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PREVALENCE OF LYMPHATIC FILARIASIS IN DISTRICTS OF EASTERN NEPAL: A POPULATION BASED CROSS-SECTIONAL HOUSEHOLD SURVEY

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INTRODUCTION

Lymphatic filariasis is a major public health problem in various part of the world. It causes permanent and progressive physical disability. The visual disability is a cause of social and economical implications of the disease. Some 120 million people are infected worldwide, and the disease is endemic in more than 80 countries and territories. Over one third of the population at risk lives on the Indian subcontinent with an estimated 45 million infected individuals.[1] An international task force for disease eradication identified filariasis as one of the six currently eradicable or potentially eradicable diseases. WHO has plan to treat more than 1 billion people, a fifth of the world population by the use of simple, safe, inexpensive, conveniently delivered drugs that kill the parasite.[2] A very few epidemiological surveys were done in Nepal and were limited to semi-urban areas of the central part of country.[3-6] Sherchand et al. had done a mapping of lymphatic filariasis in Nepal and reported the overall prevalence of lymphatic filariasis as 13%. The present study was undertaken to assess the knowledge of study population about lymphatic filariasis and to estimate the prevalence of lymphatic filariasis in Morang, Sunsari and Saptari districts of eastern Nepal.

REVIEW OF LITERATURE

Lymphatic filariasis is a major public health problem in many parts of the world. It ranks the second place for making people disabled with an estimated 1.1billion people exposed to risk of infection in the world and 119 million cases (disabled). An international task force for disease eradication identified filariasis as one of the six currently eradicable or potentially eradicable diseases. In 1997 the WHO assembly called for the elimination of lymphatic filariasis as a Public Health Problem globally. The morbidity is much more than thought as it causes elephantiasis and genital damage. But it gets low priority in the National Control Program, as it does not cause mortality.

Problem in Nepal

A very few epidemiological surveys were done in Nepal and were limited to semi-urban areas of the central part of country. Sherchand et al. had done a mapping of lymphatic filariasis in Nepal and reported the overall prevalence of lymphatic filariasis as 13%. The present study will be done to assess the burden of disease in eastern Nepal.

Epidemiology

Human lymphatic filariasis results from infection with the nematode parasites *Wuchereia bancrofti, Brugia malayi and / or Brugia timori.* The juvenile adult worms normally live in the lymph vessels and lymph nodes, and the microfilariae are not found in the blood. The bancroftian filariasis (Caused by Wuchereia Bancrofti) is the most widespread human lymphatic filarial infection. The largest number of people both "at risk", and infected, live in India, but the diseases is severe problem in many other Asian countries, notably Bangladesh, Burma, China, Indonesia, Malaysia, Paupa New Guines, the

Philippines, Sri Lanka, Thailand and Vietnam. Brugian filariasis has a more restricted distribution, which overlaps in place with bancroftian fialriasis.

The distribution of the disease is patchy and endemicity rates show variation.

Clinico-epidemiological patterns of Filariasis

Five patterns describe the vast majority of foci; their distinctive feature.

a) Long-standing intense transmission in a population subject to little immigration or emigration.
b) Recent introduction of transmission or recent increase in intensity of transmission due to natural or man made ecological changes, such as dam construction or the adoption of large scale, irrigated rice field.
c) Mass immigration of susceptible, uninfected and unsensitised population into endemic areas, as in agricultural resettlement schemes and military operations.
d) Recent emigration of young, microfilaraemic but clinically unaffected people, usually in search of employment.
e) Long-standing, low intensity transmission in a stable population with little immigration or emigration.

Agent

Wuchereria bancrofti is the most common infectious agent in India. The length of the male worm is about 2.5 to 4 cm and that of female 8 to 10 cm. The microfilaria of *W. bancrofti* and *B. malayi* appear in the blood at night.

Host

Man is the definitive host and the mosquito is the intermediate host.

Vector

At least 80 species of mosquitoes of the genera Culex, Aedes and Anopheles serve as vector and intermediate hosts of W. bancrofti. Anopheles and Aedes species are important vector mosquitoes in rural areas, the former in Asia, Africa and South America and the later in the Pacific.

The principal vector is culex quinquefasciatus and its relative resistance of insecticides makes it difficult to control culex quinquefasciatus develops mainly in habitats containing highly polluted water rich in organic matter. Since wastewater is the main breeding source, the larvae can develop in virtually any type of breeding place found in the human environment. Latrines are the most widespread types of breeding place in most countries. Other important breeding sites include septic tanks, wells, tanks, cisterns, jars, blocked ditches and gutters, irrigation wells and small throw away containers. They have also been found in such natural habitats as tree holes, crab burrows, coral rock holes, and banana leaf axils.

Behavioral Aspects

The large majority of culex quinquefasciatus feed at night mostly indoors. They feed mainly below the knees of a seated person or any part of the body of a person lying down. Several authors have recorded a peak biting activity between 1:00 to 2:00 am. In its classical environment, an inhabited region, culex quinquefasciatus rarely fly more than a few hundredmeters. However, in an uninhabited area it can travel much further. Peak periods of density are usually associated with rainy seasons.

Transmission Aspects

The vectors of W.bancrofti belong to the genera Culex, Aedes and Anopheles. This is important because the anatomical pattern of disease may be affected by the biting habits of the local vector species, and because vector control may offer the most cost-effective means of disease prevention in organized public health programs.

Habitat

The adult parasites live in the lymphatic system of the man.

Life Cycle

After copulation, the female worm gives off microfilaria or larval forms, which enter the blood stream. These live for about 70 days. The female mosquito bites the patient at night and sucks blood-containing mocrofilaria.

- The microfilaria shed their sheath within two hours of their entry into the stomach of the mosquito.
- The larvae penetrate through the stomach wall of the mosquito and reach the thoracic muscles, where they grow further.
- The larvae increase in size and develop in alimentary canal.
- In the final stage the larvae become active. These are thin and long and migrate to the mouth of the mosquito, ready to be transmitted to a new host.

Reservoir of Infection

Infected patients are the usual reservoir. Lizards, Birds, Dogas, Cattle, Horses, Monkeys and may be other possible reservoirs.

Clinical Manifestations

The incubation period varies from five to ten months. The clinical manifestations depend on the stage in the course of illness.

a) Phase of invasion. Eosinophilia and lymphadenopathy are usually present during this stage.

b) Asymptomatic or carrier phase.

c) Acute illness. This is characterized by fever, lymphadenitis, lymphedema and epididymoorchitis in males.

d) Chronic phase. The patients show hydrocele, chyluria, thickened skin of genitals, legs and arms (often called elephantiasis).

The acute stage

The acute clinical manifestations of filariasis are characterized by recurrent attacks of fever associated with inflammation of the lymph nodes (lymphadenitis) and lymph vessels (lymphangitis).

In bancroftian filariasis, recurrent attacks of fever associated with lymphadenitis are less frequently seen than in brugian filariasis. In addition to the lymph nodes in the inguinal, axillary and epitrochlear regions, the lymphatic system of the male genitalia is frequently affected, leading to a combination of these.

In burgian filariasis, the affect lymph nodes are mostly situated in the inguinal and axillary regions, with inflammation along the course of the distal lymphatic vessels. Quite often, an attack of lymphadentis is precipitated by hard physical work.

The Course of Infection

Typically, each attack of fever and lymphadentitis lasts for several days and usually subsides spontaneously following best rest. However, it may follow a more or less characteristic retrograde lymphangitis, edematous infiltration of the surrounding subcutaneous tissues, or even formation of abscesses, which may in turn ulcerate and lead to scarring. In contrast to bacterial infections, the ulcer in filariasis is relatively clean, and produces a serosanguinous fluid. Lymphoedema is quite often present in these fulminate episodes. Usually, the edema subsides after each episodic attack, but with repeated attacks of edema persists, leading to chronic lymphoedema.

The social aspects of acute filariasis

The acute clinical course of filariasis may last for several days or up to 4 – 6 weeks with a fulminating episode, and may result in prolonged inability to work. As filariasis is more prevalent in rural areas and in the slums of cities, and as it affects predominantly the young and active working section of the population, it can result in significantly decreased productivity of the poorer sectors of the community – those who can least afford it.

Chronic stage

The chronic signs of filariasis do not usually develop before the age of 15 years and only a small proportion of the infected community is affected. However, immigrants from areas where filariasis is not endemic tend to develop elephantiasis more often and much sooner (sometimes within 1 – 2 years) than do the indigenous populations of endemic areas.

Hydrocele

Filarial hydroceles are fluid swellings of the tunica vaginalis; the fluid is clear and straw colored. Hodroceles follow repeated attacks of tuniculitis and are seldom painful.

Bleeding and extravasations of lymph cause fluid to appear bloodstained or turbid and milky. Hydroceles are commonly unilateral at first but soon become bilateral, although there are often remarkable differences in size. Repeated taping may lead to their conversion into a hard, fibrotic mass and cause abscess formation. Hydrocele fluid may contain microfilariae when examination of blood proves negative but absence of microfilariae does not refute filarial etiology for the hydrocele.

For field purposes, the following grading is recommended for hydrocele:

Grade I – Smaller than the patient's fist,

Grade II – in between grades I and II,

Grade III – bigger than the patient's head.

Lymphoedema and/ or elephantiasis

The most common site is the leg. Lymphoedema in patients with Brugian filariasis is preceded by a history of several years of attack of lymphadentis and lymphangitis; this is less often obtained in Bancroftian fialriasis. The onset is most frequently around the ankels, spreading to the dorsum of the foot, calf and thigh. Lymphoedema is transient, soft and pitting at first and responds well to rest and elevation of the leg. However pitting edema soon becomes brawny edema and the swelling is then hard and permanent; subcutaneous thickening of skin and hyperkeratosis occur, and there is fissuring of skin accompanied by nodular, warty, papillomatous changes especially in the feet. The World Health Organization has classified lymphoedema as follows:

- **Grade I** lymphoedema: mostly pitting edema; spontaneously reversible on elevation;
- **Grade II** lymphoedema: mostly nonpitting edema; spontaneously reversible on elevation.
- **Grade III** lymphoedema (elephantiasis): Gross increase in volume in a grade II lymphoedema with dermatosclerosis and papillomatous lesions.

After 1 to 3 years, lymphoedema develops into elephantiasis. Fibroblastic actively in the lymph fluid or interstitial spaces in edematous limbs leads to subcutaneous fibrotic tissues.

Diagnosis of bancroftian filariasis relied almost exclusively on the detection and identification of microfilariae in night blood specimens, because *W. bancrofti* microfilariae have a natural periodicity, with highest intensity in the peripheral blood at night and few or none during the day. The other alternative test is a diethylcarbamazine (DEC) provocation test, where the suspected individual is given a single oral dose of 50-100mg of diethylcarbamazine followed by a blood sample 30- 45 minutes later. This procedure can be done in daytime as DEC flushes out the microfilaria into the peripheral blood. The sensitivity of this test is almost comparable to that of night blood surveys. Recently, circulating filarial antigen in serum and whole blood specimens can be detected by immunochromatographic card test (ICT). ICT filariasis test kit is composed of specific polyclonal and monoclonal antibodies to *W. bancrofti* antigen. The high sensitivity, lack of cross-reactions, no night blood collection, single reagent and rapidity of the test makes suitable for use in many endemic areas in developing world.

OBJECTIVES

GENERAL

To assess the burden of disease in three districts of eastern Nepal

SPECIFIC

To assess the knowledge of study population about lymphatic filariasis

To estimate the prevalence of lymphatic filariasis in Morang, Sunsari and Saptari districts of eastern Nepal

MATERIAL AND METHODS

This study was carried out in three districts (Morang, Sunsari & Saptari) of eastern Nepal over a period of three months from January to March 2004. The study protocol was approved by the Ethical and Research Committees of the Nepal Health Research Council. The sample size of three districts was calculated by sample proportionate to population size based on last census 2001 and calculated sample number of Saptari, Sunsari and Morang were 4000 (40.%), 3000 (30%) and 3000 (30%) respectively. All 10 years chronic filariasis cases recorded in district health office were listed and cluster was made. At second stage, VDCs and municipality were taken where chronic filariasis cases were present. After that a list of household was taken from VDC office. Approximately 100 households (400 individuals) were selected by systematic random sampling technique. All individuals of selected household above the age of 15 years were taken for interview and blood examination. If particular person was not available or refused to participate in the study, next person was taken for the study. Consent from each individual was obtained prior to include in the study.

Data Collection

The filarial survey was comprised of the survey proforma and night blood collections by the laboratory technician. The proforma was comprised of socio-demographic profile, knowledge and beliefs of study population about lymphatic filariasis. The proforma was filled in the field by trained enumerator during house-to-house survey. The structured questionnaires were pretested for validitity and reliability.

Parasitological test

Night blood collections were made from 23.00 PM- 2.00 AM. Sixty micro-liters of finger-pricked blood were drawn for thick blood film. The slide were dried and respectively numbered. Next morning it was dehaemoglobinised by putting the slide in water, dried and fixed in methyl alcohol and then stained with Giemsa's stain, dried and examined for microfilaria (MF) under microscope.

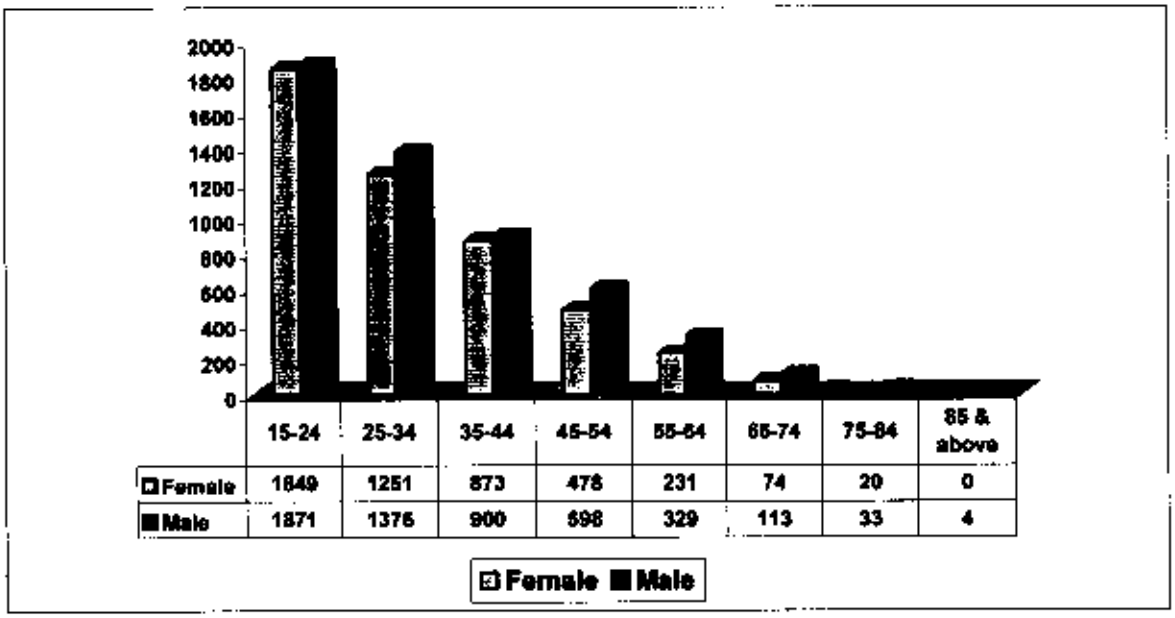
The total number of microfilaria in the thick smear multiplied by 5 made the number per ml of blood.

Analysis: All information was put in the pre-coded format. The analysis was done using SPSS 10.00 statistical package.

OBSERVATION AND RESULTS

The sample of 10,000 was made up 4776 (52.2%) males and 5224 (47.8%) females with M: F ratio of 1.09:1. The individuals age ranged from 15-96 years with a mean 33.41 ± 13.94 years, and the majority (55%) were in the 20-40 years.

Age and Sex Distribution



Majority (98.2%) of the study population was Hindu by religion.

Religion of the study population

Religion	Frequency	Percent
Hindu	9821	98.21
Kirat	4	0.04
Muslim	175	1.75
Total	10000	100.0

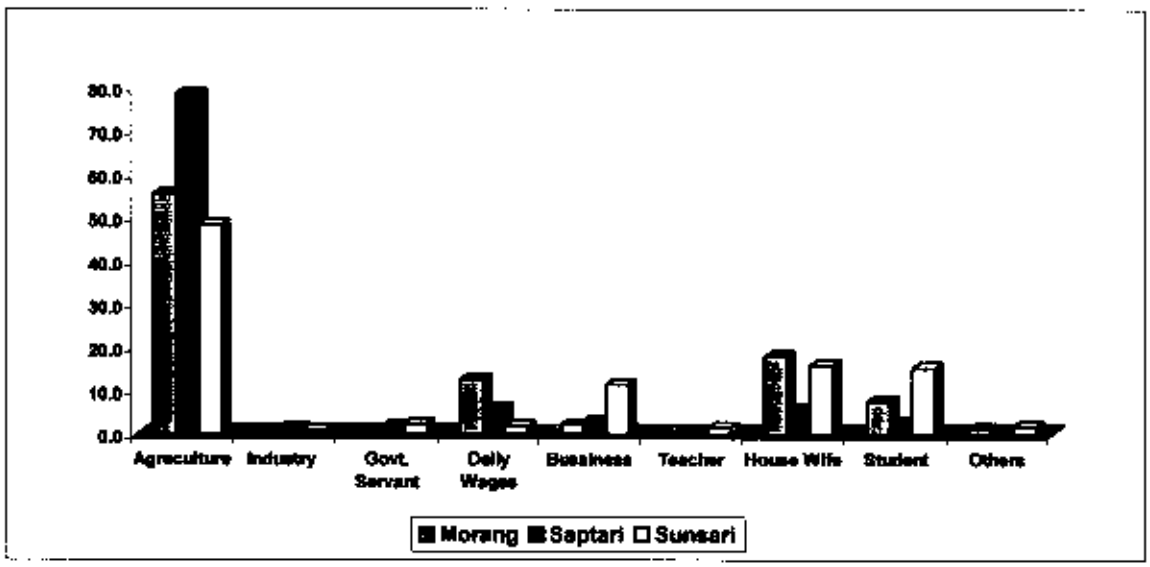
Approximately 58% of the study population could not read or write.

Educational status of the study population

Educational status	Number of study population	Percentage
Illiterate	5774	57.7
Literate	256	2.6
Primary	993	9.9
Middle	866	8.7
High	436	4.4
S.L.C.	1073	10.7
Intermediate	476	4.8
Bachlor & above	126	1.2

The major occupations were agriculture (63.5%), housewives (11.6%), students (7.8%), daily wages (6.8%) and business (5.2%).

Occupation of study population



Only 33% family had agriculture land and most of them (90%) used to grow paddy. Fifty seven percent population reported stagnant water near their houses and it was more common in Saptari

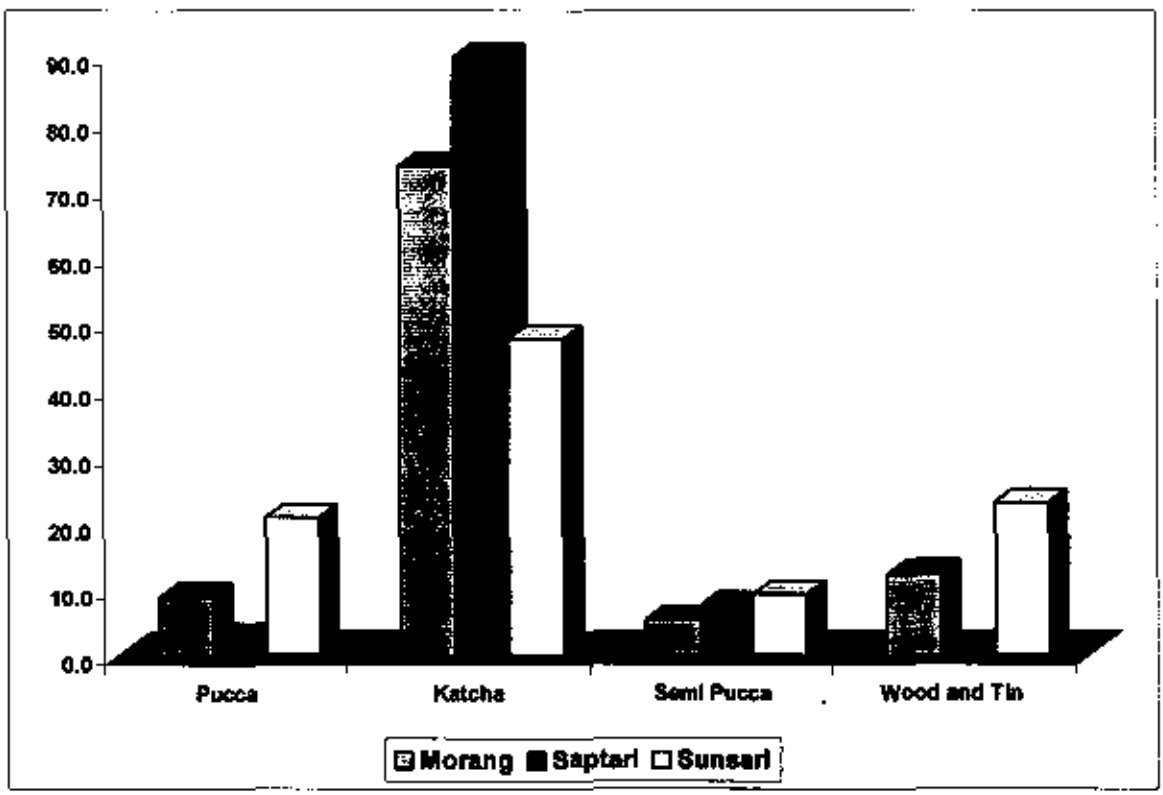
district (77%).

Stagnant water near the houses

Stagnant water	DISTRICT			Total
	Morang	Saptari	Sunsari	
No	1684	916	1710	4310 (43.1%)
Yes	1316	3084	1190	5690 (56.9%)
Total	3000	4000	3000	10000

Type of houses

Approximately seventy two percent houses were Katcha type and the roof was made up of thatch (59.9%). This type of house was common in all three districts.



Type of houses of the study population

In all three districts, majority (96.2%) of them used to sleep inside the house. Fifty-six percent respondents had cattle, 84% tied their cattle out side the house but it was less than

10 feet (87.3%) distance from the house. Regarding the use of pot to keep water, most of the respondents (51.34%) used earthen pot for keeping drinking water.

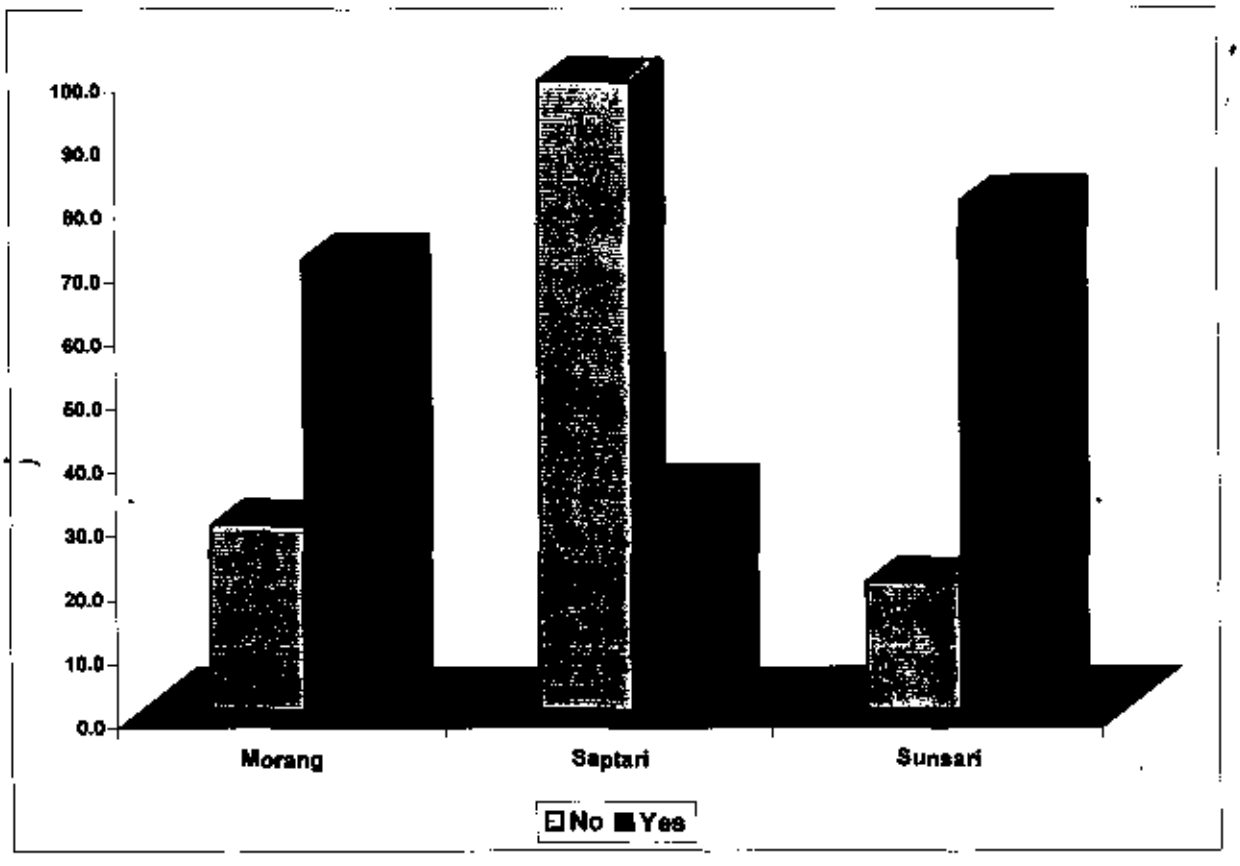
Travel (night stay)

Majority of the individuals of three districts reported that they stay in night occasionally in other places mainly in nearby places in India.

Interest in media

Approximately 56% respondents had interest in media and among them 21.5% heard the health education program but it was poor in Saptari district. Radio was the most common source of information and 46% listen radio in their houses.

Interests in Media



Awareness of lymphatic filariasis prevalence

Approximately 37% subjects of three districts said that filariasis is a problem in their village and were reported by 80 %, 13 % and 7% study population from Saptari, Sunsari and Morang respectively. Only 1.7% subjects from three districts reported that their family members suffered from elephantiasis, hydrocele, breast elephantiasis and/or adenolymphangitis.

Knowledge about lymphatic filariasis

Majority of the respondents (95.68%) did not know the cause of filariasis. Only 2.9% knew that filariasis is caused by parasites and was reported by 78%, 19.9%, 1.1% population of Sunsari, Saptari and Morang district respectively. Approximately, 1.1% belief that filariasis is due to the curse of the God.

Knowledge about the cause of filariasis

Cause of filariasis	DISTRICT			Total
	Morang	Saptari	Sunsari	
Curse of God	28	83	0	111 (1.11%)
Trauma	4		2	6 (0.6%)
Don't Know	2963	3841	2764	9568 (95.68%)
Parasites	3	59	234	296 (2.9%)
Other	2	17		19 (0.19%)
Total	**3000**	**4000**	**3000**	**10000**

Only 9.2% respondents said that filariasis is a communicable disease and 9% cited mosquito bite as the route of transmission

Knowledge about the route of transmission of filariasis

Transmission of filariasis	DISTRICT			Total
	Morang	Saptari	Sunsari	
Don't know	2297	56	2228	4581 (45.9%)
Sand fly bite	91	34	3	130 (1.3%)
Bad Air	109	8	4	121(1. 2%)
Touching	14	10	0	24(0.2%)
Others	230	3286	723	4239(42.4%)
Mosquito bite	259	604	42	905 (9.0%)
Total	3000	4000	3000	10000 (100.0%)

Majority of subjects (89.5%) were either uncertain or felt that filariasis is not curable and only 2.6% heard of any drug used in filariasis.

Knowledge about curability of filariasis

Curable	DISTRICT			Total
	Morang	Saptari	Sunsari	
Yes	9	904	135	1048 (10.5%)
No	36	866	1052	1954 (19.5%)
Don't Know	2955	2230	1813	6998 (70.0%)
Total	3000	4000	3000	10000 (100.0%)

Knowledge about control measures

Approximately eighty percent people said that they used bed-nets in their household to protect from mosquito bites. However 81.4% subjects were either did not know or said spraying insecticide cannot control filariasis but 92.8% would allow a person to spray insecticide in their whole houses. Majority of respondents (98.5%) did not know the last time of spraying operation done in their village. One third of study population stated that, general hygiene in the locality and clean atmosphere can prevent filariasis.

Spraying insecticide control filariasis

Spraying insecticide control filariasis	DISTRICT			Total
	Morang	Saptari	Sunsari	
Yes	243	238	1379	1861 (18.61%)
No	22	142	15	179 (1.79%)
Don't Know	2735	3620	1603	7957 (79.57%)
Others	0	0	3	3 (0.03%)
Total	**3000**	**4000**	**3000**	**10000 (100.0%)**

About 92% of subjects agreed that they are ready to use bed nets if supplied them at a reduced and affordable price.

Majority of the respondents (99.2%) were ready to participate in the study by giving blood for screening the microfilaria and also ready to motivate their neighbor to get screened for microfilaria.

Clinical manifestations of lymphatic filariasis

A history of filarial adenolymphangitis was noted in 0.3%.

Clinical manifestations of filariasis in three districts of eastern Nepal

Clinical manifestation	Districts			Total
	Morang 3000	Saptari 4000	Sunsari 3000	10000
Elephantiasis	74	30	6	110 (1.1%)
Hydrocele	110	15	5	130 (1.3%)
ADL	9	16	6	30 (0.3%)
Breast Swelling	14	5	1	20 (0.2%)

Hydrocele and elephantiasis was recorded in 1.3% and 1.1% respectively. Breast swelling was also observed in 0.2%. Therefore, the morbidity due to lymphatic filariasis showed an average of 2.9%.

The frequency of total disease attributable to filariasis was higher in males (186) than in female (98). Moreover other chronic forms of disease were seen in both the sexes, the prevalence of elephantiasis was more in females (69/110; 62.7%).

Clinical manifestations of filariasis among gender specific

Clinical manifestation	**Gender**		**Total**
	Male 186	**Female** 98	10000
Elephantiasis	41	69	110 (1.1%)
Hydrocele	130	-	130 (1.3%)
ADL	15	15	30 (0.3%)
Breast Swelling	-	14	20 (0.2%)

Microfilaremia

Only 10 study subjects were positive for microfilaria in night blood sampling. Thus, the overall prevalence of lymphatic filariasis from a 10000-studied population from 3 districts of eastern Nepal was 0.1%. District wise prevalence of lymphatic filariasis were 0.07% (2/3000), and 0.2% (8/4000) in Morang and Saptari respectively.

Microfilariemia positive cases among people of three districts of eastern Nepal

Name of District	No. of People examined			No. of Positive people for Microfilaria		
	Male	Female	Total	Male	Female	Total
Morang	1482	1518	3000	2	0	2
Saptari	2107	1891	4000	4	4	8
Sunsari	1633	1367	3000	0	0	0

Regarding the age and sex of the microfilaremia positive cases, there were 6 males and 4 females. The age was ranged from 16-49 years in males and 20-59 years in females with male to female ratio 1.5: 1. None of the diseased cases revealed microfilaremia and all of them received anti-filariasis treatment.

Frequency of microfilaremia among people by age and sex

Age Group (Years)	Male		Female		Total	
	No. Exam	No. Positive	No. Exam	No. Positive	No. Exam	No. Positive
<20	772	1	688	0	1460	1
20-29	1706	2	1680	1	3386	3
30-39	1047	1	1060	2	2108	3
40-49	815	1	702	1	1517	2
50-59	513	1	385	0	898	1
60-69	277	0	190	0	467	0
70 & above	94	0	71	0	165	0
Total	5224	6	4776	4	10000	10

Treatment received for filariasis

Individuals taking part in the study were asked about taking anti-filariasis drugs and noted that 400 (4%) had taken medicine and among them 3 and 7 cases had developed local and generalized reactions respectively.

DISCUSSION

The overall prevalence of lymphatic filariasis from 3 districts of eastern Nepal was 0.1%. However, district wise prevalence of lymphatic filariasis were 0.07% (2/3000), and 0.2% (8/4000) in Morang and Saptari respectively, Sherchand et al [6] reported negative antigenaemia in Saptari district while positive in Sunsari and Morang districts. It might be the study was only performed on volunteers.

Lymphatic filariasis occurs in individuals of all ages and both sexes. As the chronic manifestations of lymphatic filariasis appear most frequently later in life, clinical and pathological investigations have focused on the adult population. The present study showed 6.9%, 1.65% and 0.6% of villagers with clinical signs and symptoms of filariasis in Morang, Saptari and Sunsari districts while none of them revealed micro-filaremia. It could be the medical practitioner over this region prescribed DEC to the patient suffering from fever with cough and cold. In the present study the prevalence of disease was age dependent in both sexes. This observation is also in agreement with other reports.[6-8] The prevalence of total disease attributable to filariasis was higher in males (186) than in female (98). Sherchand et al and Pani et al also reported similar observation in their studies.[6, 7] Hydrocele was contributing to higher overall disease burden in males than that of elephantiasis. It is in agreement with Pani et al.[7] The male preponderance reflects a relatively higher exposure of males to mosquito bites and other anatomical and hormonal differences between males and females.[8] Moreover other chronic forms of disease were seen in both the sexes, the prevalence of elephantiasis was more in females (69/110; 62.7%).

Housing quality, and inadequate waste disposal and sanitation facilities have all been shown to contribute the growing of the disease. In the present study, the majority of

respondent had Katcha house, they tied their cattle nearby their houses and they have inadequate sanitation facilities.

Although, people in the study communities are familiar with lymphatic filariasis and knew the affected people, the knowledge about the cause of the disease by parasite and the mode of transmission of the disease by mosquito bite was poor. Only 10.5% felt that filariasis is curable and the drugs for the disease are available. Interestingly more then 80% of the respondent knew about measures to control the mosquito but may not be helpful in preventing the disease.

SUMMARY

The overall prevalence of lymphatic filariasis from 3 districts of eastern Nepal was 0.1% in the study population. District wise prevalence of lymphatic filariasis were 0.07% (2/3000), and 0.2% (8/4000) in Morang and Saptari respectively. The disease was more common in males than in females. Hydrocele was the most common clinical manifestation. Elephantiasis was more common in female than in male. Majority of respondent had Katcha house, they tied their cattle nearby their houses and they had inadequate sanitation facilities. People in the study communities are aware about lymphatic filariasis and knew the affected people but the knowledge about the cause and the mode of transmission of the disease was poor. Three fourth of the respondent knew the measures to control the mosquito but they do not know that mosquito control will help in preventing the filariasis. Ignorance and incorrect knowledge about the cause of disease may lead to neglect the personal protection measures.

The successful control program of lymphatic filariasis requires appropriate health education, which depends upon the requirement of the local populations. Based on the present data from the present study, a health education program can be developed.

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