DISCUSSION

Lymphatic filariasis (LF) is a major tropical disease. LF has been identified as one of the six eradicable or potentially eradicable infectious diseases by the International Task Force for Disease Eradication (CDC, 1993). It is still a major public health problem in many parts of the world. Lymphatic filariasis is a major social and economics courage in the tropics and subtropics of Africa, Asia, Western Pacific and parts of the America, affecting over 120 million people in 80 countries. More than 1.1 billion people live in areas where there is a risk of infection (WHO, 1998). LF is also a major public health problem in India; the disease is endemic all over India. Filarial surveys carried out during the past two and half decades explain that areas which were free from filariasis showed evidence of low degrees of transmission. Heavily infected areas are found in Uttar Pradesh, Bihar, Jharkhand, Andhra Pradesh, Orissa, Tamil Nadu Kerala and Gujarat (WHO, 2006).

In India, in spite of National filariasis Control Programme (NFCP) being in operation for about 5 decades, the diseases showing an upward trend both in urban and rural areas of the country. In 1995, the WHO identified filariasis as the second leading cause of disability world wide. Studies on filariasis in India have shown that the disease prevalence is significantly lower in urban areas than in rural areas. The recently developed strategy of “communication for behavioural impact” (COMBI), a sharp focus on disease identification and prophylaxis, has given good results. The research scholar went from door to door, convincing people and delivering the drugs. This study showed that the effective communication between the health worker and community (with greater involvement of communities) can achieve the high coverage needed for LF elimination.
In the present study, 3292 people have been suffering due to fever (out of 30,835 surveyed population) and 163 people have shown clinical LF (out of 3292 fever cases). Human infection with the parasite led to damage in lymphatic vessels leading to temporary and/or permanent disabilities. Dunn (1976, 1979) and Evans et al., (1993) also advocated the social and behavioural aspects of LF in humans.

LF is characterized by a wide spectrum of clinical manifestations - occult, chronic and acute. In the present investigations, 11 filarial patients showed occult manifestations, 18 acute manifestations and 16 chronic manifestations. NICD, India (1996) reported that in India, millions of people suffer from occult filarial infection in endemic areas without diagnosis. Another important observation in the present study is that the age group of 15 years and above is the target group for LF (age group of 2-5 and 6-14 found free of infection). Significant variation is found in the severity of disease and organs affected; this may be due to high levels of microfilariae in blood/lymph. Ottesen (1990) reported that the heavy load of microfilariae in the lymphatic system may cause severe adverse reactions in endemic patients.

Also, it is of interest to note that the severity of adverse reactions subsided in LF patients after the drug treatment. Ismail et al., (2001) and Molyneux and Zagaria (2002) also reported that the adverse reactions seen in endemic communities may subside due to DEC and albendazole treatment.

The study on the age groups revealed the occurrence of LF in 15 years and above old patients (totally absent in 2-5 and 6-14 year age groups). Singh et al., (2006) found the overall microfilaria prevalence as 6.2 % (out of 1878 persons) and affected age groups were above 5 years in a rural area of Patna District, Bihar. Similar age
distribution is also documented in other studies (Singh et al., 2008) and may be this age group is the main work force involved in weaving and getting exposed to mosquito bites. An interesting aspect is that, in the age group of 15 years and above, (among surveyed population of 1620), the occurrence of fever cases was found to be 887 in males and 733 in females. The occurrence of disease (LF) is little higher in females (98 cases) than in males (65 cases); this might be due to greater exposure to the bites of infective mosquitoes. Also, because of the habit of female patients sitting indoor keeping their legs in ditches (kept to support weaving machinery) might have favored to expose to mosquito bites.

The clinical examination of filarial patients revealed various disease manifestations viz., hydrocele, genital swelling and elephantiasis of legs etc. In the present study elephantiasis of both legs was the most common chronic manifestation found in 4 individuals (3 females; 1 male). Elephantiasis in right leg was encountered in 13 (6 females; 7 males) individuals and in left leg in 23 (17 females; 6 males) people. Studies from weavers colony of Pedana Municipality have shown that acute form of LF, such as swollen legs, hydrocele and swollen hands and chronic forms of LF, such as swollen legs, formation of blisters (on legs), excessive mass in muscles and lesions have significant impact on the life of the patients. Olszewski et al., (1993) and Pani et al., (1995) reported that acute attacks of lymphangitis lead to progression of the disease from lymphoedema to elephantiasis. Ramaiah et al., (1997, 1999) advocated that chronic forms of LF lymphoedema and hydrocele have a marked impact on the daily life of patients.
The occurrence of acute (18), chronic (16) and occult (11) attacks is very significant in the present study. Occult manifestations such as chills with low grade fever, cough, adenitis and color change (copperish red), swelling in affected organs, tropical pulmonary eosinophilia and lymphoedema, acute manifestations such as fever episodes, organ swelling and lesions and chronic manifestations such as lymphoedema, elephantiasis, massive muscles, blisters, nodules, warts, lesions and genital organ swelling were encountered in diseased individuals. Ichhpujani and Bhatiya (2002) also reported symptoms of disease in occult filariasis; microfilariae were found in lymph nodes, lungs, liver and spleen and absent in the peripheral blood. It is known that regular hygiene practices such as washing of the affected part may play an important role in preventing the progression of oedema. Shenoy et al., (1999) and Addiss and Dreyer (2000) reported that foot care can significantly decrease the frequency of acute adenolymphangitis. Foot care is said to be mainstay for morbidity control of LF (Shenoy et al., 1998; 1999).

The Hb (in 45 patients), and platelet levels (in 9 patients) decreased markedly and remained lower than those of normal values. The level of WBC, RBC, polymorphs and monocytes remained in normal range. There was a slight eosinophilia in 30 patients. In all the 45 filarial patients, it was found that the larval/worm load triggered the host parasite interaction which is responsible in lowering the level of Hb and platelets in blood. These results confirm that of Marathe (2003) who reported normal level of Hb, polymorphs, lymphocytes, eosinophils and monocytes in a 30 years old male patient in Baroda. Vardhani (1976) reported significant decrease of weight and leucocytes during nematode infection (Ancylostoma caninum) in mice. WHO (1997) and Melrose (2002)
reported marked eosinophilia in patients of asymptomatic microfilaraemia. Marathe (2003) did not find symptoms of tropical pulmonary eosinophilia or peripheral eosinophilia in a filarial patient in Baroda. Similarly, the abnormal increase of lymphocytes and eosinophils in all the filarial patients confirm that of Vardhani (2003) who described eosinophilia in vertebrata host (mouse) during helminthic infection. Jha et al., (2008) reported eosinophilia and microfilaremia in acute phage of bancroftian filariosis. The normal response of monocytes and polymorphs in the blood of filarial patients (45) suggest the non-significant pathogenic effect of LF in the level of these cells. Prasanthi et al., (2009) found Hb, lymphocytes, monocytes, eosinophils and platelets and serum protein in normal range in a filarial patient in South India.

The levels of AST, ALT, ALP, protein, albumin, globulin and A/G ratio in all the 45 patients were insignificant when comparison was made with the normal range of healthy individuals. It is clear from the results that the antigens/toxins of *W. bancrofti* could not disturb the metabolism of AST, ALT, ALP and protein in diseased individuals. This may be because of the low load of microfilariae in the blood/lymph of patients. Though microfilariae migrate to liver (from blood) during their migration before they settle in lymph, they do not influence the metabolism of AST, ALT, ALP and protein in liver. **No information is available on the biochemical changes in the serum of LF patients.**

In the present study before treatment with DEC, there is high level of IgA, IgG (except in 8 occult patients) and IgM in occult, acute and chronic patients; similarly after treatment with DEC, there is normal level of IgA, IgG and IgM in acute and occult patients and high level of IgA, IgG and IgM in chronic patients. Extreme levels of serum
IgE and high titres of antifilarial IgG and IgE were found in patients of asymptomatic microfilaraemia (WHO, 1997; Melrose, 2002). Rawlins et al., (1994) collected venous blood from 292 patients attending a filarial clinic in George town, Guyana and found 41 blood samples positive for *W. bancrofti* microfilariae; IgG was found in 87.8% and IgM in 65.9% patients. The main strategy in the control of lymphatic filariasis includes chemotherapy. It was possible to eradicate filariasis in countries like Japan, Taiwan, South Korea, Solomon Islands and China is in the final stages of an exceptionally effective control programme by implementing simple treatment methods (WHO, 1995).

Treatment of mf carriers and disease cases with antifilarial drugs is possible by effective chemotherapy. Reduction in transmission of disease and reduction of morbidity can be done by chemotherapy.

Diethylcarbamazine citrate (DEC) has been the main drug of choice in the treatment of lymphatic filariasis. DEC is effective, safe and cheap and has shown both microfilaricidal and macrofilaricidal (killing of adult worms) effects (Ottesen, 1985; Dreyer et al., 1995a). The ideal DEC drug remained as a main drug for treatment of acute chronic and occult filarial infections; disease control requires long term follow-up of the cases during treatment for clinical and immunological changes. Changes in haematological/immunological parameters following therapy can be evidences for elimination of infection in the affected people. Suitable immunoassays were developed to detect and confirm filarial etiology in acute, chronic and occult filarial infection will be useful for prompt initiation of treatment and follow up of the cases.

One hundred sixty three cases belonging to different clinical groups of filariasis were give a long term treatment with DEC (6 mg/kg body wt.) for 21 days in each month.
for 6 to 12 months based on clinical prognosis and results of immunomonitoring. Apart from DEC, the patients depending on the type of clinical manifestations also received other measures like application of elastic crepe bandage and topical antibiotics and or antihistaminics. All the cases put on DEC treatment were advised to report after every three months for 12 months. During each visit, the cases were examined clinically. Rawlins *et al.*, (1994) found the level of IgG and IgM in normal range among patients with clinical filariasis.

In the present study, before treatment with DEC, the occult, acute and chronic patients (except in patient 1, 6, 7, 8, 9, 11, 22, 28, 28, 29 and 44) showed low count of CD3, normal count of CD4 and Low count of CD8 (except in patient 14, 20, 21, 22, 23, 24, 25, 29, 30, 34, 35, 36, 38, 39, 40, 42, 43, 44 and 45). Similarly, after treatment with DEC, the occult, acute and chronic patients showed CD3, CD4 and CD8 cell counts (except in 11 individuals) in normal range.

Patients with LF show a wide range of clinical and immunological characteristics, often related to immune response (Ottesen, 1980). Lymphocyte subsets (CD4 and CD8 cells) in all subjects were enumerated to understand the mechanism underlying in immune response. The normal range of CD4 cells and lowered level of CD8 cells in LF patients confirm that of Lal *et al.*, (1989) who also found no significant difference in the percentage of CD4 and CD8 cells in LF patients compared to normal subjects. These results are contrary to those of Piessens *et al.*, (1982) who reported increased number of CD8 cells in mf individuals. The reasons for this discrepancy are not known; it may be due to technical factors in different studies. These results also support the concept that T cell mediated immune responses are playing an important role in LF patients as suggested...

The present data suggests that DEC treatment may have an important positive impact on the immune system of the host to respond to filarial infection, thereby increasing (slight) the level of CD4 and CD8 cells and expelling the infection. These results are similar to that of Nielson et al., (2007) who also found largest increase of CD4 cells after treatment with DEC. Steel and Nutman (2011) also found that mf positive infected patients had a reduced CD4 central memory (TCM) compartment in LF patients. The presence of CD4 cells in the circulation of patients with filariasis was also reported by Mitre et al., (2008).

In the present survey, a total of 3292 blood smears were collected from the inhabitants of weavers colony, Pedana Municipality. Microfilaria (mf) rate and mean mf density was 3.88 % and 8.187. The disease rate was 4.95 % and the endemicity rate was 8.83 %. mf density was found in 15 years and above age group. Singh et al., (2000) and Das et al., (2006) found high mf density in younger age group in a rural community of Bihar and Pathankot (Punjab) respectively. The survey in Pathankot town of Punjab revealed 1.19 mf rate and 15.05 mf density (out of 2136 blood smears); mf rate was highest in 20-49 years age group and mf density was high in younger age group (Singh et al., 2000). Das et al., (2006) reported acute and chronic filarial cases as 0.5 % and 9 % respectively from the survey conducted in Patna District in Bihar (out of 1872 persons); microfilariae were found in 10 % of acute and 11.2 % of chronic filarial cases. Also, these rates are comparable to the rates found earlier in Northern India by Prasad et al.,
(1993), Patel et al., (2000), Singh et al., (2006), Kumar et al., (2006), Das et al., (2006) and in Madhya Pradesh by Mishra and Bhadoriya (2009). Parija and Garg (2010) found 2214 (43.78 %) LF positive case out of 5056 clinically suspected cases in and around Puducherry; majority of cases were males (57.8 %) belonging to the age group of 21-40 years.

LF is considered as a rural disease due to various risk factors for transmission of disease and this is confirmed by the present survey in 23 wards of rural area with the mf rate 3.88 % and disease rate 4.95 %. The present survey revealed that 128 patients are carrying microfilariae; the number of microfilariae found was 1048. Since the mf rate is 3.88 %, this area can be classified as endemic as indicated by Sharma et al., (1977). The programmes to create awareness about filariasis and disease control are very important; at the same time those who have already developed chronic pathology should not be overlooked. The results obtained are very promising. It is also worth noting that the direct or indirect filarial pathology can be extremely painful and many people are confined to their houses and are unable to take part in productive activity. There is a need to check and control the transmission of LF in this surveyed area.

Conclusion

The present study concludes that the majority of the cases reported were among females who work indoors and have exposure to mosquito bites. The chances of acquiring the disease are more in the unclean and/or improper sanitation conditions.

The study also concludes that proper education is required about the disease prevalence and the effective treatment for the elimination of the disease.