation in the kala-azar control program. On being asked if they heard about suffering of any family member from kala-azar, about one-half (56%) of the respondents would become scared or disturbed. Regarding the effect on family income, all the respondents (100%) had the attitude that, when a person gets kala-azar, not only the individual, but the whole family has been affected economically, that is, the disease drained the family resources. Their attitude regarding patient care was satisfactory as 58.3% were for cleanliness, 16.8% for mosquito net, but 10.6% had the wrong impression that isolation of patients would be required (Table 3).

In response to questions about prevention and control awareness, only a negligible proportion (1.2%) believed in indigenous medicines (leaves, root and herbs of

Table 3
Distribution of respondents according to kala-azar related attitude for the control of kala-azar ($n = 1,574$).

| Attitude | <i>n</i> | % |
|-------------------------------------------------------------------------|----------|------|
| Seriousness of disease as compared to malaria | | |
| Very serious | 1,259 | 80.0 |
| Serious | 186 | 11.8 |
| Ordinary | 14 | 0.9 |
| Do not know | 115 | 7.3 |
| Kala-azar considered an important problem | | |
| Yes | 1,560 | 99.1 |
| No | 10 | 0.6 |
| Do not know | 4 | 0.3 |
| Kala-azar can be controlled through community participation | | |
| Yes | 1,570 | 99.7 |
| No | 0 | 0.0 |
| Do not know | 4 | 0.3 |
| Effect on family Income | | |
| Yes | 1,574 | 100 |
| No | 0 | 0 |
| Complete cure of the disease is possible | | |
| Yes | 1,496 | 95.0 |
| No | 72 | 4.6 |
| Do not know | 6 | 0.4 |
| When you know about suffering from kala-azar, reactions realized by you | | |
| Scared/ disturbed | 881 | 56.0 |
| Immediate doctor's advice | 139 | 8.8 |
| Rushed to hospital | 124 | 7.9 |
| Pray to God | 33 | 2.1 |
| Do not know | 397 | 25.2 |
| Patient's care ^a | | |
| Cleanliness | 918 | 58.3 |
| Use of mosquito net | 264 | 16.8 |
| Isolation of patient | 167 | 10.6 |
| Precaution in diet | 107 | 6.8 |
| Do not know | 469 | 29.8 |

^aMultiple responses

locally available trees) for the treatment of kala-azar, while majority (92.9%) would choose available specific allopathic medicines, such as SSG, Pentamidine, and AMB/

Fungizone. On being asked about the utilization of health services, government hospitals and Primary Health Center were the first choice for treatment by 73.6% of the respondents if a suspected case of kala-azar occurred in the household, followed by private doctors or private hospitals (19.6%). A small proportion (3.1%) of the respondents was in favor of village-level traditional healers, and 3.7% had no idea where to go for the treatment of kala-azar. The prevention measures practiced by the respondent was not found satisfactory because 66% did not know about the prevention measures, and only 19.7% use mosquito net as prevention measure. Only 20% of the households had at least one usable bed net in their family. That DDT spray can control the disease was believed by 17.1% of the subjects, while 10.8% had the wrong impression that only cleanliness can be used as a preventive measure (Table 4).

Important sources of information about kala-azar were friends, relatives, and neighbors (60.6%), followed by health personnel (20.5%). The role of mass media was found to be limited, with newspapers (8.3%), radio (6.2%), magazines (1.8%), and television (0.8%). Similarly, the role of school to provide information was also limited to 1.8% (Table 5).

DISCUSSION

Kala-azar is a major public health problem in Bihar, and its prevention and control are priorities. Presently, vector-borne disease control programs primarily rely on controlling the vector; diagnosis and treatment have often been overlooked the importance for the target population (Ruebush *et al*, 1992). In this study, heads of the households were selected as the study subjects because they have the decision-making capacity for the household.

Table 4

Distribution of respondents according to the use of preventive practices for control of kala-azar ($n = 1,574$).

| Practices | <i>n</i> | % |
|-------------------------------------------------------------------------|----------|------|
| Drug preference for the treatment of kala-azar | | |
| Specific medicine | 1,462 | 92.9 |
| Indigenous medicine | 19 | 1.2 |
| Do not know | 93 | 5.9 |
| Choice of utilization of health services for the treatment of kala-azar | | |
| PHC/govt hospitals | 1,158 | 73.6 |
| Private doctors | 309 | 19.6 |
| Village level doctors | 49 | 3.1 |
| Do not know | 58 | 3.7 |
| Prevention measures from mosquito/sand-fly bite ^a | | |
| Use of mosquito net | 310 | 19.7 |
| DDT spraying | 269 | 17.1 |
| Cleanliness | 170 | 10.8 |
| Isolation of VL patient | 44 | 2.8 |
| Do not know | 1,038 | 66.0 |

^aMultiple responses

In the traditional Indian social context, in most situations the eldest male member of the household holds this responsibility. To obtain household and community participation to make a disease control program successful, understanding of such local customs and traditions is very important. Understanding of the level of awareness and its related attitude and practices about kala-azar of the community can be the key to the success of an elimination program launched by the Government of India. Kala-azar control activities presently restricted to vector control, in the form of DDT spraying, and treatment of kala-azar cases. But, unfortunately irregular DDT spraying and irregular drug availability at peripheral level have been reported (Kumar *et al*, 2004; Mondal *et al*, 2009).

Table 5

Respondents and sources of information about kala-azar ($n = 1,574$).

| Source of information | Frequency | % |
|-----------------------|-----------|------|
| Health personnel | 323 | 20.5 |
| Friends and neighbors | 954 | 60.6 |
| Television | 12 | 0.8 |
| Newspaper | 131 | 8.3 |
| Magazines | 28 | 1.8 |
| Radio | 98 | 6.2 |
| School | 28 | 1.8 |
| Total | 1,574 | 100 |

This study found the majority (70%) of the respondents lived in thatched or mud plastered houses, were engaged in agricultural laboring, and 60.2% of them were illiterate. These findings suggest the poor living condition of study villages. This could be one of the important factors responsible for the increased burden of kala-azar in Bihar. Similar observations were made by Alvar J *et al* (2006) in his article Leishmaniasis and poverty. KAP studies on malaria suggest that education has a significant role to play in enhancing knowledge (Panda *et al*, 2000; Sharma *et al*, 2001, 2003). It has also been documented for infectious diseases (*eg*, TB, malaria) that low levels of knowledge and awareness apparently influence initial health care seeking behavior after the onset of symptoms (Enwuru *et al*, 2002; Matta *et al*, 2004). This may also have significance for kala-azar. Most of the respondents (96%) had heard about the kala-azar. In another study in India, Nepal, and Bangladesh (Mondal *et al*, 2009), almost all (98%) of respondents reported their awareness of kala-azar, which is similar to our study. In a study done in Muzaffarpur (Singh *et al*, 2006a), 97.4% of the respondents were aware of the disease. This is

not an unusual finding; the possible reasons for better awareness about the disease could be that Muzaffarpur is one of the districts with the consistently highest endemicity in the state for more than 30 years and can be considered to be the epicenter of the kala-azar epidemic in Bihar (Singh *et al*, 2006a).

Our data revealed that generally the majority (95.7%) were not having an in-depth awareness about the transmission of kala-azar. Vast majority of the respondents were familiar with kala-azar, but most of the respondents failed to recognize correctly the common symptoms of kala-azar. These findings were identical to another study conducted in Muzaffarpur (Singh *et al*, 2006a), but they are in contrast to another study results (Mondal *et al*, 2009). It is important for the community to know the breeding sites and habitat as a preventive measure to reduce the chance of vector-human contact. Our findings were again identical with other studies (Singh *et al*, 2006a; Mondal *et al*, 2009).

Over all the above findings were consistent with earlier conducted studies on malaria, filariasis, dengue, and kala-azar in different parts of the world (Ramaiah *et al*, 1996; Koirala *et al*, 1998; Ahluwalia *et al*, 2003, 2004; Tyagi *et al*, 2005; Matta *et al*, 2004, 2006; Acharya *et al*, 2005; Singh *et al*, 2006a). The difficulty our respondents had in identifying the mode of transmission was important, because, if sandflies are not perceived to be important in the transmission of kala-azar, they may not act appropriately to protect themselves against their bites. Their awareness needs to be enhanced because the above-mentioned studies have suggested that, if villagers do not perceive mosquitoes to be responsible for disease such as malaria, they do not take sufficient measures to protect themselves against the vector.

The present study findings suggest that there has been insufficient impact of the decade-long Malaria/Kala-azar Control Program in the area. Awareness of transmission, vector, and symptoms about kala-azar was poor, which strongly suggest that absence of proper kala-azar health education program in the study area. Despite such poor levels of knowledge about the disease; surprisingly, a good proportion (58%) correctly pointed out that kala-azar was not a contagious disease. There may be several explanations for this, but one possible explanation may be their long experience in kala-azar endemic areas. Most of the villagers assumed that they have seen the families in which only one member had suffered from kala-azar, but the rest did not suffer. Other possible explanation may be that their socio-economic condition meant that they could take an interest in such types of activities, or the limited media from which they obtained their information. In spite of kala-azar care deliveries services at peripheral levels, such low level of awareness was surprising. One possible explanation for this could be the absence of health education, mass media, involvement of NGO, and so forth concerning the disease at peripheral level.

A wide gap was seen between awareness and related attitude. Almost all our respondent considered kala-azar to be a serious condition that "drained" family resources, but could be controlled by community efforts. Similar findings were found in awareness/ KAP studies on various diseases (Ramaiah *et al*, 1996; Koirala *et al*, 1998; Ahluwalia *et al*, 2003; Matta *et al*, 2004, 2006; Acharya *et al*, 2005; Tyagi *et al*, 2005; Rijal *et al*, 2006; Singh *et al*, 2006a; Mondal *et al*, 2009). These similar findings suggest that respondents' strong positive attitude towards kala-azar, its seriousness,

and such a strong attitude could be from their experiences in endemic areas. Many respondents had experiences of individuals who has suffered from kala-azar, even fatalities in the locality, and their fear of the expenses of diagnosis and treatment. People seemed to have the opinion that the confirmatory test of kala-azar, such as bone-marrow and splenic aspiration are only available at specialized hospitals.

The availability of the drug SSG at periphery and the increasing trend of unresponsiveness to SSG made people fear that, if they suffered from kala-azar, Amphotericin B/*Videshi* injection which was required for treatment, would not be available at the PHC. Their experience of expenditure for this disease, to fellow villagers, may be the possible reason for this attitude. The basis for such a strong attitude towards community participation under the program might be again due to their long experiences towards Pulse-Polio program; HIV/AIDS control program, and so forth, sponsored by the government of India whereby better results had been achieved.

The respondents reported that, when a person gets kala-azar, not only the individual but also the whole family is affected economically. These views of the respondents may be one of the important causes for such a strong attitude towards affect on their family income. Such strong positive attitude of respondents towards kala-azar may provide a hope for health planner and policy makers that proper health awareness programs, of kala-azar will be helpful in controlling the disease at community level.

Practices based on awareness were reasonable, except for the preventive measures adopted for the disease in the study area. Notable in the study was that 92.9%

believed that only specific medicine like SSG, Pentamidine and AMB/Fungizone could cure the kala-azar. The reason behind this practice may be possibly their familiarity with the drugs. They name SSG as *Deshi*, and Pentamidine/AMB/Fungizone as *Videshi* injection. Another possible reason may be that they had lived in the kala-azar endemic villages since their birth. They have seen numerous cases that were treated with either SSG or Pentamidine/AMB/Fungizone and had been cured so that they could resume their normal work. The preference for free government treatment at PHCs or hospitals was not consistent with other studies conducted in India (Singh *et al*, 2006a; Mondal *et al*, 2009). The possible explanation for that may be the impact of current Kala-azar Elimination Program under which diagnosis and treatment is made available at public health system free of cost, and provision of incentives is made for kala-azar patients and their attendants. Despite such a preference, they pointed out the many difficulties associated with treatment at PHCs and government hospitals. They were of the opinion that the quality of kala-azar care delivery services offered by these centers needs to be improved considerably. The other possible explanation could be their economic backwardness, and they could not afford to pay for consultation fees or treatment.

The respondents did not indicate that they frequently practiced prevention measures because the majority (66%) did not know about prevention measures, and only few (20%) used mosquito net as a prevention measure. These findings were not consistent with similar studies conducted in the neighboring country, Nepal, which found that virtually no one knew how the disease could be prevented (Koirala *et al*, 1998; Singh *et al*, 2006a). Our

study found that only 17.1% consider DDT spraying as prevention measure, which was not consistent with an earlier study in Nepal where respondents were highly responsive to DDT spraying program (Koirala *et al*, 1998). The main reason respondents gave for allowing their houses to be sprayed with insecticide in Nepal was the resulting reduction in the number of mosquitoes and sandflies.

A possible explanation for our study results may be loss of faith in DDT spraying due to its poor quality that they judged by the reduction in mosquitoes and sandflies bites or the resulting reduction in the number of mosquitoes and sandflies in the household. The respondents, who favored DDT spraying as precautionary measure to control kala-azar, surprisingly, were not aware that DDT or insecticides also kill sandflies. Therefore, the villagers need to be informed about the benefits and risk of DDT spraying, which would probably encourage other villagers also to have their houses sprayed. In Thailand, disagreement between spray teams and homeowners has led to high refusal rates, but conversely, in Guatemala and other Latin American countries, due to the long-term commitment to malaria control program, resulted in a decline in the refusal rate (Hongvivatana *et al*, 1982).

Although only 20% of the households had at least one usable bed net in their family, its acceptability and efficacy against kala-azar need to be determined. A case control study in Nepal identified use of bed net as protection against kala-azar (Bern *et al*, 2000). The habit of sleeping outside during the summer and rainy season without any protection measure against bites was very common, and, as only 20% use nets, they are at greater risk of acquiring kala-azar. These populations may be considered an important group of

hosts susceptible to sandfly bites. Health workers should make such people aware that sleeping outside without taking appropriate personal vector control measure exposes them to infection from the bites of sandflies.

In the present study, sources of information were most likely to be friends, relatives and neighbors, while the role of mass media was found to be limited. This finding is not consistent with the findings of other studies conducted on malaria and dengue (Karanja *et al*, 2002; Acharya *et al*, 2005; Matta *et al*, 2006). This suggests that mass media, such as television, radio, magazine, and newspaper are not a very important source of information for kala-azar in India. One of the possible explanations for that could be the poor IEC activities for kala-azar through all sources including mass media.

Overall, these findings suggest ineffective information, education, and communication efforts of the public health system and other responsible agencies. Even after such prolonged and incessant disease transmission in the area, this lack of awareness about kala-azar, indifferent attitudes, and incorrect practices are indicators of poor commitment of the health policy planners for the disease. Even if health care facilities were comprehensive, acceptable, and accessible, the purpose would not be achieved if the community itself is not involved in the program. It is vital to know the extent of awareness and related preventive attitude and practices of a community and to improve it to a satisfactory level before launching any control program to get the maximum support from the community. In this study, although the awareness about kala-azar was quite high, more emphasize should be laid on putting this knowledge into attitude and practices. The respondents poor awareness about

symptoms, mode of transmission, preventive measures of the disease, and breeding sites of sandflies emphasizes the need for rethinking remedial action. It has already been documented by various studies that health education would offer promise of influencing individuals to adopt preventive measures (Singh *et al*, 1998; Yadav *et al*, 1999).

Thus to avert the spreading of disease in newer areas which were non-endemic of kala-azar in Bihar earlier this study results emphasize the need for increasing kala-azar awareness activities through involving the health workers, and the school in the community on a massive scale. The above observations may be true only for the study population because of convenience sample and cannot be generalized to other populations belonging to different socio-economic or cultural backgrounds.

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