**CHAPTER-I**

**INTRODUCTION**

Ruminant is the most important component of the domesticated animals and suffers from various infectious and non-infectious diseases. Among which digestive disorder or anorexic condition of the large and small ruminants is the most common problem in Bangladesh which hamper proper growth and production of animals. A good rumen environment and microbial activity are the most important factors for good digestion and metabolism and ultimately for better production of the animal.

The inhabitants of rumen microbial eco-system is a complex consortium of different microbial groups living in symbiotic relationship with the host, act synergistically for the bioconversion of lignocellulosic feeds into volatile fatty acids which serves as a source of energy for the animals (Kamra, 2005).

This rumen environment consists of mainly rumen fluid and rumen microflora. The different physical and biochemical parameters of the rumen fluid e.g. color, odor, consistency, pH, motility, and number of rumen microflora are closely related with rumen environment, digestion and proper metabolism of ruminant. Digestion in rumen is solely dependent upon microbial activity and physiological parameters of rumen fluid (Cristine and Pugh, 1998).

Any alteration in rumen physiology causes digestive disorder. Therefore examination of these parameters such as- pH, color, and odor, consistency of rumen fluid and motility and number of rumen protozoa are the important indicator of the anorexia, reduced feed intake and other digestive disorder of animal. Marked reduction in the motility of rumen protozoa could be due to low intracellular and environmental pH and high atonicity of the rumen encountered in lactic acidotic animals (Basak, *et. al.*, 1993).

Micronutrients (mineral) of feed play an important role in nutrient utilization, growth and production. These are integral constituents of several enzymes of living organisms. Mineral sufficient feed are utilized very efficiently. The imbalance of minerals not only impairs mineral utilization but may also alter rumen environment, reproduction and health status of animals leading to their lower productivity. Mineral status of feeds and fodder are influenced by soil and environmental condition (Cristine and Pugh, 1998).

The rumen microbes have specific requirements for both macro and micro minerals to meet the needs of structural components of cell and for components of enzymes and co-factors. Little is known about the requirement of mineral for rumen microbial population and as a thumb rule it is accepted that if the animal is not deficient then it is unlikely that the rumen microbes will be deficient ( Hungate, 1966).

Blood parameters are highly affected by rumen dysfunction. In rumen dysfunction, the microbial activity and biochemical processes get upset. Resultant outcome is the formation of abnormal toxic products of metabolism. The physical, microbial and biochemical alteration in the rumen can therefore be considered as important diagnostic tools for any number disorder of rumen (Chakrabarty, 1996). Ruminal dysfunction is the most common physiological disordered of ruminants. In Bangladesh ruminants also suffer from different digestive disorders and caused heavy losses every year. Previous study shows that the prevalence of digestive disorder in ruminants is more than other disease and it is about 47.05% where parasitic infection only 26.79% and infectious disease 7.84% (Pallab, *et. al.*, 2012).Although these types of disorder are the most common in Bangladesh, there are limited studies on digestive disorder of ruminant especially goat. Therefore, the present study was undertaken with the following objectives.

* To study the physical parameters of rumen fluid (e.g. color, odor, consistency, pH) clinically affected goat.
* To study the motility and counting of rumen protozoa in rumen fluid in relation with indigestion.
* To study the status of selective biochemical parameters (phosphorus, glucose, potassium, sodium, chloride, total protein) in rumen fluid and blood during rumen dysfunction.
* To study hematological parameters in blood of affected goats.

CHAPTER-II

**REVIEW OF LITERATURE**

**Physical parameters of Rumen fluid:**

Indigestion is clinically characterized by anorexia, lack of rumen movement and changes of pH of rumen contents and finally rumination ceases (Blood, *et. al.*, 1989).

The rumen microbial ecosystem is complex and responsible for the bioconversion of lignocellulosic feeds into volatile fatty acids. High pH values observed when putrefaction of protein is occurring in the rumen or if the sample is mixed with saliva (Blood, *et al.,* 1989). Excessive alkaline pH (7.5 to 9.5) will inhibit the contraction power of rumen and causes digestive disorder. When pH exceeds 7.5 there are decreases in the number of rumen flora (Chakrabarty, 1996).

As the pH falls below 6, the salts of volatile fatty acids convert into free acid forms and provide some buffering. The marked and prolonged depression of rumen pH seen in later stages must have been due to increased lactic acid concentration which in turn converts carbonate and bicarbonate into carbonic acid and it farther dissociates to water and carbon di-oxide. Thus, the absorption of lactic acid reduces the body’s reserves of bicarbonates leading to acidosis (Dunlop, 1972). High lactic acid concentration in rumen decreases the rumen pH 5 or less lead to destroying of cellulytic bacteria and protozoa. The microscopic examination of a few drops rumen fluid on a glass slide (with a cover slip) at low power will reveal the absence of rumen protozoa which is a reliable indication of an abnormal state of the rumen, usually acidosis.

There is a great correlation between pH of rumen fluid and motility and number of rumen protozoa. Change of pH, due to any abnormal condition of rumen causes the great changes of protozoal motility and total count. The different value of pH in different disordered condition of rumen which causes anorexia is given below (Hungate, *et. al.,* 1952).

|  |  |
| --- | --- |
| **Condition** | **pH** |
| Normal | 6.3 to 7.0 |
| Simple indigestion | 5.6 to 7.2 |
| Acid indigestion | 4.0 to 5.8 |
| Alkaline indigestion | 7.3 to 8.5 |

Ruminant feeding with high concentrate diets results in lowering of rumen pH below 6.0 with a marked decrease in protozoal concentration (Dehority and Scott, 1967).

In rumen analysis, anorexia may cause the fluid to appear darker, increase pH that related with decreased the number and motility of protozoa. A gray color, low pH and dead or no protozoa are seen in ruminal acidotic animal from grain overload (Cristine and Pugh, 1998).

Normal rumen fluid color is variable between yellowish brown to greenish. It may be changed with nature of feeds and different abnormal condition of the rumen (Chakrabarty, 1996).

|  |  |
| --- | --- |
| **Condition** | **Color** |
| Green fodder/grass | Pure green to greenish olive color |
| Straw | Yellowish brown color |
| Acid indigestion | Milky grey in color |
| Alkaline indigestion | Dark brown |
| Impaction | Greenish back |
| Blot | Greyish green |

Odor of the rumen fluid depends on the condition of rumen. Abnormal conditions of rumen yield different odor.

|  |  |
| --- | --- |
| **Condition** | **Odor** |
| Healthy | Aromatic, vinegar like |
| Acid indigestion | Pungent and sour |
| Subacute indigestion or protein over feeding | Putrid and fishy |
| Alkaline indigestion | Amoniacal smell |

Normal consistency of the rumen fluid is watery or slightly viscous and varied with the conditions (Srinivasan and Gnanaprakasan, 1990).

|  |  |
| --- | --- |
| **Conditions** | **Consistency** |
| Normal | Watery or slightly viscous |
| Acidosis | Poridge or gruel like or watery |
| Impaction | Hard caked, Scanty |
| Frothy-bloat | Foaming |
| Alkalosis | Variable /sometimes watery |
| Vagus indigestion | Semi-liquid |

Changes in ruminal pH alter the numbers and growth of rumen protozoa. Feeding of high concentrates diets with a corresponding marked decrease in rumen pH is commonly thought to essentially eliminate the protozoa (Purser and Moir, 1959)

**Biochemical parameters of rumen fluid**:

Kamra (2005) revealed that the efficiency of ruminants to utilize such a wide variety of feeds is due to highly diversified rumen microbial ecosystem consisting of bacteria (1010-1011)cells/ml representing more than 50 genera, ciliate protozoa(104-106/ml) from 25 genera, anaerobic fungi (103-105) zoospores/ml representing 5 genera and bacteriophages (108-109/ml).The ecosystem is dynamic as the microbial population changes considerably on change of diet so as to adapt it to the new feed ingredients.

Little is known about the requirement of minerals for rumen microbial population and as a thumb rule it is accepted that if the animal is not deficient then it is unlikely that the rumen microbes will be deficient. Generally either no mineral supplements are used or a mixture is given salt licks (McDowell, *et. al.*, 1983) or as molasses suitably fortified with minerals (Kunju, 1986).

However, more is known about the requirements of microbes for sulfur, phosphorus, magnesium and cobalt (Durand and Komisarczuk, 1988). As with any deficiency of a nutrient, a mineral deficiency for rumen microorganism is first reduced growth rate of microbes with or without decrease in digestibility become more extreme the digestibility of forage must decrease along with the decrease in microbial pool size and it is only than feed intake will decrease. Correlation of the deficiency will obviously have reverse effect.

The mineral requirement of rumen microbes is normally considered to be fulfilled when the requirement of the animal is met. However, microbial growth in the rumen is dependent on the availability of major mineral as well as trace mineral in the rumen to allow for normal cell function and metabolism (Durand and Komisarczuk, 1988) and the supply of mineral should matched the amount of energy available for fermentation and therefore the mineral requirement should be related to fermentable organic matter in the rumen. The National Dairy Development Board, Anand, India undertook to develop UMMB lick which is safe for ruminant feeding and besides providing a continuous source of fermentable N, energy and minerals (Kunju, 1986).

**Hematological parameter of blood:**

Clinicopathologic data consisting of a complete blood count (CBC) and serum biochemical analysis can be helpful in differentiating gastrointestinal diseases, developing a prognosis and plan for treatment and monitoring treatment. A CBC rarely identifies a specific disease but it can be helpful in evaluating the severity of dehydration, anemia and hypoproteinemia. An anemic and dehydrated animal may have normal PCV and total protein values. Changes in the total and differential white blood cell count indicate acute or chronic inflammation (Cristine and Pugh, 1988).

**Ruminal disorders:**

Ruminal acidosis:Ruminal acidosis is the most common digestive disturbance in ruminant livestock when their diet is suddenly changed from forage to concentrate or when excessive amounts of highly fermented diet are eaten. Etiology of rumen acidosis or acid indigestion are mainly-(I) Accident ingestion of excessive carbohydrate containing foods (rice, wheat, potatoes, grain), (II) Overnight kept boiled rice, (III) Feeding of stale bread from hockers, (IV) Ingestion of kitchen garbage and hotel or ceremonial refusal containing boiled rice etc. (Chakrabarty, 1996). In the acute form, lactic acid accumulates in the rumen, due to an imbalance in microbial populations and an associated decrease in pH, causing metabolic acidosis (Dawson, *et. al.,* 1997). In case of ruminal acidosis the blood pH become acidic, high hematocrit value, alter PCV, increase blood lactate, decrease bicarbonate, increase SGOT level, decrease thiamine level and fall in alkaline phosphatase activity (Kurar and Gupta, 1974).

*Streptococcus bovis* has been identified as the main bacterial species involved in the production of lactic acid from rapid growth on the highly fermentable forms of carbohydrate (Dawson, *et al.,* 1997). If adaptation to the grain diet is gradual, populations of lactic acid-consuming bacteria such as *Megasphaera elsdenii* and *Selenomonas ruminantium* convert the lactic acid to propionic acid and prevent a rapid decline in pH (Nocek, 1997). The broader microbiological changes associated with acute lactic acidosis are based primarily on culture based investigations (Nagaraja and Titgemeyer, 2007) and probably do not provide a complete understanding of the organisms that are responsible. Acute acidosis is mainly a problem in developing countries in ruminants fed large amounts of concentrates or fermented carbohydrate to achieve high levels of productivity.

In sub-acute ruminal acidosis (SARA), lactic acid does not accumulate during low-pH conditions and other factors such as microbial population change, increased gut permeability, bacterial lipopolysaccharides, and inflammatory and immune responses may have a role in the etiology of SARA (Plaizier, *et al.,* 2008). In contrast to lactic acidosis, which is characterized by low pH and increased lactate, SARA seems to be an intermediate state where microbial fermentations are instable and unpredictably oriented to butyrate, propionate, or both at the expense of acetate (Lettat, *et al*., 2010).

Ruminal alkalosis: Incidence of alkaline indigestion is comparatively less common than other forms of indigestion. Protein rich food is the main offenders characterized by anorexia, dull and depression along with atony of rumen. Etiology of rumen alkalosis are-(I) Intake of protein rich food, (II) Intake of placenta after calving,(III)Ingestion of decomposed protein, (IV) Drinking of contaminated and sewerage water etc. Due to enormous intake of protein there will be excessive accumulation of ruminal ammonia, nitrogen and decrease in V.F.A. leading to an alkaline pH of rumen fluid. Excessive alkaline pH will inhibit the rumen musculature. The paresis and high pH bring about inappetance and interfere with cellulose digestion (Chakrabarty, 1996).

**Rumen physiology:**

The rumen (the first compartment of the ruminant stomach) is essentially a fermentation vat at the beginning of the ruminant digestive system. The rumen houses many species of bacteria, protozoa and other microbes feed on the rumen contents. Carbohydrates are the primary energy source for these microbes in the goats’ diet. These come in two basic forms. The first is cell soluble carbohydrates (sugars and starches) and the second is the cell wall carbohydrates (pectin, cellulose, hemicellulose and lignin). The rumen microbes digest these carbohydrates converting them into volatile fatty acids, which are the main source of energy for the goat. The digestibilities of the two types of carbohydrates vary greatly according to several variables including: maturity and species of forages; source of carbohydrate (starch vs. cellulose); and the processing that has taken place (grinding of grain or chopping of forages).

Different groups of microbes digest the cell soluble carbohydrates (typically found in commercial feeds) than those that digest the cell wall carbohydrates (typically found in forages). To further complicate matters, each group of microbes thrives under different pH ranges. The starch- and sugar-consuming bacteria prefer a more acidic environment (pH range of 5.5 – 6.0) while the fiber-digesting bacteria prefer a more neutral environment (pH 6.0 – 6.8).

The type of diet influences the pH of the rumen. Forages (through the act of cud chewing) stimulate saliva production. The saliva of a goat contains bicarbonate, which buffers the rumen pH (makes it hard to become acidic). Also, the carbohydrates found in forages are more slowly digested than those found in grains and thus rapid pH drops do not occur. Conversely, starches found in grains are rapidly fermented resulting in a rapid production of acids. Due to the low fiber content of the grains, goats don’t generate as much saliva and thus the acid levels rise unchecked. As the pH in the rumen decreases, the forage-digesting microbes are killed off, leaving the way clear for lactic acid producing microbes to reproduce faster and thus produce even more acid, reducing the pH further.

Also, diets low in effective fiber (fiber must be a minimum length of 2 to 3 inches) will cause a decrease in rumen pH. This occurs for two reasons. First, if forage particle size is too short, the forages pass through the rumen too quickly to be effectively digested. Thus, the number of fiber-digesting microbe’s decreases and the number of starch-digesting microbes (especially lactic acid-producing bacteria) increases and as a result, pH lowers. Also, short fiber particles don’t require cud chewing to further reduce particle size and therefore the goat produces less buffering saliva. Adding fats and oils to the diet can also reduce the rumen pH. Certain fats and oils can reduce fiber digestibility by killing fiber digesting bacteria and/or coating of fiber particles (Jakie, 2006).

**CHAPTER-III**

**MATERIALS AND METHODS**

**Study area and Time:**

A cross sectional study was carried out at SAQTVH, Chittagong for a period of seven days during internship period from 21 October to 28 October.

**Study population:**

A total of 5 clinically affected goats with a history of anorexia, inappetance were examined and brought under study after though clinical examination. Rumen fluid and blood samples were collected from the respective goat.

**Collection of sample:**

Rumen fluid was collected with a long sterilized G.T.V. needle with syringe punching at the middle of the left para-lumber fossa. After collection of rumen fluid it was transported to laboratory through thermo flask in ice, in rubber stopper test tube with a layer of paraffin to preserve anaerobic environment. These samples were stored in refrigerator for 3-4 hours with adding 1 drop of Mercuric Chloride solution in 5 ml rumen fluid as preservative. The rumen fluid was strained through a double fold muslin cloth. The samples were centrifuged at the rate of 3000 rpm for 15 minutes to remove suspended particulate materials (Chakrabarty, 1996).

**Physical examination procedure:**

**Color:** Color of the rumen fluid was observed by naked eye and compared with rumen fluid of healthy animal and digestive disordered animal.

**Odor:** Odor of the collected rumen fluid was observed by organoleptic test and was recorded.It varied with the physiological condition of rumen. Different condition offer different odor.

**Consistency:** Immediately after collection of rumen fluid consistency was observed and different types of consistency were found in different sample.

**pH:** Rumen pH is an important factor for good digestion and microbial activity. It was determined by wide range pH indicator paper and digital pH meter (Hanna) in the laboratory. The pH of rumen fluid changes due to different causes such as ruminal acidosis, alkaline digestion which ceases the microbial activity of the rumen.

**Examination of protozoal activity and motility:** A drop of fresh rumen fluid was taken in a glass slide and a cover slip was placed over it and examined under microscope. The motility was graded arbitrarily as -, +, ++, +++, i.e. none, mild, moderate and vigorous respectively. The grading of motility is presented below.

|  |  |  |
| --- | --- | --- |
| Density | Symbol | Grade |
| None | - | 1 |
| Mild/Few | + | 2 |
| Moderate | ++ | 3 |
| Vigorous | +++ | 4 |

**Counting of Rumen protozoa:**

**Reagents:**

(i)Formal saline (0.85%Normal saline with equal volume of formalin).

(ii) 5% Lugol’s iodine.

(iii) 30% Glycerin.

(iv) Working solution: Formal saline-1.0 ml, Lugol’s iodine5%-2.5 ml, Glycerine 30%-1.5 ml.

**Method of counting:** At first 1:10 dilution of freshly collected ruminal fluid was diluted with working solution. Then following a gentle shaking 0.1 ml was placed in a counting slide with a pipette and covered the cover slip. Different total counts were carried out by 40x objective. (In case of haemocytometer with Neubar ruling 8sq.mm was counted) and the average was multiplied by 50,000 dilution factor. The result was expressed as total counts per ml (n x 105) (Chakrabarty, 1996). After calculating the ruminal protozoa in collected sample it was compared with previous study and standard one.

**Collection of blood:** Blood was collected from jugular vein by syringe from the same animal from which the rumen fluid was collected and half of the blood was kept in a vacutainer tube (BD vacutainer®) using sodium fluoride/Na2 EDTA (3 mg/6 mg).

**Determination of blood pH:** After collection of blood by using wide range pH paper pH of blood was determined.

**Determination of Complete Blood Count:** After collection of blood it was taken in tube .Then by using Abacus junior vet Hematology analyzer CBC was determined. 50 µl of blood were aspirate by abacus junior vet Hematology analyzer for CBC.

**Separation of serum for determination of mineral constituents:** After collection of blood the syringe was placed inclined position for 1-2 hours at room temperature. Then the syringe was kept in refrigerator at 40c for overnight. Then centrifuged 3000 rpm for 15 minutes.

**Determination of the biochemical parameter of rumen fluid and blood:** After completing the physical examination, the selective biochemical parameters were tested following respective procedure using biochemical analyzer (hemalyzer 3000®).

**Procedure for assay of different biochemical parameters:**

1. Enzymatic colorimetric test for Glucose: The method of enzymatic colorimetric test used to analyze the glucose. GOD-PAP Method without deproteinization ( kit: Glucose liquicolor, Germany (email: [human@human.de](mailto:human@human.de)) (Brahman, *et.al.*, 1997 and Teucher, *et. al.*, 19712).
2. Photometric colorimetric test for Total protein (Biuret Method) (Weichselbum, *et.al.*, 1946 and Josephon, *et.al.*, 1957).
3. Photometric UV test for phosphorus (Daly, *et.al.*, 1972; Gamst, *et.al.*, 1980 and Tietz, *et. al.*, 2006).
4. Photometric UV test for sodium, potassium and chloride (Tem, *et. al.*, 1958; Sunderman, *et.al.*, 1959; Schales, *et. al.*, 1941 and Schoenfeld, *et. al.*, 1964).

**Data entry and analysis:** The obtained data were entered into MS Excel-2007. A descriptive analysis was carried to express the results in mean with standard deviation and percentage. Biochemical indices were expressed in gm/liter for total protein, milligram/dl for glucose and phosphorus, mmol/l for sodium, potassium and chloride.

**CHAPTER-IV**

**RESULT AND DISCUSSION**

**Table 1.Physical parameters of rumen fluid:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sample | Color | Consistency | Odor | pH of rumen fluid | Motility of protozoa | No. of Protozoa/ml |
| 1 | Milky grey | Gruel like | Sour | 5.0 | Absent | - |
| 2 | Greenish | Thick watery | Aromatic | 6.5 | Vigorous | 2.5x106 |
| 3 | Greenish brown | Watery | Sour | 5.5 | Absent | - |
| 4 | Greenish brown | Gruel like | Pungent | 7.4 | Mild | 1.3x103 |
| 5 | Milky grey | Thick Watery | Pungent | 7.2 | Moderate | 1.55x104 |

The table1 portrays physical parameters of rumen fluid. These include color, odor, consistency and pH in relation to the motility of rumen flora. The pH was ranged in between 5.0 to 7.4. Rumen protozoal activity was absent below pH 5.5 to less and mild motility was found at pH 7.4. Vigorous motility was found at 6.5 which was 2.5x106 per ml of rumen fluid.

**Fig.1:** Physical parameter of rumen fluid (color and consistency).

The pie chart (Fig.1) shows the percentage of 3 different colors rumen fluid of goat which include greenish (20%), greenish brown (40%) and milky grey (40%).Basically these color depend on the diet and abnormal condition of the rumen. Earlier workers showed that during acid indigestion ,color of rumen fluid become milky grey while in alkali digestion color of rumen fluid became dark brown or greenish brown color and due to chronic bloat it became greyish green(Chakrabarty, 1996).The present findings coincided with the earlier study.

The pie chart (Fig.1) shows the percentage of consistency. There are 3 types of consistency in collected rumen fluid likely watery, thick watery and gruel like respectively, 20%, 40%, and 40% which indicated different abnormal condition of rumen in goat. During rumen acidosis the rumen fluid consistency becomes gruel like, during chronic bloat it become foamy (Gnanaprakasan, *et. al.,* 1990).

**Fig. 2:** Physical parameters of rumen fluid (odor and motility).

The pie chart (Fig.2) shows the percentage of odor of rumen fluid. The 40% rumen fluid odor was sour, followed by aromatic 20% and pungent 40%. Chakrabarty, (1996) found that putrid, aromatic, sour and stale indicates the protein over feeding or sub acute digestion, normal condition, acid indigestion and chronic bloat or inactive gastric juice, respectively which is coincided with the present findings.

In this study the floral motility of rumen were categorized as vigorous (20%), moderate (20%), mild (20%) and absent (60%) in animals. There is a correlation between rumen pH and protozoan motility since the number of count varied with the pH change which is coincided with the Dehority and Scott, (1967) showed that excessive high carbohydrate green grass or hay causes acid indigestion of goat. The present study showed that when the pH was lower (5.0 to 5.9) protozoan count per ml of rumen fluid was zero and during alkalosis rumen protozoal count became less which is in agreement with the earlier findings Purser and Moir, (1959).The results of the study showed that the rumen motility became less or absent with the change of pH beyond normal limit (table1) which is concurred with the results of early study. (Blood and Radostits, 1989 and Basak, *et. al.* 1993) reported that there was absence of rumen protozoal motility in experimentally induced lactic acidosis in goats.

Kamra, (2005) showed the number of ciliated protozoa of rumen ranged between 104 to 106/ml of rumen fluid that number varied with the change of feeding habit ,rumen environment ,such as rumen acidosis, alkalosis, bloat and impaction which causes anorexia in ruminants. In the present study, those goat were suffering from chronic acidosis or simple indigestion their protozoan motility and count were either less or absent that which are in close agreement with the earlier study (Blood and Radostits, 1989 and Chakrabarty, 1996).

**Table: 2 Bio chemical parameters of rumen fluid (N=5):**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameters** | **Rumen fluid** | | **Blood** | |
|  | Mean ±SD | Min - Max | Mean ±SD | Min - Max |
| pH | 6.32±1.04 | 5-7.4 | 6.86±.713 | 5.8-7.6 |
| Phosphorus(mg/dl) | 18.16±3.36 | 13.8-22 | 12.76±1.53 | 11.7-15.4 |
| Potassium(mmol/l) | 4.18±.24 | 3.77-4.36 | 4.566±0.61 | 4.2-5.64 |
| Sodium (mmol/l) | 142.1±3.98 | 136.8-147.7 | 137.02±7.61 | 125.1-144 |
| Chloride (mmol/l) | 103.7±4.37 | 99.1-110.6 | 97.78±9.174 | 84.7-105.8 |
| Glucose (mg/dl) | 28.06±11.07 | 9.9-38.8 | 83.8±50.08 | 22.9-152.2 |
| Total protein (g/dl) | 2.68±2.38 | 0.2-5.8 | 9.2±1.198 | 8.1-10.6 |

The table 2 shows the selective biochemical parameter of rumen fluid and blood of 5 digestive disordered goats. The average pH of rumen fluid is almost 6.32 that ranged between 5-7.4. The decrease in pH of the ruminal fluid noted in the present study corresponds to increase production of volatile fatty acids like acetic, proprionic and butyric acid. The decrease in pH of the rumen favors the growth of streptococci with decline in the number of normal Gram negative bacteria and protozoa, which further aggravates the process of lactic acid production. Similar findings have also been reported by several other researchers (Kezar and Church, 1979; Cao, *et. al*., 1987; Crichlow, 1989; Aslan, *et al*., 1995; Mohamed, *et al*., 1998).The mean value of phosphorus is almost 18.16 mg/dl and the mean value of studied electrolytes include potassium 4.18mmol/liter, sodium 142.1 mmol/liter, chloride 103.7 mmol/liter in rumen fluid respectively.

The average pH of blood is 6.86 that ranged from 5.8 to 7.6. The blood pH of acidotic group was found to be lower than normal value which is in agreement with previous findings (Ullah, *et. al*., 2013; Cao, *et. al*., 1987). The decrease in the pH may be due to over-distention of rumen which impedes venous return to heart. This factor impairs hepatic perfusion and poorer lactic acid utilization which in turns leads to systemic lactic acidosis, manifesting decrease blood pH. The mean value of serum phosphorus is 12.76 mg/dl and other studied electrolytes were potassium 4.57mmol/liter, sodium 137.02 mmol/liter, chloride 97.78 mmol/liter. Significant increase in serum sodium level and decrease in serum potassium level might be due to retention of sodium and excess excretion of potassium by the kidney which were agreement with Gupta, *et. al.*, (2012).

The table 2 shows the level of glucose and total protein in rumen fluid and blood of clinically digestive disordered goats. Average concentration of glucose in rumen fluid and blood is 28.06 mg/dl and 83.8 mg/dl respectively, while concentration of total protein in the same biological fluid is 2.68 gm/dl and 9.2 gm/dl consecutively. The difference in blood glucose concentration is varied because of levels of nutrition and the metabolic activity of individual animal reported by Shumaila, *et. al*., (2012). A significant increase of total protein in blood was also reported by Gupta, *et. al.*, (2012) in acidotic goat.

**Table 3: Hematological parameters of blood (N=5):**

|  |  |  |
| --- | --- | --- |
| **Parameters** | **Mean ±SD** | **Min-Max** |
| WBC(103/µl) | 26.39±17.36 | 7.64-54.3 |
| RBC(106/µl) | 1.43±0.79 | 0.85-2.56 |
| Hb(g/dl) | 10.18±2.12 | 8-13 |
| HCT (%) | 5.3±2.974 | 3.13-9.54 |
| MCV(fl) | 36.6±0.55 | 36-37 |
| MCH(pg) | 67.3±21.24 | 50.8-91.4 |
| Lymphocyte (%) | 53.8±34.01 | 20.6-93.5 |
| Monocyte (%) | 2.3±3.47 | 0.5-8.5 |
| Granulocyte (%) | 53.35±35.89 | 4.8-78.5 |

The table 3 shows the selective hematological parameter of 5 digestive disordered goats. The average value of WBC is 26.39 that range from 7.64 to 54.3. A change in the total and differential white blood cell count indicates acute and chronic inflammation (Cristine and Pugh,  1998). The mean value of RBC (1.43), HCT (5.3), MCV (36.6) and MCH (67.3) of the present findings does not corroborate with earlier findings (Clarence, *et al.,* 1991). The Hb level of the present study is within normal limit. The average percentage of lymphocyte, monocyte and granulocyte is 53.8, 2.3 and 53.35 respectively. The present findings are not corroborated with earlier findings (Clarence, *et al.,* 1991). Significant increase of WBC values, which could be attributed to hemocencentration due to loss of intra vascular water in rumen reported by (Gupta, *et. al*., 2012).

**CHAPTER-V**

**CONCLUSION**

In the present study there is found strong correlation with the physical changes (color, odor, consistency and pH), motility of rumen and the number of protozoa in rumen fluid of the clinically digestive disordered goats which were suffering from anorexia, chronic acidosis, and simple indigestion. Besides, biochemical and hematological parameter of rumen fluid and blood were also observed in case of anorexic or digestive disordered goat. The result of this study will support to the study and result of many scientist who worked in rumen physiology, microbiology and rumen ecosystem of cattle, goat and sheep.

**Recommendation:** Laboratory diagnosis is essential for giving proper treatment of digestive disordered animal to reduce treatment cost.

**Limitation:**

* Small number of sample size.
* It was not possible to identify specific rumen microflora.
* Lack of management information.
* No control groups.

**CHAPTER-VI**

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