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Influence of season, age, and sex on morbidity and mortality pattern of neonatal Caprine kids in Tarai and Bhawar areas of Uttarakhand

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Abstract

This study was carried out to determine the morbidity and mortality rate due to common conditions in goat kid's up to the age of three months from the tarai and bhawar areas (Udham Singh Nagar and Nainital) of Uttarakhand. Diagnosis of various conditions was mainly based on history, clinical symptoms, and laboratory investigation of oocysts in case of Coccidiosis. Overall morbidity and mortality rate of 52.63% and 21.05% was observed. Morbidity and mortality rate was comparatively higher in winter season (56.30%, 60.0%) than summer (30.46, 23.46%) and rainy (13.23%, 16.53%). Morbidity rate during 1- 2 months of age (37.53%) was higher than during the first month (36.92%) and 2-3 month (25.53%) where as mortality rate was higher during the first month (42.30%) followed by 1-2 months (34.61%) and 2-3 months age period (23.07%). A higher rate of morbidity and mortality was observed in males (56.53%, and 54%) than females (43.46% and 46%). Coccidiosis was recorded as the major cause of morbidity and mortality followed by pneumonia and kid scours.

Keywords: Neonatal kids, morbidity, mortality, Tarai region, Nainital, Udham Singh Nagar

1. Introduction

Among livestock, goat acts as an essential animal in many areas of the world, where it is kept as a source of meat, milk, manure, and fiber. In many areas of the world especially to marginal and landless farmers, goat has replaced cows due to its higher prolificacy, shorter generation interval, relatively intelligent, independent, and resistant to several infections hence often described as "poor man's cow" [1, 2]. The success of goaterly depends upon the survival of offspring's produced and accordingly the mortality and morbidity of offspring's are of great concern to farmers because it represents an irreversible financial and genetic loss. Neonatal mortality is a principal factor ascertaining the productivity of herd and is also a sensitive index of management efficiency [3]. Mortality in kids occurs due to diseases, managerial faults, or congenital problems. Several factors influence the rate of morbidity and mortality in kids like kidding season, birth weight, milk yield of dam, feeding status of dam during pregnancy, litter size, parity, and occasionally sex of offspring [4]. Among these infectious diseases have been recognized as the major impediments to the economical and profitable rearing of kids and a limiting factor in kid production worldwide. Further, the situation is deteriorated because of indiscriminate and continuous uses of antibacterial drugs which lead to emergence of drug resistance. Comparatively, kids are much susceptible to infections than adults [5]. The major conditions prevailing in kids that halt the growth and development, risks the survival, and often results in death are pneumonia, enteritis, hypothermia, congenital problems, predation, and others. Pneumonia and enteritis are the main causes of mortality in kids [6]. Enteritis is most prevalent condition affecting kids especially those, which are bred under intensive system of breeding [7]. On an average 20% of goat kids, die each year due to different diseases [8]. The tarai and bhawar region of Uttarakhand is suitable for livestock rearing due to its moderate climate, adequate fodder availability and most of the farmers in this region are small, marginal, or landless engaged with goat farming. Goats are allowed to graze during the daytime while kept indoors during the night hours. Knowledge of disease pattern in different seasons and age groups is of immense help in health management to reduce mortality [9]. Therefore, to address the diseases and other health problems and to make the goat farming profitable, the morbidity and mortality pattern of the farm should be known [10]. This study was undertaken, with the objective to record the morbidity and mortality rate of goat kids with respect to season, age, and sex.

2. Material methods

In present study kid's up to the age of 3 months were screened from March 2016 to February 2017 around Udham Singh Nagar and Nainital districts of Uttarakhand. All kids belonging to this region were screened for the presence of clinical signs of different diseases. Kids were initially screened for enteritis, pneumonia, congenital defects, and other miscellaneous conditions. History, clinical signs, and laboratory investigation for Coccidiosis were used a criteria for the diagnosis of these conditions. All the kids showing clinical signs of diarrhea and oocyst per gram (OPG) above 5000/g were included in Coccidiosis [11], while as rest of diarrheic cases were recorded in Kid scours. Those kids having difficulty in breathing, nasal discharge, coughing, inappetance and fever were included in Pneumonia, while as cases like atresia ani or recti, ankylosis of joints, congenital goiter, and knuckling were included in Congenital defects group. Those kids, which were born very weak, having low birth weight and show less growth and development were included in General weakness group. Other cases like dermal infection, abscesses, predation, and sudden death were included in Miscellaneous group. Morbidity and mortality rate was based on season, age, and sex. The calendar year was divided into 3 seasons: Rainy (July to October), winter (November to February), and summer (March to June). The time period was divided into three age groups viz., 0-1 month, 1-2 months, and 2-3 months. Sex of the kids was also taken into consideration.

2.1 Morbidity rate

Morbidity rate (%) was calculated by dividing the total number of diseased cases with total kids screened.

$$\text{Morbidity Rate (\%)} = \frac{\text{Total diseased kids}}{\text{Total kids screened}} \times 100$$

2.2 Mortality rate

Mortality rate (%) was calculated by dividing the total number of kids died with total kids screened.

$$\text{Mortality rate (\%)} = \frac{\text{Total kids died}}{\text{Total kids screened}} \times 100$$

Morbidity and Mortality rate was also individually calculated for each cause like Coccidiosis, Kid scours, Pneumonia, General weakness, Congenital defects, and Miscellaneous group with respect to season, age, and sex.

2.3 Statistical analysis

The data were analyzed by applying Chi-square test using SPSS 11.0 software.

3. Results and discussion

3.1 Morbidity rate

Out of total 1235 kids screened, 650 were suffering from various disorders, recording an overall morbidity rate of 52.63%. Contrasting results to the present findings were reported by earlier works [8, 12]. Coccidiosis with morbidity rate of 39.07% (254/650) was the major condition affecting kids followed by Pneumonia as 34.0% (221/650), Kid scours as 17.38% (113/650), General weakness as 5.84% (38/650), Miscellaneous causes as 2.61% (17/650) and Congenital defects as 1.07% (7/650) as shown in table 1. Our findings are in association with Parvez [13] and Alam [14] who also reported parasitic infections as the major cause of morbidity in goats.

The chi-square analysis showed that a significant ($P < 0.05$) difference in morbidity in different seasons was observed. As shown in table 1 maximum morbidity rate of 56.30% (366/650) was recorded during winter followed by summer with 30.46% (198/650) and lowest during rainy season with 13.23% (86/650). Lowest morbidity rate during rainy season in present study might be due to lesser number of kidding in this particular season. However, our findings are in contrast to earlier reports of higher morbidity rate in rainy season (72.37%) than in winter season (52.40%) and summer season (41.50%) [4]. The higher morbidity during winter season in our study may be due to increased number of kids born during this particular season so that it becomes difficult to handle and manage such a large number of kids. Unhygienic housing conditions and reduced availability of feed, which leads to less milk availability to kids, also increases morbidity. Also in winter season kids are more confined to house making them more prone to infection. Highest rate of Coccidiosis was reported mainly during winter season followed by summer and least in rainy season with morbidity rate of 54.72% (139/254), 32.67% (83/254) and 12.59% (32/254) respectively. In kid scours morbidity rate of 60.17% (68/113), 28.31% (32/113) and 11.50% (13/113) was seen in winter, summer and rainy season respectively. In case of Pneumonia, morbidity rate of 59.27% (131/221), 29.41% (65/221) and 11.31% (25/221) was seen in winter, summer and rainy season respectively.

During summer season, overall morbidity rate of 30.46% was recorded. During this season Coccidiosis was the major cause of morbidity (41.91%) followed by Pneumonia (32.82%), Kid scours (16.16%), General weakness (7.07%), Miscellaneous (1.51%) and Congenital defects (0.50%). During rainy season, overall morbidity of 13.23% was observed. Coccidiosis (37.20%) was found as the major cause of morbidity followed by Pneumonia (29.06%) Kid scours (15.11%), General weakness (10.46%), Miscellaneous (6.97%) and Congenital defects (1.16%). During winter season, overall morbidity of 56.30% was recorded. Coccidiosis was found as the major cause of morbidity (37.97%) followed by pneumonia (35.79%), Kid scours (18.57%), General weakness (4.09%), Miscellaneous (2.18%) and Congenital defects (1.36%).

3.2 Age wise Morbidity

A significant ($P < 0.05$) difference in morbidity with respect to different age groups was observed. Maximum morbidity was observed during 1-2 months (37.53%) of age followed by 0-1 months age group (36.92%) then 2-3 months of age (25.53%) as shown in table 1. Maximum rate of Coccidiosis was reported mainly during 1-2 months of age as 44.88% (114/254) while as kid scours was reported mainly from birth up to 1 month of age as 47.78% (54/113). Higher rate of Pneumonia was observed during 1-2 months of age as 38.46%, (85/221) and general weakness from birth to 1 month as 68.42% (26/38). Similar findings were reported by earlier workers [6]. From birth to 1 month of age Coccidiosis (35.83%) was the major cause followed by Pneumonia (26.25%), Kid scours (22.5%), General weakness (10.83%), and Miscellaneous causes (1.66%). During 1 - 2 months of age, 46.72% suffer from Coccidiosis followed by Pneumonia (34.83%), Kid scours (13.11%), General weakness (3.27%), and Miscellaneous causes (2.04%). During 2-3 months of age Pneumonia (43.97%) was the major cause of morbidity followed by Coccidiosis (32.53%), Kid scours (16.26%), Miscellaneous (4.81%), and General weakness (2.4%).

3.3 Sex wise Morbidity

Analysis by chi-square showed that no significant ($P<0.05$) difference was observed in morbidity with respect to sex. A comparatively higher rate of morbidity was recorded in males (54%) than in females (46%) as shown in table 1. Prevalence of Coccidiosis in males and females were (40.74% and 37.12%), Kid scours (16.80% and 18.06%), Pneumonia

(34.18% and 33.77%), General weakness (4.27% and 7.69%), Congenital defects (1.42% and 0.66%) and Miscellaneous (2.56% and 2.67%) respectively. Our findings are in contrast with earlier findings of higher mortality in females than males [15]. There is not any major sex predilection with respect to occurrence of disease recorded in present study, but it may be due to increased number of males born than females.

Table 1: Pattern of Morbidity rate by various affections of Kids in different Seasons, Age, and Sex

Type of affection	Season			Age			sex		Total
	Summer	Rainy	winter	1 month	1-2 month	2-3 month	Male	Female	
Coccidiosis	83 (41.91%)	32 (37.20%)	139 (37.97%)	86 (35.83%)	114 (46.72%)	54 (32.53%)	143 (40.74%)	111 (37.12%)	254 (39.07%)
Kid scours	32 (16.16%)	13 (15.11%)	68 (18.57%)	54 (22.5%)	32 (13.11%)	27 (16.26%)	59 (16.80%)	54 (18.06%)	113 (17.38%)
Pneumonia	65 (32.82%)	25 (29.06%)	131 (35.79%)	63 (26.25%)	85 (34.83%)	73 (43.97%)	120 (34.18%)	101 (33.77%)	221 (34.0%)
General weakness	14 (7.07%)	9 (10.46%)	15 (4.09%)	26 (10.83%)	8 (3.27%)	4 (2.4%)	15 (4.27%)	23 (7.69%)	38 (5.84%)
Congenital defects	1 (0.50%)	1 (1.16%)	5 (1.36%)	7 (2.91%)	0	0	5 (1.42%)	2 (0.66%)	7 (1.07%)
Miscellaneous	3 (1.51%)	6 (6.97%)	8 (2.18%)	4 (1.66%)	5 (2.04%)	8 (4.81%)	9 (2.56%)	8 (2.67%)	17 (2.61%)
Total	198 (30.46%)	86 (13.23%)	366 (56.30%)	240 (36.92%)	244 (37.53%)	166 (25.53%)	351 (54.0%)	299 (46.0%)	650 (100%)
χ^2	16.24			54.03			4.78		
Significance	**			**			ns		

3.4 Overall Mortality rate

Out of 1235 kids screened during the study period, 260 kids died recording an overall mortality rate of 21.05%. Maximum mortality was reported by Coccidiosis (39.61%) followed by Pneumonia (30.76%), Kid scours (18.46%), Miscellaneous (5.76%), General weakness (4.61%), and Congenital defects (0.76%) as shown in table 2.

3.5 Season wise Mortality

The chi-square analysis showed that a significant ($P<0.05$) difference in mortality in different seasons was observed. With respect to season, overall mortality rate was highest during winter season (60.0%) followed by summer (23.46%) and rainy season (16.53%) as shown in table 2. During summer season, the main cause of mortality was Coccidiosis (47.54%) followed by Kid scours (19.67%), General weakness (11.47%), Pneumonia (9.83%), Miscellaneous (9.83%), and congenital defects (1.63%). During rainy season maximum mortality occurred by Coccidiosis (51.16%) followed by Pneumonia (18.60%), Kid scours (16.27%), Miscellaneous (9.30%), and General weakness (4.65%). During winter season maximum mortality occurred by Coccidiosis (33.33%) followed by pneumonia (42.30%), kid scours (18.58%), miscellaneous (3.20%), general weakness (1.92%), and congenital defects (0.64%). Other studies reported a higher mortality rate in rainy season [16]. Proportionately higher mortality rate during winter season in present study might be due to climate fluctuations, less availability of feed and fodders and increased pathogen attacks. In addition, kidding time fall in this particular season.

3.6 Age wise Mortality

A significant ($P<0.05$) difference in mortality with respect to different age groups was observed. Maximum mortality was

observed from birth to 1-month age period (42.30%) followed by 1-2 months (34.61%) and comparatively lesser mortality was recorded during 2-3 months (23.07%) of age period as shown in table 2. Highest mortality rate of 45.63% (47/103) due to Coccidiosis was recorded during 1-2 months of age, while as highest mortality rate of 54.13% (26/48) due to kid scours was recorded in 0-1 month of age. Highest mortality rate of 46.25% (37/80) due to Pneumonia was recorded during 0-1 month age period.

During first month age period, Pneumonia (33.63%) was the major cause of mortality followed by Coccidiosis (28.18%), Kid scours (23.63%), Miscellaneous (7.27%), General weakness (5.45%), and Congenital defects (1.81%). During 1-2 months age group Coccidiosis (52.22%) was the major cause of mortality followed by Pneumonia (24.44%), Kid scours (15.55%), Miscellaneous (4.44%), and General weakness (3.33%). During 2-3 months period, Coccidiosis (41.66%) was the major cause of mortality followed by Pneumonia (35.0%), Kid scours (13.33%), General weakness (5.0%), and Miscellaneous (5.0%).

3.8. Sex wise Mortality

Analysis by chi-square test showed that no significant ($P<0.05$) difference was observed in mortality with respect to sex. Although a higher rate of mortality was observed in males (56.53%) than females (43.46%). In males major cause of mortality was Coccidiosis (39.45%) followed by Pneumonia (29.93%), Kid scours (20.40%), Miscellaneous (6.80%), General weakness (2.7%) and congenital defects (0.68%). In females, Coccidiosis (39.82%) was the major cause of mortality followed by Pneumonia (31.85%), Kid scours (15.92%), General weakness (7.07%), Miscellaneous (4.42%), and Congenital defects (0.88%). The present findings are very well supported by earlier works [17, 18] where as contradictory results were reported by other workers [19].

Table 2: Pattern of Mortality rate in various affections of kids in different seasons, age, and sex

Type of affection	Season			Age (months)			Sex		Total
	Summer	Rainy	winter	0-1 month	1-2 months	2-3 months	Male	Female	
Coccidiosis	29 (47.54%)	22 (51.16%)	52 (33.33%)	31 (28.18%)	47 (52.22%)	25 (41.66%)	58 (39.45%)	45 (39.82)	103 (39.61%)
Kid scours	12 (19.67%)	7 (16.27%)	29 (18.58%)	26 (23.63%)	14 (15.55%)	8 (13.33%)	30 (20.40%)	18 (15.92)	48 (18.46%)
Pneumonia	6 (9.83%)	8 (18.60%)	66 (42.30%)	37 (33.63%)	22 (24.44%)	21 (35.0%)	44 (29.93%)	36 (31.85)	80 (30.76%)
General weakness	7 (11.47%)	2 (4.65%)	3 (1.92%)	6 (5.45%)	3 (3.33%)	3 (5.0%)	4 (2.7%)	8 (7.07)	12 (4.61%)
Congenital defects	1 (1.63%)	0	1 (0.64%)	2 (1.81%)	0	0	1 (0.68%)	1 (0.88)	2 (0.76%)
Miscellaneous	6 (9.83%)	4 (9.30%)	5 (3.20%)	8 (7.27%)	4 (4.44%)	3 (5.0%)	10 (6.80%)	5 (4.42)	15 (5.76%)
Total	61 (23.46%)	43 (16.53%)	156 (60.0%)	110 (42.30%)	90 (34.61%)	60 (23.07%)	147 (56.53%)	113 (43.46%)	260 (100%)
χ^2	35.72			15.98			4.06		
Significance	**			**			ns		

4. Conclusion

On average 52.63% morbidity and 21.05% mortality was observed in kids. Coccidiosis and pneumonia were the major causes of morbidity and mortality, so hygienic and improved conditions should be taken to reduce mortality and morbidity. The highest morbidity and mortality was observed in winter season, 0-1 month age group, so particular and necessary care should be taken during this particular time period. Although, morbidity and mortality rate in males is more than females but is not significant. From this study, it is clear that kid morbidity and mortality attributed to significant economic losses which can be alleviated by taking appropriate therapeutic and management steps during that particular time.

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