CHAPTER- 4

**RESULTS**

**4.1 Prevalence of ruminal acidosis**

**4.1.1 Overall prevalence of ruminal acidosis in cattle and goat**

In the entire period of observation in two temporal phases, 609 ruminant animals were recorded of which 16 were identified with ruminal acidosis indicating the overall prevalence 2.6% in ruminant **(Table 2).**

|  |  |  |
| --- | --- | --- |
| **Total no. of animal recorded** | **No. of animal affected with ruminal acidosis** | **Prevalence (%)** |
| 609 | 16 | 2.6 |

**Table 2:** The overall prevalence of ruminal acidosis in cattle and goat

**4.1.2 Prevalence of ruminal acidosis in different species**

**Table 3** shows the prevalence of ruminal acidosis in different species. There were found different prevalence among the cattle and goat, these were 4.04% in cattle and 1.9% in goat, this difference was not statistically significant (p = 0.11).

**Table 3:** Prevalence of ruminal acidosis in different species

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Species** | **No. of positive cases** | **No. of negative cases** | **Total cases** | **Prevalence (%)** | **X2 Value** | **p-value** |
| Cattle | 8 | 190 | 198 | 4.04 | 1.55 | 0.11 |
| Goat | 8 | 403 | 411 | 1.9 |
|  |

**4.1.3 Prevalence of ruminal acidosis according to sex in cattle and goat**

**Table 4** shows the prevalence of ruminal acidosis in two different sexes in cattle and goat. There was found no difference in prevalence of ruminal acidosis between male and female cattle (50% in both male and female). Higher prevalence of ruminal acidosis was noticed in male goat (62.5%).

**Table 4:** Prevalence of ruminal acidosis according to sex in cattle and goat

|  |  |  |
| --- | --- | --- |
|  | **Cattle** | **Goat** |
| Total cases | 8 | 8 |
| No. of male | 4 | 5 |
| Prevalence in male (%) | 50 | 62.5 |
| No. of female | 4 | 3 |
| Prevalence in female (%) | 50 | 37.5 |

**4.1.4 Prevalence of ruminal acidosis based on breeds of cattle and goat**

There were found higher prevalence of ruminal acidosis in ND cattle and BBG in comparison with HF cross breed cattle and Jamunapari goat, respectively. The prevalence of ruminal acidosis was 67.5% in both ND cattle and BBG and 37.5% in both HF cross breed cattle and jamunapari goat **(Table 5).**

**Table 5:** Prevalence of ruminal acidosis based on breeds of cattle and goat

|  |  |
| --- | --- |
|  **Cattle** | **Goat** |
| Total cases | 8 | Total cases | 8 |
| No. of ND cattle | 5 | No. of BBG | 5 |
| Prevalence in ND cattle (%) | 62.5 | Prevalence BBG (%) | 62.5 |
| No. of HF cross breed | 3 | No. of Jamunapari goat | 3 |
| Prevalence HF cross breed (%) | 37.5 | Prevalence in Jamunapari goat (%) | 37.5 |

**4.1.5 Prevalence of ruminal acidosis in different age groups of cattle and goat**

There were found higher prevalence of ruminal acidosis in > 2 year’s cattle and < 1$\frac{1}{2}$ year’s goats. These were 62.5% in > 2 year’s cattle and 75% in < 1$\frac{1}{2}$ year’s goat’s, respectively **(Table 6).**

**Table 6:** Prevalence of ruminal acidosis in different age groups of cattle and goat

|  |  |
| --- | --- |
| **Cattle** | **Goat** |
| Total cases | 8 | Total cases | 8 |
| No. of cases in < 2 years | 3 | No. of cases in < 1$\frac{1}{2}$ years | 6 |
| Prevalence in < 2 years (%) | 37.5 | Prevalence in < 1$\frac{1}{2}$ years | **75** |
| No. of cases in >2 years | 5 | No. of cases in >1$\frac{1}{2}$ years | 2 |
| Prevalence in >2 years (%) | **62.5** | Prevalence in >1$\frac{1}{2}$ years | 25 |

**4.2 Analysis of different parameters on ruminal acidosis**

**4.2.1 Analysis of temperature, rumen motility, ruminal fluid pH, serum pH and serum Ca**

The mean, temperature, rumen motility per 5 minutes, rumen fluid pH and serum pH of the cattle affected with ruminal acidosis were 101.06 $\pm $ 1.24$℉$, 3.25$\pm $ 2.6, 5.01$\pm $ 0.63 and 7.16$\pm $ 0.23 respectively with range (Min-Max) 99.5-103$℉$, 0-7 per 5minutes, 4.2-6 and 6.8-7.4 respectively. These parameters in case of goat were 103.01±1.14$℉$, $4\pm 2.2$ per 5 minutes, 4.9$\pm $0.63 and 7.16$\pm $0.2 respectively with range (Min-Max) 101-105$℉, 1-7 $per 5 minutes, 4-5.8 and 6.8-7.4 respectively. In addition the mean serum calcium level of goat was 9.09$\pm $1.26 mg/dl with range (Min-Max) 7.65-11.32 mg/dl **(Table 7).**

**Table 7:** Analysis of temperature, rumen motility, ruminal fluid pH, serum pH and serum calcium of cattle and goat

|  |  |  |
| --- | --- | --- |
| **Species** | ***Cattle*** | ***Goat*** |
| **Variables** | **Mean** $\pm $**std.** | **Range****(Min – Max)** | **Mean** $\pm $**std.** | **Range****(Min – Max)** |
| Temperature ($℉$) | 101.06$\pm 1.24$ | 99.5 – 103 | 103.01±1.14 | 101 – 105 |
| Rumen motility (per 5 minutes) | 3.25$\pm 2.60$ | 0 – 7 | $$4\pm 2.20$$ | 1 – 7 |
| Ruminal fluid pH | 5.01$\pm 0.63$ | 4.2 – 6 | 4.9$\pm $0.63 | 4 – 5.8 |
| Serum pH | 7.16$\pm 0.23$ | 6.8 – 7.4 | 7.16$\pm $0.20 | 6.8 – 7.4 |
| Serum calcium(mg/dl) | - | - | 9.09$\pm $1.26 | 7.65 – 11.32 |

**4.2.2 Analysis of risk factors involved in occurrence of ruminal acidosis**

Both cattle and goat highest prevalent risk factor if feeding of cooked rice. Cooked rice was a risk factor in 50% cases in cattle and 62.5% cases in goat **(Table 8).**

**Table 8:** Analysis ofrisk factors involved in occurrence of ruminal acidosis in cattle and goat

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Species** | **Variables** | **Categories** | **No. of cases** | **Percentage (%)**  | **95% CI** |
| cattle | Feed that Predispose the Ruminal acidosis | Cooked rice | 4 | **50** | 5.31 – 94.7 |
| Potato | 1 | 12.5 | 17.05 – 42.05 |
| Jackfruit residue | 1 | 12.5 | 17.05 – 42.05 |
| Bread | 1 | 12.5 | 17.05 – 42.05 |
| Palm | 1 | 12.5 | 17.05 – 42.05 |
| Goat | Feed that predispose the Ruminal acidosis | Cooked rice | 5 | **62.5** | 19.2 – 105.7 |
| Rice gruel | 2 | 25 | 13.7 – 63.7 |
| Bread | 1 | 12.5 | 17.05 – 42.05 |

**Note:** CI = Confidence interval

**4.2.3 Analysis of clinical signs of ruminal acidosis**

In terms of clinical signs, there were found moderate dehydration in most of the cases (62.5%) and in few cases there were found mild dehydration, the lowest percentage showed severe dehydration in both cattle and goat. Anuria was present 37.5% cases in cattle and 50% cases in goat. About 75% cases the abdomen size was normal and 25% cases the abdomen was distended in both species. There were found higher percentage of cases with nasal discharge (37.5%) in comparison with goat (12.5%). Lameness was present only one case (12.5%) in cattle and no lameness was found in goat **(Table 9).**

**Table 9:** Analysis of clinical signs involved in ruminal acidosis in cattle and goat

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Species** | **Variables** | **Categories** | **No. of cases** | **Percentage (%)**  | **95% CI** |
| Cattle | Feeding habit | Anorexia | 3 | 37.5 | 5.7 – 80.7 |
| Off fed | 5 | 62.5 | 19.2 – 105.7 |
| Dehydration | Mild | 5 | 62.5 | 19.2 – 105.7 |
| Moderate | 2 | 25 | 13.7 – 63.7 |
| Severe | 1 | 12.5 | 17.05 – 42.05 |
| Diarrhoea | Present  | 4 | 50 | 5.31 – 94.7 |
| Absent | 4 | 50 | 5.31 – 94.7 |
| Urination | Present  | 3 | 37.5 | 5.7 – 80.7 |
| Absent | 5 | 62.5 | 19.2 – 105.7 |
| Abdomen size | Normal | 6 | 75 | 36.2 – 113.7 |
| Distended | 2 | 25 | 13.7 – 63.7 |
| Nasal discharge | Present  | 3 | 37.5 | 5.7 – 80.7 |
| Absent | 5 | 62.5 | 19.2 – 105.7 |
| Lameness | Present | 1 | 12.5 | 17.05 – 42.05 |
| Absent | 7 | 87.5 | 57.9 – 117.05 |
| Goat | Feeding habit | Anorexia | 4 | 50 | 5.31 – 94.7 |
| Off fed | 4 | 50 | 5.31 – 94.7 |
| Dehydration | Mild | 2 | 25 | 13.7 – 63.7 |
| Moderate | 5 | 62.5 | 19.2 – 105.7 |
| Severe  | 1 | 12.5 | 17.05 – 42.05 |
| Diarrhoea | Present  | 4 | 50 | 5.31 – 94.7 |
| Absent | 4 | 50 | 5.31 – 94.7 |
| Urination | Present  | 4 | 50 | 5.31 – 94.7 |
| Absent | 4 | 50 | 5.31 – 94.7 |
| Abdomen size | Normal | 6 | 75 | 36.2 – 113.7 |
| Distended | 2 | 25 | 13.7 – 63.7 |
| Nasal discharge | Present  | 1 | 12.5 | 17.05 – 42.05 |
| Absent | 7 | 87.5 | 57.9 – 117.05 |
| Lameness | Present | 0 | 0 | - |
| Absent | 8 | 100 | - |

**4.2.4 Analysis of rumen fluid in ruminal acidosis**

In terms of rumen fluid examination, there was found rumen microflora movement dramatically reduced in both species (87.5% in cattle, 75% in goat). In most of cases the color of rumen fluid was milky grey (62.5% in cattle and 37.5% in goat). The consistency of rumen fluid were found thick watery 50% cases in cattle and watery in 37.5% cases in goat. Most of the cases (87.5%) the odor of the rumen fluid were sour in both species **(Table 10).**

**Table 10:** Analysis of rumen fluid in ruminal acidosis in cattle and goat

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Species** | **Variables** | **Categories** | **No. of cases** | **Percentage (%)**  | **95% CI** |
|  Cattle | Rumen microflora movement | Present | 1 | 12.5 | 17.05 – 42.05 |
| Absent | 7 | **87.5** | 57.9 – 117.05 |
| Color of Rumen fluid  | Greenish | 2 | 25 | 13.7 – 63.7 |
| Greenish brown | 1 | 12.5 | 17.05 – 42.05 |
| Milky grey | 5 | **62.5** | 19.2 – 105.7 |
| Consistency of Rumen fluid | Watery | 2 | 25 | 13.7 – 63.7 |
| Thick watery  | 4 | **50** | 5.31 – 94.7 |
| Gruel like | 2 | 25 | 13.7 – 63.7 |
| Odor of Rumen fluid | Sour | 7 | **87.5** | 57.9 – 117.05 |
| Pungent | 1 | 12.5 | 17.05 – 42.05 |
| Goat | Rumen microflora movement | Present | 2 | 25 | 13.7 – 63.7 |
| Absent | 6 | **75** | 36.2 – 113.7 |
| Color of Rumen fluid  | Greenish | 3 | 37.5 | 5.7 – 80.7 |
| Greenish brown | 2 | 25 | 13.7 – 63.7 |
| Milky grey | 3 | 37.5 | 5.7 – 80.7 |
| Consistency of Rumen fluid | Watery | 3 | 37.5 | 5.7 – 80.7 |
| Thick watery  | 2 | 25 | 13.7 – 63.7 |
| Gruel like | 3 | 37.5 | 5.7 – 80.7 |
| Odor of Rumen fluid | Sour | 7 | **87.5** | 57.9 – 117.05 |
| Pungent | 1 | 12.5 | 17.05 – 42.05 |

**4.2.5 Rumen fluid and blood pH of different cases in relation with duration of illness**

**Table 11:** Rumen fluid and blood pH of different cases in relation with duration of illness in cattle

|  |  |  |  |
| --- | --- | --- | --- |
| **Case no.** | **Duration of illness (Hours)** | **Rumen fluid pH** | **Blood pH (From Serum)** |
| 1 | 24 | 5.2 | 7.1 |
| 2 | 16 | 4.5 | 7.4 |
| 3 | 30 | 5.8 | 7.0 |
| 4 | 15 | 4.6 | 7.4 |
| 5 | 20 | 4.8 | 7.2 |
| 6 | 28 | 5.0 | 7.0 |
| 7 | 48 | 6.0 | 6.8 |
| 8 | 12 | 4.2 | 7.4 |

**Table 12:** Rumen fluid and blood pH of different cases in relation with duration of illness in goat

|  |  |  |  |
| --- | --- | --- | --- |
| **Case no.** | **Duration of illness (Hours)** | **Rumen pH** | **Blood pH (From serum)** |
| 1 | 48 | 5.5 | 6.8 |
| 2 | 72 | 5.8 | 7.0 |
| 3 | 40 | 5.2 | 7.2 |
| 4 | 16 | 4.2 | 7.4 |
| 5 | 24 | 4.5 | 7.3 |
| 6 | 17 | 4.0 | 7.4 |
| 7 | 32 | 5.0 | 7.1 |
| 8 | 21 |  5.0 | 7.2 |

The rumen fluid pH is lowest at 12 hours later of onset of illness in cattle and at 17 hours later of onset of illness in goat and highest at 48 hours in cattle and 72 in goat. On the other hand blood pH lowest at 48 hours later onset of illness in both cattle and goat. As increase the duration of illness the ruminal pH increase and serum pH decrease gradually **(Table 11 and Table 12).**

An important findings of this study is that there were found a positive correlation between the duration of illness of different cases and ruminal fluid pH (i.e an increase in the duration of illness also increase the ruminal fluid pH up to the certain level) and a negative correlation between the duration of illness and serum pH (i.e an increase in the duration of illness results decrease the serum pH up to a certain level). These correlations in case of cattle and goats are plotted in **Fig. 14 and Fig. 15.**

 pH

Duration of illness (Hours)

**Fig. 14:** Changes in rumen and blood pH in relation with time elapse after onset of illness in

 cattle.

 pH

Duration of illness (Hours)

**Fig. 15:** Changes in rumen and blood pH in relation with time elapse after onset of Illness in

 goat.

**4.2.6 Response to treatment**

**Table 13:** Response to treatment of different groups of animals in different treatments

|  |  |  |  |
| --- | --- | --- | --- |
| **Groups** | **No. of animals** | **Treatment strategy** | **Number of recovered animals (within days)** |
| **Day 1** | **Day 2** | **Day 3** | **Day 4** | **Day 5** | **Day 6** | **Day 7** | **Day 8** |
| A | 4 | Ruminal Alkalizer | - | - | - | 1 (25%) | 1 (25%) | 2(50%) | 2(50%) | **4****(100%)** |
| B | 2 | Ruminal Alkalizer+ purgative | - | - | - | 1 (50%) | 1 (50%) | 1(50%) | 2(100%) | - |
| C | 2 | Systemic alkalizer+ fluid | - | - | 1(50%) | 1 (50%) | 1 (50%) | 2(100%) | - | - |
| D | 8 | Ruminal and systemic alkalizer+ fluid | - | - | **5****(62.5%)** | 6 (75%) | **8** **(100%)** | - | - | - |

Among the 4 types of treatment to different groups, the group ‘D’ cases were responding quickly than other groups. The highest percentage (62.5%) of recovery rate was observed in ‘D’ group animals within third day and 100% recoveries were observed within 5 days in ‘D’ group. Other groups were taken more than 5 days for 100% recovery. So treatment with ruminal and systemic alkalizer along with fluid therapy were more effective for ruminal acidosis than other treatment group.