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Economic aspect of novel therapeutic regime for mastitis management with minimal use of antibiotics

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Abstract

The present study was conducted in VCSS Shuhama & adjacent area during the year 2011-2013. Economic implications of bovine mastitis were worked out from the loss of production during the disease period, cost of medication and veterinary services and cost of extra labour for the management of the animal during illness. The animals were divided into four group with 10 animals each. Group I included animals treated with antibiotics, Group II included animals treated with antibiotics and sodium citrate @40mg/kg b.wt, Group III included animals treated with antibiotics and sodium citrate @80mg/kg b.wt and Group IV included animals treated with sodium citrate @80mg/kg b.wt. The total cost on account of mastitis was calculated to be ₹ 3135.3± 372.7, 2798.84±228.22, 2479.94 ± 210.34 and 725.60±80.96 in group I, group II, group III and group IV respectively. However, the economic losses in group IV were lowest (₹ 725.60±80.96) and those in group I were highest (₹3135.3 ± 372.7). The framework provided in this paper can provide a basis for a future studies on the economics of mastitis and minimizing economic loss from mastitis management by combination of antibiotic and citrate therapy.

Keywords: Bovines, citrate, mastitis, economic

1. Introduction

Mastitis is considered to be the most frequent and most costly production disease in dairy herds of developed countries; Persistent decrease in milk production is the main detrimental effect that contributes to the economic impact of mastitis [1]. Mastitis is the most important disease in dairy cattle can cause up to 70 per cent of reduced milk production, nine per cent of milk discard after treatment, seven per cent of the cost of veterinary services and 14 per cent of premature culling [2]. In the National Animal Health Monitoring System of dairy herds in the US, clinical mastitis alone was the most costly disease identified, at a loss to the producer of \$27 to 50 per cow per year [3]. In India 50 per cent of dairy herd population is affected with mastitis [4], leading to an estimated loss of about ₹ 6053.21 crore annually [5].

The goal to eliminate or reduce the economic losses requires that the definite cause of mastitis be identified and then possible control measures implemented. It has been found that citrate plays a crucial role in the lactogenesis and maintains udder health through ionic equilibration [6]. Citrate levels are always low in mastitic milk [7]. It was hypothesized that replenishment of citrate deficiency with extraneous trisodium citrate might play some protective role against mastitis and hence minimize the antibiotic use and overall economic loss due to mastitis and thus study was carried out to evaluate the effect of trisodium on economic loss due to mastitis.

2. Materials and Methods

The present study was conducted in VCSS Shuhama & adjacent area during the year 2011-2013. The total of 1367 animals were presented to clinics for routine clinical examination. On clinical examination, pH, electrical conductivity (EC) & somatic cell count (SCC) a total of 40 animals was found to be affected by Clinical Mastitis. These animals were used to study the economics of mastitis. To study possible role of citrate in mastitis economics, the mastitic animals were randomly divided into 4 groups of 10 animals each. Group I included animals treated with antibiotics, Group II included animals treated with antibiotics and sodium citrate @40mg/kg b.wt, Group III included animals treated with antibiotics and sodium citrate @80mg/kg b.wt and Group IV included animals treated with sodium citrate @80mg/kg b.wt.

To evaluate the efficacy of the therapeutic regimen, the animals were evaluated for recovery by time taken for clinical recovery and time taken for recovery of milk characteristics and blood biochemistry toward normal and economics for each group was calculated. The economic implications of bovine mastitis were worked out by the following three broad parameters- Loss of production of the animal during the disease period, Cost of medication and veterinary services and cost of extra labour for the management of the animal during illness, The loss of production was calculated on the basis of the decrease in the daily production during the course of disease and quantity of milk discarded during withdrawal period multiplied by the local market value of the milk. Cost of treatment was calculated on the basis of the cost of medication used in individual case and the dues charged by the veterinarian during the treatment period. The cost of extra labour was calculated from the extra hours of time consumed in the management of the diseased animal for the administration of drugs and providing extra care during the diseased period.

2.2 Statistical Analysis

The data generated was analyzed by one way ANOVA and all data is presented as mean \pm standard error. A p-value less than 0.05 are considered significant in all statistical analyses

3. Results and Discussion

The economic implications of bovine mastitis worked out on the basis of production loss, cost of treatment and management, of the ailing animal is presented in Table I for each treatment group. The most significant factor in economic implication of bovine mastitis was the loss on account of milk discarded which was worked out at 67.3 kg per animal during the course of illness. The total cost on account of mastitis was calculated to be ₹ 3135.3 \pm 372.7, 2798.84 \pm 228.22 and 2479.94 \pm 210.34 in group I, group II and group III

respectively. However, the economic losses in group IV were lowest (₹ 725.60 \pm 80.96) and those in group I were highest (₹3135.3 \pm 372.7). While in terms of economic implications group IV showed least economic loss but in terms of clinical recovery and time take for recovery group IV showed least recovery. The mean recovery time was lowest (3.1 \pm 0.11 days) in group III and % Recovery was 90% while as recovery was 70%, 80 % and 60% in group I, II and IV. The best mean recovery time and recovery percentage in group III could be attributed to the antimicrobial potential of sodium citrate [8] and it has been seen that tri-sodium citrate decrease bacterial content of milk [7] and along with antibiotic treatment helps in the faster recovery from mastitis [9]. Tri-sodium citrate has been found very safe, economical and effective, avoiding culling of precious animal and discarding of milk [10]. Mean cost per cow of ₹ 2369 have been reported in Holstein Friesian x Kankrej [11] herd which is in agreement with our findings. The overall economic losses due to mastitis were worked out to be ₹ 886.15 \pm 93.06 [12] and ₹ 325.64 [13]. Higher costs in the present study may be attributed to the increased market rates of milk, medicines and labour. However, no single author considers all factors in the calculation of economic losses due to mastitis [14]. In the present study, the economic losses were much lower (₹ 725.60 \pm 80.96) in therapeutic group IV (citrate only) than the other groups which may be attributed to the fact that there was a significant decrease in loss on account of discarded milk as no withdrawal period was required, and cost of citrate is very low as compared to cost of antibiotics. From above study it may be that animals in group III showed early recovery which minimizes antibiotic use for management of mastitis. From economic perspective it may be concluded that group III receiving citrate therapy @ 80 mg/kg. B.W and antibiotic therapy is a suitable medicine for the treatment of the mastitis in cows.

Table I: Effect of different treatment on recovery and economic loss due to mastitis

Parameters	Group I	Group II	Group II	Group IV
Recovery (%)	70	80	90	60
Recovery time (days)	4.5 \pm 0.43 ^b	3.5 \pm 1.89 ^a	3.1 \pm 0.11 ^a	5.8 \pm 0.17 ^c
Production loss	1783.3 \pm 285.0 ^c	1796.25 \pm 231.30 ^c	1560.00 \pm 193.91 ^b	585.00 \pm 79.66 ^a
Treatment cost	552.5 \pm 62.9 ^d	390.09 \pm 44.84 ^c	375.50 \pm 30.04 ^b	13.72 \pm 0.00 ^a
Management cost	800.0 \pm 75.0 ^d	612.50 \pm 33.07 ^c	544.44 \pm 19.44 ^b	126.88 \pm 3.63 ^a
Overall	3135.3 \pm 372.7 ^c	2798.84 \pm 228.22 ^{bc}	2479.94 \pm 210.34 ^b	725.60 \pm 80.96 ^a

Values with different superscript along the row differ significantly at ($P < 0.05$)

4. Conclusion

Keeping in view the synergistic action of citrate and antibiotic in mastitis management and economic cost involved it may be concluded that citrate in combination with antibiotic can provide a novel therapeutic regime for mastitis management.

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