



RESEARCH ARTICLE

DERMATOPATHOLOGICAL STUDY OF STEPHANOFILARIASIS (HUMP SORE) IN CATTLE AND ITS THERAPEUTIC APPROACHES

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ABSTRACT

Dermatopathological investigation of stephanofilariasis involved examination of 1,427 cattle maintained under the traditional husbandry conditions of dairy farms at Birgonj Upazila, Dinajpur in Bangladesh. The investigation was carried out among 381 humpsore affecting cattle. Very close visual inspection and palpation of the entire skin surface of the body were the commonly adopted clinical methods of examination of the animals. The clinical and pathological features including topographic positions of the lesions as well as complications were also recorded. The skins of 3 typically affected cattle were collected, preserved, processed, embedded with paraffin, sectioned and stained with hematoxylin and eosin for the histopathological study. Crusts including the worm were examined in the parasitology laboratory for the identification of *Stephanofilaria spp.* Stephanofilariasis was therapeutically managed through injecting ivermectin and also the application of an ointment prepared with zinc, Potassium iodide, Methylene blue and Vaseline in an appropriate ratio. The highest incidence was recorded in the dairy farm (31.63%), animals with 10-15 years of age (83.00%) and in male (31.57%). Common predisposing factors were identified as frequent rubbing with trees, rope and metallic chain used for restraint, yoke used in draft animals, fences, barbed wire, manger protector and continuous ocular discharge. The most usual predilection sites of infection were the neck, withers or hump and ear. The characteristic clinical signs were the intense pruritis, ulcerated and non-ulcerated lesions with heavy accumulation of firm crusts. The remarkable histopathological changes were hyperkeratosis, the presence of cross and longitudinal section of parasites. Ivermectin showed the better response than that of the ointment applied locally.

Key words: Cattle, Dinajpur, Dermatopathological, Stephanofilariasis, Ivermectin.

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INTRODUCTION

Hides and skins are the valuable wealth of Bangladesh. The leather is the second highest foreign exchange earner of this country. Several skin diseases have been found to be affected the hides of cattle which not only affect the general health, production, market value and working capacity of the affected animals but also lowered the economic value of their hides. Among these diseases, stephanofilariasis (humpsore) is most important. It is a parasitic disease caused by worms of the genus *Stephanofilaria* which causes skin lesions characterized by alopecia and ulcerative nodular dermatitis in bovines.

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While recent studies characterize it as a zoonosis, its occurrence in humans is considered rare (Novaes *et al.*, 2006). Five species of the genus *Stephanofilaria* have been described as bovine parasites in a number of regions of the world; their intermediate hosts include *Haematobia irritans*, *Musca conducens*, *Musca planiceps* and *Musca autumnalis* (Riviera and Aycardi, 1985) and *Stephanofilaria* can be characterized as the agent of a disease commonly observed in exuberant high-occupancy pastures with large quantities of wet feces, principally in the hot and rainy seasons (Sutherst *et al.*, 2006). The microfilaria takes about 25–30 days inside the fly to complete part of its life cycle (Rai *et al.*, 2010). As the disease is located mainly on or near the region of the hump and neck, it causes extensive skin damage. The value of the animals also reduced due to the ugly looking lesion altogether accounts for

huge economic loss (Ibrahim *et al.*, 2013). Treatment of Stephanofilariasis with Antimosan has been attempted in Indonesia (Holz and Adiwinata, 1957), Northwest Germany (Dirkman and Radermacher, 1960 a,b,c) and Comilla, Bangladesh (Ahmed and Ali, 1973). These reports indicate that Antimosan is effective against stephanofilariasis but the time required in the treatment is protracted. As the disease is widely prevalent in Dinajpur district especially in Birgonj hence, keeping in view of its prevalence as well as its economic importance, a fresh initiation has been undertaken to investigate the present status of prevalence, transmission dynamics, predisposing factors, pathology and severity of the disease.

MATERIALS AND METHODS

Study area, period and experimental animals: The study was carried out in the Upazilla Veterinary Hospital, Birgonj in Dinajpur, Bangladesh on the duration from March to December 2016. The animals registered in the hospital for the diagnostic and therapeutic purposes and also the physically visited animals of different locations were considered as the experimental animals. The total 1,427 animals of different types, sexes and ages were registered in the hospital as clinical cases, among which 381 cases of Stephanofilariasis were recorded throughout the experimental period. The farming system and seasonal occurrences of the disease were also recorded properly.

Clinical examination: The animals were clinically examined by the direct visual method and the farmer's complaints regarding sickness of these animals were also emphasized. The epidemiological investigation was done based on the population of clinical cases, topographic positions of lesions, predisposing factors interlinking with the aggravation of lesions and typification of the lesion were done. The data of clinical investigation were recorded in a register, organized systematically and analyzed statistically.

Pathological Examination: The gross morbid lesions of the disease were systematically examined, noted and categorized. The suitable sizes of skins of 3 typically stephanofilariasis affected cattle were collected from the live patients subjected to the diagnosis and further histopathological study. The collected samples were preserved at 10% formalin solution and subsequently processed, embedded with paraffin, sectioned and stained with hematoxylin and eosin method systematically for histopathological examination as per recommended methods (Luna, 1968).

Therapeutical Approaches: Among the affected animals, 60 cattle were randomly allocated into 2 groups, named Group A and Group B with 30 in each and were treated with 5ml of Ivermectin for 3 to 4 injections at weekly intervals irrespective of the size and severity of the lesions in Group A and with topical ointment (Zinc oxide 45 gm. Potassium iodide 2 gm., Methylene blue 1 gm. and Vaseline to make 100 gm) in Group B. The therapeutic approaches were assessed on the basis of skin healing and normal posture of the animal.

RESULTS

Incidence of Stephanofilariasis: Irrespective of the regions, out of 1,427 cattle, 381 (26.69%) showed lesions of Stephanofilariasis caused by *S. assamensis*. The higher

incidence was recorded in Dairy Farm (31.63%) than rural areas (26.00%), Table -1. As per different types of cattle, the highest incidence rate was recorded in bull (83.00%) followed by the dry cow (59.24%) and milch cow (2.79%) even no stephanofilarial lesion was seen in either heifer or bull calves, Table-2. Male animals were mostly affected (31.57%) is compared to female (16.98%), Table 3. The prevalence was highest among the animals of 10 to 15 years age group (83.00%) followed by 5 to 10 years (59.24%) and 2-5 years (3.25%), Table-4.

Predisposing factor: A breach in the continuity of epidermis of the skin is the pre-requisite condition for the subsequent development of hump sore. In this study the most commonly observed predisposing factors for breach in the epidermis are in case of inner canthus of the eye due to continuous ocular discharge and feeding of the discharge by flies, base of the horn and base of the ear by frequent rubbing of restraining rope, behind the poll with continuous rubbing of chain or raze mad to control the animal, middle and posterior neck occurred by frequent and continuous rubbing during ploughing, drawing cart and with oil or molasses machine, abdominal wall or other regions injured by rough floor of farm, barbed wire, during fighting with each other and hump/withers by manger under farm conditions and by metallic rod or bamboo at the open place animals to prevent soiling of the food in the manger. Breach is the origin of the lesion in the skin which becomes enlarged by secondary bacterial infections (*Staphylococcus aureous*, *Staphylococcus albus* etc.). The severity of the lesions in different predilection sites was shown in Table-5.

Distribution of Lesion: It was observed the hump sore lesions mostly on or around the hump and also observed on the back and on the ventral surface of the body, anterior and posterior to the navel and on the abdomen.

Clinical findings: Most frequently observed clinical findings were intense pruritis that was characterized by rubbing the affected part against the wall, pillar, posts, stanchion bar, trees, fences etc. A central ulcer or excoriation may be produced or enlarged the existing one by pruritis or rubbing disturbance, Fig-1. The excoriation caused by rubbing was seen complicated by screw-worm infestation, warts and yoke gall. In many instances, the initial wound of the skin was covered by grayish white crust hence favored the stephanofilarial infection. The non-ulcerated lesions frequently become excoriated favoring further deposition of stephanofilarial larvae and gradually obtain the characters of ulcerated lesions resulting partial or completely devoid of hairs.

The ulcerated lesions had central ulcers of various sizes and shapes surrounded by larger peripheral crusty areas in most of the lesions with irregular boundary. The discharge of the ulcers was pureblood, serum or blood mixed serum. The surface of the ulcers was frequently hemorrhagic and moist but dry surface covered by thin blackish or brownish crusts and a number of flies were seen feeding on the discharges. The color of the crusty/scabby part was found to vary from grayish white to blackish and this part was raised from the ulcerated part or normal skin surface. The thickness of the crusty part of the lesions was up to 2.3 cm according to character and degree of crust formation, compared to the normal skin thickness of about 2.5 mm. The shape of the lesions was characteristically circular although roughly rectangular, triangular or irregular shaped lesions were not uncommon.

Table 1. Prevalence of Stephanofilariasis under Farm and rural conditions

Traits	Dairy Farm	Villages (Rural house hold)	Total
Animals Examined	177	1250	1427
Animals infected	56	325	381
Percentage	31.63	26.00	26.79

Table 2. Prevalence of Stephanofilariasis in different types of cattle

Traits	Heifer calf	Bull calf	Heifer	Bull	Dry cow	Milch cow	Steer
Animals examined	250	79	216	300	211	215	156
Animal infected	0	0	0	250	125	6	0
Percentage	0	0	0	83.00	59.24	2.79	0

Table 3. Prevalence of Stephanofilariasis on the basis of sex

Traits	Male	Female
Animals examined	950	477
Animals infected	300	81
Percentage	31.57	16.98

Table 4. Prevalence of Stephanofilariasis in various age groups of cattle

Traits	1-6 (month)	6-12 (month)	1-2 (Year)	2-5 (Year)	5-10 (Year)	10-15 (Year)	15-20 (Year)
Animals examined	250	79	216	215	211	300	156
Animal infected	0	0	0	7	125	250	0
Percentage (%)	0	0	0	3.25	59.24	83.00	0

Table 5. Typification of clinical findings of Stephanofilariasis

Clinical features	Inner canthus of eye	Base of horn	Base of ear	Behind the poll	Middle and posterior neck	Abdominal wall	Hump/ withers
Alopacia and/ or matted hairs	+++	+++	+++	++	+++	++	+++
Pruritis	+	+	-	-	++	-	+++
Cutaneous thickening	++	++	++	++	++	++	+++
Erythema	++	-	-	-	++	+	+++
Exudation	+++	+	+	++	+++	++	+++
Scab/ crust formation	+	++	++	++	+++	+++	+++
Hyperpigmentation	-	++	++	++	+++	+	+++

-: Absent, +: Mild, ++: Moderate, +++: Severe/ Marked

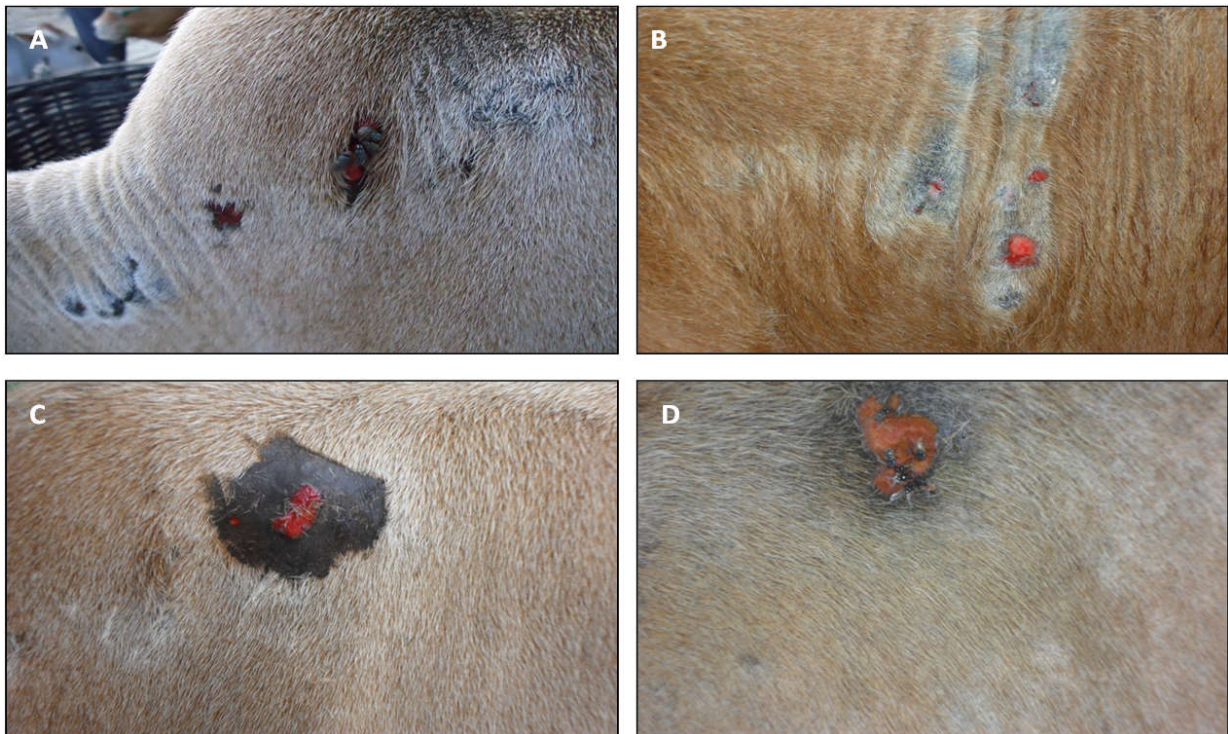


Fig. 1. Clinical signs of the affected animals, A. Wounds produced at different body parts including hump, B. Widened area of hump sore including keratinized and fresh wound areas, C. Fresh wound developed due to pruritus, D. Hump sore with cutaneous erosion produced due to intense rubbing with hard object and fly infestation

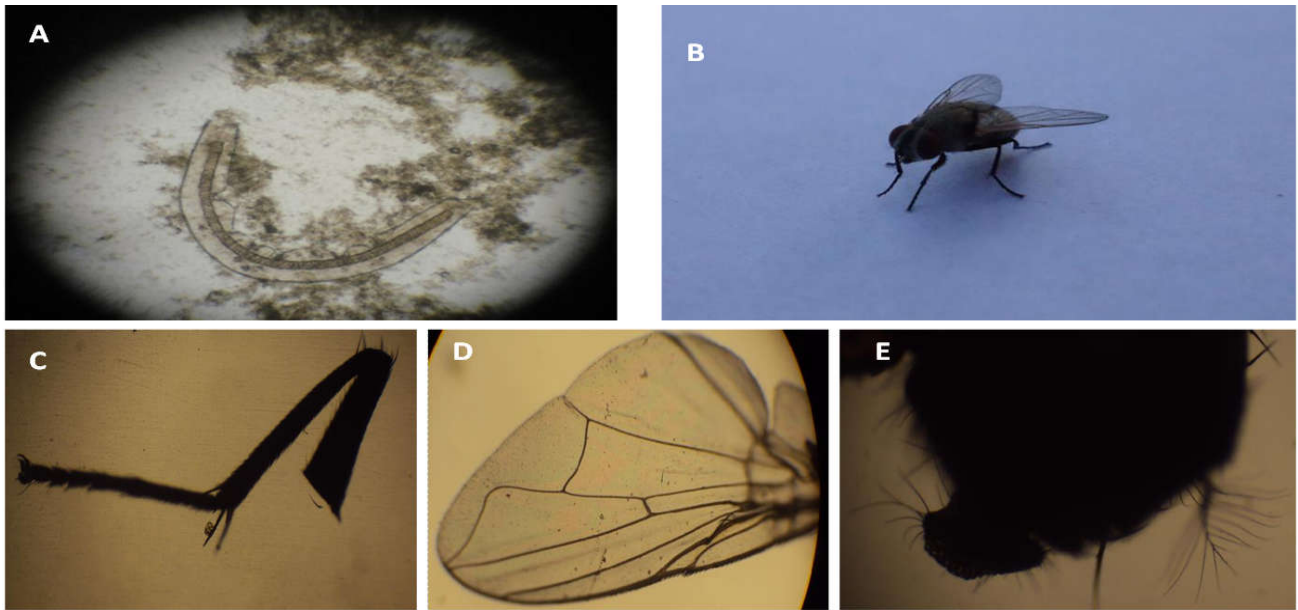


Fig. 2. Oetiological agents A. Microfilaria on Stephanofilarial skin scraping, B. *Musca* sp., C. Leg- characteristics of the flies collected from the wounded area, D. Wing- characteristics of the flies collected from the wounded area, E. Mouthparts- characteristics of the flies collected from the wounded area

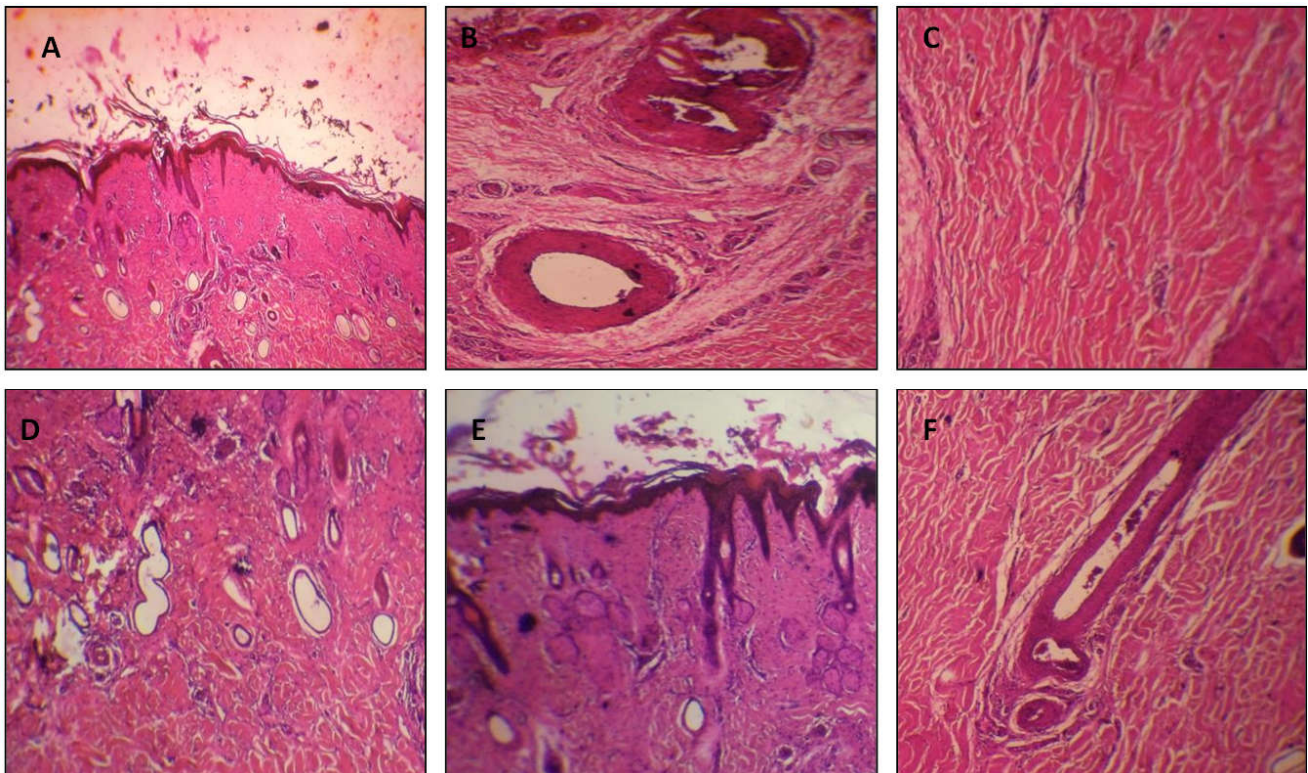


Fig. 3. Histopathological images, A. Hyperkeratinization with distortion of keratinized layer B. Cross section of filarial worm (*Stephanofilaria* spp.) encapsulated with proliferating fibrous connective tissue and reactive cells , C. Proliferation of loose connective tissue predominantly collagenous fibers and fewer reactive cells, D. Reactive dermis , E. Hyperkeratinization, proliferation of glandular structures specially sebaceous gland and reactive cell infiltration , F. Longitudinal section of parasite (*Stephanofilaria* spp.) surrounded by connective tissue fibers

Pathological findings: Grossly the characteristic lesions were observed mostly on or around the hump. Single circular or irregularly shaped lesions of varying size were found in most cases. The lesion was found to commence as one small circle which gradually increased in size and covered with dark thick hard crust having crevices, and cracks. Slight to moderate bleeding surfaces were observed, the lesions were either picked up by crows or rubbed on rough surfaces by the animals themselves for irritation.

Histopathological examination of the collected Samples was done with hematoxylin and eosin staining method. There was marked hyperkeratosis of stratum conium of epidermis and discontinuity or loss of integrity of the superficial layer of the epidermis (Fig-3.A). There was severe dermatitis and also the proliferation of fibrous connective tissue and reactive cell infiltration (fig-3.B). These findings of this study correlate with the findings of Jones, Hunt, King (2000), their statement was hyperkeratosis and parakeratosis in the epidermis, in addition

to severe dermatitis, findings which were also taken by researchers as indicative of the disease (Fig-3.E). Cross and longitudinal section of stephanofilarial parasites were seen in tissue sections which were encapsulated with fibrous connective tissue (Fig-3.F). Probably, these findings are related to the death of the parasite and the consequent sensitization of the host. There was an extensive proliferation of fibrous connective tissue (non-neoplastic) at the reticular area of the dermis. Some slides show characteristic neoplastic cell islands.

Therapeutic findings: Therapeutic Responses according to the study resulting complete cure of stephanofilariasis caused by *Stephanofilaria assamensis* or significant clinical improvement in 18(90%) of the 20 cases of Group A by injecting Ivermectin. In case of group B, there was an evidence that topical application of ointment (Zinc oxide 45 gm. Potassium iodide 2 gm., Methylene blue 1 gm. and Vaseline to make 100 gm) twice daily is less effective than group A.

DISCUSSION

During the study period among 1427 cattle, a total of 381 animals had typical lesions indicating 31.63% incidence of the disease which simulates with the earlier reports of Md. Fazlul Haque (1982) who reported 31.10% incidence of the disease out of 4033 cattle in Mymensingh district. The sex wise, age wise and animal type wise incidence are also in similarity with other workers in Bangladesh like 20% (Huq, 1953), 25% (Rahman, 1957), 24% (Mia and Haque, 1967), 20% (Hassan, 1969), 20% and 30% (Islam,1977). The disease is more common in the farm than villages (Huq 1953, Rahman 1957 and Dewan 1971a). This is supported by the present observation of higher incidence in the farm (31.63%) than villages (26.00%). Close contact of -the animals and negligent management of cutaneous abrasions could be the cause of higher incidence of humpsore under farm conditions of Bangladesh. It was observed the hump sore lesions mostly on or around the hump and also observed on the back and on the ventral surface of the body, anterior and posterior to the navel and on the abdomen which is agreement with the reports of Mia and Haque (1967), Bhattacharjee (1970), Dewan (1971a). Common clinical findings were intense pruritis that was characterized by rubbing the affected part against different hard objects and a central ulcer or excoriation may be produced or enlarged the existing one by pruritis or rubbing disturbance which are in agreement with Huq 1953, Rahman 1957 and Dewan 1971a. The characteristic gross lesions observed mostly on or around the hump. Single circular or irregularly shaped lesion of varying size was found in most cases. The lesion was found as one small circle which gradually increased in size and covered with dark thick hard crust having crevices, and cracks. Slight to moderate bleeding surfaces were observed which are also similar to the findings of Mia and Haque, 1967. There was marked hyperkeratosis of stratum corneum of epidermis and discontinuity or loss of integrity of the superficial layer of the epidermis. There was severe dermatitis and also the proliferation of fibrous connective tissue and reactive cell infiltration. These findings of this study correlate with the findings of Jones, Hunt, King (2000), their statement was hyperkeratosis and parakeratosis in the epidermis, in addition to severe dermatitis, findings which were also taken by researchers as indicative of the disease. There was an extensive proliferation of fibrous connective tissue (non-neoplastic) at the reticular area of the dermis. These statements correlate with the findings of Goldschmidt et al. (1988). Other important features

were not possible to study due to lack of electron microscope and laboratory facilities. In this study, complete cure of stephanofilariasis caused by *Stephanofilaria assamensis* or significant clinical improvement in 18 (90%) of the 20 cases by injecting Ivermectin. But according to Ahmed and Ali (1973) clinical recovery or significant improvement of humpsore lesions by subcutaneous injection of Antimosan but required the longer time than our observation. Considering the report of Dewan and Rahman (1970), humpsore is complicated by secondary bacterial infections, the ointment we applied with a view to preventing such infections to improve the healing process while Ahmed and. Ali (1973) only applied 1% gentian violet solution.

Conclusion

Stephanofilariasis is more prevalent in dairy farm cattle than the rural household cattle in the study area. The highest prevalence of stephanofilariasis was observed in the Dairy farm (31.63%) and the male (31.57%) of 10-15 years age groups (83.00%) resulted. Hyperkeratinization, distortion of keratinized layer and proliferation of fibrous connective tissue is the general histopathological features and fly infestations appeared as common disorders in the stephanofilariasis affected animals. Complete recovery of the lesion was shown in the surgical intervention group than in ivermectin injection group and even topical ointment application group which was also proved even by histopathologically.

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Conflicts of interest: The authors declare no conflicts of interest.

REFERENCES

- Ahmed, S. and Ali, M. I. 1973. Treatment of humpsore with Antimosan solution. *Vet. Med. Rev.*, No.2, PP 136-142.
- Ali, A. 1973. Theory of Statistics. First Edition, Dhaka Book Mart, 38, Ban-labazar, Dhaka- 1, PP. 350-351.
- Baki, M. A. and Hossain, M.I. 1982b. Preliminary studies on the cause of recurrence of humpsore (stephanofilariasis) in zebu cattle. *Bang. J. Agril. Sci.* Submitted for publication).
- Bhattacharjee, M. L. 1970. A note of stephanofilarial dermatitis among elephants in Assam. *Elephants in Assam. Science and culture*, 36(11. PP 600-601.
- Buckley, J. J. C. 1937. On a new species of stephanofilaria causing lesions in the legs of cattle in the Malay Peninsula, *J. Helminth*, 15(4. 233-242.
- Das, K. M. 1955. Occurrence of microfilariae of *Stephanofilaria assamensis* in the peripheral blood of cattle. *Ind.Vet. Jour.*, 32(2. PP 136-137.
- Dewan, M. L. 1971b. Experimental development of stephanofilariasis in zebu cattle. In materialy nauchnoi konferentsii povoprosam, veterinarii. Part I. Moscow, USSR, Veterinary Acad. USSR, PP 83-84.
- Dewan, M. L. and Rahman, M. M. 1970. Isolation of microorganisms from stephanofilariasis (humpsore) and their roles in the initiation of the disease. *Bang. Vet. Jour.*, 4(1/4. PP 25-30.

- Holz, J. and Adiwinata, R. T. 1957. Investigation on the treatment of stephanofilariasis in cattle with Antimosan. *Vet.Med.Rev. Nachr.*, No.1.
- Ibrahim M. Z. U., Hashim M. A., Hossain M. A. and Al-Sultan. II. 2013), comparative efficacy between surgical intervention, organophosphorus and ivermectin against humpsore (stephanofilariasis) in cattle, *Journal of Advanced Biomedical & Pathobiology Research*, Vol.3 No.3, PP 100-109.
- Luna, L. G. 1968. Manual of histologic staining methods of the armed forces institute of pathology. 3.ed. New York: McGraw-Hill, PP 258.
- Mia, A. S. and Haque, A. 1967. Skin diseases in cattle. *Pak. J.Vet.Sc.* 1(3. PP 76-83.
- Novaes, A. P., Miyashida, A. Y. 2006. Estefanofilariose, vetores e mecanismo de transmissão : uma nota preliminar. São Carlos: Embrapa Instrumentação Agropecuária,. PP 11.
- Rahman, A. and Khaleque, A. 1974. Treatment of humpsore with Xeguvon in local cattle of Bangladesh. *Vet. Med. Rev.*, No-4, PP 379-362.
- Rai, R. B., Ahlawat, S. P. S., Surgriv, S., Nagarajan, V., Singh, S. 1994. Levamisole hydrochloride: an effective treatment for stephanofilarial dermatitis (humpsore) in cattle. *Tropical Animal Health and Production*, Boston, v. 26, n. 3, PP 175-176.
- Riviera, B. and Aycardi, E. R. 1985. Epidemiological evaluation of external parasites in cattle from the Brazilian cerrados and the colombian eastern plains. *Zentralblatt Fur Veterinarmedizin Reihe. Germany*, v. 32, n. 6, PP 417-424.
- Sutherst, R. W., Bourne, A. S., Maywald, G. F., Seifert, G. W. 2006. Prevalence, severity, and heritability of Stefanofilarial lesions on cattle in central and southern Queensland. *Australian Journal Agricultural Research, Australia*, v. 57, n. 7, PP 743-750.
