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Prevalence of ovine footrot in Brahmaputra Chars (shoals) in Mymensingh

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Abstract

A retrospective cohort study was conducted from July 2012 to August 2013 to determine prevalence of ovine footrot in chars (Shoals) of Mymensingh Sadar Upazila, Bangladesh, centred in Paranganj Union Parishad. A field survey used a prepared questionnaire and investigation of farm management. The prevalence of ovine footrot was 4.2% in the study group of 687 sheep, in 106 farms. The prevalence differed according to farm type and housing system. Prevalence of ovine footrot was higher (9.5%) in farms where sheep and other livestock were housed under the same roof. Prophylactic medication and footbath practice were absent. Common care and management practices were sheep bath, house and floor cleaning, deworming, and therapeutic medication. Highest prevalence (7.0%) was recorded in farms where prophylactic medication and deworming was irregular, and antiseptics were not used in sheep bathing and cleaning of sheep house and floor. The results suggest that improvement of the housing environment and management practices are required to control footrot. (*Bangl. vet*. 2014. Vol. 31, No. 2, 74 – 83)

Introduction

Infectious footrot is a contagious disease of sheep with serious consequences leading to significant economic loss due to weight loss, low fleece weight, labour and treatment costs, decreased milk production, and premature culling (Reilly *et al.,* 2012; Glynn, 1993). It is a debilitating and highly infectious disease that has significant economic impact in sheep-farming countries with a temperate climate and moderate to high rainfall (Cagatay and Hickford, 2005). Different strains of *Dichelobacter nodosus* cause disease of different severity, ranging from benign to virulent (Cheetham *et al.,* 2006). Benign footrot is a self-limiting interdigital dermatitis, whereas severe under-running of the horn of the hoof defines virulent footrot (Dhungyel *et al.,* 2013).

Footrot is a leading cause of lameness in sheep (Sreenivasulu *et al*., 2013). Fleece value can be reduced by 4 to 5% along with 12% reduction of body weight (Ware, 2005; Marshall *et al.,* 1991). Sheep are reared for meat and wool production in Bangladesh (Hassan and Talukder, 2011). Indigenous sheep of Bangladesh can weigh up to 41 kilograms (Hassan and Talukder, 2011) with an annual wool production between 267 and 531g per animal per cutting (Pervage *et al*., 2009). Footrot may cause up to 8% lower wool production (Marshall *et al*., 1991), 0.5 micron drop in fibre diameter and up to 10% lower staple strength (Ware, 2005).

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Sheep constitute a major portion of livestock in Bangladesh, and provide raw material for industry, and serve as social security for the rural poor. They also provide security against crop failure due to natural disasters (National Livestock Extension Policy, 2013). It is the third most economically important livestock in Bangladesh and total number of sheep farms was reported to be 10,289 (WFP, 2011). Both commercial and subsistence sheep farming exist in Bangladesh: subsistence farming is more common (BBS, 2011). About 32% of the total sheep population are reared in Barind, Jamuna basin and coastal areas (Hassan and Talukder, 2011). Traditionally sheep are raised on harvested or fallow lands, roads, canal sides, and also on aquatic weeds and grass in shallow stagnant water (Sultana *et al.,* 2010). Ovine footrot is closely related with the farm biosecurity and environment (Stehman, 2004). Understanding the relationship between the occurrence of ovine footrot, farming environment and management practices could produce valuable insight on biosecurity and disease control strategies. The present study is aimed at determining the relationship between indigenous farming practices and the prevalence of footrot lesions in sheep of flood-prone riverside areas of Mymensingh district of Bangladesh.

Materials and Methods

Study design

A cross-sectional survey was conducted from July 2012 to September 2013 in flood-prone riverside areas of Mymensingh district of Bangladesh. This area is a part of Jamuna basin, one of the three agro-economic zones of Bangladesh where livestock density is high (Sultana *et al.,* 2010).

Village and stakeholder selection

At first, the study team travelled to the local sheep markets and talked with the local leaders and animal traders to identify the villages with most sheep. The villages were graded according to the sheep flock density. The team then travelled to the villages with most reported sheep flocks. The team identified the popular gathering places at the village including tea-stalls, retail stores, or religious establishment. They discussed with the local villagers the study objective and asked them to identify the largest sheep flock owners who had been raising sheep for at least a year.

The largest sheep flock owner was selected as the first respondent. According to their perception, the second largest sheep flock owner was selected. The process was continued until all the sheep owners who had been rearing sheep for at least a year were enrolled. The sheep owners who didn't have sheep or who had been raising sheep for less than a year were excluded.

According to the reported sheep flock density, from highest to lowest, villages were enrolled until the desired sample size for that cluster was achieved.

Data collection

To collect data about the farming system, economic condition of the farmers, and prevalence of footrot, a questionnaire was prepared. The farms were visited in order to investigate the sheep housing and management.

Examination of sheep for footrot

Disease history from farms reporting footrot was collected along with physical examination of affected sheep.

History and examination

History of farm and management as well as previous outbreak history was collected. History of interdigital lesions with lameness, foul odour, and discharges were recorded as positive cases. Only the history of the past 12 months was recorded.

Individual sheep reported lame were placed in sitting position and closely examined for lesions in inter-digital structures including skin, soft horn, hard horn, and skin horn. Positive cases were determined by the presence of erythema, erosion, exudative necrosis, hyperkeratosis, under-running of the soft horn of the heel and sole.

Investigation of the farms

Data was collected about the type of sheep housing, hygiene, biosecurity and management practices of the farms.

Scoring of hygiene and management practice

Owners of the farms were questioned about hygienic practices. The farms were categorized as follows:

Regular = Farms with daily house and floor cleaning, use of antiseptic in bathing, scheduled deworming and veterinary health care for diseases.

Irregular = Farms with daily house and floor cleaning, no antiseptic use in bathing, therapeutic deworming, and self-treatment/local management of diseases.

Absent/rare = Farms without daily house and floor cleaning, no antiseptic use in bathing, no deworming, and no access to veterinary health care.

Data analysis

Data about sheep owners, farms, management, and ovine footrot was analysed to record the prevalence. *Chi square test* was used to estimate the significance of observed data.

Results and Discussion

The study area comprised 11 villages of the Paranganj and Borar Char Union Parishad, Sadar Upazila, Mymensingh. The area is beside the Brahmaputra River.

This area is an alluvial land. The soil type varies from loam to silt loam with very low percentage of organic substance. Average rainfall in Mymensingh Sadar is 1657 mm to 1819 mm. Majority (75%) of the rainfall was during the rainy season from May to September. In summer the temperature rises as high as 37°C. During winter the temperature stays below 12.6°C. The humidity varies between 71% and 90% (http://www.mymensingh.gov.bd). This environmental condition is favourable for the survival of both *Dichelobacter nodosus* and *Fusobacterium necrophorum* (Cederlof *et al.,* 2013). This may contribute to the higher prevalence (4.2%) of ovine footrot in this region (Table 1).

Table 1. Prevalence of ovine footrot lesions in chars of Mymensingh

Char	Stakeholder* (n = 106)			Sheep population (n = 687)	Farms affected (n = 687)	Affected sheep (n = 687)	Prevalence (n = 687)
	Male	Female	Total				
Ambikagonj	1.9(2)	0.9(1)	2.8(3)	5.4(37)	-	-	-
Mirkandapara	2.8(3)	2.8(3)	5.7(6)	6.8(47)	-	-	-
Char Baola	4.7(5)	1.9(2)	6.6(7)	4.5(31)	0.9(1)	0.6(4)	12.9
Abdullahpur	14.1 (15)	19.8(21)	33.9(36)	22.4(154)	3.8(4)	1.6(11)	7.1
Chalkshamrampur	13.2(14)	4.7(5)	17.9(19)	16.6(114)	1.9(2)	0.6(4)	3.5
Fodiar Char	3.8(4)	-	3.8(4)	5.1(35)	-	-	-
Char Hasadia	0.9(1)	-	0.9(1)	0.3(2)	-	-	-
Vatipara	14.2(15)	-	14.2(15)	12.8(88)	1.9(2)	0.7(5)	5.7
Bartipara	4.7(5)	-	4.7(5)	5.1(35)	0.9(1)	0.3(2)	5.7
Noyapara	6.6(7)	-	6.6(7)	14.3(98)	1.9(2)	0.4(3)	3.1
Guchhagram	-	2.8(3)	2.8(3)	6.7(46)	-	-	-
Total	67(71)	33.0(35)	(106)	(687)	11.3(12)	4.2(29)	4.2

* Results are presented in percentage and number of observations is in parenthesis

The overall prevalence of ovine footrot was 4.2%, which is lower than that reported in other countries. The prevalence is reported to be 8 to 10% in United Kingdom (Wassink *et al.,* 2003), and 12% to 15% in India (Sreenivasulu *et al.*, 2013; Rather *et al.,* 2011). The prevalence is 3.1% among the sheep farms in Bhutan (Gurung *et al.,* 2006). The prevalence among the 11 villages was not significantly different ($P>0.05$).

In Bangladesh, pre-monsoon hot summer is observed from March to May, with April the hottest month. From June to October is the rainy monsoon, and mid-October through mid-November generally is called autumn (http://www.banglapedia.org /HT/C_0288.HTM). Most of the affected farms observed footrot lesions in the rainy season (Fig. 1). Few cases were reported in summer and autumn. This observation is supported by previous reports where it is stated that footrot lesions are prevalent in periods of warmth and wetness (Reilly *et al.,* 2012).

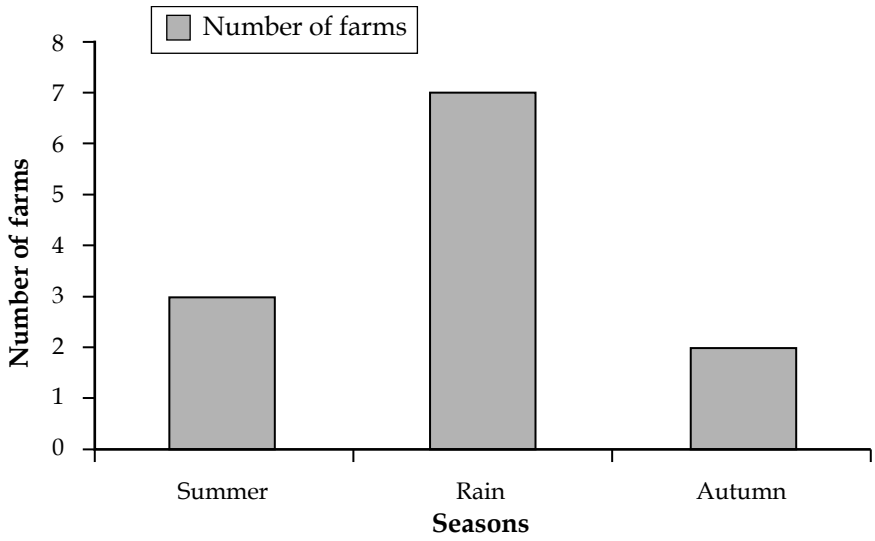

Fig. 1. Reports of ovine footrot in different seasons

The effects of housing reflect on the occurrence of the footrot and prevalence (9.5%) is found higher where other livestock species are housed together (Table 2). This is probably because of the overcrowding and poor management (Groneng *et al.,* 2013; Rogdo *et al.,* 2012).

Sheep housed in separate sheds are less likely to be affected. Separation of sheep from other livestock reduces the risk of transfer of organisms (Wassink *et al.,* 2004; Ghimire *et al.,* 1999). This indicates the importance of separate housing for sheep rearing. The prevalence of footrot is similar in sheep kept inside the house instead of an animal shed, probably because the condition is more hygienic (Angell *et al.,* 2014), but there is a chance of zoonoses (Groneng *et al.,* 2013; Ghimire *et al.,* 1999). There was a significant relationship between the housing system and disease prevalence ($P<0.001$). Housed animals are protected from environmental trauma, infected pasture, and environmental changes, which predispose the animal to the infection.

The management factors including the housing, foot trimming, foot bathing, overcrowding, and isolation of affected sheep from the pasture and location of the farms affect the prevalence of interdigital dermatitis and footrot (Kaler and Green, 2009). It supports the findings of effect of management practices on prevalence of ovine footrot. The management systems were regraded according to the frequency of farm cleaning, bathing and foot bathing, and preventive veterinary care. All of these factors affect the occurrence of ovine footrot (Kaler and Green, 2009; Wassink *et al.,* 2005).

Significant association of the factors exposure to lame sheep, time of the year, antibiotic treatment, and exhibition of sheep at agricultural events, footbathing, and a clean field are related to prevalence of footrot (Wassink *et al.,* 2004). Prevalence of footrot (1.7%) is found in sheep housed in living room. It is because the sheep spend

most of the time during day on grazing field with other livestock. This condition favours transfer of footrot from infected to healthy sheep. A significant relation was found between the hygiene and management practice categories and disease prevalence (Table 2).

Table 2. Association of management practices with prevalence of ovine footrot lesions

Factors	Categories	Farms	Sheep population	Average size	Footrot affected	Prevalence
Farm type (n = 106)	Commercial	52.8(56)	80.8(555)	9.9	3.2(22)	4
	Subsistence	47.2(50)	19.2(132)	2.6	1.0(7)	5.3
	Total	(106)	(687)	6.5	4.2(29)	4.2
Housing (n = 106)	Separate house	27.4(29)	51(350)	12.1	0.9(6)	1.7*
	Mixed house	34.9(37)	32.3(222)	6	3.1(21)	9.5*
	In home	47.2(50)	16.7(115)	2.3	0.3(2)	1.7*
	Total	(106)	(687)	6.5	4.2(29)	4.2
Hygiene and management (n = 106)	Regular	22.6(24)	26.2(180)	-	0.2(1)	0.6*
	Irregular	49.1(52)	40.6(279)	-	1.8(12)	4.3*
	Absent/rare	28.3(30)	33.2(228)	-	2.3(16)	7.1*
	Total	(106)	(687)	-	(29)	4.2
Age (n = 687)	<6 months	-	20.2(139)	-	1.0(7)	5.0
	> 6 months	-	79.8(548)	-	3.2(22)	4.0
	Total	-	(687)	-	4.2(29)	4.2
Sex (n = 687)	Male	-	18.6(128)	-	1.2(8)	6.3
	Female	-	81.4(559)	-	3.1(21)	3.8
	Total	-	(687)	-	4.2(29)	4.2

*Significant association exists between variables in chi square test ($P<0.05$)

Prevalence of footrot depends on the environmental condition and pasture (Reilly *et al.,* 2012; Whittington, 1995). The prevalence is higher in temperate climate with high temperature (Hussain *et al.,* 2013). The management systems also affect the prevalence of footrot. Lower prevalence among the British and Australian farms is due to the better management (Rogdo *et al.,* 2012; Wassink *et al.,* 2003). The eradication of virulent footrot from Nepal (Sreenivasulu *et al.,* 2013) also indicates the importance of management. The data shows that the farms with regular hygiene and management practices (Table 2) have 8 times lower prevalence (0.5%). It is because regular management practices prevent the colonization of the bacteria in the interdigital space (Abbott and Lewis, 2005). It decreases the chance of damage of the skin integrity due to trauma, wetness or mud deposition, which is essential for the footrot organism to invade the interdigital space.

Sheep owners of the study areas do not practice footbath, foot trimming or paring of hoof, which are commonly practised in developed countries. Hygiene and management practices recorded in the study populations are listed in Table 3. Footbaths were absent in all farms. Only 4.7% of the farms used disinfectant during cleaning the sheep house and floor. Most farmers did not seek veterinary care when sheep showed lameness.

Table 3. Management practices in sheep farms of Paranganj

Management factors	Frequencies	Number of farms*
Foot bath	Absent	-
House/floor wash with disinfectant	Present	4.7(5)
	Absent	95.3(101)
Sheep bathing	Weekly	60.4(64)
	Biweekly	19.8(21)
	Once/twice a month	19.8(21)
Antiseptic in bathing	Present	77.4(82)
	Absent	22.6(24)
Veterinary care	Local veterinary paraprofessional	22.6(24)
	Self-treatment	47.2(50)
	Absent	30.2(32)
Deworming	Scheduled	22.6(24)
	Therapeutic/irregular	28.3(30)
	Absent	49.1(52)

*Number of observations in parenthesis, n = 106

Management of ovine footrot lesions

During study period, 12 farms reported observing footrot lesions and only 2 (17%) of them used parenteral antibiotics prescribed by local veterinary paraprofessionals (Fig. 2). Rest of the farmers depended upon the local and traditional management practices which are outlined in figure below:

Farmers' perception of ovine footrot

Respondents were asked to point out the major infectious and non-infectious constraints of sheep farming in the study area in order to evaluate their perception about economic losses due to ovine footrot. Their responses are shown in Fig. 3 below. Only 3% of them reported footrot as a major concern. Most of them (37%) reported that predators, mostly stray dogs, were the major constraints. However, reports of many deaths in newborn sheep and sudden deaths in pregnant ewes require further investigation.

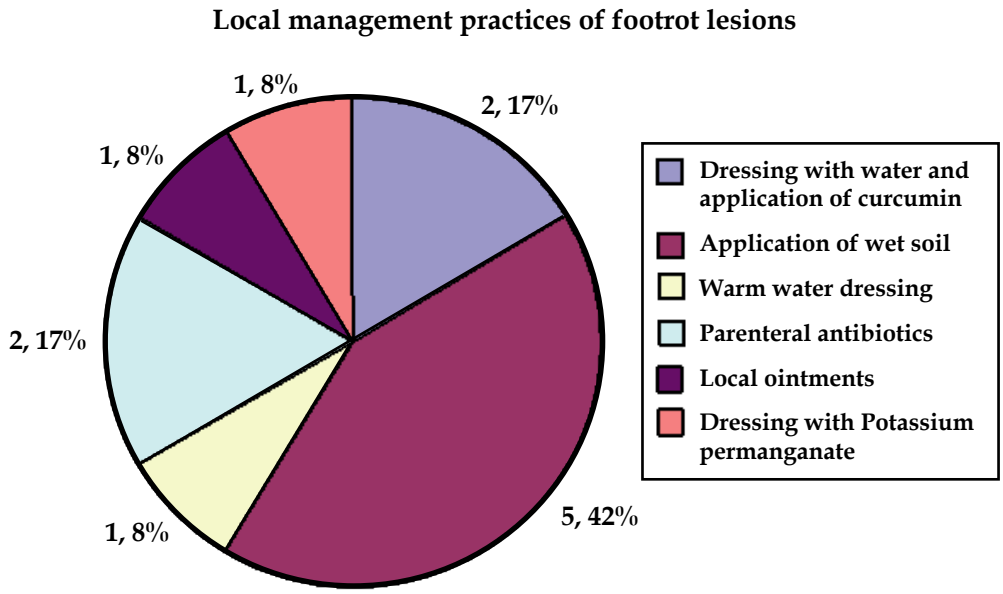

Fig. 2. Traditional management of ovine footrot lesions in affected farms

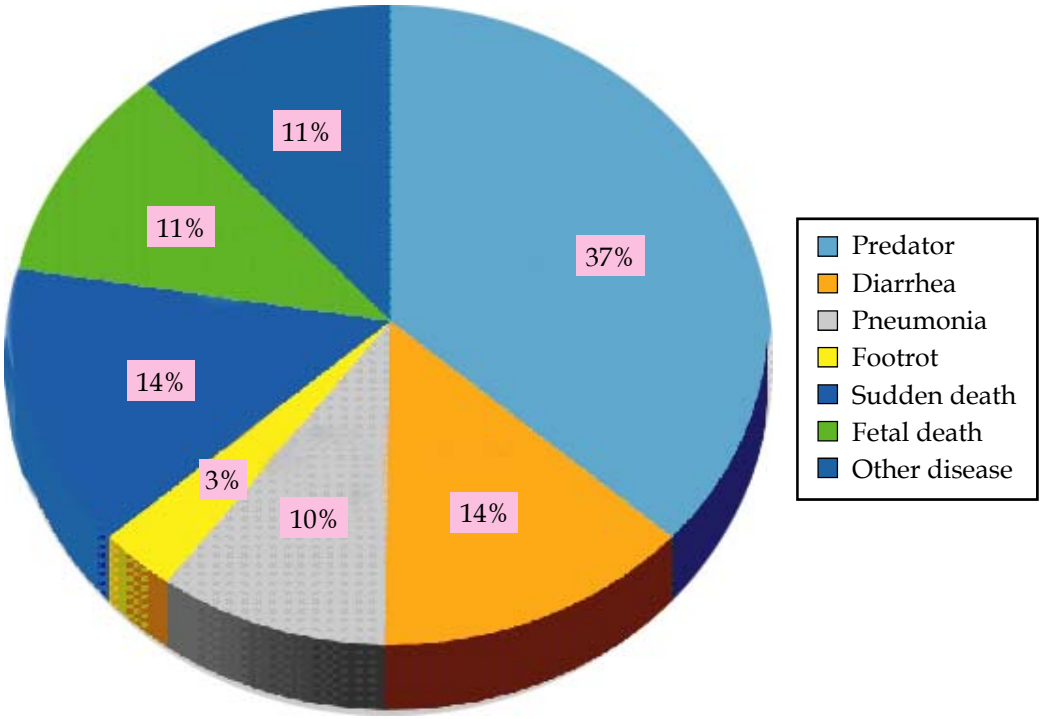

Fig. 3. Sheep farmer's perception of footrot compared to other farming constraints

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