EPIDEMIOLOGICAL MEASURES OF CAUSAL ASSOCIATION BETWEEN SHEEP POX AND ITS DETERMINANTS

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Abstract: An epidemiological study was undertaken to assess the measures of causal association between sheep pox and its determinants in north-west agroclimatic zone of Tamil Nadu. Study populations of 66 animals from 15 different sheep pox outbreak flocks were taken with respect to the exposed determinants such as nomadism, overcrowing and endoparastic infestation. Relative risk, odds ratio and attributable fraction were 1.52, 2.25 and 0.34 for nomadism, 1.55, 2.40 and 0.35 for overcrowding and 0.64, 0.42 and -0.56 for endoparastic infestations, respectively. Above results indicates that nomadism and overcrowding were causally associated with the occurrence of sheep pox outbreak in this region.
Keywords: Sheep pox, Causal association, Agroclimatic zone, Nomadism.

INTRODUCTION

Sheep pox is a highly contagious, host specific viral infection and causes high rate of morbidity and mortality in sheep (Singh *et al*., 2007). Sheep pox is enzootic in India, and several outbreaks have been reported regularly from almost all the states (Bhanuprakash *et al*., 2005), including Tamil Nadu. Tamil Nadu has a sheep population of more than 79.91 lakhs (Basic Animal Husbandry Statistic, 2010) which is mainly reared by small and marginal farmers and landless labourers and act as an important source of family income and are known as the 'moving banks' of shepherds (Bhanuprakash *et al*., 2006). The estimated annual loss due to the sheep pox is Rs.4,792 per flock (Senthilkumar and Thirunavukkarasu, 2010) and this shows that sheep pox outbreaks are regular feature in this state. Hence, this study was made to ascertain the association between sheep pox and its determinants in the north-west agroclimatic zone of Tamil Nadu.

MATERIALS AND METHODS

A total of 66 animals from 15 different sheep pox outbreaks were identified in the above zone based on the history and clinical symptoms of sheep pox and confirmed by laboratory diagnosis. Endoparasitic infestation was assessed by fecal sample examination. Relative risk, odds ratio, and attributable rate were used to determine the causal association between sheep pox and hypothetical determinants as per the formula described by Martin *et al.* (1994). These measures are independent of sample size and include the strength of association and the effect of different risk factors in exposed individuals. The association is assessed by 2×2 contigent table (Table-1).

Relative risk (RR)

It is calculated as the ratio between the rate of disease in the exposed group and the rate of disease in the unexposed group.

Relative risk = {a/(a+b) / c/(c+d)}

If relative risk values are equal to 1, < 1 and >1 indicates that there will be no, sparing and strong associations between hyphothetical factor and disease respectively.

Odds ratio (OR)

It is a cross product ratio and used to measure the strength of association. It is interpreted exactly the same as relative risk.

Odds ratio = ad / bc

Attributable rate (AR)

It is determined by substracting the rate of disease in the unexposed group from the rate in the exposed group. The larger the attributable rate, the greater the effect of the factor in the exposed group.

Attributable rate = {a/(a+b) - c/(c+d)}

RESULTS AND DISCUSSIONS

Animal's exposure and disease status, values of epidemiological measures and nature of association are shown in table - 2

Nomadism

Relative risk and odds ratio were 1.52 and 2.25 respectively, which were greater than one. Attributable fraction was 0.34, which indicates that 34 per cent of sheep pox cases in nomadic animals are due to nomadism. This indicates that nomadism is causally associated and may be viewed as a putative causal factor in the occurrence of sheep pox. Jindal *et al.*

(2006) and Hegde *et al*. (2009) also reported that the nomadic farmers who take their flocks from one place to other might have helped in the transmission of the sheep pox virus. Sheep pox outbreak occurs either due to movement of infected flocks into a non-endemic area or movement of a susceptible flock into an endemic area.

Overcrowding

Relative risk and odds ratio were 1.55 and 2.40 respectively, which were greater than one. Attributable fraction was 0.35, which indicates that 35 per cent of sheep pox cases in overcrowded animals are due to overcrowding. The present study indicates that overcrowding is causally associated, because sheep pox virus is often transmitted by the respiratory route during close contact as indicated by Bhanuprakash *et al*. (2006). Sheikh-Ali *et al*. (2004) also found that the intensive production system with high animal density is a predisposing factor in the outbreak of sheep pox.

Parasitism

Relative risk and odds ratio were 0.64 and 0.42 respectively, which were less than one. Attributable fraction was – 0.56. This indicates that parasitism is not causally associated and may be viewed as a sparing factor in the occurrence of sheep pox. This is contrary to the statement of Bhanuprakash *et al*. (2005) who stated that sheep infested with gastro-intestinal parasites (concurrent infections) predispose to the occurrence of sheep pox.

CONCLUSION

Assessment of epidemiological measures indicates that nomadism and overcrowding were causally associated with the occurrence of sheep pox outbreak in this region.

ACKNOWLEDGMENTS

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Table 1: 2×2 contigent table for calculating these measures of association

Risk factor status	Disease status		Total
	Disease	No disease	
Exposed	a	b	a+b
Not exposed	c	d	c+d
Total	a+c	b+d	a+b+c+d

Table 2: Animal's exposure and disease status, values of epidemiological measures and nature of association

Factors	Exposure	Disease		RR	OR	AR	Association
		Present	**Absent**				
Nomadism	Present (53)	31	22	1.52	2.25	0.34	Present
	Absent (13)	5	8				
Over crowding	Present (48)	29	19	1.55	2.40	0.35	Present
	Absent (18)	7	11				
Parasitism	Present (18)	7	11	0.64	0.42	-0.56	Absent
	Absent (48)	29	19				

Note: RR – Relative risk; **OR** – Odd's ratio; **AR**- Attributable rate