Epidemiology of Cryptosporidial Infection in Lambs of Kashmir Valley

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ABSTRACT
Cryptosporidium spp. infection was recorded in lambs of Kashmir valley with an overall prevalence of 38.18%. The infection was high in diarrhoeic (43.72%) than non-diarrhoeic (29.87%) lambs. Prevalence was significantly higher (P<0.001) in herds having > 50 animals (46.15%) as compared to those having < 50 animals (28.81%). Association between cryptosporidial infection and diarrhoea was more frequent (P<0.001) in lambs of 1 day to < 1 month of age (66.67%) than lambs of > 1 month of age group (29.86%). Seasonal prevalence was significantly higher (P<0.001) during winter/spring (46.70%) as compared to during summer/autumn (27.75%). Excretion of cryptosporidial oocysts was significantly higher (55.77%) in lambs of < 1 month age during winter. However, there was no significant difference in cryptosporidial infection with regard to sex of animals.

Keywords: Cryptosporidium spp., sheep.

Introduction
Cryptosporidiosis is characterized by severe diarrhoea in neonatal ruminants, and is one of the primary agents of neonatal diarrhoeal syndrome (Current, 1985; Xiao et al., 1993). Cryptosporidiosis usually remains asymptomatic in animals, but may be life threatening in young livestock (Wilson, 1983; Booth, 1980). Domestic animals play an important role in environmental contamination by continuously excreting oocysts in their faeces. Human infection results from exposure to infected animals particularly calves and lambs (Nouri and Karami, 1991; Mosier and Oberst, 2000).

In Kashmir, cryptosporidiosis was reported in dairy calves with a prevalence rate of 29.37% (Sheikh et al., 2007). However, its prevalence in other species particularly in sheep which form the major component of the livestock industry has not yet been studied. The present study was, therefore, undertaken to study the prevalence of cryptosporidiosis in lambs since a considerable percentage of lamb mortality is attributed to gastroenteritis in Kashmir valley.

Materials and Methods
Three hundred and eighty five faecal samples were collected from lambs of unorganized sheep farms of Kashmir valley in the age group of 1 day to < 6 months. The study was conducted between March, 2004 to Dec. 2006 and the samples were collected during spring (March - May) summer (June- August) autumn (Sep. - Nov.) and winter (Dec. - Feb.). The samples were collected directly from the rectum and depending on their consistency were scored as diarrhoeic and non-diarrhoeic. These were diluted 1:5 with normal saline and sieved through a strainer to remove coarse particles. Following
centrifugation at 1500 rpm for 5 min, 15 ml of Sheather’s sugar solution was added to the sediment for the separation of oocysts. A thin layer of supernatant was taken on glass slide by platinum loop, and dried at room temperature. The slides were stained by Modified Ziehl Neelsen (MZN) staining technique (Current and Garcia, 1991). The intensity of the infection was assessed semi-quantitatively by counting the number of oocysts in 15 randomly selected microscopic fields under oil immersion in direct faecal smears stained by MZN staining technique. The scores were categorized as negative (no oocysts), slight (1 to 5 oocysts), moderate (6 to 10 oocysts) and severe (>10 oocysts). The results were analyzed by Chi-square Test (Snedecor and Cochran, 1967).

Results and Discussion

The overall prevalence of Cryptosporidium spp. in lambs of one day to < 6 months of age group was 38.18%. Prevalence was significantly higher (P< 0.001) in lambs between one day to 1 month (55.77%) than in those between 1 to < 6 months of age (26.20%) (Table 1). Prevalence of 23 to 100% in lambs from different countries has been reported (Olson et al., 1997; Tzipori, 1998; Xiao et al., 1993; Causape et al., 2002; Alonso-Fresan, et al., 2005).

Of the 385 lambs, 60% were diarrhoeic and 40% non-diarrhoeic. Cryptosporidial infection was significantly higher (P<0.01) in diarrhoeic (43.72%) than in the non-diarrhoeic lambs (29.87%) (Table 2). Joachim et al. (2003) reported a higher prevalence of up to 50% in diarrhoeic than in the non-diarrhoeic lambs. The prevalence in herds with > 50 animals was significantly higher (46.15%) as compared to herds with < 50 animals (28.81%) (P<0.001). High prevalence in herds with > 100 animals has been reported (Alonso-Fresan et al., 2005). Statistical analysis revealed correlation between excretion of oocysts and diarrhoea in lambs of one day to < 1 month age group and the probability of presenting diarrhoea was significantly higher (P<0.001) in lambs shedding oocysts (66.67%) than in those not excreting the parasite (33.33%) (Table 3). The prominent clinical symptoms exhibited by the infected lambs were anorexia, dehydration, retarded growth and depression with yellowish-green watery faeces. Similar clinical symptoms have been reported previously (Tzipori et al., 1981; Angus et al., 1982; de Graff et al., 1999). The non-diarrhoeic lambs were apparently healthy.

Table 1: Age-wise prevalence of cryptosporidiosis in lambs.

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>No. of animals examined</th>
<th>+ve Oocyst</th>
<th>-ve Oocyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td>156</td>
<td>87(55.77)</td>
<td>69(44.23)</td>
</tr>
<tr>
<td>&gt; 1</td>
<td>229</td>
<td>60(26.20)</td>
<td>169(73.80)</td>
</tr>
<tr>
<td>Total</td>
<td>385</td>
<td>147(38.18)</td>
<td>238(61.82)</td>
</tr>
</tbody>
</table>

χ²= 34.370*; *P<0.001;
Figures in parentheses indicate percentage.

Table 2: Prevalence of cryptosporidiosis in diarrhoeic and non-diarrhoeic lambs.

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>No. of animals examined</th>
<th>+ve Oocyst</th>
<th>-ve Oocyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhoeic</td>
<td>231</td>
<td>101(43.72)</td>
<td>130(56.28)</td>
</tr>
<tr>
<td>Non-Diarrhoeic</td>
<td>154</td>
<td>46(29.87)</td>
<td>108(70.13)</td>
</tr>
<tr>
<td>Total</td>
<td>385</td>
<td>147(38.18)</td>
<td>238(61.82)</td>
</tr>
</tbody>
</table>

χ²= 7.152*; *P<0.001;
Figures in parentheses indicate percentage.
overcrowding of animals during these seasons. Low prevalence in June (2.4%) and high (22%) in December was reported in calves (Lefay et al., 2000). The season-wise prevalence was higher in diarrhoeic than in the non-diarrhoeic lambs of all age groups under study. Lambs under one month of age seem to be more prone to infections by Cryptosporidium spp. as compared to higher age groups depicting lack of maternal support and with the increase in the age, lambs seem to combat cryptosporidial infections through more organized self defense mechanisms.

The oocyst excretion levels were significantly higher in diarrhoeic than in non-diarrhoeic lambs of all age groups which is indicative of lesser intensity of infection in non-diarrhoeic lambs. Cryptosporidium oocysts have been recovered from clinically healthy as well as infected animals (Current, 1985; Viring et al., 1993; Aranjo-Pap-do et al., 1996). There was a marked decrease in the excretion levels with increase in the age of the animal irrespective of their clinical status. High oocyst excretion levels were recorded in lambs of < 1 month of age with peak shedding levels of moderate to severe scores between 7 to 20 days of age as compared to lambs of > 1 month of age group. The excretions levels were comparatively higher in both diarrhoeic and non-diarrhoeic lambs irrespective of their age during winter/spring than in the summer/autumn seasons. This might be due to environmental, nutritional and immunological stress and also due to presence of increased number of diarrhoeic animals in flocks during these seasons, resulting in contamination of lambing areas. High oocyst excretion in faeces during winter in calves of < 1 month of age has been reported (Joachim et al., 2003).

In the present study, although females were more prone to infection (40.38%) than males (35.59%), there was no significant difference (P<0.001) in the prevalence of cryptosporidial infection in relation to the sex of the animals. Similar observations have been reported previously in calves (Aurich et al., 1990).

The presence of Cryptosporidium spp. in lambs indicates that this protozoan parasite should also be considered in the etiology of lamb with neonatal diarrhoea in Kashmir valley.

| Table 3: Age-wise relationship between cryptosporidiosis and diarrhoea in lambs. |
|-------------|-----------|------------|-------------|
| Age (months) | No. of animals examined | Oocyst + ve | Oocyst - ve |
| < 1 | 87 | 58 (66.67) | 29 (33.33) |
| > 1 | 144 | 43 (29.86) | 101 (70.14) |
| Total | 231 | 101 (43.72) | 130 (56.28) |

\[ \chi^2 = 12.182^*; \quad *P<0.001; \]

Figures in parentheses indicate percentage.

| Table 4: Prevalence of cryptosporidiosis in diarrhoeic and non-diarrhoeic lambs. |
|-------------|-----------|------------|-------------|
| Season | No. of animals examined | Oocyst + ve | Oocyst - ve |
| Winter/Spring | 212 | 99 (46.70) | 113 (53.30) |
| Summer/Autumn | 173 | 48 (27.75) | 125 (72.25) |
| Total | 385 | 147 (38.18) | 238 (61.82) |

\[ \chi^2 = 14.497^*; \quad *P<0.001; \]

Figures in parentheses indicate percentage.

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Reference


Aranjo-Pap-do., Paiva-M-don, G.S., Chaplin, F.I. and Silva-NBS-da. 1996. Occurrence of Cryptospor-


