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Therapeutic Studies on Clinical Mastitis in Goats

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ABSTRACT

The present investigation "Therapeutic Studies on Clinical Mastitis in Goats" was under taken to study the efficacy of 2 different therapeutic agents. Out of 12 goats diagnosed with Clinical mastitis, 12 goats (17 quarters) were randomly divided into two groups, *viz.,* group II and III with 6 goats in each. Besides, 6 goats were included under apparently healthy control group (Group I). The affected goats of group II was treated with Amoxirum Forte and group III was treated with Gardplus. The therapeutic efficacy was evaluated based on improvement in clinical signs, milk abnormalities, MCMT score, qualitative changes in milk, hematology, cultural examination. Administration of Gard plus in group III goats resulted in 83.33 percent of bacteriological cure rate on day 5, while 66.67 percent of bacteriological curerate was observed in goats of group III treated with Amoxirum forte.

HIGHLIGHTS

- The therapeutic efficacy was evaluated based on improvement in clinical signs, milkabnormalities, hematology and cultural examination.
- Administration of Gardplus was more efficacious as compared with Amoxirum forte.

Keywords: Goats, clinical mastitis, therapeutic management

Mastitis is a multi-etiological and complex disease that is defined as inflammation of the parenchyma of the mammary gland and is characterized by physical, chemical, and bacteriological changes in milk and pathological changes in the glandular udder tissues (Islam *et al*., 2011a). Mastitis is an essential clinical manifestation in small ruminants such as goats and needs prompt evaluation with specific therapeutic treatment (Biswas *et al*., 2021). The importance of diagnosis and treatment of mastitis in small ruminants is undoubtedly important for economic, aesthetic and welfare points of view (Sarker *et al*., 2015).

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MATERIALS AND METHODS

The mastitis affected goats were randomly divided into two groups i.e., groups II and III for the purpose of the trail, each containing 6 goats. While group I consisted of healthy goats. For this therapeutic study, two antibiotics Viz. Amoxirum Forte and Gardplus were chosen. The affected goats of group II was treated with Amoxirum Forte (Amoxycillin Sodium 200 mg and Sulbactam Sodium 100 mg) @10 mg per kg body weight per day intramuscularly for 5 days. While, The mastitis affected goats of group III was treated with Gard plus (Cefoperazone Sodium 3000 mg and Sulbactam Sodium 1500 mg) @ 5 - 10 mg per kg body weight per day intramuscularly for 5 days. Both the groups of goats (group II and III) were given a similar supportive therapy which consisted of Inj. NS (fluid) @ 20 ml/kg I/V, Inj. Tribivet (B complex) @1 ml/10 kg, Inj. Zeet (Chlorpheniramine maleate) @ 0.4 ml/kg, Megludyne @ 2 mg/kg, Inj. Vetade @ 1 ml/15kg body weight daily intramuscularly with bolus Serrakind plus and Mammidium powder till the inflammatory symptoms were subsided. All the goats were treated for a period of 5 days and monitored by resolution of clinical signs, qualitative changes in the milk, hematology and bacterial cure rates.

Each case's clinical symptoms were recorded and followed on a daily basis. Before therapy, milk samples were taken for qualitative changes and cultural investigation. The absence of clinical signs and a negative or reduced bacterial culture in the milk led to the conclusion that the animal was recovered of the illness. The drug trial showing faster recovery was considered as the best therapeutic regimen.

Evaluation of Therapeutic Efficacy during the course of treatment was done by examination of case every day and the number of days it took to recover was monitored. Milk samples were collected and subjected for inspection, qualitative changes, and bacteriological tests on the fifth day post therapy. Hematological analysis was conducted in both the groups after therapy. When there was clinical normality associated with improvement in milk abnormalities and bacterial cure rates, a quarter was declared clinically cured.

RESULTS AND DISCUSSION

In the present investigation, all the 12 goats in group II and III showed similar clinical manifestation like inappetence/ anorexia, decreased milk production, swollen and painful udder, pyrexia, warmth ness of udder, pale mucous membrane, udder erythema, dehydration, asymmetry of teats, depression and hardness of udder. The clinical signs were improved earlier in group III than in group II mastitis-affected goats (Table 1).

Table 1: Days of recovery among goats affected with clinical mastitis.

Sl. No.	Clinical signs	Group II (days)	Group III (days)
1	Inappetence/ Anorexia	3	2
2	Decreased milk production	5	4
3	Swollen and Painful udder	5	4
4	Pyrexia	2	2
5	Warmthness of udder	2	2
6	Pale mucous membrane	5	4
7	Udder Erythema	5	4
8	Dehydration	3	2
9	Asymmetry of teats	4	3
10	Depression	2	1
11	Hardness of udder	4	3

Out of 9 quarters of group II goats, 3 and 6 quarters milk samples were red and white in color respectively was observed before treatment. On day 5 (after treatment) the improvement in the color of milk samples was observed in 0 and 6 quarter milk samples. The consistency of milk sample was watery, viscous and purulent among 4,5 and 0 quarters milk samples before treatment. The consistency was improved in 1, 2 and 0 quarters of milk samples after treatment. The presence of flakes and clots were seen in 4 and 2 quarter milk samples before treatment, which disappeared on day 5 after treatment. While, Out of 8 quarters of group III goats, 3 and 5 quarters milk samples were red and white in color respectively before treatment. On day 5 (after treatment), the improvement in the color of milk samples was observed in 0 and 5- quarter milk samples. The consistency of milk sample was watery, viscous and purulent among 2, 4 and 2 quarters milk samples before treatment. The consistency was improved in 0, 1 and 0 quarters milk samples after treatment. The presence of flakes and clots was seen in 5 and 1 quarter milk samples before treatment, which disappeared on day 5 after treatment (Table 2).

Table 2: Improvement in milk abnormalities in group II and group III of goats affected with clinical mastitis

Sl. No.	Milk abnormalities		Group-II		Group-II	
			Before treatment (day 0)	After treatment (day 5)	Before treatment (day 0)	After treatment (day 5)
1	Color	Red	3	0	3	0
		White	6	6	5	5
2	Consistency	Watery	4	1	2	0
		Viscous	5	2	4	1
		Purulent	0	0	2	0
3	Flakes		4	0	5	0
4	Clots		2	0	1	0

Table 3: MCMT grades in Group II and Group III clinical mastitis affected goats before and after therapy

		Group II			Group III		
Sl. No.	MCMT grade	Affected quarter on MCMT (on day 0)	Recoveredquarter on MCMT (on day 5)	Percentage efficacy	Affected quarter on MCMT (on day 0)	Recovered quarter on MCMT (on day 5)	Percentage efficacy
1	Negative	0	0	0	0	0	0
2	Weak positive (+)	1	1	100	0	0	0
3	Distinct positive (++)	3	2	66.67	2	2	100
4	Strong positive (+++)	5	4	80.00	6	5	83.33

Table 4: Mean ± SE values of somatic cell count and pH in apparent healthy control and mastitis affected goats (Group II and Group III) before andafter therapy

Sl. No.	Parameter	(Group I) Healthy control	Group II		Group III	
			Before treatment (on day 0)	After treatment (on day 5)	Before treatment (on day 0)	After treatment (on day 5)
1	SCC	7.04±0.14	19.05±0.01	12.05±0.08*	18.24±0.28	10.10±0.09*
2	pH	6.81±0.12	7.21±0.04	6.96±0.02*	7.02±0.04	6.87±0.03*

Means differ significantly ($p< 0.05$) before and after therapy.

The MCMT grades in clinical mastitis-affected quarter milk samples of group II and III goats were studied. Out of 9 and 8 quarters of group II and III, 0, 1, 3, 5 and 0, 0, 2, 6 quarters with the negative, weak positive, distinct positive and strong positive reaction on MCMT was observed before treatment. On day 5 (after treatment) 0, 1, 2, 4 and 0, 0, 2, 5 quarters were recovered based on MCMT indicating 0, 100, 66.67, 80.00 and 0, 0, 100, 83.33 percent efficacy (Table 3).

In the present study, a significant variation ($P<0.05$) in the mean values of SCC and milk pH was observed in Group II and Group III goats before and after therapy (Table 4). Though, there was the improvement in both groups, comparative means of Group I, Group II and Group III recorded that treatment given to Group III was more effective due to cefoperazone sodium + sulbactum sodium along with anti-oxidant and immune modulators. Improvement in the values of SCC and milk pH after

therapy was in agreement with Cabezuelo *et al.* (2020) who attributed it to the udder immunity enhancers/ antioxidants (contains some specific blend of fat-soluble vitamins and pH lowering salts which exerts an antioxidant effect on mammary gland epithelium) in a parturated doe affected with clinical mastitis.

In the present study, there were a significant (P<0.01) increase in the mean levels of Hb, TEC and a significant (P<0.05) increase in the PCV. While, a significant (P<0.05) decrease in TLC and a significant (P<0.01) decrease in neutrophils with a non-significant increase in lymphocytes, eosinophils and monocytes was observed in group II and group III after treatment (Table 5).

Comparative means of group II and III revealed significant improvement of hematological parameters and it was attributed to the gardplus antibiotic and inj. Vetade in Group III. Vitamin E and selenium present in mammidium powder act as an anti-oxidant to improve udder immunity, increase poly nuclear cells in udder and increase in intra cellular killing of pathogen. Vitamin A improve immunity help in defending body against microbial invaders, live yeast culture revealed positive effect on animal performance and mineral composition (Sarfaraz *et al*. 2009) and above result closely agreement with Morwal *et al.* (2019) who reported that antibiotic (Injection of Sulbactum sodium 1.5 g + Cefoperazone sodium 3.0 g @ 10 mg/kg b.wt, i.m. bi.d daily for 5 days) therapy with Supplementation of vitamin E has beneficial effect on both cellular and humoral immunity of ruminants resulting in decreased incidence of mastitis and other disease. These were in agreement with Cabezuelo *et al*., (2020); and Biswas *et al.,* (2021) who reported that parental and local routes of tetracycline and gentamicin was utilized for mastitis treatment in small ruminants in the field along with supportive therapy i.e., mammary gland immunity enhancer. The immunity enhancer contains some specific blend of fat-soluble vitamins and pH-lowering salts which exerts an antioxidant effect on mammary gland epithelium.

Out of 6 goats of group II, 66.67 percent (4/6) of goats treated with Amoxirum Forte (Amoxycillin Sodium and

Table 5: Mean ± SE values of hematological parameters in apparently healthy control and mastitis affected goats (Group II and Group III)before and after therapy

			Group II		Group III	
Sl. No.	**Parameter**	**Healthy control (Group I)**	**Before treatment (on day 0)**	**After treatment (on day 5)**	**Before treatment (on day 0)**	**After treatment (on day 5)**
1	Haemoglobin(g/dL)	11.28±0.01	10.42 ± 0.56	10.86±0.15**	09.86 ± 0.12	10.92±0.03**
2	TEC (x10^6/µl)	13.09±0.09	09.84±1.28	09.98±0.05**	08.36±0.61	09.27±0.05**
3	TLC (x10^3/µl)	09.08±0.06	15.25±1.46	13.62±0.12*	17.12±1.23	12.03±0.09*
4	PCV (%)	27.95±0.08	20.04±0.24	22.07±0.19*	21.12±1.46	23.47±0.15*
5	Neutrophils (%)	39.91±0.22	58.38±0.22	51.72±0.07**	61.03±0.21	48.20±0.09**
6	Lymphocytes (%)	58.89±0.43	40.93±0.23	42.28±0.12	38.09±0.03	36.81±0.22
7	Eosinophils (%)	0.66±0.18	0.38±0.11	0.42±0.13	0.42±0.08	0.49±0.09
8	Monocytes (%)	0.54±0.03	0.31±0.08	0.38±0.02	0.46±0.01	0.51±0.12

** Significant at (P<0.01) * Significant at (P< 0.14).

Table 6: Bacteriological cure rates observed in group II and group III goats

Sl. No.	**Group**	**No. of animals**			**No. of quarters**		
		Treated	**Cured**	**% recovery**	**Treated**	**Cured**	**% recovery**
1	II	6	4	66.67	9	7	77.78
2	III	6	5	83.33	8	7	87.50

Fig. 1: Udder swelling in group II mastitis affected goat before therapy

Fig. 2: Reduced udder swelling in group II mastitis affected goat after therapy

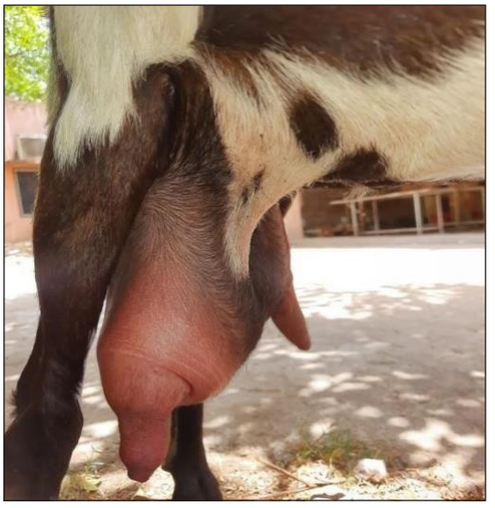

Fig. 3: Udder swelling in group III mastitis affected goat before therapy

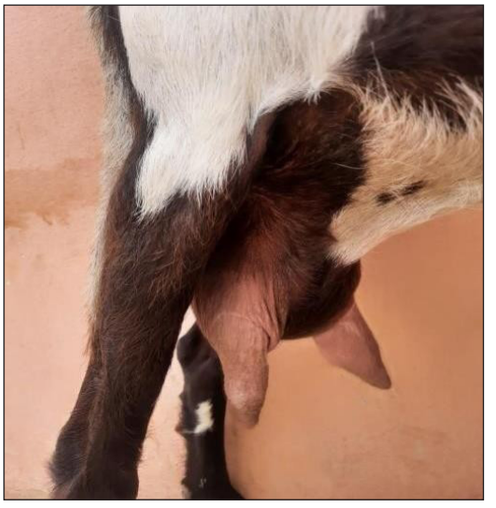

Fig. 4: Reduced udder swelling in group III mastitis affected goat after therapy

Sulbactam Sodium) were bacteriologically negative on day 5post-treatment. While in group III, 83.33percent (5/6) of goats treated with Gardplus (Cefoperazone Sodium and Sulbactam Sodium) were bacteriologically negative on day 5 post-treatment. Out of 9 quarters of group II, 77.78 percent (7/9) of quarters were bacteriologically negative on day 5 post treatment. While in group III, 87.50 percent (7/8) of goats were bacteriologically negative on day 5 post-treatment (Table 6). These findings were in close agreement with Amoxirum forte (Amoxycillin Sodium combined with Sulbactam Sodium) is apotent bactericidal penicillin which is a ß-lactam antibiotic, a ß-lactamase inhibitor. Amoxicillin exerts its bactericidal effects by preventing bacterial cell wall synthesis and disrupting bacterial cell wall integrity. It binds to a series of enzymes, known as penicillin binding proteins, which are involved in the final stages of cell wall synthesis. The binding of amoxicillin to penicillin-binding proteins

leads to the formation of defective cell walls that are osmotically unstable which leads to the lysis of bacteria (Jabbar *et al*., 169 2020).

In the present study, though there was improvement in both group II and III, it can be concluded that, the treatment given to group III was more efficacious and showed improvement in MCMT score, SCC, milk pH and hematology on day 5 after therapy and therapeutic efficacy was significant ($P<0.05$) which could be attributed to the combined action Gardplus (Cefoperazone Sodium and Sulbactam Sodium) along with Inj. Vetade and Mammidium powder in combination with antioxidants andimmune modulators which could help to ameliorate altered milk components towards normalcy and thus ensue in faster recovery. Combination of Sulbactum sodium (1.5 g) and Cefoperazone sodium (3.0 g) @ 10 mg/kg b.wt, i.m. b.i.d daily for 5 days with supplementation of vitamin E had beneficial effect on both cellular and humoral immunity of ruminants resulting in decreased incidence of mastitis and other diseases (Morwal *et al.*, 2019).

The use of non-steroidal anti-inflammatory agents as supportive treatment in mastitis has been advocated to alleviate the clinical signs of the disease and toimprove the welfare standards of the animals (McKellar., 2006). Vitamin A, D and E can act as adjunct therapy in treatment of mastitis. Vitamin E and Selenium present in mammidium powder act as an anti-oxidant to improve udder immunity, increase in poly nuclear cells in the udder and increase in intra-cellular killing of pathogen. (Sarfaraz *et al*., 2009). Vitamin A and Zn affect the epithelial health, and physical defense barriers of the udder, and alter the quality and quantity of keratin plug. Cu, Zn, Se, and vitamins A and E influence the phagocytic cells functions in cattle.

CONCLUSION

A combination of Cefoperazone Sodium and Sulbactam Sodium along with supportive therapy was found to be more effective than Amoxycillin Sodium and Sulbactam Sodium with supportive therapy.

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REFERENCES

Biswas, P., Biswas, S., Pakhira, M.C., Kar, I. and Maity, H.K. 2021. Multi drug resistant acute mastitis in a doe. *Indian J. Anim. Health,* **60**(1): 103-105.

Cabezuelo., T.M., Zaragoza, R., Barber, T. and Vina, J.R. 2020. Role of vitamin A in mammary gland development and lactation. *Nutrients,* **12**: 80.

Islam, M.A., Samad, M.A. and Anisur, A.K.M. 2011a. Bacterial pathogens and risk factors associated with mastitis in Black Bengal goats in Bangladesh. *Bang. J. Vet.Med.,* **9**(2): 155 – 159.

Jabbar, A., Saleem, M.H., Iqbal, M.Z., Qasim, M., Ashraf, M., Tolba, M.M., Nasser, H.A., Sajjad, H., Hassan, A., Imran, M. and Ahmad, I. 2020. Epidemiology and antibiogram of common mastitis-causing bacteria in Beetal goats. *Vet. world,* **13**(12): 2596.

McKellar, Q.A. 2006. The health of the sheep industry and the medicines to maintain it. *Small Rumin. Res.,* **62**: 7-12.

Morwal, S., Singh, A.P. and Goklaney, D. 2019. Therapeutic management of clinical mastitis in cows. *J. Entomol. Zool. Studies,* **7**: 265-269.

Sarfaraz, I., Yousaf, A., Muhammad, G., Abbas, Z.R., Zafar, M.A. and Ahmad, T. 2009. Evaluation of tri-sodium citrate alone and in combination with levamisole Hcl in the treatment of sub-clinical mastitis in dairy buffaloes. *Pak. J. Zool. Sup.*, **9**: 839-843.

Sarker, M.S., Bupasha, Z.B., Rahman, M.M., Akter, S., Mannan, A. and Ahaduzzaman, M. 2015. Surgical management of unilateral gangrenous mastitis in a doe: A case report. *J. Adv. Vet. Anim. Res.,* **2**(2): 232-235.