

## Impact Of Risk Factors On The Prevalence Of Mastitis In Dairy Cattle

Abou Zaid A A, El Balkemy FAM and Hend MS El Damaty

Dep. of Animal Medicine, Faculty of Vet. Med., Zagazig, University

### ABSTRACT

This investigation was carried out on a total of 770 dairy cattle from different localities and reared under various hygienic environments from July 2011 to August, 2012.

Application of California mastitis test and bacteriological examination, revealed that 291(37.8%) animals were positive; 11.2% and 26.6% for clinical and subclinical mastitis respectively. There was a significant difference ( $P \leq 0.05$ ) on the prevalence of mastitis between those animals in different parity number. The prevalence rate of subclinical mastitis rose with an increase in parity number, while the prevalence rate of clinical mastitis decrease. The prevalence rate of clinical and subclinical mastitis was also significantly affected by lactation stages ( $P \leq 0.05$ ), season ( $P \leq 0.05$ ). Similarly there was a significant difference ( $P \leq 0.05$ ) on the prevalence rate of mastitis between animals kept under different hygiene of milking process. Bacteriologically staphylococcus, streptococcus, and *E.coli* were the predominant frequently isolates in this study; 45.9%, 38.4% and 14.8% respectively. In Conclusion, good hygiene in milking process, milking clinically infected animals at last, culling chronic mastitic carriers, treating clinically infected animals and dry cow period therapy could reduced the prevalence rate of mastitis.

### INTRODUCTION

Mastitis remains incriminated as one of the critical problems of the dairy animals causing dramatic economic losses during the lactation seasons. These losses are primarily due to lower milk yield, reduced milk quality and higher costs of treatment and control (1). Mastitis pathogens of dairy ruminants can be categorized as environmental bacteria; that are commonly present in the cows environment and may reach the teat orifice from that source as *Streptococcus uberis*, *Escherichia coli* and other *Coliforms* or contagious; which are spread from infected quarters to other quarters and cows as *Staph aureus*, *Streptococcus agalactiae* (2). The major sources of pathogens and means of transmission include infected quarters and soiled udder, contaminated milking machines, teat cups, milker's hands, washing clothes.. Moreover, the stage of lactation, lactation number, trauma to udder, teat and teat canal, lesions on teat skin, immunological status of each mammary gland, bulk of infection in the environment and management conditions are

amongst the determinants which dictate the level of mastitis prevalence (3).

The present work was carried out to determine the prevalence of clinical and subclinical mastitis in dairy farms with different hygienic measures, impact of risk factors and isolate the dominant bacterial causal agents.

### MATERIAL AND METHODS

#### Lactating animals examined

A total of 770 lactating cows and buffaloes from different localities were examined; the udder of each was screened for recurrent clinical and subclinical mastitis during the period extended from July 2011 until August 2012. Seventy ten cows were picked out from three varied dairy farms in addition to 60 individual cases of dairy buffaloes.

Table 1. Examined cattle from different districts

Farms	Locality	No. of examined animals
1 <sup>st</sup>	Private dairy farm in Borg Al-Arab district at Alexandria Province.	500 dairy cows
2 <sup>nd</sup>	Governmental dairy farm in Salhiya district at Sharkia Province	160 dairy cows
3 <sup>rd</sup>	Governmental dairy farm in El-Marg district, Cairo Province.	50 dairy cows
Small holder's cases	Individual cases admitted by holders to veterinary Medicine Faculty Clinic, Zagazig University	60 dairy buffaloes

## Milk samples collection

Milk sample were aseptically collected as previously described (4).

California mastitis test (CMT) were performed as previously described (5).

## Microbiological procedures

All CMT and clinically positive samples were analyzed microbiologically(6). Positive samples were cultured on blood agar plate, MacConkey agar plate and Edward's agar plate's .Bacterial growth was identified and recorded after 24 and 48 hours of incubation at 37°C. Bacterial isolates were identified on the basis of colony characteristics, presence of haemolysis, Gram stain and biochemical tests (6).

## Statistical analysis

Data were analyzed using the computer program Statistical Package for Social Science (SPSS/PC+ 2001, Version 16). Chi - square analysis test was used to study the possible association between the prevalence rate of

mastitis and impact of risk factors(Lactation stages, lactation seasons, climatic conditions, presence of skin lesions and hygienic measures) and the results were considered to be significant at  $P \leq 0.05$  and high significant at  $P \leq 0.01$ .

## RESULTS

## Prevalence rate of clinical and subclinical mastitis

From the 770 cattle examined, 291 (37.8%) were positive for mastitis at cattle level, 86 (11.2%) clinical and 205 (26.6%) subclinical as shown in Table 2. Out of 1164 quarters examined bacteriologically, there were 840 (72.1%) quarters affected, 239 (20.5%) clinically and 601 (51.6%) subclinically.

Table 2. Prevalence rate of clinical and subclinical mastitis

Animal farms	Total No. of examined animals	No. of clinical cases	%	No. of subclinical cases	%	Total No. of cases	%
1 <sup>st</sup>	500	9	1.8	80	16	89	17.8
2 <sup>nd</sup>	160	45	28.1	78	48.8	123	76.87
3 <sup>rd</sup>	50	2	4	22	44	24	48
Small holders cases	60	30	50	25	41.7	55	91.7
Total	770	86	11.2	205	26.6	291	37.8

Risk factors

**Table 3. The effect of lactation seasons on the prevalence rate of mastitis**

Lactation seasons	Total No. of examined animals	Total No. of infected animals	Clinical mastitis	%	Subclinical mastitis	%
1 <sup>st</sup>	90	37 (41.1%)	26	28.9	11	12.2
2 <sup>nd</sup>	100	28 (28%)	13	13	15	15
3 <sup>rd</sup>	120	36 (30%)	13	10.8	23	19.2
4 <sup>th</sup>	193	77 (39.9%)	19	9.8	58	30.1
5 <sup>th</sup>	145	54 (37.2%)	9	6.2	45	31
<5 <sup>th</sup>	122	59 (48.4%)	6	4.9	53	43.4
Total	770	291	86	11.2	205	26.6

**Table 4. Prevalence of mastitis in cattle in relation to stage of lactation**

Stage of lactation	Total No. of examined animals	Clinical mastitis		Subclinical mastitis	
		No.	%	No.	%
Early(1-4 month after parturition)	160	55	34.4	21	13.1
Mid(5-8 months after parturition)	270	23	8.5	74	27.4
Late(>8months up to the onset of dry period)	340	8	2.4	110	32.4
Total	770	86	11.2	205	26.6

**Table 5. The effect of seasons on prevalence rate of mastitis in cattle**

Season of the year	Total No. of examined animals	No. of infected animals	Animals with clinical mastitis	%	Animals with subclinical mastitis	%
Summer	200	80	7	3.5	73	36.5
Autumn	150	45	4	2.6	41	27.3
Winter	250	106	63	25.2	43	17.2
Spring	170	60	12	7.1	48	28.2
Total	770	291	86	11.2	205	26.6

**Table 6. The effect of hygienic measures on the prevalence rate of mastitis in cattle**

Hygiene of milking process	No. of animals at risk	Clinical cases		Subclinical cases	
		No.	%	No.	%
Poor hygiene	270	77	28.5	125	46.3
Good degree of hygiene	500	9	1.8	80	16

Table 7. Relation between mastitis and presence of skin lesion on teat and / or udder

Animals	Lesion on teat and/or udder	No lesion
Total N o. of examined	84	686
Total No. of infected	79	212
Prevalence (%)	94%	30.9%

Table 8. Prevalence rate of single and mixed bacteria causing mastitis in cattle

Isolated microorganism	Total No. of isolates	%	CM		SCM		Single isolates		Mixed isolates	
				%		%	CM	SCM	CM	SCM
<i>S. aureus</i> *	365	31.1	96	29	269	31.9	51	140	45	129
<i>Coagulase negative staphylococci</i> **	174	14.8	55	16.6	119	14.1	39	71	16	48
<i>Str. agalactiae</i> *	197	16.8	50	15.1	147	17.4	15	60	35	87
<i>Str. dysagalactia</i> **	31	2.6	6	1.8	25	3	6	25	0	0
<i>Str. uberis</i> **	220	18.7	59	17.8	161	19.1	35	85	24	76
<i>Str. faecalis</i> **	4	0.34	2	0.6	2	0.2%	2	2	0	0
<i>E. coli</i> **	174	14.8	57	17.2	117	13.9%	16	10	41	107

\* Contagious bacteria  
CM: Clinical mastitis

\*\*Environmental bacteria  
SCM: Subclinical mastitis

## DISCUSSION

Table 2. showed that the overall prevalence of mastitis in this study was 37.8% on cattle basis and 72.1% on quarter basis. Previous study showed that the prevalence of mastitis in cattle was 32.2% (7). This is lower than reported in Ethiopia (8) where the overall prevalence of mastitis was 64.6% at cows levels and higher than reported in Pakistan (9) where the overall prevalence of mastitis in dairy cattle was 22.44%.

The difference in prevalence of mastitis observed between the reports from different parts and the present study may be due to

differences in management and husbandry condition in the area.

Table 3. showed that there was a significant difference on those animals in different parity numbers ( $P \leq 0.05$ ). The prevalence rate of clinical mastitis is gradually decreased by subsequent increasing the lactation numbers. This may be due to a build up of acquired immunity by subsequent lactation. Similar results was reported in Pakistan (10), meanwhile prevalence of subclinical mastitis rose with an increasing in parity numbers. It has been reported that older cows especially after four lactations are more susceptible to subclinical mastitis (11,12).

Table 4. showed that the stages of lactation were affected significantly the prevalence of mastitis ( $P \leq 0.05$ ). The prevalence of clinical mastitis was elevated in the first three months of lactation (34.4%) and this may be due to the dairy cattle seemed to have more oxidative stress and low antioxidant defense during early lactation and this appears to be the reason for increased their susceptibility to mastitis (13). The first month of lactation displayed the highest prevalence of mastitis (62.7%) while the late stage of lactation showed the lowest prevalence (11.2%) (14), however prevalence was dramatically increased from 13.1%, 27.4% and 32.4% in subclinical mastitis cases in early, mid and late lactation period respectively. The increase in prevalence of subclinical mastitis from 27.8% in recently parturient cattle to 32.7% and 34% in mild lactation and late lactation respectively (7).

Table 5. showed significant association between prevalence rate of mastitis and season ( $P \leq 0.05$ ). Clinical mastitis frequency was increase in winter (25.2%) and spring (7.1%) than in summer (3.5%) and autumn (2.6%) this may be due to occurrence of outbreak of foot and mouth disease during winter season and spring season, as that one of the most important complications of foot and mouth disease, occurrence of mastitis. Foot-and-mouth disease viruses can play an indirect role in the etiology of bovine mastitis. These viruses can induce teat lesions, for instance in the ductus papillaris, which result in a reduction of the natural defense mechanisms of the udder and indirectly in bovine mastitis due to bacterial pathogens (15). The increase prevalence of clinical mastitis in winter this may be due to specific risk factors for each animals group as hygiene and feeding (7). On the other hand subclinical mastitis frequency was increase in hot weather as during summer (36.6%) and during spring (28.2%) than in winter (17.2%) and autumn (27.3%). This observation may be due to poor feeding, unbalanced rations and bad hygiene become more pronounced during hot weather as the green fodders become deficient. This lead to decrease the immunity and consequently the

subclinical mastitis increased. These results agreed (16) and disagree with studies which reported that mastitis frequency is more significant in winter 26% and autumn 22.6% than in spring 15% and summer 17.8% (17).

Table 6. showed that there was a significant difference ( $P \leq 0.05$ ) on the prevalence of mastitis between cows kept under different hygiene of milking process; higher prevalence of mastitis in animals with poor hygiene of than in good hygiene of milking process.

The obtained results may be attributed to a group of shared factors of breeding where the dairy cattle lived including bad habitat, lack of hygiene unbalanced food, this group of defective conditions played a role in rendering the udder more susceptible to intramammary infection (17). Poor hygiene of milking process was also identified as a risk factor for occurrence of bovine mastitis in previous studies (18, 19).

Table 7 showed that, there was a highly significant difference ( $P \leq 0.01$ ) on the prevalence of mastitis between cows with lesion on the udder /teat skin and without this factor. Animals with skin lesions on teat and /or udder had a high prevalence of mastitis (94%). Similar observation has been recorded (12) in Central Ethiopia where the mammary gland quarters with teat lesions were 7.2 times more likely to have bacterial organisms isolated from them than those without any teat lesions.

Table 8. showed a high prevalence of staphylococcus species (45.9%) followed by streptococcus species (38.4%). Similar observation has been recorded (20). These results disagreed with the study which recorded that in recent years the proportion of mastitis caused by *Str. agalactiae* and *S. aureus* has decreased (21).

### CONCLUSION

Risk factors as poor hygiene of milking process, different climatic conditions( increase prevalence rate of clinical mastitis in winter, while subclinical mastitis prevalence rate increase in summer season), increase in number of lactation seasons, stage of lactation and other conditions that may predispose to mastitis must be taken in account in steps of mastitis control program.

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### الملخص العربي

العوامل المؤثرة على معدل انتشار التهاب الضرع في الأبقار و الجاموس الحلابة

عبدالله على ابوزيد، فاروق عطيه معوض البلكي، هند محمد سعد الدماطي

قسم طب الحيوان - كلية الطب البيطري- جامعة الزقازيق

أقيمت هذه الدراسة على ٧٧٠ من الأبقار و الجاموس الحلابة و المرباه بمزارع مختلفة في ظل بيئات صحية متباينة. على مدار عام كامل ( يوليو ٢٠١١ - اغسطس ٢٠١٢ ) .

أظهرت النتائج أن ٢٩١ حيوان (٣٧,٨%) مصاب بالتهاب الضرع بنسبة ١١,٢% و ٢٦,٦% لالتهاب الضرع الإكلينيكي و الغير مرئي على التوالي.

أوضحت النتائج أن عدد مواسم الحلابة لها علاقة عكسية مع انتشار التهاب الضرع الإكلينيكي فإذا زادت فان معدل الانتشار ينخفض تدريجيا في حين أن العلاقة كانت طردية مع معدل انتشار التهاب الضرع الغير مرئي.

وقد أظهرت النتائج الإحصائية أن هناك فروق معنوية بين معدل الإصابة بمرض التهاب الضرع الإكلينيكي و الغير مرئي و مراحل الحلابة المختلفة و فصول السنة. من ناحية أخرى، فان ارتفاع معدل انتشار التهاب الضرع في كلا النوعين كان مرتبطا معنويا مع انخفاض النظافة في عملية الحلابة. و من أكثر الميكروبات التي تم عزلها المكورات العنقودية و المكور السبحي و الايشريشيا كولاى بنسبة ٤٥,٩%، ٣٨,٤%، ١٤,٨% على التوالي.

الخلاصة يمكن أن ينخفض معدل انتشار التهاب الضرع عند الأخذ في الاعتبار العوامل المؤثرة كالنظافة عند عملية الحلب، حلب الحيوانات المصابة إكلينيكيًا في نهاية عملية الحليب، استبعاد الحيوانات ذات الالتهاب المزمن، علاج الأبقار المصابة و العلاج أثناء فترة التجفيف.