

STUDY ON DIFFERENT ASPECTS OF STEPHANOFILARIAL DERMATITIS INFECTION IN CATTLE POPULATION OF WEST BENGAL

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ABSTRACT

In the present study, prevalence, transmission, characteristics of the parasite *Stephanofilaria assamensis* and pathology of the disease caused by *S. assamensis*, commonly known as 'humpsore' were studied in two different eco-climatic zones of West Bengal (India) i.e. in coastal plain (Bay of Bengal) of South Bengal and in Himalayan foot hills of North Bengal respectively. Irrespective of the regions, out of total 1250 cattle randomly examined, 332 (26.56%) showed lesions of Stephanofilariasis caused by *S. assamensis*. The prevalence of the disease in South Bengal was found to be 17.12% in which the mentioned parasite not only affected the hump but also the dewclaw, hooves, abdomen and other parts of the body. While in North Bengal, the prevalence was quite higher (38.37 %) and infection was mostly limited to the hump region causing the so called real 'humpsore' in cattle. As per the breed of cattle is concerned, 22.60% infections recorded in indigenous cattle and 36.64% recorded in crossbred and exotic cattle. The prevalence was highest among the animals of 4 to 5 years age group (28.01%). Infection rate in males animals (29.25%) was more than in females (21.84%). Influence of season on prevalence indicated that it was highest in rainy season (47.13%) followed by summer (21.64%) and winter (8.76%). The isolation and characterization of adult and microfilariae was found to be identical with no differences in their morphology. In South Bengal and North Bengal regions *Musca conducens* and *Haematobia* sp. were identified as intermediate hosts. The histopathology of the biopsy materials revealed almost identical changes like hyperplasia, fibrosis, acanthosis with huge number of adult parasites and microfilariae in dermis layer of cross sections of skin.

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[I] INTRODUCTION

Skin of cattle is often affected by Stephanofilarial infection in the Indian subcontinent and is commonly known as 'Humpsore'. Nine species of the Stephanofilarial parasites have been reported from different parts of the world, but only *Stephanofilaria assamensis* has been reported as the causal agent of hump sore in eastern India. Though the name 'Hump sore' implies appearance of sore in the hump region but the stephanofilarial dermatitis also occurs in other parts of the body. The disease is transmitted by the fly *Musca conducens* and is prevalent in tropical countries like India [1, 2] and other countries. The disease is widely prevalent in West Bengal, India. The presence of the parasite *Stephanofilaria* sp. which affects domestic animals may harm human health [3]. Hence, keeping in view of its prevalence in West Bengal as well as its economic importance, a fresh initiation has been undertaken to investigate the present status of prevalence, transmission dynamics and pathology of the disease.

II] MATERIALS AND METHODS

2.1. Prevalence study

The study was carried out in two different eco-climatic zones of West Bengal, India, the northern foot hills areas of North Bengal and southern coastal plains of Bay of Bengal. A total of 1250 indigenous, exotic and cross bred cattle irrespective of skin lesions recorded, were examined for the presence of hump sore lesion. Out of 1250 cattle, 695 were from West Midnapur district of South Bengal and 555 were taken from Coochbehar district of North Bengal. The prevalence was recorded in three major seasons like summer (March to June), rainy (July to October) and winter (November to February) and in respect of age, sex and site of infection.

2.2. Recovery of parasites

For the identification of parasitic agent from the hump sore affected cattle, standard techniques related to recovery of adult worms and microfilaria from blood, impression smears and tissue materials of the affected regions were applied. For isolation of adult parasite, deep scrapings and pieces of healthy tissues were taken with a scalpel from the suspected lesions and treated with lukewarm (37°C) normal saline for 2 hours. The tissue debris was separated by decantation and actively motile adults were recovered by fine needles. The worms thus wriggled out were collected and preserved in 70% alcohol, cleared in lacto phenol and the morphologically characterized with light microscope. The tissue debris contents were centrifuged @ 1000 rpm for 5 minutes, for recovery of microfilaria. The sediment was mixed well with one drop of 0.1% methylene blue and examined under microscope for presence of microfilariae.

Detection of microfilaria was also made in impression smears prepared on a glass slide from oozing blood and fluid of deep scrapings of encrusted lesions and blood smears. The dried slides were fixed with methanol and stained with Giemsa stain (1:20) for 45 minutes. Peripheral blood was collected in vials containing heparin (0.2 mg/ml) from the suspected animals and thick and thin smears were prepared, fixed, stained with Giemsa stain and examined. Haematocrit test technique and Knott's techniques were applied for recovery of microfilaria from blood. For Knott's technique 9 ml of 2% formalin was mixed with 1 ml heparinized blood. The mixture was then centrifuged at 1500 rpm for 5 minutes. One drop of 0.1% methylene blue was added to the sediment and a drop of stained sediment was examined under microscope.

2.3. Vector study

The flies from the lesions / body were caught by net and thorax and salivary gland were dissected and tissues were squashed between slides and searched for presence of typical blunt crescent shaped microfilaria.

2.4. Pathological examination

Skin biopsies were taken from sites of those affected lesions by using 'Skin Biopsy Punch'. These were preserved in 10% buffered neutral formalin solution for histopathological examination as per standard technique.

[III] RESULTS AND DISCUSSION

Irrespective of the regions, out of 1250 cattle, 332 (26.56%) showed lesions of Stephanofilariasis caused by *S. assamensis*. But the prevalence of the disease in South Bengal was 17.12% [Table-1], not only affecting the hump but the dewclaw, hooves, abdomen and also other parts of the body, while in North, the prevalence was quite higher (38.37%) and mostly limited to the hump region causing the so called real 'hump sore' in cattle. As per breed of cattle is concerned, 22.60% were found affected among indigenous cattle and 36.64% crossbred and exotic cattle. The incidence was highest among the animals of 4 to 5 years age group (28.01%) followed by 5 to 6 years, 6 to 7 years, and 7 years and above age group, 3 to 4 years, 2 to 3 years and 1 to 2 years (1.80%). Males (29.25%) were found to be affected more than females (21.84%). As regard to site of lesions, the percent prevalence was recorded 27.40% in neck region, 18.67% in hump region, 17.16% at the base of dewclaws region, 13.85% in the hoof region, 4.51% in the prescapular area, 2.40% in the lateral abdominal region, 1.50% at the inner canthus of eye, and 14.45% on the other parts of the body.

Table-1: Prevalence (%) of *S. assamensis* infection in cattle population in different zones of West Bengal (India)

Zones	Ecological character	Number of cattle examined	Number of cattle affected	Percentage (%)
South Bengal	Coastal plains	695	119	17.12
North Bengal	Himalayan foot hills	555	213	38.37
Total		1250	332	26.56

It was observed that the prevalence of the disease increased from the month of May (20.66%) till it reached the peak in August (66.96%) and declined thereafter, lowest in winter till December. Thus, influence of season on prevalence indicated that it was highest in rainy season (47.13%) followed by summer (21.64%) and winter (8.76%).

Adult parasites and/or microfilariae were recovered from skin scrapings impression smears of tissue sections. Microfilariae in peripheral blood were also recovered only from 12 cases. Small, slender and whitish adult worms were collected. The male parasites ranged from 3 to 5 mm and females 7 to 11 mm. Under light microscope, a crown like cephalic structure was noticed; at a short below there was a row of cephalic spines. Except the cephalic structures, the cuticle was finely serrated at regular intervals throughout the body length and the serrations became gradually faint towards the posterior region. In males the body was almost of uniform thickness except the anterior end and posterior end, which was slightly bent ventrally. Whereas, both the ends of females were tapered, but the thickness increased gradually towards the posterior part and the tail was straight.

The centrifuged sediment and extractives of tissues in

physiological saline revealed slender microfilaria, of which anterior end was blunt and the posterior end was pointed. Examination of impression smears revealed that most of the microfilariae were sheathed; only a few were unsheathed. Above to the nerve ring, the cephalic portion was narrow and ends somewhat rounded; on the other hand towards the posterior end, the microfilariae were narrow and tapered posteriorly. Most of the microfilariae were in open 'C' posture or coiled, while undulating forms and straight forms of the microfilariae were also observed in few cases. The length of the microfilaria was varied between 120 μ m to 150 μ m. In the present study, some immature worms with 'knob head' appearance and comparatively smaller size were also recovered. In the present study microfilariae could not be recovered in both thin and thick Giemsa stained blood smears. Only a few numbers of microfilariae were observed in micro-haematocrit and Knott's methods of examinations.

Two different haematophagus flies were recovered from the body of the affected cattle in two different eco-climatic zones. In coastal South Bengal *Musca conducens* and *Stomoxys calcitrans* flies were caught during feeding on the lesions of stephanofilariasis. On dissection unsheathed crescent shaped infective larvae were recovered from the *Musca conducens* flies

only and no larvae from *Stomoxys calcitrans*. In North Bengal, plenty *Haematobia sp.* and a few *Stomoxys calcitrans* were caught from the body of the host. On dissection of both the flies and thorough examination revealed a few larvae in the thorax and salivary gland of *Haematobia sp.* but not in *Stomoxys calcitrans*.

The gross and histopathological changes in different stages of stephanofilarial dermatitis of cattle were almost same irrespective of the site involved. The diameter of the gross lesions varied from 2 to 10 cm. Exudation of serum and oozing of blood leading to crust formations, acanthosis, proliferation and annular zones of leukoderma surrounding the lesions were noticed. Raw eroded ulcerated red areas were observed at around the junction of skin and hoof. Scab, dry crust formation and acanthosis were common. In dewclaw region, lesions with excoriation proliferation and complete loss of hairs and tumorous growth up to hen's egg size were quite common.

The histopathological sections prepared from skin biopsies revealed hyperkeratinization of cornified layers of the epidermis, stratum granulosum and stratum spinosum of the epidermis were hyperplastic and micro-cavities filled with tissue debris and inflammatory cells in the epidermis. Some of the retepegs of epidermis showed proliferation and extended deep into the dermis. Transverse and longitudinal sections of adult *Stephanofilaria sp.* parasites were found in the dermo-epidermal junction, just beneath the tips of retepeg and the parasite sections were surrounded by a zone of inflammatory cells. Longitudinal sections of adult parasites were also seen in the superficial layer of dermis near the epidermis along with the infiltration of inflammatory cells. Coiled and slender microfilariae without egg capsule were noticed amidst the granulation tissue in the superficial dermis and vicinity of that microfilaria was infiltrated with few inflammatory cells. The dermis showed extensive inflammatory reaction consisting of formation of granulation tissue, especially at the superficial part of dermis and deeper part of dermis showed fragmentation of tissue. The infiltrating cells of dermis consist of neutrophils, eosinophils and mononuclear cells. Increased activity of fibroblasts with hypertrophy and atrophy of the hair follicles were observed.

The highest prevalence among the animals of 4 to 5 years of age group with gradual increase in rate of prevalence with the advancement of age up to five years and there after gradual decrease was observed in the present study. The increased percentage of clinical cases in adult male cattle (4 to 5 years) might be due to their various exposure like ploughing, pulling carts and other drought purposes and chaining with iron-chain, thick ropes etc. These lead to external injury to hump, which attracts the vector flies and is one of the predisposing factors of Stephanofilariasis.

The highest prevalence 47.13% during rainy season might be due to high temperature, humidity and rainfall resulting into

increased population of transmission vectors by their increased breeding performance during rainy season. During rainy season majority of the animals are utilized for ploughing of lands for agriculture and the hump and other parts of the body are exposed to injury which attract flies. When animals are reluctant for ploughing in the field, farmers often beat them with whip or sticks etc. to make them active which makes scratches over the skin thereby attracts the flies and might be the cause of stephanofilarial dermatitis in these sites.

The small slender and whitish parasites as observed in the present study and the 'C' shaped microfilariae with a slightly bent knob like cephalic and a sharply pointed tail in deep skin scraping were recovered earlier. Sheathed and unshathed microfilaria were recovered in the present study where as only unshathed microfilariae were recovered by earlier workers.

The dewclaws are pushed out and might be shed completely leaving behind a crater like ulcer. Acanthosis, thickening of the epidermis as a result of hyperplasia of the malpighian layer, especially the prickle cell layer, is a common feature in chronic inflammatory condition. Parakeratosis might be due to rapid cell turnover.

The presence of inflammatory cells and tissue debris in the micro-cavities of epidermis was observed in the present study. It is suggested that these are degenerating Stephanofilariae and the inflammatory reaction is against those parasites. Changes in typical hump sore were identical affecting mostly the hump region of the cattle in North Bengal while in South Bengal the sores in other parts of the body particularly the legs were quite common.

Endemicity of *S. assamensis* in India is well established and information about its prevalence, epidemiology, transmission and pathology are available [1]. But it was found that the incidence and character of the disease in hilly area (Himalayan foots) is not same with coastal plains of South Bengal. In the present study, it was observed that in contrast to 17.12% prevalence in coastal plain, it was 38.37% in North Bengal. It was further observed that in cattle population of South Bengal the lesions were distributed through out the body like hump, neck, hooves, dewclaws, and also other parts of the body. It was assumed that some factors in relation to the host parasite relationship and genetic variation in strains of the parasite are related to the limitation of the disease mostly to the hump region of the cattle of foot hills area. This type of observation in relation to variation in sites of infection in respect of eco-climatic variation has never been reported so far.

Various characteristics lesions as observed in the present study are in agreement with the findings of earlier workers [3, 4]. Exudation of serum and crust formation continuous as the lesion advances; subsequently, when the lesion becomes old and chronic, there is a granulomatous swelling on the area. Section of skin revealed acanthosis, hyperkeratosis and parakeratosis of

epidermis which has been also been observed earlier [5].

There were spongiotic changes in the epidermis and epidermal retepegs proliferation and penetration in the dermis was noticed and this epidermal retepegs proliferation may be due to chronic parasitic infection. These parasitic sections suggest that the pathological tissue changes and inflammatory reactions are brought by the parasites [6, 7]. In bulls, chronic eosinophilic dermatitis in the scrotal area associated with stephanofilariasis has been reported [8].

[V] CONCLUSION

The differences in prevalence and characteristics of Stephanofilarial dermatitis in the present study between North Bengal and South Bengal (West Bengal, India) were proposed to be due to eco-climatic differences between these two zones, difference in the intermediate hosts and also due to differences in the genetic character of strains prevalent in these areas.

CONFLICT OF INTERESTS

None

FINANCIAL DISCLOSURE

NIL

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