RESEARCH ARTICLE

STUDY OF SOCIO-ECONOMIC CONDITIONS OF VARIOUS ENDEMIC AREAS OF BIHAR WITH RESPECT TO KALA-AZAR IN INDIA

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ABSTRACT

Kala-azar i.e. Visceral Leishmaniasis has been found to be a big social problem among most of the population of Bihar. The cure of this disease is very costly and due to this, the death rate has been found to be very high especially among the poor population. The main objective of the field survey has been to determine the rate of endemicity in the affected areas and to know the special and general features of such areas regarding the geographical conditions, micro and macro environmental conditions. The types of people living including their life-styles, sanitation and socio-economic conditions have also been targeted as focus points during the field survey. KA cases and deaths have been observed to be closely related to the socio-economic conditions of the affected areas, its study and implementation may lead to fruitful method to control the Kala-azar epidemic.

INTRODUCTION

Visceral Leishmaniasis affects about 3 million populations worldwide annually. According to WHO, about 1/3rd cases of Visceral Leishmaniasis are reported from Bihar itself. Visceral Leishmaniasis is a complex disease caused by a protozoan *L.donovani* and transmitted by the vector *P.argentipes* commonly called sandflies. Notable epidemics of kala-azar have been observed in 1891, 1917 and 1933. As a consequence of withdrawal of DDT spray under NMEP from kala-azar endemic areas in 1963-64, the disease resurgence has been found to occur in late 70s because of slow build up of vector population. Currently, this disease is endemic only in Bihar, W.Bengal and eastern part of UP adjoining Bihar (Bora, 1998, Chandra, 1995 and Marwaha, 1991). The disease has been found to occur in sporadic, endemic and epidemic forms in different geographical regions of these states. Kala-azar cases have been found to be reported from many hospitals in North Bihar districts from 1974 onwards. However, by 1977, several districts of Bihar has been observed to report fresh cases and then onwards the problem has become a regular phenomenon in the entire northern districts and some districts situated South of the river Ganges in Bihar. In view of the above consequences, several control programmes have been launched the Government, but they have been a big failure. The endemic foci of sandflies need to be known before any spray programmes are initiated. It has also been observed that the poor people are most affected by this disease. In this context, it is very essential to determine the socio-economic conditions of the endemic regions which can further help to reduce the epidemic of kala-azar.

About two endemic villages from three endemic districts of Bihar, Viz. Patna, Muzaffarpur and Vaishali were selected for the field survey.

MATERIAL AND METHODS

Two methods were used for the observation in the field survey—(i) Ad libitum method, and (ii) Point one method. In the ad libitum method, each and every point was observed without any special stress to any particular point. After completion of the observation, all the points noted into the notebook were re-grouped as per their similarities and dissimilarities. This was found to be the best method for field observation because maximum numbers of facts could be listed and after completing the observation, the unwanted points were left off and useful points were sequenced. After completing the first round observation in ad libitum method, the second round observation was performed as per point one method. Every point that was to be focused was listed on a separate paper. In this manner, any wrong prediction or observation was corrected and the corrected findings were finalized for conclusion. By the above mentioned two methods, the behavioral aspects of adult sandflies, the life styles of local public, the sanitation aspects of the population, climatic and geographic condition of the locality, nature and intensity of the kala-azar disease in the population and the socio-economic condition of the susceptible population was analyzed. Handy camcorder and digital camera were used for collection of evidences during the field survey. Personal interview and few questionnaires were also used during the field survey. Final conclusions were listed

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by statistical analysis of some common points collected from all the target villages and sub-urban areas. In some cases some help and guidelines were also collected from the employees of local primary health centers (PHC)s.

OBSERVATION AND DISCUSSION

1. Target area- Village Musahari; District- Patna.

Location: Twelve kilometers west from the main area of Patna in the Phulwari block area.

No. of houses: 198.

Types of houses- Almost all the houses had been found to be ill built and with temporary roofs made of hay, leaves and polythene sheets. Only four houses had been found to be made of bricks and with concrete roof.

Geographic condition: Punpun river had been found at the far south of this village and mostly crop farms had been found in this area.

Soil type: alluvial and Soil humidity was found moderately high.

Sanitary condition: All the houses had been found to be ill built with no proper air and light inside the rooms. The houses had been found to be very closely settled and in few cases only a thin footpath was found separating the two houses. So, dampness inside the houses had been found to be very high and this favoured the growth of sandfly population. The children and women had been found excreting near the settlement and the presence of cow-sheds within most houses was found to worsen the sanitary conditions.

Presence of sandflies

    i.   P. argentipes= + + +
    ii.   P. papatasi= + + + +
    iii.   S. babu   = + +

No. of Kala-azar cases reported in one year = 32*
No. of deaths due to kala-azar in one year = 11*
(*All the above data is collected as per direct conversation through local public and may not match with government data).

Socio-economic condition of population: Most of the population of this village had been found representing the depressed castes and poverty was found as a big curse among them. Almost forty percent of the population of this village had been found living below the poverty line. Malnutrition among the children and women had been found furiously in this area. Almost four deaths had been recorded in this area due to starvation. Most of the population was never found using mosquito curtain and the kala-azar infectivity rate had been recorded to be very high. This village was focused too much in daily newspapers due to high rate of kala-azar in year 2005.

2. Target area- Block Dhanarua; District- Patna

Location: Twenty eight kilometers south from the main area of Patna in the Masaurhi area. Four kilometers from Taregana Rly Station.

No. of houses: Above two thousand.

Types of houses: Almost sixty five percent of the houses were found to be made of bricks as 'Pakka Makan' in which almost half had more than one floor. Rest houses had been found as 'Kaccha Makan' and slums.

Geographic condition- Punpun river had been found at the northern part and flood of this river had increased the humidity of soil of this area.

Soil type- alluvial and Kewal soil.

Sanitary condition: Both semi-urban type and slum-rural type habitats were found in this area. The sewage treatment had been found to be unplanned in the semi-urban area. All the lanes and roads had been found to be logged with sewage, cow-dung and vegetable wastes. Night soils and excretory wastes of poor people had been found to worsen the sanitary condition too much. The sanitary condition of the rural areas had been found to be very miserable in this block. Poor and densely populated settlements and closely situated houses featured very dirty living standards and the cattle sheds worsened the sanitary conditions. The high organic debris and more dampness had been found favouring the development of the sandflies in this area too much.

Presence of sandflies:

    i.   P. argentipes= + + +
    ii.   P. papatasi= + + +
    iii.   S. babu   = + +

No. of Kala-azar cases reported in one year = 23*
No. of deaths due to kala-azar in one year = 4*
 (*All the above data is collected as per direct conversation through local public and may not match with government data).

Socio-economic condition of population: - Lower-middle class and middle class income group had been found prominently in this area. Forty percent population had been found to be engaged in the service sector and a big population was engaged in small scale business. Milk business had been found prominently in this area. Agriculture and dairy business were found mostly in the rural areas. Unemployment had been observed as the major socio-economic problem for the rural and semi-urban area of this region. Increased rate of crime, alcoholism and drug addiction had been found as a major social problem in this area. Almost 25% of the semi-urban population and 40% of the rural population had been found below the poverty line and the rate of Kala-azar had been found more among this population.

3. Target area- Patepur ; District- Vaishali.

Location- Almost twenty kms from the main area of Hajipur.

No. of houses- Above four thousand.

Types of houses- Almost sixty five percent of houses had been found to be made of bricks or 'Pakka Makan' in which almost half had been seen with more than one floor. Rest houses had been found to be 'Kaccha Makan' and slums.

Geographic condition: River Ganges was found in the far south of this area. Average temperature range had been recorded to be 15-30^{0}C and average humidity between 70-85%.

Soil type: alluvial soil and Soil humidity was found to be very high.

Sanitary condition: Except the well built brick houses, the sanitary condition of whole block area had been found to be very poor. Except the main street, all the lanes had been found to be dirty with sewage flush on the lanes. Open garbage was been found on the streets and in front of the main doors of many houses. Organic solid, semisolid and fluid wastes had been seen to be very common here and there in the entire area. Night soils and excretory wastes of poor people were found to worsen the sanitary condition too much. The sanitary condition of the rural areas had been found to be very miserable in this block. Poor and densely populated settlements and closely situated houses had been observed to feature very dirty living standards and the cattle sheds had been found to further worsen the sanitary conditions. The huge organic debris and excess dampness have been found favouring the development of sandflies in this area too much. Maximum population of this area was observed to survive on the business of Khatals and vegetable cultivation. Vegetable cultivation had been further found to increase the garbage due to vegetable wastes.

Presence of sandflies:

i.   P. argentipes = + + + +
ii.   P. papatasi = + + + + +
iii.   S. babu   = + + +

No. of Kala-azar cases reported in one year = 116*
No. of deaths due to kala-azar in one year = 35*
(*All the above data is collected as per direct conversation through local public and may not match with government data).

Socio-economic condition of population: This area had been found to be a mixture of rural and semi-urban culture. In the semi-urban type region, mostly middle-class and lower middle class income group people had been found, but in the rural type areas most people were found belonging from the lower income group. Almost 30% people had been found living below the poverty line. Problem of unemployment was traced to be a big curse for a big portion of youths in this area. Twenty percent of the population had been found to be engaged in jobs and most of semi-urban population had been found to be engaged in the small scale business closely related to agriculture. Dairy farming and vegetable production had been found to be the main business along with the crop farming among the rural population. Rate of crime and alcohol addiction had been found as a very common problem in this area. The living standards had been found to be very miserable and many children in this area have been observed to suffer from malnutrition.

4. Target area- Raghopur Diyara; District- Vaishali

Location: Eight Km. East from the main area of Hajipur and just across the river Ganges from Banka-Ghat (Patna).

No. of houses: Around 1200.

Types of houses: Few houses had been found to be well built. Around fifty percent houses had been found to be made of bricks but with clay-tile roofs and rest houses were slum type.

Geographic condition: The southern side of this area was found to be situated on the banks of the river Ganges. This area was found to come under the diyara area of Ganges and water logging had been found to be a very common problem for this area in every rainy season. Due to its location near the river Ganges and due to water logged land areas, the relative humidity throughout the year remained above 80% level. Annual temperature ranged from 16-31^{0}C on average.

Soil type: alluvial and Soil humidity was found to be very high.

Sanitary condition: Except the well built brick houses, the sanitary condition of the entire area had been found to be very poor. Except the main street, all the lanes were found to be dirty with sewage flush on the lanes. Open garbage had been found on the streets and in front of main doors of many houses. Organic solid, semisolid and fluid wastes had been observed to be very common here and there in the entire area. Number of cattle had been found to be surprisingly very high in this area and among them, the percentage of buffalo had been found to be maximum. The dirty domestic effluents had been found logging at many places just near the houses. Due to large number of buffaloes, present in these areas, effluent logging areas were seen to be converted into small dirty ditches and this was found as a major cause of unsanitary living standards.

Presence of sandflies:

i.   P. argentipes = + + + +
ii.   P. papatasi =   + + + + +
iii.   S. babu   =   + +

No. of Kala-azar cases reported in one year = 128*
No. of deaths due to kala-azar in one year = 18*
 (*All the above data is collected as per direct conversation through local public and may not match with government data).

Socio-economic condition of population: The economic condition of this area was found to be somewhat unbalanced. The situation of agriculture had been found to be totally depending upon the mood of river Ganges as the total area had been found in the danger of heavy erosion by this river. Waterlogging problem was found to be very acute due to perennial flood from the Ganges. However, vegetable farming had been recorded better in this area. The dairy farming was recorded as the main business in this area. Although few families had been observed to be earning better through dairy business but inspite of this, most of the population in this area had been observed to be living under very poor sanitary conditions. Migration was found as another economic curse in this area. Alcohol addiction and very poor rate of literacy was found as a major social curse for this area.

6. Target area- Kurhani; District- Muzaffarpur

Location: Twenty Kilometers south from main town of Muzaffarpur.

No. of houses- More than fifteen thousand.

Types of houses: Although this area is a block and rural and semi-urban type of population had been found here, but most of the population and their living standards were found to be of purely rural type. Only few houses had been found to be very well built. No doubt, many houses had been found to be made of bricks and many of them had two floors; however the living styles had been found to match with pure rural type standards. Most of the houses found in this area had been observed to be made of half bricks with temporary roofs, a good number of Kaccha Makan had also been found and slum like huts was also found in huge numbers.

Geographic condition: Plain fields were found in this area and Gandak river was found flowing fifteen Kms near this region. South from this, many small ponds and water logged area was found in this area. Trapa and Makhana like water plant cultivation had been found prominently in these ponds. Due to presence of many ponds and usual perennial flood of Gandak River, the average humidity level of this area was recorded around 85%. The average annual temperature range of this area had been recorded between 15-28^{0}C.

Soil type: Alluvial-sandy soil called 'Balsundari' was found in this area and Soil humidity had also been found to be very high.

Sanitary condition: As usual, this area had been recorded as heavily populated and the unsanitary living standards were found as the characteristic feature. The unplanned sewage system, lack of toilets in the rural areas, and presence of cattle-sheds with the human dwellings had been found as the combined cause of very miserable sanitary conditions. The farming of Trapa and Makhana had been found to make the situation even more badly. The high level of organic debris due to unsanitary life style, and high level of dampness inside the habitats had been found favouring the fast growth of sandflies in this area. The unscientific methods of food grain and vegetable storage had been found playing an additional role in the existence of poor conditions of sanitation in this area.

Presence of sandflies:

i.   P. argentipes= + + + +
ii.   P. papatasi = + + + +
iii.   S. babu   = + +

No. of Kala-azar cases reported in one year = 108*
No. of deaths due to kala-azar in one year = 16*
(*All the above data is collected as per direct conversation through local public and may not match with government data).

Socio-economic condition of population: This area had been found as a mixture of rural and semi-urban culture. Even in the semi-urban type region, mostly lower middle class income group people was found, but in the rural type areas most people had been found to belong from the lower income group. Almost 40% people had been found living below the poverty line. The unemployment was traced as a big curse for a big portion of youths in this area. Most of semi-urban population had been found to be engaged in the small scale

business closely related to the agriculture. Dairy farming and vegetable production had been found as the main business with the crop farming among the rural population. Ponds were found as one of the important economic source of this area. Trapa and Makhana cultivation had been found as a major business on which many families had been revolving their economic axis. This had also been found as the major cause for very high population of sandflies in this area. Rate of crime and alcohol addiction had been found as a very common problem in this area.

5. Target area- Village Karja; District- Muzaffarpur

Location: Twenty kilometers from main area of Muzaffarpur.

No. of houses: 329.

Types of houses: 49 houses had been found as brick houses in which 13 were observed with more than two stories and well built type and rest were found to be somewhat ill built slum types made of clay, bricks and covered by asbestos or tin sheets or hay as roof.

Geographic condition: The northern side of this village had been found situated very near to the river Gandak. This area had been seen to come under the kachhar area of Gandak and water logging due to annual flood was found as a very common problem for this area in every rainy season. Due to flood, ponds and other waterlogged areas, the relative humidity throughout the year had been found to remain above 80% level. Annual temperature range was recorded to be 18-30^{0}C on average.

Soil type: alluvial 'Balsundari' soil and Soil humidity was found to be very high.

Sanitary condition: Except the well built brick houses, the sanitary condition of whole village had been found to be very poor. All the lanes including the main street were found dirty with sewage flush on the lanes. Open garbage had been found on the streets and in front of the main doors of many houses. Organic solid, semisolid and fluid wastes were found to be very common here and there in the entire area. Many cowsheds "Khatals" had been noticed in this area and the garbage of cow-dung mass was further observed to worsen the sanitary condition of this area. Vegetable cultivation had been further found to increase the garbage due to vegetable wastes. The unplanned sewage system, lack of toilets in the rural areas, and presence of cattle-sheds with the human dwellings had been found as the combined cause of very miserable sanitary condition. The farming of Trapa and Makhana had been found to make the scene more badly. Litchi cultivation had been found as a very important economic framework for this area .But, the mismanagement of the residues and wastes of the Litchi yards was found to play a big role for the unsanitary conditions prevailing in this village.

Presence of sandflies:

i.   P. argentipes= + + + +
ii.   P. papatasi = + + + + +
iii.   S. babu   = + +

No. of Kala-azar cases reported in one year = 42*
No. of deaths due to kala-azar in one year = 10*

(*All the above data is collected as per direct conversation through local public and may not match with government data).

Socio-economic condition of population: Major portion of the population of this area had been found to represent the depressed castes and class. Almost one fourth of the population had been found living below the poverty line. Although the makhana cultivation and Litchi farming had been observed as a very profitable business, but the ownerships of these farms were observed to be centralized in hands of few rich farmers and most of the village people had been found working in those farms as laborers. For Mahkana cultivation, workers had been noticed to spend many hours standing in waist deep water that causes many water borne diseases in them. Pond-Fishery had been found as another source for the income in these areas. Unsanitary living standards and plenty of organic wastes within the habitats was found to provide enough shelters to the sandflies in this area and maximum of the casualties due to visceral leishmaniasis have been reported from the families living below the poverty line.

RESULT

1. Maximum sandflies has been found in those districts of Bihar that are situated at the northern part of river Ganges supporting the views of Dhanda *et al.,* 1983.
2. Sandflies have been found abundantly in the region of alluvial soil where the soil humidity has been noticed very high.
3. The female sandflies prefer to lay eggs inside the cracks of the alluvial soils where the level of moisture has been measured above 80% in the northern districts of Bihar and Gangetic areas (Kaul *et al.,* 1979). The presence of ponds and other water masses with the annual flood has been found maintaining the high soil moisture level sufficiently high as per the optimum requirement for the proper development of the sandfly eggs and larval instars.
4. In all the areas covered under the general field survey in the present research, it has been noticed seriously that all those areas, where the sanitary conditions have been found miserable and organic debris were disposed without any proper management, the kala-azar disease has also been found to be endemic. The population of sandflies has been found to be very high in these areas.
5. Sandflies generally have been seen to prefer resting in a shelter having diffused light, high relative humidity ranging from 80-85% and temperature ranging from 25-30°C. *P. argentipes* has been found to be endophilic species. Majority of the specimen has been collected from cattle- sheds and a substantial number has also been found to rest in the human dwellings (Addy *et al.,* 1983).
6. Generally in the day time, the sandflies have been found resting inside the cracks and fissures of the mud plastered houses. (Palit *et al.,* 1990). The number of sandflies has been found more in the rural areas and semi-urban areas, when compared to the urban areas.
7. In the urban areas, many houses have been found having more than two or three floors. So, the population of sandflies and the intensity of the kala-azar have been found more in the rural and semi-urban areas supporting the view that sandflies are not good fliers.
8. Either due to the poor economic condition or due to illiteracy and lack of awareness, many patients quit the therapy before the full course as soon as they feel healthy. This has been reported as the main cause for the migration of resistant strains of the amastigote stages of *L. donovani* to the subcutaneous regions from the peripheral blood circulation of the patients leading to PKDL.
9. In the present survey, it has been noticed that although the cases of Kala-azar have been reported from all types of income group families, but the casualties due to this disease have been recorded mostly among the poor, and lower income group families.

Acknowledgement

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