Prevalence of Peste des Petits Ruminants (PPR) in goat in
Sylhet District, Bangladesh

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Abstract

The present study was carried out to investigate the prevalence of Peste des Petits Ruminants (PPR) in goat in Sylhet district over three years period from 2011 to 2013. Prevalence was determined based on the data of four Upazila veterinary hospitals in Sylhet district, categorized into four age groups and three seasons. Diagnosis was made by clinical signs and gross pathology. A total 8975 goats were examined during the three years period of which 1628 were found to be affected with PPR (18.14%). Among four Upazila of Sylhet district the highest prevalence of PPR was 19.86% found in Biswananth, whereas 19.3% in Sylhet Sadar, 16.26% in Fenchuganj and 15.402% in Joyntapur, where spatial variation was highly significant (P<0.01). There was significant (P<0.01) difference of PPR prevalence among the different age groups where younger goats (<2 year) were affected more than older goats. Goats of <2 year age group had the highest prevalence (21.58%) followed by (16.78%) in 2-3 year, (13.28%) in 3-4 year and the lowest (8.84%) in >4 year age group. The prevalence of PPR was significantly (P<0.01) higher in winter season (20.27%) than that of rainy (19.21%) and summer season (14.82%).

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Introduction
Bangladesh is a developing country where important part of national economy is based on agriculture and livestock sector. Livestock not only contribute to national economy but also meet the protein demand of its huge population. Goat rearing is an integral part of livestock farming system in Bangladesh and the population of goat is about 24.14 million (DLS, 2014; Khokon et al., 2017). Goat are particularly reared by low-income farmers, landless laborers and distress women who cannot afford to rear cattle, so, goat is called "Poor men's cow" in Bangladesh. Goat meat and skin production ranked 38% and 28% respectively of the total meat and skin produced from livestock in Bangladesh (FAO, 1997). However, there are several diseases of goat especially PPR, which causes higher mortality and great economic losses, as a result the poverty alleviation programme is being hampered. Infectious diseases are significant impediments to the economical rearing of small ruminants (Radostits et al., 2000).

Peste des petits ruminants (PPR) is a highly contagious and economically important viral disease of domestic and wild small ruminants. The disease is caused by a morbillivirus under the family Paramyxoviridae (Gibbs et al., 1979; Bailey et al., 2005). Clinically, PPR resembles rinderpest and is characterized by the sudden onset of depression, fever, discharges from the eyes and nose, sores in the mouth, disturbed breathing and cough, foul smelling diarrhea, with 100% morbidity and 20-90% mortality (FAO, 2009). Pseudomembranous erosive and ulcerative stomatitis; necrotic tonsillitis; fibrino-haemorrhagic enteritis and broncho-interstitial pneumonia are the major pathological features of PPR in goat. (Rowland et al., 1969; Bundza et al., 1988; Brown et al., 1991; Kul et al., 2007). PPR was first described in Côte d’Ivoire in West Africa in 1942. The disease is now widespread in tropical and sub-tropical countries, particularly in Sub-Saharan Africa, Middle East and Western and Southern Asia (Dhar et al., 2002). In Bangladesh PPR is an exotic disease of goats (Debnath, 1995; Islam et al., 2001; Ali et al., 2013). The disease was first described by FAO expert team in 1993 during their visit in northern part of the country where they found rinderpest like diseases in goat. Later the virus of the disease was identified as PPR virus by World Reference laboratory in U.K (Barrette et al., 1997; Ali and Sultana, 2012). In epidemic areas, morbidity rate has been estimated from 80% to 90% accompanied by mortality rate range from 50% to 80% (Debnath, 1995; Ali et al., 2018). After considering the aforementioned points and since no study was carried out on the epidemiology and pathological investigation of PPR in Sylhet region, the present study was planned to study the epidemiological situation of PPR in Sylhet region.

Materials and methods
Study area
This study was conducted in Sylhet district of Bangladesh. Sylhet district is located in northeast part of Bangladesh and between 24°32’ North latitude and 91°52’ East longitude. For epidemiological study, data were collected from four Upazilas of Sylhet district such as Sylhet Sadar, Fenchuganj, Joyntapur and Biswanath.

Study period
The data were collected over 3 years period (from January 2011 to December 2013) during January to June, 2014.

Study population
The study was conducted on natural PPR infected goats of various age, sex and breed that were brought to the veterinary hospital over the study period. A total number of 8975 goats were examined in four Upazilas of Sylhet district of which 1628 goat were found to be affected with Peste des petits ruminants virus.

Data collection
Data were collected from the register book of Upazila Veterinary Hospital of Sylhet Sadar, Fenchuganj, Joyntapur and Biswanath Upazila. The goat, which was brought to veterinary hospital for treatment, are registered in the patient register book based on presumptive diagnosis.
**Categorization of data**

For epidemiological study, data were categorized into age groups and seasons. All the goats were categorized into four age groups such as <2 year, 2-3 year, 3-4 year and >4 year. One year cycle was divided into 3 seasons such as summer (March to June), rainy (July to October) and winter (November to February).

**Diagnosis**

 Diagnosis of PPR was made by clinical signs. Foul smelling diarrhoea, high body temperature (106°F), encrustation of gum and lips and mucopurulent nasal discharge were reckoned as diagnostic features.

**Determination of prevalence**

The prevalence was calculated using the common rule of prevalence.

\[
\text{Prevalence} = \frac{\text{No. of PPR affected goat at period of time}}{\text{No. of goat examined in the hospital at that point of time}} 
\]

**Statistical analysis**

The data were statistically analyzed to determine the correlation of risk factors with PPR case using Graph Pad Quick Cal online statistical software. Univariate analysis using two tailed chi-square (\(\chi^2\)) test was conducted manually on three risk factor such as location (Upazilas), age and season; to find out the test of significance. P-value was calculated using chi square value by Graph Pad Quick Cal online statistical software.

**Results and discussion**

During the 3 years period from 2011 to 2013, a total of 8975 goats were brought to veterinary hospital by the owner for treatment, among which 1628 were found to be affected with PPR (18.14%). Rest of the goats was affected by several other common diseases.

**Upazila-wise prevalence**

Among the four Upazila, Biswanath had the highest prevalence of PPR (19.86%) where among 3439 no of examined goat 683 were found to be affected with PPR shown in Table 1. In Sylhet sadar, Prevalence of PPR was similar to Biswanath (19.3%) where among 1979 no of examined goat 382 were PPR affected.

The prevalence of PPR in Fenchuganj and Joyntapur was more or less similar (16.261% and 15.4% respectively) but lower than that of Biswanath and Sylhet Sadar. The variation in the prevalence of PPR among four Upazilas was highly significant (P<0.01).

**Age-wise prevalence**

The PPR prevalence among the different age groups also highly significant (P<0.01) (Table 1).

The younger goats (<2 year) were more susceptible to PPR than older goats.

Prevalence of PPR was gradually decreased with increasing the age of goat. Regarding age categories, goats of <2 year age group had the highest prevalence (21.58%) and >4 age group i.e. adult goats had the lowest prevalence (8.84%). Among other age groups, the prevalence of PPR was 16.78% in 2-3 year and 13.28% in 3-4 year aged goat respectively.

**Table 1. Prevalence of PPR in goat in Sylhet with Univariate analysis of risk factors using Chi square test.**

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>No. of animal examined</th>
<th>No. of PPR case</th>
<th>Prevalence %</th>
<th>(\chi^2)</th>
<th>d f</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upazila</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sadar</td>
<td>1979</td>
<td>382</td>
<td>19.303</td>
<td>21.64</td>
<td>3</td>
<td>0.0001**</td>
</tr>
<tr>
<td>Fenchuganj</td>
<td>1765</td>
<td>287</td>
<td>16.261</td>
<td>80.57</td>
<td>3</td>
<td>0.0001**</td>
</tr>
<tr>
<td>Joynatapur</td>
<td>1792</td>
<td>276</td>
<td>15.402</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biswanath</td>
<td>3439</td>
<td>683</td>
<td>19.86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2 yr</td>
<td>4198</td>
<td>906</td>
<td>21.58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3 yr</td>
<td>2741</td>
<td>466</td>
<td>16.78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4 yr</td>
<td>1799</td>
<td>239</td>
<td>13.28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;4 yr</td>
<td>237</td>
<td>20</td>
<td>8.84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Season</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td>2922</td>
<td>433</td>
<td>14.82</td>
<td>33.32</td>
<td>2</td>
<td>0.0047**</td>
</tr>
<tr>
<td>Rainy</td>
<td>3004</td>
<td>577</td>
<td>19.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>3049</td>
<td>618</td>
<td>20.27</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The younger goats (<2 year) were more susceptible to PPR than older goats.

Prevalence of PPR was gradually decreased with increasing the age of goat. Regarding age categories,
Season-wise prevalence

The sporadic outbreak of PPR in goat in Sylhet district occurred in the whole year round. There was highly significant (P<0.01) association of PPR prevalence among the three seasons. Winter and rainy seasons had significantly higher prevalence (20.27% and 19.21% respectively) than summer season (14.82%) but most of the animals were affected in winter season (Table 1).

Prevalence of PPR in Sylhet district

In the present study the overall prevalence of PPR in the Sylhet district was 18.14% during the study period; the result is supported by Jana and Ghosh (2002) and Durrani et al. (2010) who found 18.3% prevalence of PPR in investigation by RT-PCR of nasal swab sample from goat. Ozkul et al. (2002) in Turkey and Sarker et al. (2011) in Rajshahi found more or less similar result; both of them reported around 20% PPR prevalence in goat. But the result is lower as compared to some other previous studies; for example 50.27% by Islam et al. (2012) found at Mirzagonj Upazila in Patuakhali district and 65% by Islam et al. (2014). Among the four Upazila, Biswanath had the highest prevalence (19.86%) followed by Sylhet Sadar (19.3%) which support the result found by Jana and Ghosh (2002) in India; Durrani et al. (2010); Ozkul et al. (2002) and Sarker et al. (2011). But the result is lower as compared to Islam et al. (2012) and Islam et al. (2014).

In this study, lower prevalence was found in other two Upazilas such as 16.26% in Fenchuganj and 15.4% in Joynatapur Upazila. Variation in the prevalence of PPR among the different Upazilas is strongly significant (P<0.01). This result is in agreement with Singh et al., 2004; Durrani et al., 2010; Salih et al., 2014 and Muse et al., 2012.

Age-wise prevalence

Among the age groups the prevalence of PPR was significantly (P<0.01) higher in younger animals than that of older animals where highest prevalence (21.58%) was found in the age group of <2 year. Then the prevalence was gradually declined with increasing the age of goat such as 16.78% in 2-3 year and 13.28% in 3-4 year and lowest prevalence (8.84%) was found in >4 year aged goat. Similar result found by Sarker and Islam (2011) in Rajshahi where younger animals mostly affected (31.8%) than sucklers (13.14%) and adult (10.15%). He reported the highest PPR prevalence in young animals due to poor immunity and poor nutrition. The result is also in agreement with Samad (2008). Islam et al. (2012) found that younger animals mostly affected with PPR but the highest prevalence was found at age category of 7-12 months than other age category. However, the reverse result was found by Abubakar et al. (2009) where higher prevalence was seen in animals aged >2 years.

But Islam et al. (2014) suggest that PPR can affect goat population irrespective of age (P=0.50).

Season-wise prevalence

In the present study, it was seen that although PPR occur throughout the year but seasonal variation had very significant correlation (P<0.01) with the PPR prevalence in goat. Here animal were most prevalently affected with PPR in winter and rainy season than summer season. Highest prevalence was found in winter (20.27%) followed by rainy (19.21%) and lowest was in summer season (14.82%).

The result support the findings of Sarker and Islam (2011) where highest prevalence was in the month of December (31.68%) and January (30.34%); lowest in June (9.52%). It also agrees with Wosu et al. (1992) where PPR incidence starts to build up from end of December and rises rapidly during harmattan season to a peak in the early rainy season in April.

There was a sharp fall in the incidence over the latter part of the rainy season (May to September) in each year of study. On the contrary, Singh et al. (2004) found that the frequency of disease outbreaks was greater between the months of March and June (51.7%) as compared to other periods of the year, which does not agree with the present study. Although Islam et al. (2014) found no significant correlation of PPR prevalence respective to season.
Conclusion
In the present study, the overall prevalence of PPR in Sylhet district was 18.14% whereas the highest prevalence was found in Biswanath Upazila (19.86%).

Regarding age categories, younger animals (<2 year) were mostly susceptible to PPR (21.58%) than older animals (12.96%) and according to the season, PPR was more or less prevalent all the year round but the highest prevalence was found in winter season (20.27%) and lowest in the summer (14.82%). So, based on aforementioned investigations following recommendation can be done for the farmer: first, vaccination of animals should be done before winter and summer; second, antibody titer should be checked before vaccination and for booster doses; third, vaccination failure should be monitored by detecting antibody titer; and more care should be taken for younger animals than older animals.

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