

Incidence and modulating effects of environmental factors on infectious diseases of Black Bengal goat in Cox's Bazar district of Bangladesh

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SUMMARY

Clinical records on natural infections of various diseases among goats at Cox's Bazar Sadar Veterinary Hospital in Cox's Bazar district of Bangladesh were scrutinized for one year to determine disease trends and modulating effects of rainfall, relative humidity and mean daily air temperature on disease occurrence. From 1086 cases, male and female goats were accounted as 46.72% and 46.87% due to PPR, 20.56% and 15.63% due to pneumonia, 14.02% and 20.83% due to diarrhoea, 6.54% and 5.2% due to coccidiosis respectively, indicating a significantly lower treatment figure for PPR ($p < 0.05$). The mortality rate of the growing kids in season-I (March to June), season-II (July to October), season-III (November to February) were 14.7%, 40.6% and 19.4%. PPR and bronchopneumonia were found higher in season-III than other seasons whereas diarrhoea in season-I and coccidiosis in season-II were higher.

Key Words

Incidence, PPR, Bronchopneumonia, Diarrhea, Black Bengal Goat

Bangladeş'in Cox Pazar Bölgesinde Siyah Bengal Keçilerinin Enfeksiyöz Hastalıkları Üzerine Çevre Faktörlerinin İnsidensi ve Değişen Etkileri

ÖZET

Bangladeş'in Cox Pazar bölgesindeki Sadar Veteriner Hastanesinde keçiler arasında farklı doğal enfeksiyonların klinik kayıtları, hastalık eğilimleri, yağmur, relatif nem ve ortalama günlük ısının hastalık oluşumundaki etkisini belirlemek için bir yıl boyunca dikkatlice incelenmiştir. Erkek ve dişi keçiden oluşan 1086 vakadan %46.72 ve %46.87'si PPR, %20.56 ve %15.63'ü pneumoni, %14.02 ve %20.83'ü diyare, %6.54 ve %5.2'si de coccidiosis olarak ayrı ayrı tespit edilmiştir. Bu bulgular, PPR için belirgin bir seviyede daha az bir tedavi uygulandığını göstermektedir. I. (Mart-Haziran), II. (Temmuz- Ekim) ve III. (Kasım-Subat) sezonda gelişen oğlakların mortalite oranları sırası ile %14.7, %40.6 ve %19.4 olarak tespit edilmiştir. PPR ve bronkopneumoni, III. sezonda diğer sezonlara göre daha yüksek olmuştur. Öte yandan diyare sezon I'de, coccidiosis ise sezon II'de daha yüksek seviyede tespit edilmiştir.

Anahtar Kelimeler

İnsidens, PPR, Bronkopneumonia, Diyare, Siyah Bengal Keçisi

INTRODUCTION

The impact of infectious animal diseases seems as great at the start of the 21st Century as it was at the start of the 20th. In the developing world, these diseases continue to limit productivity, constrain development and exacerbate poverty (Perry, 2002). Owing to anthropogenic activities, there is widespread scientific agreement that the world's climate is warming at a faster rate than ever before (McMichael et al. 2001). Innumerable studies have demonstrated links between infectious animal diseases and climate and it is unthinkable that a notable in climate during this century will not significantly impact on at least some of them.

Bangladesh is remarkably affected by the consequences of climate change and it has an important role in mitigating possible impacts of climate variability on animal health. Animal health can be affected by climate change in four ways: heat-related diseases and stress, extreme weather events, adaptation of animal production systems to new

environments, and emergence or re-emergence of infectious diseases, especially vector-borne diseases critically dependent on environmental and climatic conditions (Forman et al. 2008).

High incidence of infectious diseases constitutes a major impediment to livestock production in most developing countries. Some studies are usually restricted to the prevalence rate and evaluation of seasonal influence on disease trends. Limited attention is paid to possible interaction between the different disease agents or their symptoms. It is therefore important to understand not only the interactions between different diseases occurring in the same environment, but also the modulating influence of the climatic factors driving the seasonal variations usually observe. Such knowledge is essential in planning control strategies against infectious diseases.

Objectives of the study

- To know about the seasonally infectious diseases of Black Bengal Goat in Cox's Bazar district.

- To evaluate the relationship of the diseases of goats due to climate change especially in Cox's Bazar.

MATERIALS and METHODS

Study area

The study was conducted at Rumaliarchara, Takpara, Boillapara, Kolatali of Cox's Bazar district. Among the area Kolatali, Rumaliarchara are near to costal line. Takpara and Boillapara are hilly area.

Geographical description

Cox's Bazar district is situated in the south costal belt of Bangladesh. It lies between latitude 5° 4' and 6° 3' N and longitude 6° 15' and 7° 34' E. The area is 200m above sea level except for elevations associated with the uplands (Ofomata, 1975). It has an annual rainfall of about 1700mm to 2500mm, which is concentrated almost entirely between March and October. Average humidity is about 80%, with up to 85% occurring during the rainy season. The mean daily maximum air temperatures range from 28°C to 35°C, while the mean daily minimum ranges from 19°C to 24°C. Black Bengal goats are allowed to roam throughout the seasons, thriving on indigenous browses growing in compound bushes and farm fallows with additional supplementation from kitchen wastes (Okoli et al. 2003).

Sources of information

Data on clinical cases of PPR, bronchopneumonia, diarrhea and coccidiosis among Black Bengal goats brought for treatment at government veterinary hospital at Cox's Bazar Sadar, were scrutinized for one year (September, 2008 to August, 2009). Diagnoses at the veterinary clinics are usually based on flock history, clinical signs, necropsy findings and laboratory results.

Analytical technique

The collected data dealing specifically with PPR, bronchopneumonia, diarrhoea, and coccidiosis were analyzed. All the data were stored in MS Excel 2000 and subsequently analyzed using the Stat View (1996) and package for windows. Overall, yearly, monthly and seasonal trends were computed using descriptive and quantitative analyses. The former involved the use of simple averages to determine trends across years, months and three seasons namely, hot and dry period (March to June), wet and hot period (July to October), cold and dry period (November to February). These were further subjected to analysis of variance (ANOVA) and where significant differences were observed, means were separated using the Least Significant Difference (LSD). The monthly means were also subjected to simple correlation statistics to determine possible relationships between data for the different diseases.

Climatic data for the state such as monthly means of daily air temperature, rainfall and relative humidity for the period under study were obtained from the weather station at Light House in Cox's Bazar. The modulating effects of these climatic factors on monthly disease trends were graphically determined.

RESULTS and DISCUSSION

Infectious diseases

The present results have shown that PPR, bronchopneumonia, diarrhoea and coccidiosis are important disease problems of Black Bengal goats in Cox's Bazar, Bangladesh. The present clinical record highlights

PPR as a major infection of Black Bengal goats. Simple correlation matrix of the monthly occurrence of the four diseases condition showed that coccidiosis and diarrhoea occurred together about 34% of the times; while for PPR and bronchopneumonia it was 44%. Bronchopneumonia of small ruminants is a bacterial infection caused mostly by *Pasteurella* organisms, which exists saprophytically on the mucosa of upper air passages of the respiratory tracts. They become pathogenic under environmental and other stress-causing influences such as viral and parasitic infections (Jensen, 1974; Seifert, 1996). Other aerobic bacterial agents such as *Pasteurellamultocida*, *Staphylococcus aureus*, *Streptococcus pyogenes*, *Corynebacterium pyogenes* and *Bacillus sp.* among others have been shown to play important roles in small ruminant pneumonia (Adekeye, 1984; Obi, 1997; Raji et al. 1999). These bacteria usually find their way into underlying epithelial surfaces of pneumonic lungs damaged by viral or parasitic agents and hence complicate the infection (Adekeye, 1984; Al-Tarazi and Daghall, 1997). This probably explains the moderate association observed in the present study between clinical cases of PPR and bronchopneumonia.

The present study shows that rainfall, relative humidity and mean daily air temperature have modulating effects on the occurrence of the three disease conditions in Cox's Bazar district, Bangladesh.

Higher incidence of PPR observed here during the dry months of December and January agrees with earlier reports by Obi (1983) and Onyekweodiri and Uzoukwu, 1992. The dusty and dry wind that characterizes this period of the year has been shown to enhance the spread of PPR (Obi, 1983). Bronchopneumonia was also significantly higher during the dry months. Since the animals also showed relatively higher incidence of PPR during the same dry months, it is probable that the saprophytic organisms in the air passages responsible for the initiation of pneumonia became pathogenic because of the stress of PPR.

A total of 412 goats were diagnosed as infectious cases [138,152 and 122 cases of BBG, JPG and crossbred goat (BBG×JPG) respectively]. (BBG-Black Bengal goat, JPG-Jamunapari goat). There was a significant infectious disease difference in different breeds of goats ($p \geq 0.05$). PPR was common among different breeds of goat. 34 (47.22%) PPR cases of JPG were recorded during this period which was higher than BBG (23.61%) and Crossbred goat (29.17%). A total 100 goats were diagnosed as pneumonic cases which was higher than any other single disease condition. Among the pneumonic cases 54% were BBG which is higher than JPG (30%) and Crossbred goat (16%). It indicates that BBG are more susceptible to pneumonia. 85 cases of infectious diarrhea were recorded. Highest number of infectious diarrhea were recorded in JPG ($n=35/85=41.18\%$). High prevalence of pneumonia, infectious diarrhoea and PPR were also observed by Chowdhury et al. (2002), Sriram et al. (1982) and Koul et al. (1988).

Season's Description

In case of kid mortality the seasons were described as hot and dry period (March to June), wet and hot period (July to October) and cold and dry period (November to February). But in case of adult mortality was divided into season I (April to September) when green grasses were available in the grazing lands and plots, and season II (October to March) when green grasses were not available.

Cox's Bazar is expected to get warmer, with some regions predicted to become drier, some wetter and others more seasonally variable. Warming and changes in rainfall distribution in Bangladesh will lead to changes in the spatial or temporal distributions of diseases sensitive to moisture as PPR, bronchopneumonia, diarrhoea and coccidiosis.

Kid mortality

Among the Infectious causes kid were died due to pneumonia, diarrhoea, PPR, Coccidiosis were found to be 40.90%, 27.27%, 18.18% and 4.55% respectively. Similar result were observed by Chowdhury et al. (2002) where they found that 42.39% kids died due to pneumonia followed by diarrhoea (32.61%). Sriram et al. (1982) also observed that main causes of mortality were pneumonia and enteritis

Table 1. Mortality rate of Goats and kids in the study area

Type of Disease	Reason of death	Number of case (%)	
		Goats	Kids
Infections	Pneumonia	23 (27.71)	48 (40.90)
	PPR	39 (46.91)	18 (18.18)
	Coccidiosis	2 (2.40)	4 (4.55)
	Diarrhoea	19 (22.89)	28 (27.27)

Growing goat mortality

In table 2 it was observed that among 136 kids, 30 were died (22.1%) round the year. A higher percentage of dead were observed (40.6%) during season II followed by season III (19.4%) and season I (14.7%). Similar results were observed by Mazumdar et al. (1980).

Table 2. Season-wise mortality pattern of growing kids

Seasons	Kids entered	No. of died	Mortality rate (%)
I (March to June)	68	10	14.7
II (July to October)	32	13	40.6
III (November to February)	36	7	19.4
Overall	136	30	22.1

Mortality of adult goat

In table 3 and 4 showed that most of the adult female and male died from infectious diseases like PPR (female 46.87%, male 46.72%), diarrhoea (female 20.83%, male 14.02%), pneumonia (female 15.63%, male 20.56%), coccidiosis (female 5.2%, male 6.54%). Among the non infectious diseases many female died from dystocia (7.2%) which are agreed with Mannan (1989) and Ross (1981).

Table 3. Mortality of goat in the study area

Reason of death	Number of case (%)	
	Female	Male
PPR	45 (46.87)	50 (46.72)
Pneumonia	15 (15.63)	22 (20.56)
Coccidiosis	5 (5.2)	7 (6.54)
Diarrhoea	20 (20.83)	15 (14.02)
Poisoning	3 (3.1)	3 (2.81)
Dystocia	7 (7.2)	9 (8.4)
Accident	1 (1.04)	1 (0.94)
Total	96 (100)	107 (100)

Mortality was found less in season I (30.3%) than season II (69.7%). Mannan (1989) observed the maximum mortality due to diarrhoeal diseases (25.24%) followed by enterotoxaemia (23.30%).

Seasonal effects on mortality

Table 5. Effect of season on mortality of goat at the study area

Season	Number of death	Mortality (%)
Summer	55	17.57
Rainy	97	30.99
Winter	161	51.44
Total	305	100

There is a great influence of seasonal variation on goat mortality. In highest percentage of goat mortality occurred in winter 51.44% followed by 30.99% and 17.57% in rainy and summer season respectively. Rahman et al. (1976) observed that the respective mortality rate of kids and adults in season January to March was 11.36 % and 20 %; during season April to June 35.22% and 18.18%; during season July to September 26.13% and 27.27% and during season October to December 27.27% and 34.94%. This observation strongly supports the present study.

Morbidity

Overall disease incidence of goats of all age categories is shown in Table 6.

Total goats of different age and sex: 400; Kid = 80, Growing = 60, Adult = 260.

Incidence of PPR ranked the highest portion among the infectious causes in all groups of goats, similar results were also observed by Hoque (1996), where male affected only 33% cases oppose to 67% in female. Incidence of contagious ecthyma was observed in kids and newly introduced adult female but none in the growing goats. The incidence of coccidiosis was highest in growing goat followed by kids and adults. Mortality rate was highest in kids (28.97%) followed by young goats (22%) and adult (11.78%). Incidence of diseases were the highest during hot and wet (July to October) followed by hot and dry (March-June). Most of the adult mortality was due to enterotoxaemia and kid mortality due to infectious causes like diarrhoea and pneumonia. These higher mortality in semi-intensive rearing systems possibly due to increased stresses on animal, to which they responded by higher diseases incidence and mortality (Chowdhury et al., 2002). Further work is needed to reduce the adult mortality by management and preventive (vaccine) intervention.

Table 4. Overall causes of mortality of adult goats

Diseases	Season I (April- September)				Season II (October-March)				Overall			
	M	F	Total	Mortality (%)	M	F	Total	Mortality (%)	M	F	Total	Mortality (%)
Enterotoxaemia	0	5	5	50	1	15	16	69.6	1	20	21	63.6
Diarrhoea	0	0	0	0	0	2	2	8.7	0	2	2	6.1
Dystocia	0	1	1	10	0	0	0	0	0	1	1	3.0
Predators	1	1	2	20	1	0	1	4.3	2	1	3	9.1
Mechanical	0	1	1	10	0	0	0	0	0	1	1	3.0
Others	0	1	1	10	1	3	4	17.4	1	4	5	15.2
Total	1	9	10	30.3	3	20	23	69.7	4	29	33	100

Table 6. Overall disease incidence of goats of all age categories

Diseases	Adult (> 1 year)				Growing (3 -12 months)				Kids (0 - 3months)			
	Total	M	F	Incidence (%)	Total	M	F	Incidence (%)	Total	M	F	Incidence (%)
Diarrhoea	60	10	50	30.6	35	6	29	32.4	117	50	67	33.1
Pneumonia	19	1	18	9.69	36	13	23	33.33	77	33	44	21.8
PPR	47	26	21	48.65	38	20	18	42.78	85	46	39	45.6
Conjunctivitis	15	2	13	7.65	21	8	13	19.44	44	23	21	12.5
Skin disease	3	0	3	1.53	9	2	7	8.33	15	7	8	4.2
Abortion	3	0	3	1.53	0	0	0	-	0	0	0	-
Mastitis	6	0	6	3.06	0	0	0	-	0	0	0	-
Metritis	13	0	13	6.63	0	0	0	-	0	0	0	-
Bloat	6	0	6	3.06	1	0	1	0.92	2	0	2	0.56
Abscess	2	0	2	1.02	0	0	0	-	2	1	1	0.56
Foot-rot	7	4	3	3.57	0	0	0	-	0	0	0	-
Coccidiosis	6	2	4	3.06	7	4	3	3.57	0	0	0	3.31
Accidental injuries	24	11	13	12.24	0	0	0	-	0	0	0	-
Others	20	6	14	10.20	5	0	5	4.62	3	0	3	0.84
Total	231	62	169	145.55	152	53	99	145.39	345	160	185	122.47

CONCLUSION

PPR, bronchopneumonia, diarrhoea and coccidiosis are important naturally occurring infections of goats in Cox's Bazar. The present study reports moderate association between natural occurrences of the diseases in the study area. In-depth studies are needed to further elucidate the status of PPR of small ruminants in the humid tropics. Concurrent treatment against PPR and bronchopneumonia is recommended since the present study has shown some reasonable association between their occurrences.

REFERENCES

- Adekeye, J. O. (1984).** Studies on aerobic bacteria associated with ovine and caprine pneumonic lungs in Zaria, *Nigeria Vet J* 13(1), 5-8
- Al-Tarazi, Y. H. M. and Daghall, G. J. K. (1997).** Nasal carriage of *Pasteurella hemolytica* serotypes by the sheep and goats in the Jordan. *Trop Anim Heal Prod* 29,177-179
- Chowdhury, S.A., Bhuiyan, M.S.A. and Faruk, S. (2002).** Rearing Black Bengal Goat under Semi-Intensive management 1. Physiological and Reproductive Performances. *Asian - Australasian J Anim Sci* 15 (4), 477-484

Forman S, Hungerford N, Yamakawa M, Yanase T, Tsai HJ, Joo YS, Yang DK, Nha JJ (2008). Climate change impacts and risks for animal health in Asia. *Rev Sci Tech.* 27(2), 581-597.

Hoque, M.S. (1996). Clinical prevalence and findings of diseases and disorders in cattle and goats at the Central Veterinary Hospital, Dhaka. MS Thesis. Department of Medicine, Bangladesh Agricultural University, Mymensingh, Bangladesh

Jensen, B. (1974). Diseases of sheep Lea and Febiger, Philadelphia, 171-178

Koul, G.L., Somvansha, S. and Biswas, J.C. (1988). Mortality pattern in Pashmina goats. *Indian Vet J* 65, 847-849.

Mannan, S.A. (1989). MS Thesis. Study on goat's mortality and their probable causes in Madhupur Upazilla of Tangail District. Department of Medicine, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Mazumdar, N.K., Mazumdar, A. and Goswami, K. K. (1980). Studies on some factors affecting mortality and survival rates in Pashmina kids. *Indian J Anim Sci* 50 (3), 251-255

McMichael, A.J. and Githeko, A.K. (2001). Climate Change 2001: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press: Cambridge, 453-485

Obi, T. U. (1983). Studies on the epidemiology of PPR in Southern Nigeria, *Trop Vet* 1,209-217.

- Obi, T. U. (1997).** Non-parasitic livestock diseases in Nigeria; An overview, Paper presented at National Livestock diseases workshop. March 24-27, 1997, National Veterinary Research Institute, Vom, Nigeria
- Ofomata, G. E. (1975).** Nigeria in maps -Eastern Nigeria. Ethiopia publishing house Benin City, Pp, 8-9.
- Okoli, I. C., Ebere, C. S., Uchegbu, M. C., Udah, C. A. and Ibeawuchi, I. I. (2003).** Survey of the diversity of plants utilized for small ruminant feeding in Southeastern Nigeria. *Agric Ecosystem Environ* 96, 147-154
- Onyekweodiri, E. O. and Uzoukwu, M. (1992).** Epidemiology of PPR under the traditional husbandry systems in Eastern Nigeria, *Proceedings 29th Annual Conference of Nigeria Vet Med Assoc*, 27th -30th October 1992, Kaduna, Nigeria
- Perry, B.D., Randolph, T.F., McDermott, J.J., Sones, K.R., Thornton, P.K. (2002).** Investing in Animal Health Research to Alleviate Poverty. ILRI (International Livestock Research Institute): Nairobi, Kenya.
- Rahman, A., Ahmed, M.U. and Mia, A.S. (1976).** Studies on the diseases of goats in Bangladesh: Mortality of goats under farm and rural conditions. *Trop Anim Heal Prod.* 8, 90
- Raji, M. A., Rodgers, D., Natala, A. J. and Halle, P. D. (1999).** A survey of the aerobic bacterial agents associated with ovine pneumonia in Zaria, Kaduna State, Nigeria. *Nigeria Vet J* 20(1), 75-81
- Ross, J.D. (1981).** Herd health program for Angora goats. In: *Current Veterinary Therapy, Food Animal Practice*. 1st edn., JL Howard (ed), WB Saunders Co., Philadelphia.
- Seifert, H. S. H. (1996).** *Tropical animal health* Kluwer Academic publishers, London.
- Sriram, P.K., Rao, P.R. and Naidu, N.G.R. (1982).** Goat mortality in Addhra Pradesh. *Indian Vet J* 59, 96-99.