PREVALENCE OF CLINICAL MASTITIS IN BOVINES IN DIFFERENT CLIMATIC CONDITIONS IN KPK, (PAKISTAN)

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ABSTRACT: *Clinical Mastitis is one of the lavish problems to the dairy sector of Pakistan. The objectives of the present study were to assess the impact of season, climatic change and geography on the prevalence of clinical mastitis in Khyber Pakhtunkhwa of Pakistan. For this purpose, through active disease surveillance, a total of 367 smallholder rural farmers were interviewed and 611 cattle; 606 buffaloes were observed on field for one year. The result showed significantly (P<0.05) higher prevalence of clinical Mastitis in buffaloes (20.95%) than cattle (15.38%). It also revealed significant (P<0.05) association between breed and prevalence of clinical mastitis. In lactating cows exotic breed had a significantly higher prevalence of (29.20%) whereas Zebu cattle (Achai) one of the local breeds was highly resistant to clinical mastitis. In Lactating buffaloes Nili Ravi was affected (23.78%) the most. Seasonal effect was found significantly correlated (P<0.05) with prevalence of clinical mastitis. 41.17% cases of clinical mastitis were reported in the month of July-Sep followed by post monsoon and summer. Rise in humidity and temperatures at higher altitudes showed significant (P<0.05) impact on the prevalence of clinical mastitis. It was concluded that Climate change and breed at different altitudes had a significant potential impact on the prevalence of clinical mastitis. In future, with good management, environmental stress could be controlled with right selection of breed in different geographical regions.*

Key words. Mastitis, Geographical, Prevalence, breed and environmental Stress.

1. INTRODUCTION

The livestock in Pakistan suffers from various diseases time to time and mastitis is one of most prevalent among them hindering the dairy sector development [1.2]. Clinical mastitis is the devastating maladies of lactating animals, which causes enormous production losses to the livestock industry of Pakistan. It has been documented worldwide, economically as one of the most important disease affecting dairy animal's [3-7]. In Khyber Pakhtunkhwa (KPK) province of Pakistan a study conducted indicating clinical mastitis as one of the important cause of culling at premature stage in local born and exotic breed cattle; accounting for almost 22.5% of all culling during the last 10 years period showed by [8]. Normally it occurs in two forms, clinical (overt) and sub-clinical (hidden) [9]. That causes decrease in production in the form of loss in milk yield, condemned milk, animals earlier culling and replacements [10] and more 10% decrease in residual lactation after occurrence of acute mastitis. Clinical mastitis is therefore a major problem in the lactating buffaloes of Punjab, kept under different farming systems. Previous studies conducted in other regions of Pakistan, reported 21.08 and 16.72% prevalence of clinical mastitis among buffaloes and cattle, respectively [11]. In some other regions its incidence was found 20-60% in large dairy animals [12]. Cattle with clinical mastitis are mostly found to be high yielding cows reported by [13]. Studies conducted on clinical mastitis incidence found it influenced by season of calving by [14]. Another study by [13] found that cattle calving between Dec-Feb or between June-Aug had the highest risk of getting mastitis.

The risk of global warming and climate change is now known worldwide and several alarming manifestations of change have occurred. Animals may be affected by the climate change in four ways: extreme weather events, heat-related stress and diseases, animal adaptation to production systems in new environments, and emergence or recurrence of infectious diseases, particularly vector-borne diseases significantly dependent on climatic and environmental conditions [15].

The objectives of this research were to evaluate the prevalence, the pattern, distribution and impact of varying climatic and environmental conditions on clinical mastitis (CM) in different breeds of cattle and buffaloes of Khyber Pakhtunkhwa of Pakistan.

2. MATERIALS AND METHODS

2.1. Study area

This study was conducted in the rural areas of the Khyber Pakhtunkhwa (KPK) province and FATA region of Pakistan. KPK is situated between 31^{o} 15' and 36^{o} 57' North latitude and 69^{o} 5' and 74^{o} 7' East longitude, having wide range of climatic and physical conditions. Though located in the temperate zone, the climate of KPK province varies to a great extent from region to region. In this region of the country agriculture remains the main source of livelihood for its dwellers. The average annual rainfall over the year ranges from 25-58 inches. The target population was about 6568516 lactating buffaloes and 6059041 lactating cows reported in [16].

2.2. Study population and sampling method

Lactating cattle and buffaloes were the study population occurring in KPK and FATA region (Fig-I). Different breeds of cattle and buffaloes were observed (table-I) at different altitudes having varying climatic and environmental conditions (Table-II). Sample was drawn using the multistage cluster sampling technique to select three climatic clusters (Fig-I), all these clusters initially consisted of eight

randomly selected districts and then a single village from was selected each selected district. All the sampled animals included were confirmed by the researcher free from any other infectious disease.

2.3. Sample size determination

For estimation of clinical mastitis prevalence, since no such research work was conducted in this specific study region, therefore sample size was determined by considering the prevalence calculated by [11] reporting 16.72 and 21.08% in cattle and buffaloes in Punjab (Pakistan), with 5% precision and at 95% confidence level using the formula from [17].

$n=1.96^2 P_{exp} (1- P_{exp})/d^2$

Hence, the minimum sample size mandatory for cattle was 214 lactating cattle and for buffaloes were 255. Large sample size was taken for highly accurate results.

2.4. Clinical Mastitis

Clinical mastitis was defined through the visible signs on filed examination of milking udders of the sampled dairy animals. It was considered positive when a quarter or the entire gland showed clinical signs (swollen gland, hard, warmer than normal skin, pain on touching and abnormal secretions. The milk may have flakes, clots or watery in consistency and accompanied by depression, fever and anorexia (18).

2.5. Study design and methodology

Active disease surveillance study was conducted. Various field surveys were conducted to observe and follow the selected lactating animals for one year. The data was collected from Aug 2012 till July 2013 on lactating cattle and buffaloes on a predesigned questionnaire. For clinical mastitis local language name (Table-1) was used while interviewing farmers. Total of 367 smallholder rural dairy farmers were interviewed and total of 1287 lactating cattle and buffaloes were included in the study initially. During study period 70 lactating animals were excluded from the sampled population in the follow up survey due to unavailability as per inclusion criteria.

2.6. Statistical analysis

The statistical analysis of the pooled data was performed by SPPS (Version 16.0). Descriptive analysis of the data was performed and chi square test was used to find the correlation amongst the categorical variables at 5% precision.

3. RESULT

A total of 367 smallholder dairy farmers were interviewed where total of 1217 lactating cattle and buffaloes were observed. Out of which 611 were lactating cattle and 607 were lactating buffaloes of different breeds (Table-I). The sampled dairy animals were studied under different climatic conditions at different altitudes in KPK to evaluate the impact of season and breed on the prevalence of clinical mastitis. Clinical mastitis (CM) occurred in 221 (18.15%) out of 1217 lactating animals. Prevalence of CM was found significantly ($P < 0.05$) higher in buffaloes (20.95%) than cattle (15.38%). The analysis of data showed high prevalence of CM in the humid region (22.06%) that was significantly ($P < 0.05$) higher from semi arid and sub humid region (Table-I).

CM prevalence rate of 8.10% in Zebu cattle (Achai) was significantly ($P < 0.05$) lower than any other breed of cattle. While the prevalence (29.20%) for CM was significantly higher in exotic cattle breeds. Amongst the milking buffalo population, buffaloes of Nili Ravi breed were being found affected the most with a prevalence rate of 23.78% significantly ($P < 0.05$) higher than Aza kheli and Non descriptive breeds of buffaloes in KPK (Table-I).

The prevalence of Clinical mastitis was found significantly ($P < 0.05$) higher in the season of monsoon (July-sep) that of 41.17%. While in winter season it was 5.42%, in summer (25.33%) and in post monsoon it was 28.05%. Significant seasonal variation was recorded in the prevalence of CM in KPK. District wise significant ($P < 0.05$) variation in the prevalence of CM was calculated. The highest overall prevalence of CM (33.63%) was observed in the district Buner of KPK situated at an altitude of 2260-ft from sea level. Where the annual mean temperature and average annual rainfall was found significantly (P=0.0001) correlated with the prevalence of CM (Table-2). The highest prevalence rate of CM in lactating cattle was 28.20% in the district of Buner. While milking buffaloes were mostly affected in the district of

Khyber agency with a prevalence rate of 52.84%, at an altitude of 3510-ft, average annual rainfall of 250-500 mm and annual mean temperature of 74.16 ^{0}F. The cattle were found less affected in the district of Shangla with a prevalence rate of 7.68% at the highest altitude and low mean annual temperature (Table-II). Lactating buffaloes were found significantly less affected in the district Nowshera at the lower altitude and with hot environmental conditions with less average annual rainfall. Detail of analysis given in table-II. Annual mean temperature and rainfall at different altitudes were found significantly ($P < 0.05$) associated with the prevalence of Clinical mastitis (Table-I and II).

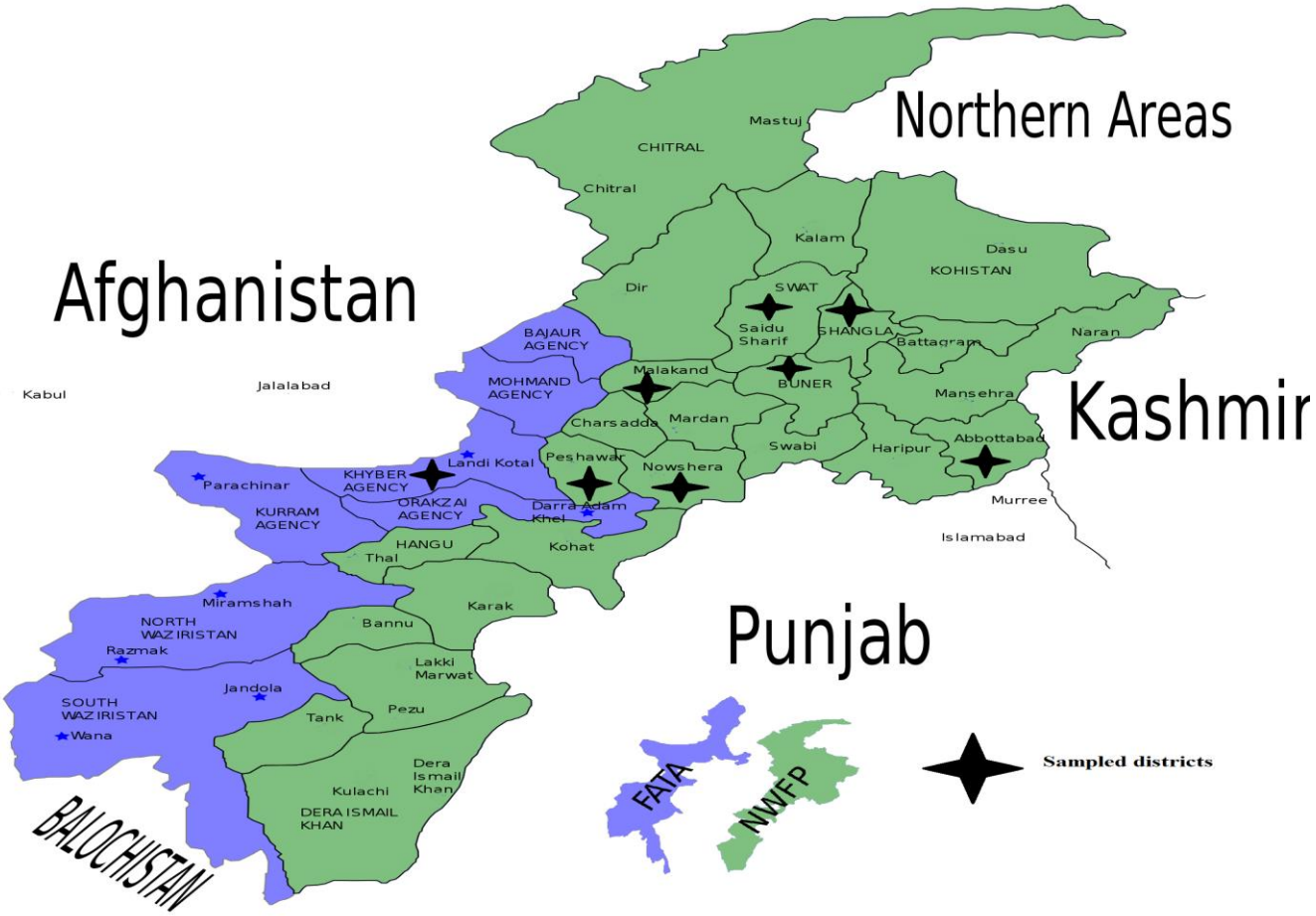

Fig-1:- Demographic presentation of sampled districts and study area.

Table: I. Prevalence of clinical Mastitis with respect to Climatic Variation in Khyber Pakhtunkhwa.

Parameters	Variables	Level	*CM Prevalence	P-value
Host specie	Cattle/Buffaloes	Cattle	15.38 (94/611)	0.012
		Buffaloes	20.95 (127/606)	
Climatic	Climatic region	Semi-Arid	13.86 (42/303)	0.03
		Sub-Humid	15.45 (53/343)	
		Humid Region	22.06 (126/571)	
Breed	Cattle breeds	Zebu cattle(achai)	8.10(3/37)	0.0007
		Cross bred	13.39(43/321)	
		Exotic Breeds	29.20(33/113)	
		Non descriptive	10.71(15/140)	
	Buffalo breeds	Nili Ravi	23.78(93/391)	0.003
		Aza-kheli	15.92(18/113)	
		Non descriptive	15.68(16/102)	
Season	Winter	(Dec-March)	5.42 (12/221)	0.0001
	Summer	(Apr-June)	25.33 (56/221)	
	Monsoon	(July-Sep)	41.17 (91/221)	
	Post Monsoon	(Oct-Mid Dec)	28.05 (62/221)	

*Clinical mastitis

Table no: II: Prevalence of Clinical Mastitis in different districts of KPK, at different Altitudes with different climatic conditions.

District Name	Overall Prevalence	*CM in Cattle	CM in buffaloes	AAM. Temp(F)	AA. Rainfall(mm)	Altitude (ft)	P-Value
Swat	15.60 (27/173)	10.52 (4/38)	17.03 (23/135)	64.16	1400-1700	3228	0.0001
Abbotabad	19.86 (30/151)	19.23(10/52)	24.24 (24/99)	62.51	500-1000	4134	
shangla	14.61 (19/130)	7.68 (7/91)	17.94 (7/39)	58.67	1400-1700	4800	
Malakand	9.90(19/192)	8.10 (9/111)	12.34 (10/81)	66.59	500-1000	2349	
Peshawer	17.51(24/137)	20.0 (18/90)	14.89 (7/47)	73.51	250-500	1178	
Nowshera	14.70(30/204)	17.30 (18/104)	12.00 (12/100)	73.16	250-500	925	
Buner	33.63(37/110)	28.20 (11/39)	36.61 (26/71)	71.33	250-500	2260	
*k.Agency***	29.16(35/120)	19.76 (17/86)	52.84 (18/34)	74.16	250-500	3510	

*CM. Clinical Mastitis, **Khyber Agency.

4. DISCUSSION

Dairy animals are of great economic significance for the rural smallholder dairy farmers all over Pakistan. The epidemiology of clinical mastitis and its association with environmental stresses in KPK has never been investigated at breed and specie level. This study was conducted to evaluate the prevalence of clinical mastitis in lactating cattle and buffaloes in the rural areas of KPK of Pakistan. The overall prevalence recorded (18.15%) for all lactating animals. The prevalence of CM was significantly ($P<0.05$) higher in lactating buffaloes (20.955) than cows (15.38%) as shown in table-I. These findings were quite in consent with the results of [19] reporting a higher prevalence in buffaloes (24.60%) of clinical Mastitis than in cattle (18.21%). But these findings were lower than those reported (71%) in exotic dairy cows by [20]. The difference might be due to the reason that only exotic breeds were studied which is thought to be less resistant to the infectious diseases and high yielding dairy breeds. While in our study various breeds were included having different prevalence of CM.

The results of our study showed higher prevalence rate of (29.20%) in exotic breeds that was significantly higher than the local and cross bred lactating cows. These findings of our study were in agreement with that of [21]. The shift in mastitis trends showed that the exotic breeds of cows could not adjusted well to the heat stress in KPK province where the climate changes continuously over a shorter span of time. The CM prevalence in our study was lower than that of [22] reporting 53.30% in dairy cows in Bangladesh. These variations might be due the difference in susceptibility of various breeds of cattle to clinical mastitis causing organisms, variation in management practices and different environmental conditions could also be responsible for these variations.

The analysis of our study also shows that CM prevalence was influenced by season, where the prevalence was significantly ($p<0.05$) higher during monsoon season (July-Sep) and followed by post monsoon season where the day time temperature starts decreasing gradually. This shows that day time temperature and humidity have a significant impact on the CM occurrence in this region especially on lactating buffaloes and exotic cattle breeds. The results of our study were in agreement with the study analysis conducted by [14, 23 and 24]. They discussed this phenomenon in term of calving season where during the early period after calving multi stresses are faced after parturition i.e. high yield milk production and environmental stress as well. Higher prevalence may also be due to larger teat size of buffaloes and exotic cattle as compared with local breeds of cattle, as previously discussed and analyzed in various studies. The result of our study were strongly in consent with that of Likewise, [13] who found that cows calving between December and February or between June and August had the highest risk of mastitis. The highest risk of mastitis for Calving during the period of Oct– January (wet season) may be explained by the open and free shelter used in the rural areas studied, which increased infectious causative agents in the cattle and buffaloes bedding. Furthermore, the raise in mastitis cases in summer season (July-Sep) may be explained by the propagation of bacteria due to high temperatures and higher humidity in the surrounding environment.

5. CONCLUSION

Mastitis being a complex disease, involves interaction of various risk factors including environment, management, animal risk factors (Teat size, breed, species, milk yield etc.) and causative agents. Therefore, its prevalence will vary a lot in different regions and species. The climate showed significant level of impact on CM prevalence in the present study area.

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7. REFERENCE

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