



Prevalence Study of Sub Clinical Mastitis in Indigenous Goats in Semi-arid Zone of Northern Hemisphere of India

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ABSTRACT

The current study was conducted to determine prevalence of sub clinical mastitis (SCM) in indigenous goats in semi-arid zone of Northern Hemisphere of India. A total of 430 milk samples from 217 lactating indigenous goats (4 blind teats) of different breed suspected for SCM were collected and screened for SCM by California Mastitis Test. The overall prevalence of SCM was reported to be 23.04 % (50 out of 217). Highest prevalence was reported in Bharatpur district of Rajasthan (33.34%) followed by Aligarh, Uttar Pradesh (31.25%) and lowest in Mathura, Uttar Pradesh (16.21%). Considering the individual udder halves, right quarter was found to be more prone to SCM than left quarter. Jakhrana breed of goat possessed highest prevalence followed by Jamnapari, Sirohi, Barbari, Beetal and Black Bengal breed. The prevalence showed an increasing trend as age of goat increases as well as parity / lactation. Similarly, more prevalence was observed in late lactation than mid and early lactation. The season wise incidence of SCM revealed highest in winter than summer season. This suggests endemicity of SCM in lactating goats in this region. Hence, early preventive measures should be taken to control of SCM to reduce further economic loss.

HIGHLIGHTS

- The Sub clinical mastitis (SCM) prevalence was higher when compared to clinical mastitis (CM) prevalence in the countries of the World.
- California mastitis test (CMT) was mostly used as indirect diagnostic test in most of the studies.
- The prevalence estimates for SCM in the goats from India was 19.89%.

Keywords: Sub clinical mastitis, diagnosis, California mastitis test, prevalence

Mastitis is the inflammation of the mammary gland, including not only intra- mammary tissues of the mammary gland but also related anatomical structures (Contreras and Rodriguez, 2011). Major economic losses due to SCM are attributed to reduced milk production, poor quality of milk, discarded milk, cost of management including veterinary services and early culling (Thompson-Crispi *et al.*, 2014). The total economic loss due to SCM is estimated in the range of INR 21,677/- to INR 88,340/-for one lactation period depending on the condition of the animal (Rathod *et al.*, 2017). Goat, known as the poor man's cow usually

reared for milk and meat suitable for Indian climatic condition. Now-a-days rearing of goat for milk has been increasing as goat milk is wholesome, easily digestible, nutritious and medicinal properties (Miranda *et al.*, 2010).

Mastitis is primarily classified into clinical (per-acute,

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acute, sub-acute, chronic and gangrenous) and sub-clinical forms. Sub clinical mastitis (SCM) is the inflammation of udder that cannot be detected by clinical methods such as inspection, palpation and organo-leptic examination (Contreras *et al.*, 2007). Sub clinical mastitis (SCM) is one of the important constraints in animal husbandry sector due to difficulty in diagnosis as well as affected goat act as a reservoir of microorganisms which are contagious in nature (Mishra *et al.*, 2018). Sub clinical mastitis (SCM) has been found to be more prevalent than the clinical form (~15 to 40 times) (Islam *et al.*, 2012).

The bacterial pathogens such as *Staphylococcus aureus*, *Streptococcus agalactiae* and other environmental pathogens have been reported as the cause of mastitis and sub clinical mastitis in dairy goats (Viridis *et al.*, 2010). *Staphylococcus aureus*, *Pseudomonas aeruginosa* and coagulase negative *Staphylococcus* are reported to be the most prevalent pathogens in case of sub clinical mastitis of goats (Byeng *et al.*, 2007).

California mastitis test (CMT) was mostly used as indirect diagnostic tests, whereas SCC was used as direct laboratory diagnostic methods for detection of SCM. Limited data were available suggesting occurrence of mastitis in indigenous goat population in semi-arid zone of Northern India. Hence, the present study was undertaken to study the prevalence of SCM in indigenous goat population of semi-arid zone of Northern India.

MATERIALS AND METHODS

Ethical approval

All the experiments carried out were approved by Institutional Animal Ethics Committee and the ethical guidelines of UP Pandeet Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Viswavidyalaya evam Go-Anusandhan Sansthan (DUVASU) were followed.

Study area

The present study area comprises of five districts of Uttar Pradesh, India, viz. Mathura, Aligarh, Bulandshahr, Agra, Hathras, and one district of Rajasthan, India, viz. Bharatpur, which are considered as the semi-arid zones of northern plains of India. This area has semi-arid climate

and mostly receives rain in monsoon season of July to September.

Selection of animals

A total of 217 lactating goats (430 teats as 4 blind teats) of Jamnapari, Barbari, Jakhrana, Beetal, Sirohi and Black Bengal breed, (>one-year old) were taken for this study. Preliminary screening was done to select animals based on the owner's complaint and/or history suggestive of SCM i.e., gradual loss of milk yield, salty taste, quick curdling, slimy or watery consistency etc.

Screening of animals for sub clinical mastitis

Approximately 5 ml milk was collected in sterile tube from each animal and were screened for sub clinical mastitis by California mastitis test (CMT) as per procedure given by (Schalm and Noorlander, 1957) using a CMT reagent. Based on reaction, the result was graded as negative, +1 (there is precipitate but no gel formation), +2 (the precipitate thickens and forms gel towards the center of paddle) and +3 (distinct gel that adhere to bottom of paddle) (Schalm *et al.*, 1971).

Study of prevalence of SCM

The parameters taken for the study were breed, age, parity, season, lactation status; geographical region as well as total prevalence based on CMT. In the present study, the stage of lactation was divided in to three classes i.e., early lactation (1 to 2 months), mid lactation (2 to 3 months) and late lactation (3 months and onwards till drying off).

RESULTS AND DISCUSSION

In the present study, a total of two hundred seventeen (217) lactating goats were screened for sub clinical mastitis (SCM) by California Mastitis Test (CMT). Out of 217 lactating goats, 50 goats were positive for sub clinical mastitis as evidenced by formation of gel or viscous mass on CMT paddle. Hence, the overall prevalence of sub clinical mastitis was 23.04 % (Table 1). The overall prevalence of SCM which was recorded as 23.04 % by CMT was in agreement with the previous findings (Islam *et al.*, 2012; Razi *et al.*, 2012; Roukbi *et al.*, 2015; Rizwan *et al.*, 2016; Mugabe *et al.*, 2017; Mishra *et al.*, 2018; Singh

et al., 2019) who recorded 29.92%, 18.64%, 36%, 18.64%, 18.29%, 13.5%, 19.89% and 29.94%, respectively. Among them, the highest incidence of SCM recorded was 76.7% whereas the lowest incidence reported was 13.5% in lactating goats with CMT (Mugabe *et al.*, 2017). Mishra *et al.* (2018) reported 19.89% (36/181) prevalence of SCM in the goats from India.

Table 1: Prevalence of sub clinical mastitis (SCM) in goats

Number of goats examined	Number of goat positive for SCM	Incidence (%)
217	50	23.04

Highest prevalence of SCM was found in Bharatpur district of Rajasthan (33.34%) followed by Aligarh district of Uttar Pradesh (31.25%) and lowest in Mathura district of Uttar Pradesh (16.21%) (Table 2). These observations revealed that the prevalence of caprine mastitis is not similar in various geographical regions. Prevalence of caprine SCM varies from 13-77% reported by various researchers at various geographical conditions (Mishra *et al.*, 2018; Singh *et al.*, 2019). The difference in the prevalence of caprine mastitis could be due to the difference in rearing system, milking technique, breed consideration, environmental temperature and management protocols.

Table 2: Prevalence of sub clinical mastitis (SCM) in different district of semi-arid zone of Northern hemisphere of India in goats

Sl. No.	District	Number of goats examined	Number of goat positive for SCM	Incidence (%)
1	Mathura (Uttar Pradesh)	74	12	16.21
2	Aligarh (Uttar Pradesh)	32	10	31.25
3	Bulandshahr (Uttar Pradesh)	28	07	25.00
4	Agra (Uttar Pradesh)	24	04	16.67
5	Hathrash (Uttar Pradesh)	38	10	26.31
6	Bharatpur (Rajasthan)	21	07	33.34
	Total	217	50	23.04

Prevalence of SCM in goats in relation to individual udder halves was presented in Table 3. The prevalence of SCM was higher in right quarter (21.86 %) as compared to left one (18.60 %). These observations were in near agreement to the findings of (Pirazada *et al.*, 2016; Sree Priya *et al.*, 2016; Singh *et al.*, 2019;). It may be due to fact that the goats which were fed to its full capacity, the rumen gets engorged and the animal tends to lie on its right side, resulted in direct contact of right sided teats with soil and become infected (Shittu *et al.*, 2008).

Table 3: Prevalence of sub clinical mastitis (SCM) in goats in relation to individual udder halves

Udder halves	Number of goats examined	Number of goat positive for SCM	Incidence (%)
Right	215	47	21.86
Left	215	40	18.60
Total	430 (4 blind teats)	87	20.30

The breed wise prevalence of SCM in lactating goats revealed a highest incidence i.e., 36.36 % in Jakhrana breed followed by 28.23 % in Jamnapari, 25 % in Sirohi, 19.41% in Barbari, 8.33 % in Beetal and 0 % in Black Bengal breed. Among the breeds Jakhrana breeds showed highest and Black Bengal showed lowest prevalence of SCM (Table 4).

Table 4: Prevalence of sub clinical mastitis (SCM) in goats in relation to breed

Sl. No.	Breeds	Number of goats examined	Number of goat positive for SCM	Incidence (%)
1	Barberi	103	20	19.41
2	Jamnapari	85	24	28.23
3	Jakhrana	11	4	36.36
4	Sirohi	4	1	25
5	Black Bengal	2	0	0
6	Beetal	12	1	8.33
	Total	217	50	23.04

These observations were in contrast with other findings (Kumhar and Shukla, 2017; Singh *et al.*, 2019) that revealed that among the different breeds, Jamnapari breed have higher (40 %) incidence of SCM which may be due to large pendulous halves, which always predisposed to

teat injury by trauma. However, the potential variability in the incidence among the breeds may be attributed to the difference in genetic disease resistance, hygiene, milking practices, management systems, and researcher’s technical knowledge (Islam *et al.*, 2011). Due to variation in number of animals and sample size might be one of the reasons for the variation in percentage of incidence of SCM among different breeds of goat.

Age is the most significant factor in determining the prevalence of mastitis in goats. In this study, an increasing trend in the prevalence of subclinical mastitis was observed with the advancement of age of the goats. Age wise prevalence was highest in goats of >4 years age (24.35 %) followed by 3-4 years aged group (22.22 %) and lowest in <3 years aged lactating goats (16 %) (Table 5). Similar findings were also recorded in various surveys in different countries across the world (Sharma *et al.*, 2007; Ali *et al.*, 2010; Gebrewahid *et al.*, 2012; Haftay *et al.*, 2016; Ferdous *et al.*, 2018; Mahlangu *et al.*, 2018; Singh *et al.*, 2019). The increased prevalence of sub clinical mastitis in older animal might be due to increase length of exposure to the pathogens compared to younger animal.

Table 5: Prevalence of sub clinical mastitis (SCM) in goats in relation to age

Sl. No.	Age group	Number of goats examined	Number of goat positive for SCM	Incidence (%)
1	< 3 years	25	4	16
2	3-4 years	36	8	22.22
3	>4 years	156	38	24.35
Total		217	50	23.04

Lactation / parity wise prevalence of SCM showed an increasing trend as with highest incidence observed in 4th and more lactation (25.92 %), followed by 3rd lactation (19.23 %) and lowest in 2nd lactation (16.66 %) (Table 6). An increased occurrence related to lactation / parity has been reported in goats by many researchers (Bergonier *et al.*, 2003; Singh, 2009; Gebrewahid, 2012; Razi *et al.*, 2012; Hafaty, 2016; Kumar *et al.*, 2016; Mahlangu *et al.*, 2018; Singh *et al.*, 2019). It is assumed that as the age increases, this also increases burden and stress onto the body due to high milk production for longer period and multiple numbers of parity. As a result, immune system of such animals is badly affected with the infectious agents

leading to mastitis (Ali *et al.*, 2010). When the duration of exposure to infection is long and spontaneous recovery rate is low, prevalence increases. The possible explanation is that the increasing age and number of parity there by, resulted in widening of teat canal which may prone to infection by entry of the microorganism via contamination.

Table 6: Prevalence of sub clinical mastitis (SCM) in goats in relation to parity / lactation

Sl. No.	Parity	Number of goats examined	Number of goat positive for SCM	Incidence (%)
1	2 nd	30	5	16.66
2	3 rd	52	10	19.23
3	4 th & more	135	35	25.92
Total		217	50	23.04

The animal wise prevalence of sub clinical mastitis as 22.22 %, 20.68 % and 35.29 % in late, mid and early lactation stage, respectively (Table 7). These findings are in agreement with the findings of (Razi *et al.*, 2012). But the present findings are not in agreement with the findings of (Islam *et al.*, 2011; Ferdous *et al.*, 2018; Singh *et al.*, 2019) who have reported that highest occurrence of SCM in early lactation followed by mid lactation and late lactation. This may be due to the increase in the SCC (Somatic cell count) in initial stage of lactation. (Bergonier *et al.*, 2003) reported the highest incidence of mastitis in small ruminant during suckling, suckling-milking periods or during first third of lactation in goats. The highest distribution of mastitis during the early period of lactation may also be due to the residual infections in udder which flare up during the early lactation period.

Table 7: Prevalence of sub clinical mastitis (SCM) in goats in relation to stage of lactation

Sl. No.	Lactation stage	Number of goats examined	Number of goat positive for SCM	Incidence (%)
1	Early	17	6	35.29
2	Mid	29	6	20.68
3	Late	171	38	22.22
Total		217	50	23.04

In present investigation, the overall occurrence of SCM according to season was observed as 23.91% and 22.4 %

in winter season and summer season, respectively (Table 8). Present findings are in accordance with (Kumar *et al.*, 2016; Singh *et al.*, 2019) who reported that mastitis prevalence was significantly higher in lactating goats sampled during the period from November to December than the periods from September to October. The reason of increased rate of prevalence during November to December months could be higher number of kidding in these months which leads to increased susceptibility to udder infection.

Table 8: Prevalence of sub clinical mastitis (SCM) in goats in relation to season

Sl. No.	Season	Month	Number of goats examined	Number of goats positive	Incidence (%)
1	Winter season	November-February	92	22	23.91
2	Summer season	March – June	125	28	22.4

CONCLUSION

In the present study, SCM in lactating goats was reported to be highly endemic on semi-arid zones of northern plains of India. The disease prevailed throughout the year and variation was observed with respect to host related factors viz. age, breed, lactation status, parity etc. Our findings showed that the right quarter was more prone to SCM than left quarter, Jakhrana breed of goat possessed highest prevalence of SCM and an increase trend of SCM as age of goat increases as well as parity / lactation. These factors should be taken into consideration and special attention should be given in management practices to prevent SCM in lactating goats. Similarly, more prevalence was observed in late lactation than mid and early lactation. Hence, early preventive measures detailed epidemiological surveillance at national level are required for prevention and control of SCM in lactating goats.

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