The Journal of Animal and Plant Sciences, 22(3 Suppl.): 2012, Page: 371-376
ISSN: 1018-7081

CROSS-SECTIONAL EPIDEMIOLOGICAL STUDIES ON MASTITIS IN CATTLE AND BUFFALOES OF TEHSIL BUREWALA, PAKISTAN

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ABSTRACT

The present study was contemplated to find out the epidemiology of mastitis in lactating cattle and buffaloes in tehsil Burewala, Pakistan. For this purpose, a total of 673 animals (n=291 cattle, n=382 buffaloes) from 300 livestock farmers were tested using Surf Filed Mastitis Test (SFMT) for the presence of mastitis. A higher prevalence (24.60%) of clinical mastitis was found in buffaloes than cattle (18.21%). The prevalence of sub-clinical mastitis was 36.38% and 33.67% in buffaloes and cattle, respectively. Quarter based prevalence of clinical mastitis in buffaloes and cattle was 8.04% and 5.75%, respectively. Quarter based prevalence of sub-clinical mastitis was 16.04% in buffaloes and 14.47% in cattle. Risk factors of mastitis found were: age, lactation number, stage of pregnancy, stage of lactation, dry period length, hard milking, calf suckling, folded thumb milking technique, teat injury, backyard housing, bricks floor, uneven floor, poor drainage system and low frequency of dung removal.

Key words: mastitis, prevalence, cattle, buffaloes, quarter, Surf Field Mastitis Test.

INTRODUCTION

Mastitis is a disease of all milking animals. It is common in dairy cattle, uncommon in beef cattle. In cattle mastitis is characterized by changes in udder tissue, colts in milk and changes in the constitution of milk and sometimes accompanied by heat and pain in udder ((Schalm *et al.* 1971). Mastitis has been recognized as one of the most expensive diseases affecting dairy animals worldwide (Lightner *et al.* 1988; Kossaibati *et al.* 1998). It has adverse effects on the economics of milk production by reducing the quantity (approx. 21%) and quality (butter fat 25%) of milk (DeGraves and Fetrow, 1993; Sordillo *et al.* 1997). Per-acute clinical mastitis has also been recognized as a cause of mortality in adult dairy cows (Menzies *et al.* 1995). In Pakistan, statistics of current losses due to this disease are not available although it was estimated about three decades ago that in Punjab province alone, total losses caused by clinical mastitis amounted to Rs. 240 million per anum (Chaudhry and Khan, 1978).

The incidence rate of mastitis in various parts of Pakistan has been reported as 20-60% in cattle and buffaloes (Rasool *et al.* 1985; Bilal *et al.* 2004; Chishty *et al.* 2007). *Staphylococcus aureus*, *Streptococcus agalactiae* and *Escherichia coli* are the most prevalent pathogens which are responsible for about 78% cases of mastitis in different areas of Pakistan (Razzaq, 1998; Ahmed 2001; Khan, 2002). An increasing incidence of mastitis in Pakistan may be due to extremely small herd size [(more than 80% animals kept in herds of 3-4 animals/family widely rampant povery and illiteracy and lack of any milk quality premium (Teufel, 1998)], standard mastitis control practices (e.g., post-milking antiseptic teat dipping and dry period antibiotic therapy) as recommended by National Mastitis Council Inc. USA (Nickerson, 1994) are conceivably difficulty to be adopted in a country like Pakistan. In fact these practices are totally non-existent even on well organized private dairy farms and public sector (military and government). Mastitis can only be controlled if epidemiology of the disease is known. This paper describes epidemiology and risk factor associated with mastitis in dairy cattle and buffaloes of tehsil Burewala, Pakistan.

MATERIALS AND METHODS

A total of 673 animals (n=291 cattle, n=382 buffaloes) from 300 livestock farmers of tehsil Burewala, Pakistan were randomly selected to find out the prevalence of clinical and sub-clinical mastitis. Data related to cattle and buffaloes were recorded in data capture form especially designed for the purpose. Entries in data capture form included were host associated determinants (age, lactation number, stage of pregnancy, stage of lactation, dry period length, milking type, presence or absence of teat injury), management associated determinants (milk let down stimulus, milking technique) and determinants associated with housing (type of housing, type of floor, condition of floor,

drainage system, dung removal frequency). Clinical mastitis was diagnosed on the basis of presence of visible or palpable signs of udder inflammation along with the changes in milk secretions whereas the subclinical mastitis was diagnosed by using Surf Field Mastitis Test (Muhammad *et al.* 1995).

Surf Field Mastitis Test (SFMT): A 3% reagent solution of household detergent "Surf" (Lever Brothers, Pvt. Ltd. Pakistan) was prepared and poured into a dispensing bottle. About 2-3 mil milk was drawn directly from the teat after thorough washing and cleaning into well of plastic paddle and equal volume of 3% reagent solution was added. Milk and reagent solution were mixed by gentle swirling of the paddle in horizontal position. Slime or gel formation was noted for the positive test.

Statistical analysis was evaluated using the χ^2 test. Probability levels (p) of <0.05 were defined as statistically significant.

RESULTS AND DISCUSSION

Prevalence of Mastitis in Cattle and Buffaloes: Epidemiological data of clinical and subclinical mastitis in cattle and buffaloes is shown in table-1. The prevalence of clinical mastitis in cattle was reported to be 18.21% while in buffaloes the prevalence of clinical mastitis was 24.60% which is congruent with the findings of Bilal *et al.* (2004) and Nooruddin *et al.* (1997). Thapa and Kaphle (2002) recorded prevalence of clinical mastitis 59% and 41% in cattle and buffaloes, respectively, and Haltia *et al.* (2006) as 52.7%. This difference may be attributed towards different geoclimatic conditions prevailing and different study area. In the present study prevalence of subclinical mastitis was also higher in buffaloes than in cattle. Dangore *et al.* (2000) and Memon *et al.* (1999) reported 35.5% and 29% prevalence of subclinical mastitis in buffaloes, respectively which is in close agreement with the findings of our study. Results of our study also correlate with the findings of Karimuribo *et al.* (2008) and Almaw *et al.* (2008) who also reported that high milk yield and age are the risk factors associated with sub-clinical mastitis. In our study Quarter based prevalence of clinical and subclinical mastitis was higher in buffaloes than in cattle. Similarly findings were also reported by Allore (1993) and Almaw *et al.* (2008). When the prevalence of clinical mastitis in relation to anatomical location of quarters was determined, it was found that prevalence was higher in forequarters than in rear quarters in cattle and it was higher in rear quarters than in fore quarters in buffaloes. The same pattern was observed in sub-clinical mastitis. Similar findings were also observed by Shukla *et al.* (1997), Bilal *et al.* (2004) and Premchand and Behra (1995) who reported that forequarters were more affected than hind quarters in case of cows where as in buffaloes hind quarters had higher prevalence of mastitis than forequarters. Prevalence of blind quarters was higher in buffaloes than cattle. The slightly higher prevalence of blind quarters in buffaloes might be due to high incidence of clinical mastitis in buffaloes as advanced untreated cases of mastitis could lead to teat blindness. Ahmad *et al.* (2000) reported similar findings in cattle and buffaloes.

Disease determinants:

Determinants associated with host: Epidemiological data of clinical mastitis associated with host determinants is given in table-2. The prevalence of clinical mastitis in cattle and buffaloes was increased with the increase in the age of animal. The highest prevalence was found in 12 year or above age group of cattle and buffaloes. Rasool *et al.* (1985) also observed an increased prevalence of mastitis in older animals. As to lactation number, the prevalence of clinical mastitis was increased with the increase in the lactation number. At lactation number 6, the prevalence was highest in both cattle and buffaloes. As the milk production is parallel to advanced lactation number and often intended to predispose the udder to mastitis (Stableforth and Galloway, 1959). Our results also correlate with the findings of Rasool *et al.* (1985), Shawabekh and Aziz (1987), Siani *et al.* (1994) and Premchand and Behra (1995). In our study prevalence of clinical mastitis was highest, in non-pregnant but lactating animals. There was decline at 1-3 months and 4-6 month pregnancy and was again increased at 7 months and above pregnancy. As the stage of lactation proceeded, an increasing trend of clinical mastitis was observed both in cattle and buffaloes. Rasool *et al.* (1985) and Bardan (1989) reported that rate of occurrence of mastitis was higher during advanced stages of lactation than early stage which supports the findings of our study. The prevalence of clinical mastitis in cattle and buffaloes was found to be inversely proportional to the dry period length. These findings are in complete alignment with the findings of Prost (1984) and Enevoldsen and Sorensen (1992) who reported decreased prevalence of mastitis in animals with increased dry period length. Hard milking cattle and buffaloes had higher prevalence of clinical mastitis as compared to easy milking animals. High prevalence of clinical mastitis in hard milkers might be due to excessive pressure during milking contributing towards trauma to the mammary tissue. Furthermore the cattle and buffaloes having teat injury had higher prevalence than cattle and buffaloes without teat injury. Teat injury predisposed the teat and udder to infection that might be the reason of higher prevalence of mastitis in injured teats. These findings of present study are supported by the finding of various workers like Geer *et al.* (1988), Heeschen, 1988, and Pyorala *et al.* (1992).

Table-1. Prevalence of clinical and sub-clinical mastitis in cattle and buffaloes.

Category	Clinical mastitis				Sub-clinical mastitis			
	Cattle		Buffaloes		Cattle		Buffaloes	
	No. examined	No. positive (%)	No. Examined	No. positive (%)	No. examined	No. positive (%)	No. examined	No. Positive (%)
Total *	291[A]	53(18.2)	382	94(24.6)	291[A]	98(33.6)	382	139(36.3)
Quarter bases **	1164 [Q]	67(5.7)	1528	123(8.04)	1085[Q]	157(14.4)	1384	222(16.0)
Anatomical location of quarters **								
LF	-	19(1.6)	-	27(1.7)	-	43(3.9)	-	52(3.7)
LR	-	16(1.3)	-	34(2.2)	-	37(3.4)	-	59(4.2)
RF	-	17(1.4)	-	30(1.9)	-	42(3.8)	-	53(3.8)
RR	-	15(1.2)	-	32(2.0)	-	35(3.2)	-	58(4.1)
Blind quarters	1164[Q]	12(1.0)	1528[Q]	21(1.3)	-	-	-	-

A= number of animal examined Q=number of quarters examined
* indicates significant difference ($p<0.05$) ** indicates non-significant difference ($p>0.05$)

Table-II. Prevalence of clinical mastitis in cattle and buffaloes in relation to determinants associated with host.

Category	Clinical mastitis			
	Cattle		Buffaloes	
	No. examined	No. positive (%)	No. Examined	No. positive (%)
Age *				
4-5 year	60	2(3.3)	73	3(4.1)
6-7 year	57	10(17.5)	81	20(24.6)
8-9 year	48	9(18.7)	87	23(26.4)
10-11 year	61	13(21.8)	78	2430.7)
12 years and above	65	19(29.2)	63	24(38.0)
Lactation No.				
1	49	4(8.1)**	63	7(11.1)*
2	42	5(11.9)	69	9(13.0)
3	56	11(19.6)	71	15(21.1)
4	46	10(21.73)	65	18(27.6)
5	50	11(22.0)	58	21(38.2)
6	48	12(25.0)	56	24(42.8)
Stage of pregnancy *				
Non preg.	79	39(49.3)	97	67(69.0)
1-3 month	58	3(5.1)	85	8(9.4)
4-6 month	80	4(5.0)	105	6(5.7)
7 months and above	74	7(9.4)	95	13(13.6)
Stage of Lactation *				
1-2 month	56	5(8.9)	93	15(16.1)
3-4 month	84	12(14.2)	89	17(19.1)
5-6 month	85	19(22.3)	111	31(27.9)
7 months and above	66	17(25.7)	89	31(34.8)
Dry period length **				
1 month	72	19(26.3)	87	31(35.6)
2 months	60	12(20.0)	92	25(27.1)
3 months	82	12(14.6)	99	19(19.1)
4 months	77	10(12.9)	104	19(18.2)
Milking *				
Easy	199	30(15.0)	233	49(21.0)
Hard	92	23(25.0)	149	45(30.2)
I Teat injury *				
Present	124	31(25)	179	62(34.6)
Absent	167	22(13.1)	203	32(15.7)

* indicates significant difference within the category ($p<0.05$)
** indicates non-significant difference within the category ($p>0.05$)

Table-III. Prevalence of clinical mastitis in cattle and buffaloes in relation to determinants associated with management.

Category	Clinical mastitis			
	Cattle		Buffaloes	
	No. examined	No. positive (%)	No. Examined	No. positive (%)
Milk let down stimulus *				
Calf suckling	111	39(35.1)	123	62(50.4)
Concentrate	75	3(4.0)	91	6(6.5)
Oxytocine	42	5(11.9)	71	13(18.3)
Manual	63	6(9.5)	97	13(13.4)
Milking technique *				
Whole hand	275	44(16)	359	80(22.2)
Folded thumb	16	9(56.2)	23	14(60.8)

* indicates significant difference within the category ($p<0.05$)

Table-IV. Prevalence of clinical mastitis in cattle and buffaloes in relation to determinants associated with housing.

Category	Clinical mastitis			
	Cattle		Buffaloes	
	No. examined	No. positive (%)	No. Examined	No. positive (%)
Type of housing*				
Backyard	75	40(53.3)	111	69(62.1)
Street	112	7(6.2)	124	12(9.6)
Open area	104	6(5.7)	147	13(8.8)
Type of floor*				
Kaccha	213	23(10.7)	284	49(17.2)
Brick	58	24(41.3)	69	36(52.1)
Cemented	20	6(30.0)	29	9(31.0)
Condition of floor				
Even	204	33(16.1)**	209	42(20.0) *
Uneven	87	20(22.9)	173	52(30.0)
Drainage system*				
Poor	37	22(59.4)	103	52(50.4)
Acceptable	155	28(18.0)	241	41(17.0)
Proper	99	3(3.0)	38	1(2.6)
Frequency of dung removal				
Once daily	83	22(26.5)**	152	49(32.2) *
Twice daily	118	21(17.7)	133	31(23.3)
Thrice daily	50	7(14.0)	54	9(16.6)
Four times daily	28	2(7.1)	31	4(12.9)
Five times daily	12	1(8.3)	12	1(8.3)

*indicates significant difference within the category ($p<0.05$) **indicates non-significant difference within the category ($p>0.05$).

Determinants associated with management: Epidemiological data of clinical mastitis associated with management determinants is given in table-3. As to milk let down stimulus, the highest prevalence was observed in the animals with calf suckling as milk let down stimulus, followed by animals with oxytocine, manual and concentrate milk let down stimuli. Prabharkar *et al.* (1990) isolated mastitis causing bacteria from the pharynx of suckling calves that support our findings. One more reason of high prevalence of mastitis in animals with suckling calves could be the injury inflicted while dragging away the calf during suckling which is common practice in Punjab province. Animals milked by folded thumb have had higher prevalence compared with animals milked by whole hand. High prevalence of clinical mastitis in cattle and buffaloes milked by folded thumb might be due to trauma inflicted by folded thumb. According to Ahmad (2000), folded thumb technique of milking predisposed the animals to high incidence of mastitis.

Determinants associated with housing: Epidemiological data of clinical mastitis associated with housing determinants is given in table-4. It was observed

that prevalence of clinical mastitis was high in backyard housed animals than animals kept in streets and open areas which might be due to highly contaminated environment in backyard areas. The findings of the present study are also in alignment with the findings of Carroll, (1977), Hogan *et al.* (1989) and Pyorala *et al.* (1992) who observed high incidence of mastitis during the time animals were housed compared with the pasture time. When the prevalence of clinical mastitis in relation to type of floor was determined, it was noted that prevalence of clinical mastitis in the animals kept on bricks floor was highest followed by the animals kept on cemented floor. The prevalence in animals kept on kaccha floor (without bricks or cement) was lowest. High prevalence of mastitis in animals housed on brick and cemented floor could be due constant sitting and standing behaviour of animals on hard surface which may lead to teat injury/trauma. These findings are supported by Ahmad (2000) who reported that buffaloes kept on brick floor had high prevalence of mastitis than on kaccha floor. According to Carroll (1977) loose housed cows provided with soft bedding had lower prevalence of mastitis than the cows provided with hard bedding. Condition of floor was also found to be a risk factor of clinical mastitis in cattle and buffaloes. The prevalence on uneven floor was higher than on even floor Uneven surface of the floor could have resulted in udder trauma/injury while sitting on uneven surface uncomfortably leading to uneven distribution of pressure on various body parts. These observations correlate with the findings of Heeschen (1988) who observed that injured compressed teats are more prone to mastitis. The prevalence of clinical mastitis in relation to drainage system was also studied. With poor drainage system the prevalence of clinical mastitis was found to be highest followed by acceptable and proper drainage system. Prevalence of clinical mastitis in cattle and buffaloes was found to be inversely proportional to the frequency of dung removal. These findings are in close alignment with the findings of Ahmad (2000).

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