

## **EFFECT OF GENETIC AND NON-GENETIC FACTORS ON PREVALENCE OF SUB-CLINICAL MASTITIS IN DAIRY COWS AT SOME SELECTED FARMS IN CHITTAGONG DISTRICT**

**M. Uddin<sup>1</sup>, M.B. Hossain<sup>2</sup> and G. Miah<sup>3</sup>**

### **ABSTRACT**

The study was investigated to know the current status and the factors related to the prevalence of sub-clinical mastitis at 12 dairy farms in Chittagong metropolitan area over the period of six months. The prevalence of sub-clinical mastitis was assessed by the results of physical examinations of the mammary gland and by California Mastitis Test (CMT) from a total of 1224 quarters of udder. The samples were randomly collected from udders apparently normal and those affected by sub-clinical mastitis. The cow-based prevalence of sub-clinical mastitis defined by a cow having at least one CMT positive was 70%. The prevalence were higher in Sahiwal x Friesian cows (81%) than other genotypes and the lowest (60%) prevalence of sub-clinical mastitis was found in (Local x Friesian) x Friesian crossbreds. Prevalence of sub-clinical mastitis was higher in large dairy farm (75%) as compare to small (75%) and medium farm (69%) size. The dairy cows at the age of 5 to 6 years were most susceptible to sub-clinical mastitis. Sub-clinical mastitis was higher in early lactation (83%) comparing mid lactation (80%) and late lactation (74%). Incidence of sub-clinical mastitis among cows were higher (79%) in third parity than others. The frequency of mastitis in hind quarter was 1.068 times higher than fore quarter. High frequency of sub-clinical mastitis (90%) were found in cows producing 5 to 10 liters milk. Higher prevalence of sub-clinical mastitis was found in dirty barn (38%) and dirty teat and udder (40%) of cows. So, it is clear that genetic and non-genetic factors have a great impact on prevalence of sub-clinical mastitis in dairy cows.

*Key words:* Genetic and non-genetic factors, sub-clinical mastitis, california test, dairy cows, lactation

### **INTRODUCTION**

Bangladesh is an agricultural based country and livestock plays an important role in the national economy of the country. Cattle population of our country is 23.4 million and annual milk production is about 20.3 lakh metric ton (DLS, 2000). Milk is considered as an ideal food which is the excellent source of almost all nutrients. However, Bangladesh has an acute shortage of milk. Availability of milk is only 37 gm per head per day whereas the requirement per head per day is about 240 gm milk (Saadullah, 2001).

Mastitis is an inflammation of the mammary gland of dairy cows accompanied by physical, pathological and bacteriological changes in milk and glandular tissue. Mastitis is defined as a disease characterized by the presence of significantly increased leucocytes content in the milk from affected gland (Blood and Radostits, 1989). The disease is common in high yielding dairy cows. Infection rate is more in successive lactation than the first lactation. Exotic and crossbred cows are more prone to mastitis. Due to improved breeding the cow's udder has to undergo rapid changes in relation to size,

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<sup>1</sup>Department of Anatomy and Histology; <sup>2</sup>Department of Physiology, Pharmacology & Biochemistry;  
<sup>3</sup>Department of Genetics and Animal Breeding, Chittagong Veterinary and Animal Sciences  
University, Khulshi, Chittagong- 4202, Bangladesh

position and adjustment for rapid removal of large volume milk and as such it is prone to injury and infection (Gibbons, 1970). Mastitis may be clinical or sub-clinical, with sub-clinical infection preceding clinical manifestation. Yet the relationship between the two within a herd is not predictable (Rolands and Booth, 1988).

The prevalence of clinical mastitis in dairy cows of Bangladesh Milk Producer's Co-operative Union Ltd. (BMPCUL), Baghabarighat, Sirajgong area has been reported to be 16% (Al-Shawabkeh and Aziz, 1987). The incidence of mastitis was found to increase with number of lactation. Mastitis is the one of the most costly disease affecting dairy cows. It has been estimated that mastitis reduced milk yield by approximately 2% and butter fat by 25% in affected cattle as a compared to normal one. The milk of the infected cow is not suitable for the human consumption. In India, financial loss due to incidence of blind teat as a result of mastitis and loss of milk from clinical case of mastitis has been estimated as 92.57 cores of taka every year (Dhanda and Sethi, 1946). The prevalence of mastitis of clinical (13.3%) and sub-clinical (15.8%-19.5%) in dairy cattle of Bangladesh is the basic risk factors associated with increased risk of mastitis to enable their control. Epidemiological analysis of disease, breed, age and season are the basic risk factors but their effects on the occurrence of mastitis are still controversial. The epidemiological study was carried out to determine the distribution and association of clinical mastitis with demographic and temporal variable (Nooruddin *et al.*, 1997). Some tests like White Slide Test (WST) and California Mastitis Test (CMT) has been developed for rapid screening the udder infection. Very limited research works on mastitis have been carried out in Bangladesh. The prevalence of sub-clinical mastitis in milch cows has been reported 16.52% with WST and 15.77% with CMT from (BMPCUL) Baghabarighat, Sirajgong district by Prodhan *et al.*, (1996) and 18.5% with WST from the greater Mymensingh district by Rahman *et al.*, (1997). Considering the above facts the present investigation was carried out to-i) detect the prevalence of sub-clinical mastitis in dairy cows in Chittagong region and ii) investigate the factors that enhance the risk of sub-clinical mastitis.

## MATERIALS AND METHODS

### **Duration and area of study:**

The present study was carried out from June to November 2008 at twelve dairy farms in the urban and peri-urban areas of Chittagong municipality. The climatic condition was characterized by late rainy and early winter season. The experimental design was prospective cohort types.

### **Unit of study and Questionnaire:**

Individual cow was selected as study unit. In the selected area a total of 306 numbers of lactating cows were handled but the number of affected animals were 215. Pre-tested questionnaire was prepared and all the information from the farm was gathered to it by close observation and with the help of the owner of the farms.

### **Case definition and Selection:**

Sub-clinical mastitis was defined based on the following physical examination and California Mastitis Test (CMT). Milk samples were collected at the time of milking of 306 cows. These samples were tested with CMT reagents. Sub-clinical signs were asymmetry of teats and affected teat surface was blackish or discolor.

### **Diagnostic test:**

The detection of sub-clinical mastitis in affected cows was detected by CMT.

Table 1. Interpretation and Scoring of the CMT test.

Score	Meaning	Description of visible reaction
+	Negative	Mixture remains liquid, homogeneous, with no evidence of thickening.
++	Slightly positive	The slight thickness that forms is seen best by tipping the paddle back and forth and observing the mixture as it flows over the bottom of the cup. Trace reactions tend to disappear with continued rotation of the paddle. Read at 10 seconds.
+++	Positive	A distinct thickening of the liquid forms, but there is no tendency toward a gel formation. With some milk, the thickening may disappear after prolonged rotation of the paddle (20 seconds or more). Read at 10 seconds.
++++	Highly Positive	Mixture thickens immediately, and a gel formation is suggested. As the mixture is swirled, it tends to move in toward the center, exposing the bottom of the outer edge of the cup. When the motion is stopped, the mixture level out and covers the bottom of the cup. Read at 10 second. The surface may become elevated like a partially fried egg.

**Analysis:** The data were tabulated in Microsoft Excel. Analysis and figures were prepared through Microsoft Excel.

## RESULTS AND DISCUSSION

### Management of animal and milking practices:

The practices of milking hygiene and management system were poor for the majority of the farms sampled. Most of the farmer's were not practice preventive measures, such as the use of udder disinfectants, post milking, teat dipping and dry cow therapy. There was no surveillance program in the place for mastitis. It was evident that the entire floor was concrete type. Extra bedding in the form of plastic floor mat was provided in 15% of the animal houses visited during the study. In all farms, milker washed their hand with water every time before milking. Although, 85% of the farmer's mentioned to wash the cows udder before milking. About 65% of the farms, calves were introduced to stimulate milk let down and applied a variety of lubricants including cooking oil and mustard oil.

### Prevalence of mastitis:

A total of 215 cows (70%) were affected with sub-clinical mastitis out of 306. In contrast to present study prevalence of mastitis reported by Sofie *et al.*, (2007) 52.2% on a cow basis at least one culture positive, respectively which are lower than our findings. According to the Prodhan *et al.*, (1996), Parai *et al.*, (1992) and Rahman *et al.*, (1997) prevalence of sub-clinical mastitis were 19.3%, 16.5% and 18.5% respectively, which were lower than present findings (70%). But according to Merck Veterinary Manual all dairy herds had cows with sub-clinical mastitis; however, the prevalence of infected cows varies from 15-75% which agrees with present finding. The prevalence of sub-clinical mastitis was higher in the dairy farms due to poor health management practices, sampling variation technique, sample size and geographical location.

### Breed and sub-clinical mastitis:

The prevalence of sub-clinical mastitis according to the breed is presented in Table 2. From the table we observed that the prevalence of Sahiwal x Friesian was higher (90%) than others genotype combination. Prevalence in (Local x Friesian) x Friesian genotypes was the lowest among the others breed combination. The variation in the susceptibility of sub-clinical mastitis according to breed was also reported by Batra, (1988) and Rahman *et al.*, (1997). They investigated the higher frequency of sub-clinical mastitis in Local x Friesian cows which was not similar with present findings. This variation due to farm management and environment of the study area.

Table 2. Prevalence of sub-clinical mastitis related to breed

Sl No.	Breed	Total tested animal	Total test positive animal	Prevalence (%)
1	L x F	108	78	72
2	Sl x F	31	25	81
3	(L x F) x F	50	30	60
4	L x J	16	10	63
5	(S x F) x F	34	24	71
6	(L x F) x (S x F)	19	14	74
7	(L x F) x S	25	17	68
8	J x F	23	17	74
	Total	306	215	

L= Local; S= Sahiwal; F= Friesian; J= Jersey

#### Farm size and sub-clinical mastitis:

From the Table 3, we observed that the prevalence of sub-clinical mastitis according to farm size was higher (73%) in large type farm and lower in small farm (67%). High prevalence of sub-clinical mastitis in large farm may be due to contagiousness of mastitis. The organism of the mastitis easily transmitted one individual to another.

Table 3. Prevalence of sub-clinical mastitis related to farm size

Type of farm	No. of farm	No. of cow tested	No. of test positive cow	Prevalence (%)
Small	7	102	67	66
Medium	3	95	66	69
Large	2	109	82	75
Total	12	306	215	

#### Parity and sub-clinical mastitis:

The prevalence of sub-clinical mastitis among of cows was higher in third parity than other parities (Table 4). Bunch *et al.*, (1984) reported that higher prevalence of sub-clinical mastitis in second lactation which was not similar with present findings due to variation of breed and management of housing system. Kapur and Singh (1982) found the highest prevalence of sub-clinical mastitis in third lactation and subsequent in second which was similar with present findings. Prodan *et al.*, (1996) also reported the infection of sub-clinical mastitis were more from the second lactation to on words than in the first one. In general, the highest milk produced in third to fifth lactation. So, it is great chance to susceptible mastitis during the lactation period. Other scientists like Dohoo *et al.*, (1984), Grohn *et al.*, (1990) reported that fifth and sixth parity more susceptible to mastitis.

Table 4. Prevalence of sub-clinical mastitis related to parity

No. of Parity	No. of animal tested	No. of test positive animal	Prevalence (%)
1	51	30	59
2	54	41	75
3	56	44	79
4	49	36	73
5	23	16	70
6	27	18	67
7	31	21	68
8	15	9	60
Total	306	215	

**Age and sub-clinical mastitis:**

The variations in the susceptibility of sub-clinical mastitis according to the age are shown in Figure 1. Dohoo *et al.*, (1984) also found the older cows were more susceptible to mastitis. This was inconsistent with present findings due to geographical variation, housing and feeding management.

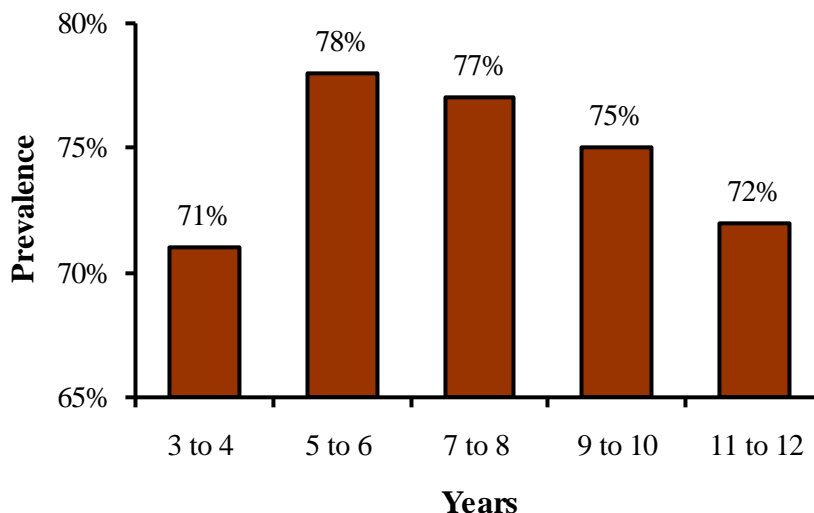


Figure 1. Prevalence of sub-clinical mastitis related to age group

**Quarter of udder and mastitis:**

The frequency of sub-clinical mastitis in hind quarter (1.068 times) is higher than fore quarter (Table 5). According to Merck Veterinary Manual the variation in the susceptibility according to quarter 5 to 40%. Parai *et al.*, (1992) found 23% quarter infection rate which is lower than present findings. This variation due to poor udder health management, geographical locations and floor management system.

Table 5. Prevalence of sub clinical mastitis related to quarter of udder

Quarter	No. of quarter tested	No. of test positive quarter	Prevalence (%)
Fore	612	268	44
Hind	612	288	47
Total	1224	556	

**Stage of lactation and sub-clinical mastitis:**

Frequency of sub-clinical mastitis in early period of lactation was higher (83%) than late period of lactation (Figure 2). Higher prevalence of mastitis in third month of lactation reported by Rahman *et al.*, (1997), which was consistent with present findings. Busato *et al.*, (2000) reported sub-clinical mastitis at quarter level were 21.2% for lactation period 7 to 100 days and 34.5% for 101 to 305 days post partum. Distribution of mastitis in different stages of lactation recorded in the present study was similar to Pal and Verma (1991). They reported lower prevalence of mastitis in stage of lactation above 5 months (150 days).

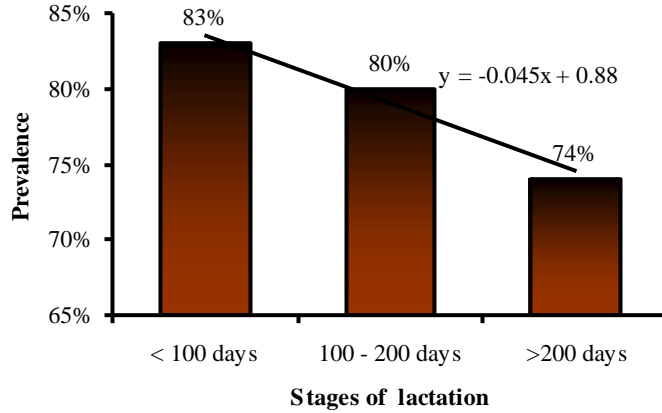


Figure 2. Prevalence of sub-clinical mastitis related to stage of lactation

**Milk production and mastitis:**

Cow produces 5 to 10 liters milk was more susceptible to mastitis (Figure 3). Rahman *et al.*, (1997) reported higher prevalence of mastitis in cows producing 5 to 9 kg milk in the morning which agrees with our findings. Cows those are give more milk have great chance of susceptible mastitis.

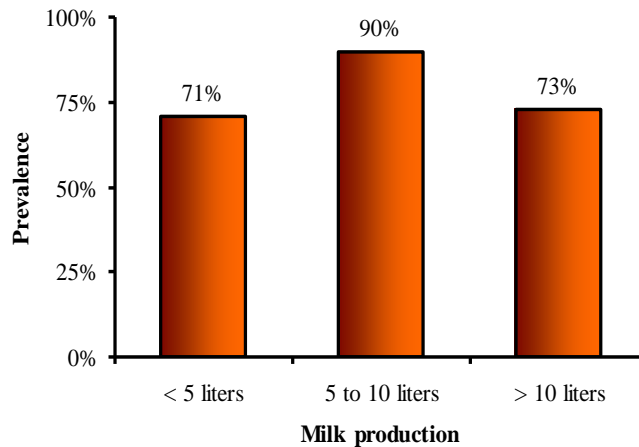


Figure 3. Prevalence of sub-clinical mastitis related to subsequent milk production

**Cleanliness and sub-clinical mastitis:**

Cleanliness has direct effect on cow's mastitis. Table 7 showing the sub-clinical mastitis considering various cleanliness conditions. Prevalence of sub-clinical mastitis was higher (38%) in heavy dirty barn condition and lowered in clean barn condition (22%).

Table 7: Prevalence of sub-clinical mastitis in relation to cleanliness

Category	Barn cleanliness			Udder and teat cleanliness		
	Examined	Mastitis positive	Percentage	Examined	Mastitis positive	Percentage
Clean	96	21	22	112	26	23
Moderately clean	115	30	26	96	32	33
Dirty	84	32	38	94	38	40
Total	295	83		302	96	

Management factors play an important role in prevalence of sub-clinical mastitis. Factors such as barn cleanliness, types of floor, appearance of udder cleanliness which is frequently judged in farm. Sanitary factors related to actual milking procedures, namely- use of clean water, washing of the hands before milking and use of disinfectants for cleaning the udder and teat appeared to play more important role in mastitis prevalence. The prevalence of sub-clinical mastitis is higher in dirty (40%) udder and teat than in clean (23%) udder and teat (Table 7).

### CONCLUSION

Mastitis is recognized worldwide as one of the most precious diseases affecting dairy industry. Many dairy man do not recognized fully tremendous losses sustained though unrealized milk production. At the sub-clinical level dairyman could be unaware of the problems. The study shows that higher prevalence of sub-clinical mastitis was in large farm compare to medium and backyard. A well documented continued research and educational effort is required to increase producer awareness of costs due to mastitis of dairy enterprise. Control of this costly disease must be based on continuing program of prevention and elimination of infection. Microbiological and epidemiological surveillance is necessary for effective treatment and control of the diseases. Since, worldwide sub-clinical mastitis is regarded to be the major cause of milk losses attributable to udder infections, it is important to educate farmers on improving animal husbandry practices and adopting better milking hygiene measures along with the use of CMT in disease monitoring.

Considering of CMT results, it is recommended that the owner of the dairy farms have to maintain a carefully planned mastitis control program consisting of:

- i) Follow proper milking procedure.
- ii) Maintain hygienic condition and use of effective teat dips.
- iii) Calves should be prevented from suckling milk of other cows.
- iv) The non responsive quarter should be permanently dried up.
- v) The first strip of milk should not be allowed to fall on the floor. They may be stripped in separate container along with disinfectant in it.
- vi) The floor of the milking shed should be washed with running water.
- vii) All the utensils and container should be cleaned and washed properly.
- viii) Clinical cases treatment recommended by veterinarian.

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