

# Epidemiological Measures of Disease Occurrence in Bluetongue

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**Abstract:** *Bluetongue is a primarily midge-borne devastating hemorrhagic viral disease of sheep characterized by high morbidity and mortality resulting severe economic losses to sheep farmers. An epidemiological study was undertaken to assess the crude and specific measures of morbidity, mortality and case fatality against bluetongue in sheep. In this study, a total of 11 bluetongue outbreaks were selected by active and passive surveillances in north-west agroclimatic zone of Tamil Nadu, India. Overall morbidity, mortality and case fatality rates were 6.15%, 3.31% and 53.82% respectively. Morbidity, mortality and case fatality rates were higher in adults than young animals. Morbidity, mortality and case fatality rates were higher in Mecheri breed than Trichy black and Non-descriptor. Difference in disease frequency was not observed between males and females. The present study concludes age and breed predisposing exist in the outbreaks of bluetongue.*

**Key words:** Bluetongue, Epidemiological measures, Active and passive surveillances, Disease frequency

## 1. Introduction

Bluetongue (BT), an infectious and non-contagious disease of ruminants, is caused by BT virus (BTV), an RNA virus which belongs to the Orbivirus genus of the family Reoviridae [1]. There are 24 immunologically distinct BTV serotypes (BTV1 to BTV24) currently recognized worldwide, and recently described Toggenburg virus is proposed to be a 25<sup>th</sup> serotype [2]. The first outbreak of BT in sheep and goats in the country was recorded in 1964 in Maharashtra State. Since then, several outbreaks of the disease have been reported in sheep [3]. In sheep, the severity of disease varies with the breed of sheep, virus strain and environmental stresses. Affected sheep may have pyrexia, leukopenia, oral erosions, facial edema, and hyperemia of the oral mucous membranes and coronary band [4]. The virus can infect most of domestic and wild ruminants, but sheep show distinct clinical signs with heavy losses in the form of mortality and morbidity [5]. The estimated annual economic loss due to BT outbreak was Rs. 52 lakhs in TamilNadu and about \$ 3 billion worldwide [6], [7]. This study was aimed to assess the disease frequency of BT in sheep of Tamil Nadu, India.

## 2. Materials and Methods

### 2.1. Study zone

Tamil Nadu is divided into seven agroclimatic zones viz., Cauvery delta, North-east, West, North-west, High altitude, South and high rainfall zones. The study was carried out in the North-west agroclimatic zone, primarily comprising Namakkal, Salem, Dharmapuri and Krishnagiri districts and situated between 11 and 12°55' north latitude and 77°28' and 78 ° 50' east longitudes with mean annual rainfall of 877.6 mm.

### 2.2. Outbreak data

Bluetongue outbreak particulars in the study zone were collected by both active and passive surveillances as per

protocol prescribed by Martin [8]. A total of five and six outbreaks were identified by active and passive surveillances respectively for a period of twelve years (June 1997 to May 2009) and used in this study. Out of 4898 animals under the risk, 301 and 162 were affected and died respectively. Categorization of animals under age, breed and sex are shown in table 1.

### 2.3. Analysis of data

Crude measures are an expression of the amount of disease and death in a population as whole; they take no account of the structure of the population affected. Crude and specific rates of morbidity, mortality and case fatality were calculated as per the method followed by Thrusfield [9].

$$\text{Morbidity rate} = \frac{\text{Number of sheep showing signs of bluetongue} \times 100}{\text{Total number of susceptible sheep under risk}}$$

$$\text{Mortality rate} = \frac{\text{Number of sheep died due to bluetongue} \times 100}{\text{Total number of susceptible sheep under risk}}$$

$$\text{Case fatality rate} = \frac{\text{Number of sheep died due to bluetongue} \times 100}{\text{Total number of sheep showing signs of BT under the study}}$$

## 3. Results and Discussion

### 3.1 Crude measure

Overall morbidity, mortality and case fatality rates were 6.15%, 3.31% and 53.82% respectively. In Tamil Nadu, varying degree of morbidity rates of 3.30-22.80% and 13.00% were observed by Saravanabava [10] and Vengadabady [11] respectively. Saravanabava [10] and Vengadabady [11] observed almost similar pattern of mortality rate of zero to 6.10% and 1.15% respectively. Kulkarni *et al.* [12] and Prasad [13] reported an overall case fatality rate of 25.00% in rural areas of Maharashtra and 43.00% organized farms of Hisar, respectively. In the present study, varying degree of disease frequency might be

due to difference in geography and husbandry practices as said by Sreenivasulu [14]

### 3.2 Specific measures

Specific measures of disease are those that describe disease occurrence in specific categories of the population related to host attributes such as age, sex, breed and method of husbandry, etc. They convey more information than crude measures on the pattern of disease and categories of animal that are particularly at risk of disease [9]. Specific measures of morbidity, mortality and case fatality are shown in the table 1.

#### 3.2.1 Age specific measure

Morbidity, mortality and case fatality rates were 5.72%, 1.94% and 33.87% in young sheep and 6.27%, 3.79% and 58.99% in adult sheep respectively. Infection rate and severity of the disease were more in adults than young animals. Shringi and Shringi [15] also indicated that BTV infection was common among adult animals. But, Sreenivasulu [14] observed that sheep aged 6 - 12 months were more susceptible than adults. Higher frequency of disease in adults might be due to increased nomadic activity for search of fodder and movement of adult stock for marketing.

#### 3.2.2 Breed specific measure

Morbidity, mortality and case fatality rates were 6.51%, 3.26% and 50.00% in Trichy Black, 9.33%, 6.66% and 71.43% in Mecheri and 3.00%, 0.59% and 19.57% in Non-descriptor breeds of sheep respectively. Infection rate and severity of the disease were more in Mecheri breed of sheep respectively than other breeds. Similarly, Saravanabava [10] and Saravanabava and Venkatesan [16] reported that the Trichy black is more susceptible than Mecheri breed. Worwa [17] and Coetzee [18] also observed the breed predisposition in the occurrence of bluetongue in sheep.

#### 3.2.3 Sex specific measure

Morbidity, mortality and case fatality rates were 8.83%, 4.03% and 45.65% in male and 5.83%, 3.32% and 55.29% in female sheep respectively. Similarly, Shringi and Shringi [15] indicating that the prevalence of BTV was not markedly affected by the sex.

### 4. Conclusion

Specific measures indicate that age and breed predisposing exist in the infection rate and severity of BT. It is important to consider the above factors when attempting prevention or eradication of the disease with appropriate vaccines.

### 5. Future Scope

Bluetongue is a devastating economically important disease of sheep. Assessing the measures of disease frequency in the affected sheep flock will be helpful to ascertaining severity of disease, measures to be undertaken for containment of the diseases and analysis of cost-benefit ratio of alternative disease control programme.

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### Author Profile



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**Table 1:** Categorization of animals and specific measures of morbidity, mortality and case fatality rates of bluetongue in sheep

Specific measure	Categories	No. at risk	No. affected	No. died	Morbidity rate (%)	Mortality rate (%)	Case fatality rate (%)
Age	Young (< 1 year)	1084	62	21	5.72	1.94	33.87
	Adult (> 1 years)	3814	239	141	6.27	3.70	58.99
Breed	Trichy Black	2089	136	68	6.51	3.26	50.00
	Mecheri	1276	119	85	9.33	6.66	71.43
	Non-descriptor	1533	46	9	3.00	0.59	19.57
Sex	Male	521	46	21	8.83	4.03	45.65
	Female	4377	255	141	5.83	3.22	55.29