Prevalence of sub-clinical mastitis in dairy farms

MA AL Quaderi, M Husain, MGS Alam, M Khatun* and MA Hossain
Department of Surgery and Obstetrics, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

Abstract

A total of 560 lactating cows belonging to Bangladesh Agricultural University dairy farm (n = 59): Local Zebu (L), Local × Friesian (L × F), Local × Jersey (L × J), Local × Red Chittagong Cattle (L × RCC), Local × Sahiwal (L × SL), Red Chittagong Cattle (RCC); and Central Cattle Breeding Station and Dairy Farm (n = 501): Local Zebu, L × F, SL × F, Sahiwal and Australian Friesian Sahiwal (AFS) were selected to measure prevalence of subclinical mastitis (SM). The California Mastitis Test was done and the prevalence of SM was 68% on cow basis and 57% on quarter basis. The prevalence rate was significantly higher in L × F (87%, P < 0.05), SL × F (88%, P < 0.05), L × J (100%, P < 0.01), AFS (89%, P< 0.05) and SL (100%, P < 0.01). The local Zebu (31%) and RCC (28%) were least susceptible to SM. SM was significantly higher in multiparous (P < 0.05) and older cows (P < 0.05). The front quarters were more prone to SM than the rear. Factors such as breed, age, parity and management may have been responsible for high prevalence of SM in both farms.

Introduction

Mastitis is inflammation of the mammary gland (Burvenich et al., 2007; Fox, 2009) characterized by swelling, heat, redness, hardness and pain with abnormalities in milk. It is the most costly disease to the dairy industry, because of decreased milk yield, treatment and prevention cost and finally culling of the affected cows (Bar et al., 2008; Hertl et al., 2011; Murphy et al., 2008). Mastitis compromises animal welfare as well as its treatment is associated with human health hazard (Fogsgaard et al., 2011; Rasmussen et al., 2011).

Mastitis is most commonly caused by the bacteria belongs to Enterobacteria, Staphylococci, Streptococci families (Bradley, 2002). About 75-80% mastitis is subclinical, characterized by a significantly increased leukocyte count in milk (Bradley 2002). Subclinical mastitis (SM) affects the quality, quantity of milk, damages the udder tissue and most important mastitis form to cause greatest economic loss. SM is silent usually of long duration and often remained undetected in existing poor udder health management system where lack of advisory scheme. Hence, early detection and the prevalence records of SM are important for mastitis control. Comprehensive reports on SM in Bangladesh are lacking but a prevalence of 47% was recorded (Kader et al., 2003), and 55% was recorded in Sahiwal cows (Ghosh et al., 2004). This study was undertaken to study:

*Corresponding author:- E-mail: monarahman24@yahoo.com
The prevalence of SM in two intensively managed dairy farms in Bangladesh
The involvement of breed, parity, and age with the prevalence of SM
The problems relevant to the prevalence of SM in dairy farms.

Materials and Methods

Study area

The investigation was conducted at Bangladesh Agricultural University Dairy farm (BAUDF) and the Central Cattle Breeding Station and Dairy Farm (CCBSDF), Savar, Dhaka from January to May 2005 and June to November 2007. The farms were visited several times to collect breed, parities, ages of cows and the management practices.

Animals, housing, feeding and milking

The BAUDF consisted of 59 lactating cows: Local Zebu (L), Local × Friesian (L × F), Local × Jersey (L × J), Local × Red Chittagong Cattle (L × RCC), Local × Sahiwal (L × SL), Red Chittagong Cattle (RCC). The CCBSDF consisted of 501 cows: Local Zebu, L × F, SL × F, Sahiwal and Australian Friesian Sahiwal (AFS). The average body weights of the local and crossbred cows were 250 kg ± 15 kg and 300 kg ± 20 kg, respectively. The floor of the houses in both farms was made of bricks and cement. No bedding material was used. Stall feeding was practised in both farms in the morning and afternoon. All the cows had access to water ad libitum. All lactating cows were hand-milked in the morning and afternoon with their calf at feet. There was no practice of teat-dipping or dry cow therapy.

Sample collection and detection of subclinical mastitis

Fresh milk samples from each quarter of selected cows were collected aseptically in separate glass tube as described by Rosenberger (1979) at morning milking and the tube was labelled with the number of the cow. California mastitis test (CMT) was used to detect sub-clinical mastitis (SM) using the CMT test liquid and a plastic paddle with four cups according to the manual (KRUUSE® company of Denmark). The initial milk was discarded and a small amount of milk was squeezed out of each teat into the paddle. The surplus milk was tipped out of the paddle leaving 2 mL of milk in each cup. Then 3 mL of CMT test liquid was added to each cup. The paddle was gently rotated to thoroughly mix the contents. The reaction was scored as follows:

Negative (1): The mixture remained unchanged; Weak positive (2): The mixture began to coagulate and turned slightly mucus but could still be shaken; Positive (3): Movement of the mixture and unmistakable mucus formation was observed and it was still possible to tip a small portion of the mixture cut; Very positive (4): A jelly-like mucus consistency was formed, it was difficult to shake the mixture and it was no longer possible to tip any surplus mixture out.
Sub-clinical mastitis in dairy farms

Statistical analysis
Data were entered into Microsoft Excel® work sheets. Prevalence was defined as the number of positive cases of SM per 100 cows tested. T-test was performed to obtain the values of significance using the SPSS® software (Steel and Story, 1983).

Results and Discussion
Of 560 cows, 386 (68%) were positive to CMT and of 2059 active quarters, 1167 (57%) were positive to SM. The CMT graded SM scores were as follows: 43% as score 2, 35% as score 3 and 22% as score 4. The front-left, front-right, rear-left, and rear-right quarter infection rates were 60%, 59%, 55% and 52%, respectively. The prevalence of SM in L, L × F, L × SL, SL × F, RCC, L × RCC, AFS, L × J, and SL breeds were 31%, 87%, 56%, 88%, 28%, 50%, 89%, 100% and 100%, respectively (Table 1). The prevalence was significantly higher in L × F (P < 0.05), SL × F (P < 0.05), ASF (P < 0.05), SL (P < 0.01) and L × J (P < 0.01).

Table 1. Prevalence of California Mastitis Test (CMT)-positive cases in different breeds

<table>
<thead>
<tr>
<th>Breeds</th>
<th>No. of tested cows</th>
<th>No. of CMT (+) cows</th>
<th>% of CMT (+) cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>134</td>
<td>41b</td>
<td>30.6b</td>
</tr>
<tr>
<td>L × F</td>
<td>243</td>
<td>210a</td>
<td>86.7a</td>
</tr>
<tr>
<td>L × SL</td>
<td>48</td>
<td>27c</td>
<td>56.3c</td>
</tr>
<tr>
<td>SL × F</td>
<td>89</td>
<td>78a</td>
<td>87.6a</td>
</tr>
<tr>
<td>RCC</td>
<td>18</td>
<td>5b</td>
<td>27.8b</td>
</tr>
<tr>
<td>L × RCC</td>
<td>4</td>
<td>2d</td>
<td>50.0d</td>
</tr>
<tr>
<td>ASF</td>
<td>9</td>
<td>8d</td>
<td>88.9d</td>
</tr>
<tr>
<td>L × J</td>
<td>6</td>
<td>6d</td>
<td>100d</td>
</tr>
<tr>
<td>SL</td>
<td>9</td>
<td>9d</td>
<td>100d</td>
</tr>
<tr>
<td>Total</td>
<td>560</td>
<td>386</td>
<td></td>
</tr>
</tbody>
</table>

Level of significance * *
ASF = Australian Sahiwal Friesian, F = Friesian, J = Jersey, L = Local Zebu, SL = Sahiwal, RCC = Red Chittagong Cattle. * Within columns figures with different letters differ significantly (P < 0.05)

The prevalence of SM in cows from 1st to 7th parity is presented in Fig. 1. The prevalence of SM was 76.4%, 82.5%, 71.7%, 92.3%, 88.0%, 86.4% and 92.3% in parities 1 to 7, respectively. The prevalence was significantly (P < 0.05) higher in parity 4th and above.

The prevalence of SM in cows aged 2 to 14 years was 50%, 69.8%, 64%, 68.8%, 68.5%, 65.6%, 59.6%, 62.8%, 71.1%, 75.7%, 65.2%, 66.7%, 88.6%, respectively. Cows aged 14 years and above had significantly higher (P < 0.05) prevalence of SM (Fig. 2).
Management

Management in BAUDF and the CCBSDF was poor. There was no post-milking teat-dipping, no udder towels were used, and there was no dry cow therapy. The milkers did not wash their hands between milking of cows. The cows were washed twice daily with fresh water, but cow dung was sticking to the teats and udder during milking.

Housing was poor. Spiders' webs were seen in the beams. In both the farms, manure was removed only twice daily and the cows had to lie on the manured floor. No
disinfectant was regularly used to disinfect the floor. The floors were not regularly
washed and were embedded with algae.

Combined effect of breed, age, parity and management were responsible for high
prevalence of SM in both BAUDF and CCBSDF. The prevalence of SM was
significantly higher in \( L \times F, SL \times F, L \times J \), AFS crosses and in SL breed. The L and
RCC were least susceptible to SM. Older (over 14 years) and higher parity cows (Over
4) had significantly higher prevalence of SM.

Management of the herd and hygienic milking are considered important risk factors
for SM (Kivaria et al., 2004; Sarkar et al., 2013). The management and hygienic
conditions of the farms were poor, which might lead to higher susceptibility to SM.
Despite these L, RCC, \( L \times RCC, L \times SL \) were less susceptible to SM with least
susceptibility of pure L and RCC cows. Our study supports Kader et al. (2003);
Hossoin (2004) measured the prevalence of SM in L as 45.5\% & 25\%, respectively,
compared with our finding of 31\%. However, difference in the prevalence might be
due to seasonal and management variations, number of animals observed. In contrast,
higher prevalence was recorded in \( L \times F, SL \times F, AFS \), which is important for culling
(Bell et al., 2010). It would be interesting to investigate the reasons for higher
resistance of L, RCC and less resistance of Holstein-Friesian cows. Genomic influence
studies on mastitis are emerging (He et al., 2011; Pighetti et al., 2011; Khatun et al.,
2013). Somatic cell count (SCC) has significant genetic association for SM either in
challenged \( E. coli \) mastitis (Khatun et al., 2013) or whole genome study (Minozzi et al.,
2011). Hence, our local zebu and zebu cross can be investigated in regard to SCC level
for SM, which would be the basis for further genomic study. However, number of
total cows for \( L \times RCC, L \times J, ASF \) and SL were less, which should be increased in
future to get more significant result.

The increase in SM with age is consistent with other studies (Kader et al., 2003; Ghosh
et al., 2004; Radostits et al., 2000). The fluctuation might be due to variation in the
number of cows in different age groups (Fig. 2). Increased age predisposes the cow to
exposure of infection with mastitis pathogens and decreases the potency of the teat
sphincter (Pankey et al., 1991). In contrast younger cows possess significantly better
polymorphonuclear leukocyte function than multiparous cows (Dulin et al., 1988;
Hogan et al., 1989). SM increases with parity (Kader et al., 2003; Mungube et al, 2004;
Nooruddin et al., 1997; Sarkar et al., 2013). Our study found same findings where cows
in 4\textsuperscript{th} parity and above had significantly higher prevalence of SM than other parities.
The mean prevalence of SM in cows (68\%) is higher than Ghosh et al. (2004; 55\%);
Giannenechini et al. (2002; 52\%). The quarter prevalence (57\%) was close to Kader et al.
(2003; 46.6\%); Jin et al. (2000; 55.5\%). The differences might be due to hygienic
practice, number of cows observed and season.

Post-milking teat dipping (Erskine and Eberhart, 1990), milker preparation and dry
cow therapy reduce the prevalence of SM (Shem et al., 2001; Kivaria et al., 2004; Sarkar
et al., 2013), but were not practised in the farms. Moreover lack of routine detection of
SM (Busato et al., 2000), large herd size (Kivaria et al., 2004; Romain et al., 2000), water
scarcity, residual suckling, dirty floor embedded with algae, delay in manure removal, no use of disinfectant may have aggravated the condition. Poor management and compromised animal welfare affect the productivity of farms (Costa et al., 2013; Husfeldt et al., 2012). Good management (Sarkar et al., 2013), herbal therapy (Fang et al., 1993), dry-cow therapy and teat dipping can markedly reduce the incidence of SM.

In conclusion, the prevalence of SM was significantly higher in L × F, SL × F, L × J, AFS crosses and in SL cows. The L and RCC were least susceptible to SM. Multiparous cows (over 4th parity) and older cows (over 14 years) were significantly more susceptible to SM. Good management might reduce the prevalence of SM in Bangladesh.

References


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