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Epidemiological and Bacteriological Investigation of Bovine Mastitis in Khartoum State, Sudan

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Abstract

A cross-sectional study was conducted in large and small dairy farms in Khartoum state from April to October 2012. The objectives were to estimate the overall prevalence of bovine mastitis (clinical and subclinical), elucidate the association of potential risk factors and to isolate and identify the bacteria associated with mastitis from milk samples. A total of 646 lactating dairy cow comprising 51 local, 590 cross and 5 pure breed cows were randomly selected and screened using California Mastitis Test (CMT) for subclinical mastitis and clinical examination for clinical mastitis. The overall individual animal prevalence was found to be 51% (6.3% clinical and 44.7% subclinical). The prevalence in different localities was 67.7% in Ombadda, 45.2% in Omdurman, 50% in East Nile and 45.1% in Khartoum. The overall herd prevalence was 90.5% (27% clinical and 63.5% subclinical). The percentage of mastitis within quarters was 24% (4% clinical and 20% subclinical, 50% in the hind quarters and 48.7% in the front quarters). Risk factors such as, locality, health score, stage of lactation, parity, previous exposure to mastitis, teat injuries, presence of ticks, yielding milk, herd size, floor disinfectant, water scarcity, drainage system, dung removing, farm fencing and education level showed statistically significant association with the occurrence of mastitis in the univariate analysis (p-value ≤ 0.25). The results of the present study also showed that locality, stage of lactation, parity, previous exposure to mastitis and yielding milk had statistically significant association with mastitis in the multivariate analysis (p-value ≤ 0.05). Twenty five subclinically positive milk samples and 25 milk samples from clinically affected cows were subjected to bacteriological examination. All 50 samples yielded growth. Among these cultured positive samples, the prevalent mastitis causing agents isolated were: 61.1% *Staphylococcus spp.*, 15% *Streptococcus spp.*, 6% *Corynebacterium spp.*, 3% *Aerococcus spp.*, 2% *Micrococcus spp.* and 2% *Bacillus spp.*

Keywords: Mastitis, Epidemiology, Prevalence, Risk Factors, Dairy Farms.

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Introduction

Food and Agricultural Organization estimated that 42% of the total herds, for the private holdings are milking cows. However, milk production often does not satisfy the needs of people due to multitude of associated factors (FAO, 2003). Mastitis is the inflammation of the mammary gland. It is highly prevalent problem in dairy cattle and is one of the most important threats affecting the world's dairy industry

(Wallenberg *et al.*, 2002). Despite significant advances in the understanding of the disease, clinical and subclinical mastitis remains a problem in dairy herds and prevalence rates in many countries remain similar to those published decades ago. In the complex milieu of the modern dairy farm, it is the interaction of production diseases including mastitis, their relationship with nutritional strategy, housing, environment and the fundamental influence of social and attitudinal factors that make prevention and control such a challenge However, clinical mastitis represents only the 'tip of the iceberg' and it is the significance of the sub-clinical disease that is frequently underestimated (Luke and Michael, 2009). Bovine mastitis can be caused by physical or chemical agents but the majority of cases are infectious and usually caused by bacteria which consist mainly of *Staphylococci, Streptococci* and *Escherichia coli* (Capurro *et al*., 2010). To simplify understanding of mastitis, it will need to consider the three major factors which are involved in this disease: the causative microorganisms, the cow as host and the environment which can influence the cow and the microorganisms (Schroeder, 2012).

In Khartoum state, the disease has not been comprehensively studied and epidemiological information on the overall prevalence and associated risk factors of the disease are inadequate. Therefore, this study was conducted to clarify the following objectives:

1/ To estimate the prevalence of bovine mastitis (clinical and subclinical) in Khartoum state.

2/ To investigate the associated risk factors with bovine mastitis.

3/ To isolate and identify the bacteria associated with bovine mastitis.

Materials and Methods

Study Area: Khartoum is the political capital of the Sudan. The state lies between longitudes 31.5 -34^{o} east and latitude 15-16^{o} north in an area about 28.165 square kilometers. Most of the Khartoum state lies in the climatic semi-desert region, while northern areas lie in desert zones. The climate of the state is ranging from hot to very hot. The weather is rainy in summers, cold and dry in winters. Average rainfall reaches 100-200 mm in the northeastern areas and 200-300 mm in the North Western areas. Temperature ranges in summer between 25 - 40 degrees in the months from April to June, and 20-35 in the months from July to October. In winter, however, temperatures continue to decline between Novembers to March they range between 15-25 degrees. Geographically, Khartoum is divided into three governorates: first governorate (Jabal Awlia and Khartoum localities), second governorate (East Nile and Bahri localities), and third governorate (Omdurman, Ombadda and Karari localities). According to 2008 population census, the population of Khartoum state is estimated to be about five million people. Most of the populations are workers and personnel in the State chambers, the private sector and banks. In addition, there is a large segment of capitalists dealing in trade and another segment represented by migrants and displaced people working in marginal activities.

Study Population:

The population of cattle in Khartoum is estimated as 240003 cattle. Cattle distributed in Khartoum state are 138067 in East Nile, 28016 in Bahri, 13578 in Ombadda, 13901 in Karari, 20455 in Omdurman, 20360 in Jabal Awlia and 5626 in Khartoum localities (Khartoum census, 2008).

Study Design:

A cross sectional study was performed which involved the selection of sample of individuals from a large population and then the determination for each individual of the simultaneous presence or absence of disease and hypothesized risk factors association were investigated (Thrusfield, 2007).

Sampling Method:

In this study, a multistage random sampling had been carried out in Khartoum state. The state comprises seven localities (Khartoum- East Nile – Bahri – Karari - Omdurman – Ombadda – Jabal Awlia) each one of these localities has many of administration units. Therefore, four localities (Khartoum- East Nile- Omdurman – Ombadda) had been chosen by simple random sampling and each one of them has cattle camps which consist of herds. Herds and individual cows were selected randomly. Sample Size: The sample size was estimated according to the following formula**:**

$$n = \frac{1.96^2 * P(1-P)}{d^2}$$

Where: n = required sample size

p = expected prevalence

d = desired absolute precision (Thrusfield, 2007)

The expected prevalence was obtained from a recent study which was carried out in and around Hawassa, southern Ethiopia, in which the prevalence was 30% (Abera *et al*., 2012).

Accordingly a number of 323 cows was calculated. Three hundred twenty three of sample size was thought not enough to represent all study population in the four localities selected. Then this sample size was inflated by multiplying by 2 according to Thrusfield theory (Thrusfield, 2007). Therefore 646 animals were investigated.

Diagnosis:

Clinical examination of the udder: Clinical findings like abnormalities of secretions, size, consistency and temperature of mammary gland were examined by visual inspection and palpation. Pain reaction upon palpation, change in the milk (blood tinged milk, watery secretions, clots, pus), and change in consistency of udder were considered as indications of the presence of clinical mastitis. Cows, which did not have clinical mastitis, were subjected to further investigation for subclinical mastitis using California Mastitis Test as screening test.

California Mastitis Test (CMT):

CMT was used to detect subclinical mastitis. Two (ml) of milk from milk of each udder quarter was milked in a plate that had four separated cups (Buddle). Three ml CMT liquid was added to each cup and mixed gently by rotating the plate. The reaction was then visually scored depending upon the amount of gel formation as follows:

- Negative = no reaction.

-Trace = appearance of streaks can be made visible during rotation of the plate.

- Positive = gel formation.

Quarter that scored negative and trace were assumed healthy.

Laboratory Diagnosis:

From 626 samples, 50 positive samples were further examined in the Veterinary Research Institute, Soba for bacterial diagnosis. Thus, they were divided into two forms (Clinical and Subclinical).

There was a strict aseptic procedure followed to avoid milk sample contamination.

Sampling Techniques:

The conventional milk sampling collection was followed to avoid contamination. Microbiological Procedure: Selected positive samples (50 samples) in the CMT and clinical inspection were cultured on blood agar plate and incubated aerobically at 37 C^o and examined for growth at 24hrs.

Bacteria were identified by using colony morphology, haemolytic pattern on blood agar media and further microscopic examination (Gram Staining) (Yuan, *et al*., 2012). The cultured plates showed different

types of colonies, where then cultured again separately and incubated at 37C^o for 24 48hrs to give pure culture and then Gram stained according to Barrow and Feltham (1993). Thereby primary tests were carried out (Catalase - Oxidase - OF- motility - glucose) to identify Genus of different gram positive bacteria.

Questionnaires survey:

A semi-structured questionnaire was prepared and filled to evaluate the effect of potential risk factors on the occurrence of mastitis. Risk factors considered were divided into individual animal risk factors and management risk factors.

Statistical analysis:

The collected data were entered into a spreadsheet program (Microsoft Office Excel 2003) and transferred to SPSS version 17.0 for analysis. First, the data were analysed by simple descriptive statistics using frequency and cross-tabulation tables. To estimate the statistical significance of association between potential risk factors and mastitis infection a univariate analysis was performed using the Chi-square (χ^2) test. The Chi-square (χ^2) was considered significant if it had a p-value ≤ 0.25. Risk factors significant in the univariate analysis were entered for further multivariate analysis using the Logistic Regression. In the Logistic Regression, a risk factor with a p-value ≤ 0.05 was considered significantly associated with mastitis. The strength of association was determined by Exp B which is equivalent to the Odds Ratio (OR).

Results

A total of 646 lactating cow (51 local, 590 cross and 5 pure breeds) were examined in 63 dairy farms in Khartoum state during the study period from April to October, to determine the prevalence of mastitis by clinical inspection and California Mastitis Test (CMT). Three hundred and thirty (51.0%) animals were positive, 286 (44.7%) animals were subclinical and 41(6.3%) animals were clinically affected (Table 1). The overall individual prevalence of mastitis (clinical and subclinical) in Khartoum state was 51.0%. In 63 dairy farms, the overall herd prevalence was 90.5% (27% clinical and 63.5% subclinical) (Table 2). Furthermore, the quarter prevalence was 24% (Table 3).

Table 1: Prevalence of clinical and subclinical mastitis in 646 dairy cattle examined in Khartoum state

Result	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	316	48.9	48.9	48.9
Subclinical	289	44.7	44.7	93.7
Clinical	41	6.3	6.3	100.0
Total	646	100.0	100.0	

Table 2: Herd prevalence of clinical and subclinical mastitis in 63 dairy farms in Khartoum State

Result	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	6	9.5	9.5	9.5
Clinical	17	27	27	36.5
Sub-clinical	40	63.5	63.5	100.0
Total	63	100.0	100.0	

Table 3: Quarter prevalence of clinical and subclinical mastitis in 646 dairy cattle (2584 quarters) in Khartoum State

Quarter	Total examined	Subclinical (%)	Clinical (%)
Front right	646	128 (20)	29 (4.4)
Front left	646	130 (20.1)	26 (4.02)
Hind right	646	126 (19.5)	31 (4.7)
Hind left	646	134 (20.7)	25 (3.8)
Total	2584	518 (20)	111 (4)

Risk factors analysis:

Risk factors such as, locality (p-value = .003), health score (p-value = .000), stage of lactation (p-value = .004), parity (p-value = .009), previous exposure to mastitis (p-value = .000), teat injuries (p-value = .06), presence of ticks (p-value = .001), yielding milk (p-value = .000), herd size (p-value = .10), floor disinfectant (p-value =.21), water scarcity (p-value = .03), drainage system (p-value = .006), dung removing (p-value = .21), farm fencing (p-value = .05) and education level (p-value = .09) showed statistically significant association (p-value < 0.25) with the occurrence of mastitis in the univariate analysis (Table 4). The results of this study also showed that locality (p-value = .02), stage of lactation (p-value = .004), parity (p-value = .02), previous exposure to mastitis (p-value = .007) and yielding milk (p-value = .000) had statistical significant association with mastitis (p-value ≤ 0.05) in the multivariate analysis (Table 5).

Bacterial isolation: Twenty five subclinically positive milk samples and 25 milk samples from clinically affected cows were subjected to bacteriological examination. All samples were cultured positive. Among these cultured positive samples, the prevalent mastitis causing agents isolated were: 61.1% *Staphylococcus spp.*, 15% *Streptococcus spp.*, 6% *Corynobactirum spp.*, 3% *Aerococcus spp.*, 2% *Micrococcus spp.* and 2% *Bacillus spp.*

Table 4: Univeriate analysis of association of potential risk factors with bovine mastitis using the Chi-square test

Risk factors	No. Tested	No. +ve	df	χ^2	p-value	Risk factors	No. Tested	No. +ve	df	χ^2	p-value
Locality						Yielding milk					
Ombadda	99	67(67.7)				High	180	152(84.4)			
Omdurman	104	47(45.2)	3	13.9	.003	Low	466	178(38.2)	1	111.1	.000
East Nile	308	154(50.0)									
Khartoum	135	62(45.9)									
Health score						Herd size					
Good	460	214(46.5)				Small (≤10)	50	20(40)			
Poor	50	37(74.0)	2	17.00	.000	Large (>10)	596	310(52)	1	2.66	.103
Fair	136	79(58.1)									
Stage of lactation						Floor disinfectant					
Late	262	116(44.3)	1	8.2	.004	Yes	252	121(48)			
Early	384	214(55.7)				No	394	209(53)	1	1.55	0.21
Parity						Water Scarcity					
Few (1- 2)	209	95(45.5)				Not available	487	237(48.7)	1	4.63	0.03
Moderate (3 - 5)	330	167(50.6)	2	9.3	.009	Available	159	93(58.5)			
Many (>5)	107	68(63.6)									
Previous exposure						Drainage system					
Yes	178	115(34.8)	1	17.9	.000	Good	390	182(46.7)			0.006
No	468	215(65.2)				Poor	256	148(57.8)	1	7.7	
Teat injuries						Dung removing					
Absent	601	301(50.1)	1	3.5	.06	Yes	581	292(50.3)	1	1.6	.21
Present	45	29(64.4)				No	65	38(58.5)			
Presence of ticks						Farms fencing					
No	563	273(48.5)	1	11.9	.001	Walls	163	94(57.7)	1	3.78	.05
Yes	83	57(68.7)				Iron	483	236(48.9)			
Quarter type						Education level					
Non pendulous	566	280(49.5)	1	4.8	.029	Educated	427	208(48.7)	1	2.83	0.09
Pendulous	80	50(62.5)				Illitrate	219	122(55.7)			

Table 5: Multivariate analysis of association of potential risk factors with bovine mastitis using Logistic Regression

Risk Factors	No. Tested	No +ve (%)	Exp B (OR)	95% CI For Exp B	p-value
Localities					
Omdurman	104	47(45.2)	Ref		
Ombadda	99	67(67.7)	2.5	1.2 – 5.3	0.025
Khartoum	135	62(45.9)	1.4	0.6 – 2.8	0.23
East Nile	308	154(50.0)	1.5	0.8 – 2.8	0.49
Stage of lactation					
Late	262	116(44.3)	Ref	1.2 – 2.6	0.004
Early	384	214(55.7)	1.7		
Parity					
Few (1- 2)	209	95(45.5)	Ref	0.7 - 1.7	0.5
Moderate (3-5)	330	167(50.6)	1.1	1.1 - 3.7	0.02
Many (>5)	107	68(63.6)	2.1		
Previous exposure					
No	468	215(45.9)	Ref	1.2 -2.7	0.007
Yes	178	115(64.6)	1.7		
Yielding milk					
Low	466	38(38.2)	Ref		
High	180	152(84.4)	7.9	4.8 - 12.6	0.000

Table 6: Bacteria isolated from bovine clinical and subclinical mastitis from 50 positive mastitic milk samples

Species	Clinical	Subclinical	Total	%
Staphylococcus spp.	18	15	33	61.1
Corynebacterium spp.	1	5	6	11.1
Micrococcus spp.	1	1	2	4
Bacillus spp.	2	-	2	4
Aerococcus spp.	1	2	3	5
Streptococcus spp.	4	4	8	15
Total	27	27	54	100%

Discussion

Mastitis is the outcome of the interaction of many risk factors associated with host, pathogen(s), and environment. The present study was carried out to determine the mastitis prevalence, association with important potential risk factors and the major causative agent. The prevalence of subclinical mastitis was higher than that of clinical mastitis, this could be due to the reason that in Khartoum state subclinical mastitis receives little attention and efforts have been concentrated only on the treatment of clinical cases. The prevalence of clinical and subclinical mastitis was 6.3% and 44.7%, respectively, with an overall prevalence of 51%. There is agreement with previous observations, with a rate of 31.67% and 0.93% of subclinical and clinical mastitis respectively in Gondar, Ethiopia (Moges *et al.*, 2011), 23.0% and 11.9 in Southern Ethiopia (Biffa *et al*., 2005). The overall prevalence in the present study is close to three previous studies conducted by Sori *et al* (2005) in Sebeta, Ethiopia, Hashemi *et al*., (2011) in Fars province, Iran and Junaidu *et al*., (2011) in Sokoto, Nigeria, which was 52.78%, 44.7% and 52% respectively. Furthermore, in this study herd prevalence was also investigated among 63 dairy farms. The majority of the cases of mastitis were higher in subclinical than clinical mastitis, which was 64% and 27% respectively. Previous studies did not show adequate information about the rate of herd prevalence. Additionally, quarter's prevalence rate showed a higher rate in subclinical (20%) than clinical mastitis (4%). Moreover, slightly higher rate in hind quarters (49%) than that of front quarters (48%), which is compatible with previous findings from Mekelle, Ethiopia, which was 28.34% subclinical and 3.27% clinical and for hind and front quarters 62% and 60% respectively, (Gebrekrustos *et al*., 2012). In our view, the hind quarters are more exposed to dirt when the cow lies down on the floor as well as they are more contaminated with fecal materials. Also, they are in direct touch with the hind limbs when the cow walks.

Twenty six risk factors were entered into SPSS using cross-tabulation and Chi-square to estimate significant statistical association between risk factors and mastitis with a significance level ≤ 0.25. The following risk factors show a significant association with mastitis: locality (p-value = .003), body condition (p-value = .000), stage of lactation (p-value = .004), parity (p-value = .009), previous exposure to mastitis (p-value = .000), teat injuries (p-value = .06), presence of ticks on udder (p-value = .001), quarter type (p-value = .02), yielding milk (p-value = .000), herd size (p-value = .10), floor disinfectant (p-value = .21), water scarcity (p-value = .03), drainage system (p-value = .006), dung removing (p-value = .21), farms fencing (p-value = .05) and education level (p-value = .09). In this study, there is a difference in mastitis prevalence among the four localities that were selected randomly (Table 4). This might be due to different management practices that were applied in farms in different localities. This significant statistical association of mastitis with locality (p-value = 0.003), is supported by a previous study conducted in Southern Ethiopia by Biffa *et al*., (2005). In our study body score showed a significant statistical association with mastitis (p-value = .000). This result is in agreement with the findings of previous works conducted in Tanzania by Kivaria *et al.*, (2006) and by Uddin *et al*, (2009) in Mymunsingh, Bangladesh. However, it is well suggested that poor body condition is usually associated with debilitating disease which may produce high somatic cell count (SCC) which is detected as intra-mammary infection and have negative effect on milk quality and milk production (Kivaria *et al*., 2004). Regarding stage of lactation, two reports in Ethiopia found higher prevalence of mastitis during early lactation than in late lactation (Kerro and Tareke, 2003). In Irland, Berry and Meaney (2005) suggested

that increased prevalence of mastitis in attributed to changes in both immune function and nonspecific host defense mechanism in peri-partum dairy cow. Concerning parity, it was significantly associated with mastitis prevalence (p-value =.009). Our study confirmed increase in mastitis with an increase in parity number. This is in accord with findings of studies in Central Highland, Ethiopia by Mungube *et al*., (2004) and in Southern Ethiopia by Biffa *et al*., (2005). This high prevalence in cows at third parity and above could be attributed to increasing ease of penetration of teat duct by pathogen and accumulation of previous infection; in addition, old cows especially after four calving are more prone to mastitis (Tadesse and Chanie, 2012). In this study, previous exposure to mastitis showed significant statistical association with mastitis prevalence (p- value = 0.000), this is in agreement with a study reported in Shashemene, Ethiopia by Abera *et al*., (2012). This finding suggested that treatment of cows for mastitis may not be effective in eliminating the pathogen and the disease may persist. Also there is a report of antimicrobial resistance among pathogen which cause mastitis (Abera *et al*., 2012). About teat injuries and lesions predispose the udder to infection, that might be the reason of higher prevalence of mastitis in injured teats. The finding of the present study is supported by previous studies conducted in Dar Esalam, Tanazania by Kivaria *et al*., (2006) and Matios *et al*., (2009) in Asella, Ethiopia. It was explained by Uddin *et al*., (2009), that teat injuries provide a medium for the growth of the pathogenic bacteria, which affect the udder, so that, in case of injuries the risk of an infection increases. Ticks and diseases they transmit are widely distributed throughout the world, particularly in tropical and sub-tropical regions (FAO, 2003). Tick leaves small abrasion and lesion on teat and udder skin which may let ease of organisms penetration inside udder. Tick infestation in this study showed a significant association with mastitis (p-value = .001) and this is in early stage of lactation may be agreement with the results of previous studies in Bahirdar, Ethiopia by Almaw *et al*., (2008). Our results showed higher mastitis rate in pendulous udder than non-pendulous udder which were 68.7% and 48.5% respectively. The significant statistical association (p-value = 0.02) in our study is in agreement with previous finding in Faisalabad, Punjab, Pakistan reported by Ali (2009) and Hussain *et al*., (2012) in Punjab, Pakistan. It might be due to the reason that, round, pendulous udder gets injuries and abrasion which may facilitate pathogen(s) to grow. Our result showed that cows in large herd size had a higher prevalence than small herd size, 52% and 40% respectively, and showed a significant statistical association with mastitis prevalence (p-value = 0.10). This is in agreement with a previous work reported in Sirajganj, Bangladesh by Islam *et al*., (2010). Water Scarcity showed significant statistical (p-value = 0.03) association with mastitis. The finding of a significant statistical association (p-value = 0.03) is supported by prior studies conducted in Tanzania by Kivaria *et al*. (2004) and Kivaria *et al*. (2006) in Tanzania also, which explained that abundance of water might lead to dirt, wet udder at milking time. It was also found that water contamination often occurred in the storage containers used, thus cows might have been exposed to the dirt. It was suggested that the microbiological quality rather than amount of water, which is associated with mastitis (Kivaria *et al.,* 2004). Floor disinfectant, yielding milk and floor drainage showed significant statistical association with prevalence of mastitis also, which were (p-value = 0.21), (p-value = 0.00) and (p-value = 0.006) respectively. Regarding, dung removing it seems to affect the prevalence of mastitis appreciably. Moreover, it showed significant statistical association (p-value = 0.12) with mastitis. A similar result has been observed by Ali (2009) in Faisal Abad, Pakistan. About farms fencing, it was

found that cattle dwelled under walls fencing condition had a higher prevalence compared to iron fencing 53.7% and 49.2% respectively. Poorly designed structures of wall housing subjects the animals to unnecessary stressful condition which then increases the risk of infection of cows probably as a result of decrease of phagocytic activities of leukocytes (Kivaria, 2006). Out of 427 of lactating cows examined under educated owners, 208 (48.7%) were tested positive and of 219 of lactating cows were examined under illiterate owners, 122 (55.7%) were tested positive. Education level showed a significant association with mastitis (p-value = .09). This is in agreement with the findings of the study conducted in Faisalabad, Pakistan by Ali (2009). This could be attributed to poor management of animals by illiterate farmers compared to educated ones (Ali, 2009).

These risk factors which had a significant effect in the univariate analysis were fitted in a multivariate logistic regression model at a significance level ≤ 0.05, so as to control for confounding and to measure the strength of association. In the multivariate analysis risk factor such as, locality, stage of lactation, parity, previous exposure to mastitis and yielding milk were found significantly associated with the occurrence of mastitis (Table 5). As for locality, our results are supported by Biffa *et al*. (2005) in Southern Ethiopia (OR = 7.5, 95% CI = 5.5 – 10.0, p-value = 0.001,). Regarding stage of lactation

our result is in agreement with the reports conducted in Bahirdar, Ethiopia by Almaw *et al*., (2007) (OR= 1.8, p-value = 0.00,), and in Adama town, Ethiopia by Abera *et al*., (2012) (OR = 2.3, 95% CI = 1.3 – 4, p-value = 0.01,). As for parity, our result is in agreement with previous studies conducted in Asella, Ethiopia by Matios *et al*. (2009) (OR = 1.5, 95%CI = 1.3 – 1.8, p-value = 0.000,). Also, our result on pervious exposure to mastitis is in accord with the study conducted in Southern Ethiopia by Biffa *et al*., (2005) (OR = 4.5, 95%CI = 3.7 – 5.5, p-value = 0.001,). Regarding milk yield, our result is in agreement with a previous work carried out in Punjab, Pakistan by Hussain *et al*. (2012) (OR = 1.2, 95%CI = 1.1 – 1.4, p-value = 0.005).

Out of 54 bacteria isolates from 50 mastitic cows from different farms selected randomly, *Staphylococcus spp* was the most prevalent pathogen (Table 6). Differences in bacteria isolated might be due to lack of effective udder washing and drying, post-milking teat dip and drying, hand washing, and lack of disinfectant in milking routine of the area (farms). These findings are in agreement with previous reports conducted by Sori *et al*., (2005) in and around Sebeta, Ethiopia, Igbal *et al*., (2004) in Peshawer, Pakistan and Workinch *et al*. (2002) in Ethiopia.

Conclusion

- In view of our findings, mastitis is prevalent in Khartoum dairy farms and subclinical mastitis is the most prevalent.
- The study also concluded that *Staphylococcus* and *Streptococcus* were the most frequent causes of bovine mastitis.
- Potential risk factors such as locality, previous exposure to mastitis, stage of lactation, parity and milk yield influenced the prevalence of mastitis.

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إستقصاء وبائي وباكتيري لمرض إلتهاب الضرع في الأبقار في ولاية الخرطوم – السودان

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المستخلص

دراسة استقطاعية اجريت في مزارع ابقار اللبن الكبيرة والصغيرة في ولاية الخرطوم في الفترة من ابريل الى اكتوبر 2012م بهدف معرفة معدل انتشار مرض التهاب الضرع السريري وتحت السريري ، معرفة العوامل المؤثرة على حدوث المرض وعزل وتحديد الباكتيريا المسببة للمرض . ثم فحص 646 عينة لبن أخذت من أبقار اللبن وقد كانت السلالات كالآتي :51 سلالة محلية – 59 هجين و5 سلالة اجنبية .ثم اختيار هذه الأبقار بطريقة الاختيار العشوائي ثم فحصت العينات باختبار كاليفورنيا للالتهاب تحت السريري وبالفحص السريري (الاكلينيكي) لتشخيص الالتهاب السريري . كان المعدل الكلي لالتهاب الضرع 51% (6.3% التهاب سريري و 44.7% التهاب تحت السريري) .كان معدل الانتشار في المحليات كالآتي:67.7% في امبدة، 45.2% في ام درمان،50% في شرق النيل ، و45.1% في الخرطوم، وقد كان معدل الانتشار الكلي لإلتهاب الضرع في القطيع 66.2% (27% سريري و53.5% تحت السريري) وقد كان معدل انتشار الالتهاب في ارباع الضرع 24% (4% سريري و20% تحت السريري، 50% في الربعيين الخلفيين و48.7% في الربعيين الأماميين) العوامل المؤثرة الآتية كان لها تأثير معنوي في حدوث وانتشار التهاب الضرع في أبقار اللبن وهي :المحلية، الحالة الصحية ، مرحلة الإدرار ، عدد الولدات ،التعرض السابق للالتهاب ، جروح في الحلمة ، وجود قراد،انتاج اللبن ،عدد القطيع ،استعمال المطهر ، ندرة المياه ، التخلص من المياه ، التخلص من الزبالة ،سور المزرعة ومستوى تعليم المزارع وقد كان هذا التأثير باستعمال التحليل الإحصائي لكل عامل مؤثِر بمفرده على حدوث وانتشار المرض ($P\leq0.25$).أما في التحليل الإحصائي متعدد العوامل مجتمعة فقد كانت العوامل الآتية ذات تأثير معنوي وهي المحلية، مرحلة الادرار،عدد الولدات، التعرض لإصابة سابقة، وكمية اللبن المنتج ، وقد كانت كلها $P\leq0.05$ وهو التأثير المعنوي المعتبر في هذا التحليل. من 50 عينة ايجابية (25 التهاب سريري و25 التهاب تحت سريري) تم عزل *Staphylococcus spp* من 61.1% ، *Streptococcus. spp* من 15%، *Corynebacterium spp* من 6%، *Aerococcus ssp* من 3% ،*Micrococcus spp* من 2% و*Bacillus spp* من 2% .