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Outbreak of sheep pox among cross bred sheep in Kashmir valley

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Abstract

Sheep pox is an acute and highly contagious viral disease of sheep characterized by fever, generalized papules or nodules, vesicles (rarely), internal lesions (particularly in the lungs), and death. It causes huge economic losses due to high mortality in flocks, decreased growth and increase in treatment costs. It is endemic in many parts of the world including India. An outbreak of Sheep pox was observed in cross breed (Kashmir Merino) sheep during autumn season of 2019 in District Budgam and Bandipora, J&K. The infected animals showed high fever and inappetance followed by appearance of papules initially in areas devoid of wool like axilla, inguinal region, face etc. The morbidity, mortality and case fatality rates in the present study were 35.50%, 4.31% and 13.26%, respectively. The morbidity and mortality were higher in lambs and ewes than adults and males, respectively. The mortality and morbidity was higher in lambs and female sheep as compared to adults and males. Non-vaccination, mixing of livestock at highland pastures and non-segregation of infected were among precipitating factors of the sheep pox outbreak.

Keywords: Outbreak, sheep pox among, valley

Introduction

Jammu and Kashmir (J and K) has enormous repository of sheep genetic resources [2] which plays an imperative role in improving the socio-economic setting of small and marginal farmers and landless laborers in rural areas. However, infectious diseases along with many other factors impede sheep husbandry and hence economy of these sheep farmers. Among the infectious diseases, sheep pox poses main threat through decreased production and increased mortality to this vast repository of sheep genetic resources of the country. The amount spend on treatment of animals adds to economic losses of poor farmers. The pox is a malignant cutaneous disease of sheep caused by a virus, belonging to genus Capripox, sub-family Chordopoxvirinae of the Poxviridae family [1]. It is highly contagious and devastating disease which is widely distributed in some parts of world [3]. The viral disease causes high economic losses from the high mortality, abortions, skin damage, loss of wool and mutton. The disease also results in skin defects, abortion, mastitis in ewes and high mortality in lambs [4]. The incubation period ranges from 8 to 13 days, with a maximum incubation of 21 days [5]. The transmission of virus is either by close contact, aerosols, or indirectly by feed and water [6]. The virus can remain viable for months on wool or dried scabs [5]. It is one of the main viral diseases of sheep and goats, with high morbidity and mortality of 70-90% [7], which may even reach to 100% [8]. The sheep is the primary host and all age groups are equally affected. However, young lambs are at higher risk of death [9]. The present article describes natural outbreak of sheep pox in Budgam district of Kashmir valley in Kashmir Merino sheep under unorganized sector.

History of outbreak

An outbreak of sheep pox was observed in Budgam and Bandipora districts during 2019-20 in cross breed Kashmir Merino sheep. Sheep pox was observed in flocks of 64 (23 from Bandipora and 41 from Budgam) farmers having 1955 (875 and 1080, respectively). The descriptive investigation followed by a case-control study was carried to establish the associated risk factors. A standard case definition was used for case-control study. A case was defined as a sheep having any symptom of sheep pox like fever, necrotic skin lesions, papules

or nodules anywhere on the body, mucopurulent nasal discharge and swollen eyelids. All flock owners were interviewed for vaccination status, migration, livestock strength etc. and animals were examined for sheep pox symptoms. Animals which developed symptoms were separated from the flock and treated symptomatically.

Data Collection

To find the risk factors associated with sheep pox, clinical examination of all the sheep was carried out in flocks of 64. The information associated with sheep pox cases was collected from farmers by using the semi-structured questionnaire. The attack rate (AR), mortality rate (MR) and case fatality rate (CFR) was calculated. The AR is proportion of animals that develop disease / total no. of animals at risk. Similarly, mortality rate is proportion of animals that died of sheep pox / total no. of animals at risk. The case fatality rate is proportions of animals died due to sheep pox among animals which developed pox symptoms as per case definition. All the animals in 64 the flocks were considered the at-risk.

Results and Discussion

The present study reports outbreaks of sheep pox in Budgam and Bandipora districts of Kashmir Valley during 2019-20. Vaccination against sheep pox was not practiced in affected areas. The morbidity, mortality and case fatality rates due to sheep pox were 35.50%, 4.31% and 13.26%, respectively and are presented in Table 1. The attack rate and mortality rate was higher in Bandipora as compared to Budgam. However, case fatality rate was higher in Budgam (Table 1). The morbidity and mortality case fatality rates were higher in lambs than adults. The case fatality rate was higher in male sheep than female sheep whereas morbidity and mortality rates were higher in females than males (Table 1). The morbidity and mortality rates were higher in recently parturated ewes and ewes in advanced stages of pregnancy. Mortality (%) of 0, 8.3, and 4.5 and morbidity of 1.5, 26.9 and 8.3 in American Merino sheep, Rambouillet sheep and Australian cross bred sheep, respectively were reported by Mondal *et al.* (2004) [10] due to sheep pox. Roy *et al.* (2008) [4] observed morbidity of 64.28% and 75% and mortality of 10% and 12.5%, respectively in Madras Red sheep and Mechery

sheep whereas Manimaran *et al.* (2016) [11] reported a morbidity and mortality of 80.00% and 4.17% in Khilakaraisal in an organized farm of Tamul Naidu. A recent report revealed that the morbidity and mortality rates in the flock were 18.4% and 6.3%, respectively [8]. Published literature on sheep pox outbreaks yielded differing mortality and morbidity rates due to sheep pox in sheep. In the present study, lower mortality rate was found despite a high morbidity rate. Bhanuprakash *et al.*, (2011) [12] also reported lower direct losses due to mortality. The number of mortality and morbidity animals during the outbreak depends on the virulence of virus, size of population affected, flock size and susceptibility of animals and on the basic reproductive number i.e average expected number of secondary infections produced by a single primary infection in a completely susceptible population [12]. However, breed [13] and the most remarkably the herd immune status [14] may be some additional contributing factors affecting mortality and morbidity due to sheep pox infection. The high morbidity, mortality and case fatality rates in young lambs compared to adult animals was in consonance with the report of Qurat ul Ain *et al.* (2019) [5]. The results are explained by low level of immunity in young animals [19]. In our study, the morbidity rate (attack rate) and mortality rates were higher in lambs compared to adult animals which are in accordance with the study of Qurat ul Ain *et al.* (2019) [5]. The results of present study advocate and validate atatement of Bhanuprakash *et al.* (2006) [12] that exotic and young animals are highly susceptible. This may be due to the lower levels of immunity in young animals. Also, both morbidity as well as mortality was higher in ewes in advanced pregnancy compared to dry ewes which may be due to the dominance of Th2 type of immune responses in pregnancy coupled with stress of pregnancy. The sheep pox is endemic in Kashmir valley and most outbreaks are observed during autumn season. However, [15] reported that most sheep pox outbreaks were seen during the rainy season in Karnataka. Mixing of animals for grazing along with nutritional stress in absence of vaccination for sheep pox and lack of awareness may be the contributing factors for the outbreaks. Qurat ul Ain *et al.* (2019) [5] also reported more outbreaks of sheep pox during winter and autumn.

Table 1: Attack and mortality rates in outbreak of sheep pox

Animals	Total Population	Infected Animals	Attack Rate (%)	Deaths	Mortality rate (%)	Case fatality rate (%)
Overall	1955	694	35.50	92	4.71	13.26
District						
Budgam	1080	247	22.87	44	4.07	17.81
Bandipora	875	447	51.09	48	5.49	10.74
Age						
Adult	1708	492	28.81	62	3.63	12.60
Lamb	247	202	81.78	32	12.96	15.84
Sex						
Male	491	72	14.66	16	3.26	22.22
Female	1464	622	42.49	76	5.19	12.22

Clinical signs and gross pathology

The skin lesions which were observed included erythematous macules which progressed to hard papules in most of the animals. The erythematous macules were observed on all body parts. However, the skin lesions were highly concentrated in parts devoid of wool like muzzle, axillae (Fig 3), ears, eyelids, vulva (Fig 4), anus (Fig 4), mammary gland

and inguinal area. Oral and nasal lesions were also observed in many cases. Animals in which nasal lesions were observed developed rhinitis and pneumonia whereas animals with oral lesions were off-fed and died with progressive loss of body condition. Mucopurulent nasal discharges were observed in sheep with nasal lesions. Blepharitis and conjunctivitis was also observed in two ewes. Maggot infestation was observed

in two male and three female sheep. The affected animals were segregated and treated with Enrofloxacin, Melonex and Avil parenterally for 5 days. All animals which had not developed symptoms along with sheep of nearby villages were vaccinated with killed sheep pox vaccine to create a buffer zone. The movement of animals was restricted from unaffected to infected areas. Outbreak was controlled after about two month of treatment. Postmortem of dead animals were conducted and pox lesions were observed on lungs, liver etc. The clinical findings observed during present study are in consonance with earlier reports. Abortion and secondary pneumonia were also observed during present survey. Abortion and secondary pneumonia are complications of sheep pox [16, 17]. Congested, edematous, consolidated firm white nodules along with necrotic foci and inflammatory changes were observed on lungs. Similar lesions were reported by literature [11, 18].



Fig 3: Lungs presenting picular pox lesions



Fig 4: Liver of animal died of sheep pox



Fig-3: Pox lesions in axillae



Fig 4: Pox lesions in vulva, anus and tail

Conclusion

Sheep pox continues to threaten sheep husbandry of Kashmir Valley. The current outbreak was result due to lack of vaccination, mixing of livestock and lack of awareness among farmers. The study had limitations, as farmers did not have the accurate birth or age records of the animals. Moreover, despite repeated requests for segregation of infected and non-infected animals, there was continuous mixing of livestock during the outbreak period. On the basis of these findings, it is highly recommended that farming community should be educated about the importance of vaccination and sanitary precautions and live attenuated sheep pox vaccination should be included in schedules vaccination programmes. Further, more research is required to investigate field vaccine effectiveness, the variation of the strain, and estimation of the economic losses due to such outbreaks. The unorganized sheep rearing, low vaccine coverage and lack of awareness, introduction of new diseased animals and mixing of animals have contributed to the spread of this sheep pox. In J and K, the slaughter policy and movement restrictions for disease control are difficult to execute due to various socio-economic factors. Therefore, an economical and sustainable approach for disease control is mass vaccination.

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