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## Incidence and risk factors of clinical mastitis in dairy farms of Theni district in Tamil Nadu

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### Abstract

On a total of 60 dairy farms, the incidence of clinical mastitis among the dairy farms was surveyed and clinically examined in the Theni district of Tamil Nadu. By combination of farmer interviews and site observation, data were collected from five taluks of Theni district, including both large and small-holding farmers. The incidence of clinical mastitis was found to be 15.92% among 578 milch cows. By Chi-square test, the association of mastitis incidence was highly significant ( $p < 0.01$ ) with floor cleaning method, rearing system, milking area hygiene, utensil, and milking man hygiene. A significant association ( $p < 0.05$ ) was noticed with udder hygiene. The incidence of mastitis was more prevalent in small herd sizes (20.91%), graduate farmers (17.59%), manual cleaning methods (17.57%), semi-intensive systems (36.73%), manual methods of milking (17.65%), thatched roof types (30.76%), and mud soil (18.31%) in cows kept in the less hygiene category and with previous occurrences of mastitis.

**Keywords:** Clinical mastitis, incidence, risk factors, Theni district

### Introduction

Worldwide, India stands to be the largest producer of milk. Milk production was showing an annual growth of 5.29%, and the per capita availability of milk is around 444 grams per day, with 221.06 million metric tons of production during 2021–22 (Government of India, Department of Animal Husbandry and Dairying, 2022). In the dairy industry, one of the most costly diseases causing severe losses to farmers is mastitis. Mastitis acts as an important indicator of animal health and was associated with losses in milk quality and quantity, therapeutic costs, antibiotic usage, work pressure, culling of animals, and the net profit of the farm (Singh and Singh, 1994) [9]. Mastitis occurrence was complex and was caused by three major factors: exposure to microorganisms, cow defense mechanisms, and factors relating to environment and management (Mungube *et al.*, 2004) [4]. Among the microorganisms, wide numbers of bacteria, fungi, and mycoplasma were playing a role in causing mastitis, in that bacteria was predominant. The pathogens responsible for mastitis were classified as contagious and environmental. The pathogens most contagious were *Streptococcus agalactiae*, *Staphylococcus aureus*, and *Mycoplasma bovis*, and the major environmental pathogens includes *Enterobacteriaceae* (particularly *Escherichia coli*) and *Streptococcus uberis* (De Vliegher *et al.*, 2012) [5]. The risk factors associated with the incidence of clinical mastitis vary from quarter-level to herd-level. It is related to parity, herd size, number of quarters affected, month of lactation, season of the year, somatic cell count in previous lactation, and clinical mastitis history as cow-specific risk factors. Environmental risk factors like floor type, cleaning method, milking method, rearing pattern, and hygienic practices were also influenced the incidence of mastitis (Leelahapongsathon *et al.*, 2014) [3].

### Materials and Methods

Data was collected from a total of 60 dairy farms, including both large and small scale, in the five taluks of Theni district, Tamil Nadu. These farms had a total of 859 cows, of which 593 were Holstein Friesian cross, 237 were Cross Breed Jersey, 12 were native breeds, and 18 were non-descriptive breeds. Among those 578 animals were milch cows. Mostly for milking cows, small-holding farmers used the manual method of hand milking, and large-holding farms used the bucket-type milking machine.

Data were collected using a combination of farmer interviews and site observation. The risk factors associated with mastitis related to cow, farm, and environment, including general farm management (herd size, educational status of farmers, floor cleaning method, floor type, roof type, rearing system, milking method), hygienic practices (Milking area, utensil, milking man, and udder hygiene), number of quarters affected, and reoccurrence data's were collected. A percentage analysis was employed to analyze the incidence and associated risk factors of mastitis in dairy farms in Theni district. A non-parametrical chi-square test was used for analyzing the data.

**Results and Discussion**

The overall incidence of mastitis irrespective of kinds of dairy farms in Theni district was found to be 15.92% of the total of 578 milch cows. The incidence of mastitis based on farm size was represented in Table 1. The farm size was categorized as small (1–5 animals), medium (6–10 animals), and large (>10 animals). The incidence was found to be 20.91%, 18.33%, and 13.51% in small, medium, and large herd size farms, respectively. It was observed that the incidence of mastitis is inversely related to herd size, as higher in small herds, and the finding was in concurrent with Suresh *et al.* (2017) [6]. The chi-square test revealed that herd size had no significant association with the incidence of mastitis.

**Table 1:** Incidence of mastitis in relation with Herd size

Category	Total no. of cow	No. of cow affected	Percentage of animal affected
Small	110	23	20.91
Medium	120	22	18.33
Large	348	47	13.51
Total	578	92	15.92

( $\chi^2 = 4.08^{NS}$ ;  $P > 0.05$ )

The incidence of mastitis related to the educational status of dairy farmers was presented in Table 2. The percentage of mastitis incidence was observed at 12.96, 15.26, and 17.59 percent, respectively, in illiterate, school and graduated farmers. This finding was in controversy with other findings (Suresh *et al.*, 2017 and Singh *et al.*, 1999) [6, 7] as educational status was negatively correlated, but in our finding, incidence was higher in graduate categories, which might be due to rearing of high-yield cross-bred animals with poor immunity and less knowledge regarding management practices. The chi-square test revealed that the incidence of mastitis had no significant association with the educational status of the farmers.

**Table 2:** Incidence of mastitis in relation with educational status of farmers

Category	Total no. of cow	No. of cow affected	Percentage of animal affected
Illiterate	54	7	12.96
School	308	47	15.26
Graduate	216	38	17.59
Total	578	92	15.92

( $\chi^2 = 0.90^{NS}$ ;  $P > 0.05$ )

The relationship between the incidence of mastitis and some management practices was also documented. The data, which

included floor cleaning method, rearing system, milking method, and type of roof, were collected and represented in Table 3. The floor cleaning method was categorized into pressure gun and manual, in that the incidence was found to be 6.02 and 17.57%, respectively. The lower incidence in the pressure gun cleaning category might be due to the fact that effective cleaning with pressure removes major dirt and residues. The chi-square test revealed that the incidence of mastitis was highly significant with the floor cleaning method.

Among the systems of rearing, the incidence was higher in the semi-intensive system (36.73%), followed by the intensive (14.06%), and extensive (10.0%) systems. This finding was contradicted with Siraj Arga *et al.* (2012) [11] and Suresh *et al.* (2017) [6] and incidence was higher in intensive systems due to close contact and a conducive environment. The finding was in agreement with Sarba *et al.* (2017) [12] and could be attributed to the variation in environmental hygienic standards, influenced by dirty and wet sampling area. The chi-square test revealed that the rearing system had a highly significant association with the incidence of mastitis.

**Table 3:** Relationship between the incidence of mastitis and management practices

Management practices	Methodology	Total no. of cow	No. of cow affected	percentage of animal affected
Floor cleaning type	Pressure gun	83	5	6.02
	Manual	495	87	17.57
Rearing system	Intensive	519	73	14.06
	Semi intensive	49	18	36.73
	Extensive	10	1	10.0
Milking method	Hand	425	75	17.65
	Machine	153	17	11.11
Roof type	No shed	40	8	20.0
	Thatched roof	13	4	30.76
	Cement sheet	27	3	11.11
	Tin sheet	508	77	15.15

( $\chi^2 = 7.08^{**}$ ;  $P < 0.01$ ), rearing system ( $\chi^2 = 17.45^{**}$ ;  $P < 0.01$ ), milking method ( $\chi^2 = 3.59^{NS}$ ;  $P > 0.05$ ), and roof type ( $\chi^2 = 3.18^{NS}$ ;  $P > 0.05$ )

Among the milking methods, the incidence of mastitis was higher in the manual method of milking (17.65%) compared to the machine type (11.11%). The higher incidence rate in the manual method of milking by hand was probably associated with poor hygienic practices. In respect to roof type, the incidence of mastitis was found to be higher in thatched roofs (30.76%), followed by the no shed category (20.0%), tin sheet (15.15%), and cement sheet (11.11%) (Table 3). Incidence of mastitis had no significant association with the milking method or roof type of the farm.

Among the mastitis-affected animals, the incidence in a single quarter (57.61%), two quarters (22.83%), one or two quarters (17.39%), three quarters (2.17%), and four quarters (0%) were reported and represented in Table 4. The data indicated that the incidence was higher in a single quarter when compared to multiple quarters, and this finding was in agreement with the reports of Kulkarni *et al.* (1982) [8] and Saini *et al.* (1994) [9]. Quarter-level risk factors were associated with previous bacterial infection, teat position, and teat-end hyperkeratosis (Breen *et al.*, 2009) [15].

**Table 4:** Incidence of mastitis in relation with numbers of quarters affected at a time

No. of quarters affected	No. of animal affected	Percentage of quarters affected
1	53	57.61
2	21	22.83
3	2	2.17
4	0	0.00
One or Two	16	17.39

The type of floor was also documented and correlated with the incidence of mastitis. Table 5 shows the incidence of

**Table 5:** Relationship between type of flooring and incidence of mastitis

Category	Total No. of cow	No. of cow affected	Percentage of animal affected
Sand	71	13	18.31
Concrete	310	52	16.77
Rubber Mat	89	9	10.11
Stones	108	18	16.67
Total	578	92	15.92

( $\chi^2 = 2.76^{NS}$ ;  $P > 0.05$ )

Previous occurrences of mastitis also had an influence on the incidence of mastitis. In the present survey, among the 92 affected animals, 47 had a history of mastitis, with a reoccurrence rate of 51.09%. The higher incidence in previously affected animals was similar to the finding of Suresh *et al.* (2017) [6]. The recurrent mastitis might be due to either a persistent infection of the mammary gland or a

mastitis is 18.31, 16.77, 10.11, and 16.67%, respectively, in Muddy soil, concrete, rubber mat, and stone types of floors. The finding showed a higher incidence in Muddy Floor than other categories, which might be due to possibilities of improper cleaning and high moisture content, which would have promoted udder infection easily via teat. Mekibib *et al.* (2010) [10] and Suresh *et al.* (2017) [6] also documented a higher incidence of mastitis on muddy soil floors compared to other categories. The incidence of mastitis was not significant ( $P > 0.05$ ) with the type of floor.

reinfection of a quarter (Grieger *et al.*, 2014) [13]. Important risk factors associated with recurrence include lactation stage, number of parities, and pathogen species involved in preceding mastitis. (Jamali *et al.*, 2018) [14]. A higher incidence of reoccurrence of clinical mastitis in dairy cows in the present study would be due to few inheriting genetic factors resulting in poor udder health and immunity.

**Table 6:** Incidence of mastitis in relation with previous occurrence

Total no. of animal affected with mastitis	Total no. of animal with previous occurrence of mastitis	Reoccurrence rate
92	47	51.09

**Table 7:** Relationship between the hygiene and incidence of mastitis

Category	Milking area hygiene	Utensil hygiene	Milking man hygiene	Udder hygiene
Less hygiene	38(41.31%)	25(27.17%)	59(64.13%)	57(61.96%)
Good hygiene	54(58.69%)	67(72.83%)	33(35.87%)	35(38.04%)

( $\chi^2 = 8.20^{**}$ ;  $p < 0.01$ ), utensil hygiene ( $\chi^2 = 36.89^{**}$ ;  $p < 0.01$ ), milking man hygiene ( $\chi^2 = 10.54^{**}$ ;  $p < 0.01$ ) and Udder hygiene ( $\chi^2 = 5.39^*$ ;  $P < 0.05$ )

The data collected related to hygienic management practices were presented in Table 7. The hygienic practices were categorized as milking area, utensil, milking man, and udder hygiene. Among those, the incidence of mastitis was higher in the less hygiene category in milking man (64.13%), udder hygiene (61.96%), and utensil hygiene (72.83%) when compared to milking area (58.69%) and utensil hygiene (72.83%). Dairy cows with poor milking hygienic standards such as absence of proper udder washing, improper cleaning, and unhygienic milkers were more common factors and serve as a vehicle for the occurrence of mastitis (Tezera and Ali, 2021) [16]. The incidence of mastitis was highly significant with milking area, utensil, and milking man hygiene ( $P < 0.01$ ) and significantly ( $P < 0.05$ ) associated with udder hygiene. Proper cleaning of the udder, animal waste, and shed with a disinfectant solution could have reduced the incidence of mastitis.

## Conclusion

In a survey and clinical investigation of 60 dairy farms reared 578 milch cows, the incidence of mastitis was 15.92%. Floor cleaning technique, rearing system, milking area hygiene, utensil and milking man hygiene are important risk factors influenced the incidence of mastitis. There was noteworthy

correlation recorded between udder hygiene and incidence of mastitis. Albeit in different degrees, a number of risk variables that were prevalent on dairy farms, could be positively correlated with occurrence of mastitis. Inadequate veterinary services, insufficient hygiene and a lack of awareness on various management modern techniques were the main risk factors for the mastitis. To achieve adequate knowledge on appropriate management practice, encouraging adoption of additional preventive measure is essential to reduce the incidence of mastitis in dairy cows.

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