

Seasonal Rhythmicity of Contagious Ecthyma in Small Ruminants

Q.U. Nazir^{*1}, M.I. Yattoo², S. Bashir¹, G.N. Sheikh¹ and A.A. Dar¹

^{*1}Division of Veterinary Epidemiology and Preventive Medicine, ²Division of Veterinary Clinical Complex, FVSc& AH, SKUAST-Kashmir, Srinagar- 190006, India

^{*1}Corresponding author e-mail: qnazir24@gmail.com

Journal of Livestock Science (ISSN online 2277-6214) 14: 14-18
Received on 6/11/22; Accepted on 21/12/22; Published on 8/1/23
doi. 10.33259/JLivestSci.2023.14-18

Abstract

Small ruminant species including ovine and caprine species are vulnerable to seasonal and periodic rhythmicity of many pathogenic organisms or diseases. However, such a study on contagious ecthyma was lacking until recently we explored the seasonal and periodic occurrence of this important contagious and zoonotic disease affecting sheep, goats and many other species of wild ruminants. Outbreaks (N=12) of contagious ecthyma were investigated from ovine and caprine species during November, 2016 to May, 2017. Descriptive epidemiology was studied with respect to various host- and environment- related factors. Seasonal occurrence was more in spring (29.33 %) compared to winter (3.05 %). Time-related occurrence of the disease revealed maximum number of cases in April (56.1 %) and minimum during February (2.0 %). Age related occurrence showed that lambs and kids of < 3 months of age were more affected compared to > 3 month old animals (74.9 % versus 25.1 %). Variation in spatial distribution was noted when the other host-pathogen-environment factors did not differ significantly (P>0.05). The overall morbidity, mortality and case-fatality rates observed were 7.23 %, 0.42 % and 5.8 % respectively. From this study it can be inferred that contagious ecthyma has seasonal and periodic rhythmicity in ovine and caprine species.

Keywords: Caprine; Contagious ecthyma; Ovine; Small Ruminants; Season

Introduction

Seasonal and periodic rhythmicity of many pathogenic organisms or diseases affecting small ruminant species including ovine and caprine species has been noted (Muheet et al., 2019; Yattoo et al., 2019a). These rhythms reflect constant presence of the pathogens and usual occurrence of the disease in hosts. This helps in understanding the biological rhythms of host-pathogen-environment interaction thereby devising the appropriate management strategies for better health of ovine and caprine species including sheep and goats (Muheet et al., 2019; Yattoo et al., 2019a).

Contagious ecthyma is an economically important contagious and a zoonotic disease affecting sheep, goats and many other wild ruminant species besides human beings (Inoshima et al., 2000; Hosamani et al., 2006; Hosamani et al., 2009; Zhao et al., 2010). It is a viral disease caused by parapox viruses and results in cutaneous, respiratory or gastrointestinal lesions (Buttner and Rziha 2002; Guo et al., 2003; Gokce et al., 2005; Radostits et al., 2007; Housawi et al., 2009; Nandi et al., 2011).

Seasonal rhythmicity is believed to be associated with contagious ecthyma in sheep and goat (Radostits et al., 2007). However, such as study on contagious ecthyma was lacking until recently we explored the seasonal and periodic occurrence of this important contagious viral zoonotic disease of sheep and goats.

Materials and Methods

In this study a total of twelve (N=12) outbreaks of contagious ecthyma affecting 12 flocks having 2865 animals including sheep and goat were investigated from November 2016 to May 2017 in Himalayan state of Jammu and Kashmir, India. The occurrence was studied with respect to season, period, age, species, place and flock size. Morbidity was calculated from no. of cases affected and mortality from the no. of deaths among the affected cases and expressed as percentage (%).

Statistical Analysis

SPSS software was used for analyzing the data for prevalence percentage in various seasons, time periods, age, species, place and flock size, and correlation among these variables was calculated by Pearson correlation coefficient. Statistical significance was considered for values with $P \leq 0.05$.

Results and Discussion

Of the 12 outbreaks analyzed, 207 animals out of 2865 animals in 12 flocks, were affected with contagious ecthyma as shown in Table 1. Highest prevalence of cases was noted in spring (29.33 %) compared to winter (3.05 %). Periodically maximum number of cases was observed in April month (56.1 %) and minimum during February month (2.0 %) as given in Fig 2. Age related occurrence showed that lambs (Fig 1) and kids of less than 3 months of age were affected more compared to greater than 3 month old animals (74.9 % versus 25.1 %). There was variation in spatial distribution of no. of cases (Table 1) with 13.7% in Srinagar, 10% in Budgam, 8.5% in Ganderbal and 5.75% in Leh (Fig 3), when the other host-pathogen-environment factors did not differ significantly ($P > 0.05$). The overall morbidity, mortality and case-fatality rates observed were 7.23 %, 0.42 % and 5.8 % respectively.

Seasonal and periodic rhythmicity of diseases reflects constant presence of pathogenic microorganisms and usual occurrence of disease outbreaks that affects health and productivity of animals including small ruminant species like sheep and goat (Piccione and Caola 2002; Piccione et al., 2008; 2019; Yattoo et al., 2019a). Understanding such biological rhythms of host-disease-pathogens enables devising early managemental strategy for prevention and control of such diseases along with better health of domestic livestock or wild life species (Muheet et al., 2019; Yattoo et al., 2019a; 2019b). Hence studies focusing on these biological rhythms are vital under current scenario of frequent disease outbreak occurrence (Muheet et al., 2019; Yattoo et al., 2019a). Such studies on biological rhythms of host and pathogens are lacking in many of the important diseases affecting humans and animals, contagious ecthyma being one among them.

Contagious ecthyma is an economically important contagious and a zoonotic disease affecting domestic and wild ruminant species along with human beings (Hosamani et al., 2009; Zhao et al., 2010). This parapox viral disease produces cutaneous, respiratory or gastrointestinal lesions (Buttner and Rziha 2002; Gokce et al., 2005; Radostits et al., 2007; Housawi et al., 2009; Nandi et al., 2011). Occurrence of contagious ecthyma in sheep and goat is believed to be related to season and time period (Radostits et al., 2007). This is in corroboration with our finding of higher prevalence in spring season compared to winter season which might be due to both favorability of the environment for virus pathogen and susceptibility or predisposition of animals to these viral pathogens. In the present study, higher percentage of cases observed in April (56.1 %) and March (23.2 %) compared to other months could be due to favorable external environmental conditions and predisposition to mucosal abrasions due to grazing

in these months (Radostitiset *al.*, 2007). The parapox virus is quite resistant and survives for several months in a cool environment and is destroyed by high and very low temperature (McKeever and Reid 1986).

Young animals are more susceptible to pathogens compared to adult ones (Muheetet *al.*, 2019; Yattooet *al.*, 2019a). Thus higher prevalence of contagious ecthyma outbreaks in lambs and kids of < 3 months of age (74.9 %) compared to animals aged > 3 months (25.1 %) could be due to inadequate immunity of young animals (Yeruhamet *al.*, 2000), friable nature of mucous membranes and/or eruption of teeth. The findings are in accordance with the observations made by Reid (2000) and de la Concha-Bermijillo (2003) who observed more severe contagious ecthyma lesions in animals less than 2 month of age. Pathogenicity of virus also determines occurrence in young animals (McKeever *et al.*, 1988).

Table 1. Spatial distribution of contagious ecthyma outbreaks

District	Village	Flock Strength	No. of Affected	Morbidity	Mortality	Case Fatality
GANDERBAL	1.Bakoor	100	08	8.0%	0.0%	0.0%
	2.Shuhama	51	06	11.76%	0.0%	0.0%
	3.Khalmula	190	28	14.74%	0.0%	0.0%
	4.Shuhama	649	49	7.6%	0.77%	10.2%
	5.Rangil	156	04	2.56%	0.0%	0.0%
	6.Daryaden	30	03	10.0%	0.0%	0.0%
	7.Haripora	12	03	25.0%	0.0%	0.0%
SRINAGAR	1.Batpora	70	09	12.85%	2.85%	22.22%
	2.Nowhata	15	02	13.33%	0.0%	0.0%
	3.Khimber	02	01	50.0%	0.0%	0.0%
BUDGAM	1.Malpora	60	06	10.0%	0.0%	0.0%
LEH	1.Nidder	1530	88	5.75%	0.33%	5.68%
TOTAL		2865	207	207 (7.23)	12 (0.42)	12 (5.80)



Fig 1. Animals with contagious ecthyma lesions on lips, gums, oral commissures



Fig 2. Temporal distribution of cases

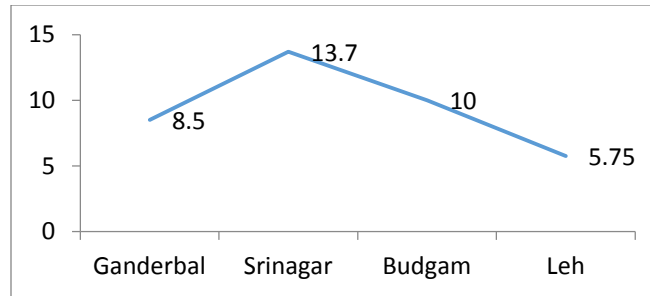


Fig 3. Spatial distribution of contagious ecthyma outbreaks in various districts

More no. of cases in urban Srinagar than other districts may be due to overcrowding, intensive farming or lesser sample size than the rural districts. Contagious diseases generally spread in overcrowded herds under intensive farming.

Animal-risk factors like breed and gender had no effect on outbreak occurrence. This may be due similar susceptibility of male or female animals in various breeds. Parapox virus affects both sheep and goat (Spyrou and Valiakos 2015). Managemental factors like type of rearing, feed/fodder offered, sheds for housing the animals and floor characteristics had no effect on occurrence of contagious ecthyma outbreaks. This may be due non-significant relation of these factors with this disease.

The present study revealed seasonal and periodic rhythmicity of contagious ecthyma in sheep and goat. This study revealed more prevalence in younger age groups in spring season around April month. Comparatively more disease outbreaks in spring season than the winter season suggest suitability of environment for pathogen and predisposition for host. Similarly, more no. of disease cases in the months of April than the other months indicates temporal variation of outbreak occurring under suitable climate targeting favorable age groups or herds. Young animals like lambs and kids lacking immunity were more frequently affected than the older animals. Other risk factors like species, gender, breed or management did not show significant effect on occurrence of disease outbreak. This study helps in better understanding biological rhythms of host-pathogen interactions in contagious ecthyma thus enabling devising better managemental strategies for prevention and control of this viral contagious disease. Other risk factors like species, gender, breed or management did not show significant effect on occurrence of disease outbreak.

Acknowledgments

Authors are thankful to the authorities of Sher E Kashmir University of Agricultural Sciences and Technology of Kashmir (SKUAST-K) for providing support and facilities.

Conflict of interest:No potential conflict of interest was reported by the authors.

References

- 1) Buttner, M. and Rziha, H.J. 2002. Parapoxviruses: from the lesion to the viral genome. *Journal of Veterinary Medicine B, Infectious Diseases and Veterinary Public Health* 49: 7-16
- 2) De la Concha-Bermejillo, A., Guo, J., Zhang, Z. and Waldron, D. 2003. Severe persistent ORF in young goats. *Journal of Veterinary Diagnostic Investigation* 15: 423-431.
- 3) Guo, J., Zhang, Z., Edwards, J.F., Ermel, E.W., Taylor, J.C. and de la Concha-Bermejillo, A. 2003. Characterization of a North American ORF virus isolated from a goat with persistent, proliferative dermatitis. *Virus Research* 93: 169-179.
- 4) Gokce, H.I., Genc, O. and Gokce, G. 2005. Sero-prevalence of contagious ecthyma in lambs and humans in Kars, Turkey. *Turkish Journal of Veterinary and Animal Sciences* 29: 95-101.
- 5) Hosamani, M., Bhanuprakash, V., Scagliarini, A., McInnes, C.J. and Singh, R.K. 2009. ORF: an update on current research and future perspectives. *Expert Review. Anti Infection*. 7: 879-893.
- 6) Hosamani, M., Bhanuprakash, V., Scagliarini, A. and Singh, R.K. 2006. Comparative sequence analysis of major envelope protein gene (B2L) of Indian ORF viruses isolated from sheep and goats. *Veterinary Microbiology* 116: 317-324.

- 7) Housawi, F.M.T. 2009. Biochemical changes associated with experimental ORF infection in sheep and goat. *Pakistan Veterinary Journal* 22: 8-10.
- 8) Inoshima, Y., Murakami, K., Yokoyama, T. and Sentsui, H. 2000. Genetic heterogeneity among parapox viruses isolated from sheep, cattle and Japanese serows (*Capricornis crispus*). *Journal of General Virology* 82: 1215-1220.
- 9) McKeever, D.J., McEwan, P.E., Jenkinson, D.M., Hutchinson, G. and Reid, H.W. 1988. Studies of the pathogenesis of ORF virus infection in sheep. *Journal of Comparative Pathology* 99: 317-328.
- 10) McKeever, D.J. and Reid, H.W. 1986. Survival of ORF virus under British winter conditions. *Veterinary Record* 118: 613-614.
- 11) Muheet, Malik, H.U., Parray, O.R., Bhat, R.A. and Yattoo, M.I. 2019. Seasonal and periodic rhythmicity of respiratory infections in small ruminants. *Biological Rhythm Research* DOI: 10.1080/09291016.2019.1576283.
- 12) Nandi, S., De, U.K. and Choudary, S. 2011. Current status of contagious ecthyma or ORF disease in goat and sheep- A global perspective. *Small Ruminant Research* 96: 73-82.
- 13) Piccione, G. and Caola, G. 2002. Biological rhythm in livestock. *Journal of Veterinary Sciences* 3(3): 145–157.
- 14) Piccione, G., Giannetto, C., Casella, S. and Caola, G. (2008). Circadian activity rhythm in sheep and goats housed in stable conditions. *Folia Biologica (Kraków)* 56(3–4): 133–137.
- 15) Radostits, O.M., Gay, C.C., Hinchcliff, K.W. and Constable, P.D. 2007. *Veterinary Medicine: A textbook of diseases of cattle, horses, sheep, pigs and goats*. 10th Edition, Elsevier Scientific Publications, Saunders, pp 1418-1421.
- 16) Reid, H.W. 2000. ORF. In: Martin, W.B., Aitken, I.D. (Eds.), *Diseases of sheep*, third edition Blackwell Science, Oxford.
- 17) Spyrou, V. and Valiakos, G. 2015. ORF virus infection in sheep and goats. *Veterinary Microbiology* 181: 178-182.
- 18) Yattoo, M.I., Bhat, R.A., Muheet, Parray, O.R., Shabir, M., Kubrevi, S.S., Dar, R.A., Angmo, K. and Kanwar, M.S. 2019a. A study on biological rhythms of Himalayan Pashmina goats. *Biological Rhythm Research* DOI: 10.1080/09291016.2019.1571703.
- 19) Yattoo, M.I., Shabir, M., Kubrevi, S.S., Dar, R.A., Angmo, K., Kanwar, M.S., Bhat, R.A., Muheet. and Parray O.R. 2019b. A study on biological rhythms of Himalayan yaks. *Biological Rhythm Research* DOI:10.1080/09291016.2019.1579883.
- 20) Yeruham, I., Perl, S. and Abraham, A. 2000. ORF infection in four sheep flocks. *Veterinary Journal* 160: 74-76.
- 21) Zhao, K., Song, D., He, W., Lu, H., Zhang, B., Li, C., Chen, K. and Gao, F. 2010. Identification and phylogenetic analysis of an ORF virus isolated from an outbreak in sheep in the Jilin province of China. *Veterinary Microbiology* 142: 408-415.