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EFFECT OF OCCURRENCE AND SEVERITY OF MASTITIS ON REPRODUCTIVE PERFORMANCE AND CULLING OF FRIESIAN COWS

By

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ABSTRACT

The objective of this study was to determine effect of occurrence and severity of mastitis before first service on reproductive performance and culling. A total of 389 Friesian cows (108 primiparous cows and 281 multiparous) were categorized based on occurrence of mastitis before first service: healthy cows (Control) and cows with mastitis. Cows with mastitis were divided into three groups based on severity of mastitis: subclinical mastitis, clinical mastitis and acute mastitis. Mastitis cases were categorized based on somatic cell count (SCC) in milk. Days of first services, number of services per conception, days open, conception rate and calving interval were recorded. Also, effects of mastitis on culling percentage of cows were evaluated. Results showed that, days of first service, days open, calving interval and number of services per conception were significantly increased in cows with mastitis (124.68±32.47, 177.91±24.43, 456.56±23.91 days and 2.67±1.08 services, respectively) than the control cows(89.03±7.93,105.40±9.18, 384.52±9.35 days and 1.53±0.50 services, respectively). Moreover the conception rate was lower in cows with mastitis (49.39%) than the control cows (68.44%). Also, the results indicated that, the negative effects of mastitis on the reproductive performance were most pronounced in multiparous cows in comparison with primiparous cows. Where the days of first service, days open, calving interval and number of services per conception were higher in multiparous cows with mastitis in comparison with primiparous cows with mastitis, while first service conception rate in multiparous cows with mastitis was better. When the severity of mastitis increased, the day's open, calving interval and number of services per conception increased. The cows with subclinical mastitis showed days of first service longer and first service conception rate greater. Culling rate was higher in cows with mastitis (14.63%) than the control cows (8.44%) and it was high for cows with acute clinical mastitis (28.57%). Culling rate for primiparous

cows was affected by mastitis more than multiparous cows, especially primiparous cows with acute mastitis (33.33%).

It was concluded that, cows experiencing mastitis before first service had a low reproductive performance compared with healthy cows and response effect was observed based on severity of mastitis cases. So that, to maximize reproductive efficiency**,** breeders need to recognize the effect of mastitis on reproductive performance and focus on preventing mastitis during critical period of breeding.

Keywords:

Friesian cows, mastitis, somatic cell count, reproductive performance and culling.

INTRODUCTION

Somatic cell count (SCC) in milk is a long-established parameter of milk quality **(Miller *et al.,* 2004**). The SCC is important to dairy producers both because counts that are too high can lead to poor quality or even unsaleable milk and SCC can be used to monitor mastitis incidence in the herd **(Mostert *et al.,* 2004**). Mastitis is one of the most costly and common diseases affecting dairy cows throughout the world. The economic impact of mastitis on dairy herds is related to reduced milk production, reduced milk quality, with increases in SCC, increased milk costs due to the treatment and discarded milk, and increased risk of culling. In addition to the negative impact on milk yield and its components, mastitis was reported to have a detrimental effect on the reproductive performance in lactating dairy cows **(Lavon *et al.,* 2011 and Hudson *et al.,* 2012**).

The most detrimental effects of mastitis on reproductive performance were observed when it occurred near the time of artificial insemination or during the interval between artificial insemination and first pregnancy diagnosis **(Hertl *et al.,* 2010 and Hudson *et al.,* 2012**). **Oliveira *et al.* (2013)** reported that, approximately 30% of first cases of clinical mastitis occurred during the first 60 days after calving, immediately before the beginning of most breeding period. **Hudson *et al.* (2012)** observed that, there was substantial-sized and additive relationship with subclinical mastitis, although the sizes of these associations were generally smaller compared with those with clinical mastitis at similar timing.

Reproductive efficiency is one of the most important factors associated with dairy farm profitability and is negatively affected by mastitis. The occurrence of mastitis has been associated with increased days to first artificial insemination**,** increased services per conception, increased days open, increased incidence of pregnancy loss, and decreased pregnancies per artificial insemination at first insemination.

Mastitis is one of the major disease and management problems of dairy cattle. **Shook and Schutz (1994)** indicated that, mastitis was the third major reason for premature culling of dairy cows, following low yield and reproduction as the primary reasons for disposal, where mastitis accounted for 6 to 17% of culling. They have shown that approximately 50% of total health care costs were attributable to mammary function and that, the vast majority of the mammary health care costs are due to mastitis.

As measures of fertility for lactating dairy cows, more attention and efforts to prevent diseases that might decrease reproductive efficiency need to be assigned. Prevention of mastitis caused by environmental pathogens should focus on reduction of new intramammary infections during the dry period and early lactation. Therefore, the objective of this study was to determine the effect of the occurrence and severity of mastitis occurring before first service on reproductive performance and culling in Friesian cows.

MATERIAL AND METHODS

Animals and management:

The present study was carried out at Sakha Experimental Station, Animal Production Research Institute, Agricultural Research Center, and Ministry of Agriculture. A total of 389 Friesian cows (108 primiparous cows and 281 multiparous) ranged from 3 to 12 years of age and had average live body weight ranged between 400 and 650 kg were used in this study. Animals were housed in open sheds and fed traditional summer ration consisted of concentrate feed mixture (CFM), berseem hay, rice straw and corn silage and traditional winter ration consisted of concentrate feed mixture, fresh berseem and rice straw. Cows were fed to cover the recommended requirements according to Animal Production Research Institute Recommendation **(APRI, 1997**) for dairy Friesian cows. Animals were fed in groups feeding assigned according to live body weight, milk yield and reproductive status. Water was available for animals all the day round.

Cows were machine milked twice daily at 6:00 and 17:00 h. Daily milk yield was individually recorded for the lactation period. At each milking, cows were examined for symptoms of clinical mastitis before each milking by trained milkers. Clinical mastitis was characterized by visible abnormalities in the milk or inflammation, hardness, and redness of a quarter. Treatment for mastitis was initiated shortly after diagnosis. In addition, periodically milk samples were obtained to determine somatic cell count of milk. Somatic cell counts were determined for each milk sample by Fossomatic 90 (A/S N Foss Electric, Hillerød, Denmark) during 24 h postcollection by the previously described method **(Gonzalo *et al.*, 1993).**

Experimental design:

Dairy cows were categorized based on the occurrence of mastitis before first service: healthy cows (Control) SCC were < 200,000 cells/mL (56 primiparous cows and 169 multiparous cows) and cows with mastitis, SCC were >200,000 cells/mL (52 primiparous cows and 112 multiparous cows). Cows with mastitis were classified into three subgroups based on the severity of mastitis: subclinical mastitis SCC were >200,000 to <400,000 cells/mL (18 primiparous cows and 45 multiparous cows); clinical mastitis SCC were >400,000 to <1000,000 cells/mL(19 primiparous cows and 47 multiparous cows) and acute mastitis SCC were >1000,000 cells/mL (15 primiparous cows and 20 multiparous cows) according to **Pinzon-Sanchez and Ruegg (2011), Ruegg (2012) and Oliveira *et al.* (2013**). All cows were free from any other diseases with healthy appearance.

Reproductive performance:

Estrus was detected by visual observation of cow estrus behavior each morning and afternoon by trained workers. Cows in estrus were artificially inseminated using frozen semen within 14 hours after onset of the first spontaneously occurring estrus. Days of first services, number of services per conception, days open, conception rate and calving interval were recorded. Pregnancy status was confirmed via palpation per rectum of uterine contents 60 days after artificial insemination. Also, effects of mastitis on percentage culling of cows were recorded.

Statistical analysis:

The obtained data were statistically analyzed using **SAS (2002)**. The significant differences among means were tested using Duncan's Multiple Range Test **(Duncan, 1955).** Categorical variables included occurrence of mastitis (two levels: control and mastitis), categorized severity of mastitis (four levels: control, subclinical, clinical and acute clinical) and parity (two levels: primiparous and multiparous). Probability values ≤ 5% were considered significant.

RESULTS AND DISCUSSION

1. Herd characteristics:

The average milk yield was 10 kg/primiparous cow while it was 14.5 kg/multiparous cow per day.Based on the definition of mastitis severity approximately 16.7% (18/108) of primiparous cows had subclinical mastitis, 17.6% (19/108) had clinical mastitis and 13.9% (15/108) had acute mastitis. But in multiparous cows approximately 16.0% (45/281) had subclinical mastitis, 16.7% (47/281) had clinical mastitis and 7.1% (20/281) had acute mastitis.

2. Reproductive performance:

2.1. Effect of mastitis on days of first service:

Data in Table (1) shown that, days of first services was significantly ($P<0.05$) affected by the mastitis. Results revealed that days of first services was significantly increased ($P<0.05$) in cows with mastitis, where cows with mastitis had 124.68±32.47 days in comparison with the control cows 89.03±7.93 days. The significant deference was approximately 35.65 days. Parity had an effect ($P<0.05$) on days of first service, with primiparous control cows had 84.61± 4.12 days in comparison with multiparous control cows had 90.50± 8.35 days. In cows with mastitis, the difference in days to first service between primiparous and multiparous cows decreased to 1.3 days ($P>0.05$). The negative effect on days of first service was most pronounced in primiparous cows by delaying the first service in 39.18 days in comparison with multiparous cows, where the delay was 34.59 days.

When the mastitis cases were categorized according to the severity of the infection, cows with subclinical mastitis had days of first service longer (130.98±28.35 days) than other mastitis groups, this was clear in multiparous cows (136.40±30.63 days). While in primiparous cows with acute clinical mastitis cases longer (135.93±47.02 days).

Table (1): Effect of the occurrence and severity of mastitis on days of first services (days) of primiparous and multiparous cows.

Groups	First service (days)		
	Primiparous	Multiparous	Overall mean
Control	84.61± 4.12^{Bc}	90.50± 8.35^{Bd}	89.03±7.93^{Bc}
Mastitis	123.79±28.61^{A}	125.09±34.23^{A}	124.68±32.47^{A}
<u>Mastitis Groups:</u>			
Subclinical	117.44±15.20^{b}	136.40±30.63^{a}	130.98±28.35^{a}
Clinical	120.21±14.30^{b}	121.62± 34.27^{b}	121.21±29.80^{b}
Acute clinical	135.93±47.02^{a}	107.80±34.39^{c}	119.86±42.08^{b}

Means with different superscripts within columns differ at P≤0.05. A, B = Comparison between control and mastitis cows. a,b,c,d = Comparison between control and mastitis groups.

These results agreed with that reported by **Schrick *et al.* (2001)** who demonstrated that, onset of clinical mastitis before first service increased the number of days to first service compared with cows without clinical mastitis or cows with clinical mastitis after establishment of pregnancy. Cows with clinical or subclinical mastitis before first service had increased days to first service (77.3±2.7 and 74.8±2.7 days, respectively) compared with controls (67.8±2.2 days; P<0.05). From this result they concluded that subclinical mastitis reduced reproductive performance of lactating cows similar to clinical mastitis. In the same indicator, increased days to first artificial insemination for cows with mastitis prior to first artificial insemination could have been due to insufficient follicular development; an ovulation, resulting from blockage of the LH surge; or decreased estrogen synthesis, resulting in the loss of behavioral estrus **(Barker *et al.*, 1998)**. Similar finding was observed by **Schrick *et al.* (2001)** who reported that, inflammation stimulates the immune system resulting in the release of cytokines which may inhibit the action of FSH on LH receptor formation in granulosa cells and inhibit FSH-induced cAMP production. Also, they indicated that cytokines, released following endotoxin challenge, block the pulsatile secretion of LH but not FSH through alterations in nitric oxide production to inhibit GnRH. Consequently, mastitis could influence reproductive function via alterations in LH and FSH activity or function, thus affecting follicular development and (or) oocyte maturation.

<u>2.2. Effect of mastitis on number of services per conception:</u>

Data in Table (2) showed that, number of services per conception was significantly (P<0.05) affected by the mastitis. The number of services per conception was significantly increased (P<0.05) in cows with mastitis (2.67±1.08 services) than the control cows (1.53±0.50 services). Parity had an effect (P<0.05) on number of services per conception, where, primiparous control cows had more services (1.95±0.23 services) in comparison with multiparous control cows (1.39±0.49 services). In cows with mastitis, multiparous cows had more services (2.86±1.21 services) than primiparous cows (2.27±0.53 services), this suggest that, the negative effects of mastitis on the reproductive performance in multiparous cows are more severe.

The results in Table (2) indicate that, when the severity of mastitis increased the number of services per conception increased. This effect was clear in multiparous cows with acute clinical mastitis (4.00±1.17 services).

Table (2): Effect of the occurrence and severity of mastitis on number of services per conception of primiparous and multiparous cows.

Groups	Number of services per conception (NS/C)		
	Primiparous	Multiparous	Overall mean
Control	1.95±0.23^{Bb}	1.39±0.49^{Bd}	1.53±0.50^{Bd}
Mastitis	2.27±0.53^{A}	2.86±1.21^{A}	2.67±1.08^{A}
Mastitis Groups:			
Subclinical	2.11±0.47^{b}	2.20±0.40^{c}	2.17±0.42^{c}
Clinical	2.00±0.33^{b}	3.00±1.35^{b}	2.71±1.24^{b}
Acute clinical	2.80±0.41^{a}	4.00±1.17^{a}	3.49±1.09^{a}

Means with different superscripts within columns differ at P≤0.05. A, B = Comparison between control and mastitis cows. a,b,c,d = Comparison between control and mastitis groups.

These results consistent with that reported by **Schrick *et al.* (2001**) who indicated that, cows with either clinical or subclinical mastitis before first artificial insemination had increased services per conception and that reproductive performance did not differ between types of pathogens. Cows with clinical or subclinical mastitis before first service had increased number of services per conception (2.1±0.2 and 2.1±0.2) compared with controls (1.6±0.2; P<0.05). In addition to that, services per conception (3.0±0.2) were increased (P<0.05) in cows with clinical mastitis during the period between first service and pregnancy. Cows initially diagnosed subclinical that became clinical during the period between first service and pregnancy exhibited increased services per conception (4.3±0.7) compared with control animals ($P<0.05$). The reproductive performance is most severely impacted when subclinical infections develop, then progress to the clinical stage **(Schrick *et al.,* 2001).** Cows with clinical mastitis between first artificial insemination and conception required an additional artificial insemination, had a greatly lengthened breeding period, and had the greatest number of days to conception compared with all other cows. The bovine mammary gland synthesizes $PGF_{2\alpha}$ and increased $PGF_{2\alpha}$ was found in milk from cows with clinical mastitis **(Anderson *et al*. 1986**).

2.3. Effect of mastitis on days open:

Table (3) illustrated that, number of days open of Friesian cows was significantly ($P<0.05$) affected by mastitis. Cows with mastitis had 72.51 days open more than the control cows (177.91±24.43 vs. 105.4±9.18, respictivily, $P<0.05$). When the effect of parity for this variable was analyzed, control primiparous cows had 7.19 days open more than control multiparous cows ($P<0.05$). While primiparous cows with mastitis had 10.06 days open less than multiparous cows with mastitis ($P<0.05$).

Also, from these data, when the mastitis cases were classified according to the severity of the infection, observed that when the severity of mastitis increased the number of days open increased too. This was clear in both primiparous and multiparous cows with acute clinical mastitis (185.33±23.97 and 209.00±22.57 days, respectively).

Table(3): Effect of the occurrence and severity of mastitis on days open (days) of primiparous and multiparous cows.

Groups	Days open (days)		
	Primiparous	Multiparous	Overall mean
Control	**110.80±4.97^{Bd}**	**103.61±9.56^{Bc}**	**105.40±9.18^{Bd}**
Mastitis	**171.04±22.14^{A}**	**181.10±24.87^{A}**	**177.91±24.43^{A}**
Mastitis Groups:			
Subclinical	**157.89±17.97^{c}**	**172.11±22.47^{b}**	**168.05±22.11^{c}**
Clinical	**172.21±17.10^{b}**	**177.83±19.26^{b}**	**176.21±18.71^{b}**
Acute clinical	**185.33±23.97a**	**209.00±22.57^{a}**	**198.86±25.74^{a}**

Values with different superscripts within columns differ at P≤0.05. A, B = Comparison between control and mastitis cows. a,b,c,d = Comparison between control and mastitis groups.

These results agreed with **Schrick *et al.* (2001)** who found that, cows with clinical or subclinical mastitis before first service had increased days open (110.0±6.9 and 107.7±6.9 days, respectively), compared with controls (85.4 ±5.8 days; P<0.05). They pointed out that cows with either clinical or subclinical mastitis before first artificial insemination had increased days open and that reproductive performance did not differ between types of pathogens. On other hand, **Barker *et al.* (1998)** found that, days open for cows with clinical mastitis after first service (137 days) was significantly greater (P≤0.01) than for control cows and those that developed clinical mastitis after confirmed pregnancy (92 days). Moreover, **Dechow *et al.* (2007)** found that, estimates for days open were stronger in first lactation, but near zero in third and higher lactations, whereas heterosis increased across lactation for somatic cell score. The trend for heterosis in days open (15.08% for first lactation to 1.43% for third and higher lactations) was opposite that observed for yield. Least squares means for somatic cell score also grew in magnitude as lactation progressed, from 3.17% in first lactation (non-significant) to 15.40% in third and higher lactations (P < 0.05). In addition, **Morek-Kopec *et al.* (2009)** showed that elevated SCC as an indicator of mastitis within each interval of preceding test-day to first insemination caused a decrease in the non-return rate. While, **Schrick *et al.* (2001)** reported that, elevated body temperature is another symptom often associated with clinical mastitis, so that cows exposed to heat stress experienced increased embryonic mortality. Furthermore, effects of hyperthermia were greatest when experienced between the onset of estrus and insemination or during early embryonic development. The endotoxin effects have been reported to be present in various tissues involved in reproduction, including the hypothalamus, ovary, and endometrium **(Hertl *et al.*, 2010)**. The ovarian follicular growth might be interrupted because of bacterial infection, and similarly in the endometrium, lipopolysaccharide (LPS) were associated with production of prostaglandin E2 rather than prostaglandin F2α, resulting in a prolonged luteal phase **(Herath *et al.*, 2007; 2009**) and potentially lower probability of ovulation and conception. Also, **Williams *et al.* (2008**) observed that, fewer animals ovulated following intrauterine infusion with LPS compared with control cows because LPS suppressed ovarian cell function.

2.4. Effect of mastitis on first service conception rate:

The conception rate from first service was affected by mastitis (Fig. 1). Results revealed that conception rate was lower in cows with mastitis (49.39%) than the control cows (68.44%). The primiparous control cows had first service conception rate (60.71%) less than multiparous control cows (71.01%). Also,the primiparous cows with mastitis had first service conception rate (36.54%) less than multiparous cows with mastitis (55.36%).

When the mastitis cases were categorized according to the severity of the infection, first service conception rate was the less for cows with acute clinical mastitis (42.86%). Furthermore, Fig. (1) showed that, first service conception rate for primiparous cows was affected clear by mastitis more than multiparous cows, especially primiparous cows with clinical mastitis (31.58%).

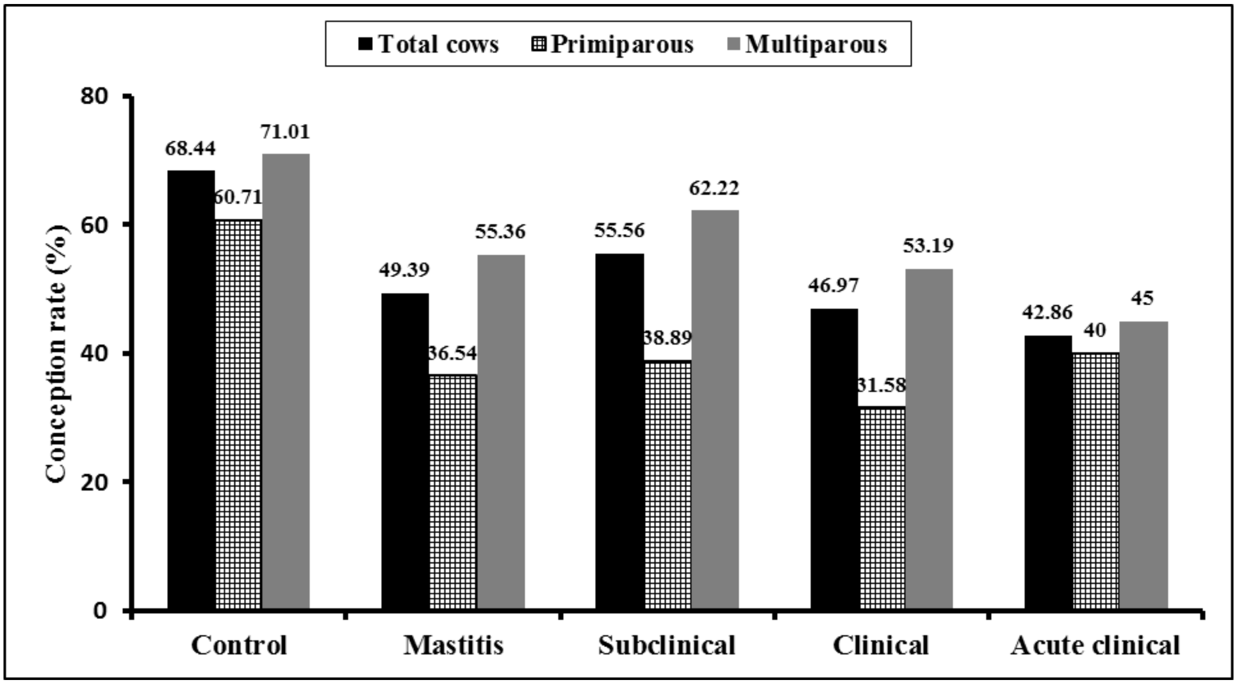

Fig. (1): Effect of the occurrence and severity of mastitis on first service conception rate (FSCR) of primiparous and multiparous cows.

The results of this study were in agreement with **Konig *et al.* (2006**) clinical mastitis in cows is strongly associated with low conception and higher services per conception. Recent studies found that mastitis was genetically associated with reduced fertility, with a genetic correlation ranging between 0.21 and 0.41. **Santos *et al.* (2004)** showed that, first artificial insemination conception rates were depressed by clinical mastitis occurring before artificial insemination, caused by either gram-positive or gram-negative bacteria. **Konig *et al.* (2006)** found that, SCC>400,000 cells/mL of milk during the entire lactation lowered the pregnancy rate. **Hudson *et al.* (2012)** demonstrated that, subclinical mastitis present at between 1 and 30 days postservice was associated with the largest decrease in pregnancy rate. The magnitude of the relationship tended to increase with increasing SCC. The odds of a service leading to a pregnancy were decreased by around 18% where an SCC of between 200,000 and 399,000 cells/mL which was recorded at <31 days postservice, whereas the odds were decreased by almost 26% when the SCC was >399,000 cells/mL. The magnitudes of these relationships are comparable with those with clinical mastitis very close to the service date; only clinical mastitis at the time of service was associated with a much greater decrease in pregnancy rate.

This provides evidence that subclinical mastitis as well as clinical mastitis has a clinically significant relationship with reproductive outcome.

2.5. Effect of mastitis on calving interval:

Calving interval of Friesian cows was significantly (P<0.05) affected by mastitis (Table 4). Results revealed that, the calving interval was significantly longer (P<0.05) in mastitic cows than the control cows by 72.04 days (456.56±23.91 and 384.52±9.35 days, respectively). Mastitis caused an increase in the calving interval in both primiparous and multiparous cows, but had the greater impact on multiparous cows, where the period was 77.00 days longer in comparison with primiparous cows (59.83 days).

When the mastitis cases were categorized according to the severity of the infection, there was a very significant differences (P<0.05) in calving interval between mastitis groups (Table 4). The results showed that cows with acute clinical mastitis had 92.31 days more calving interval than the control cows (P <0.05), while cows with subclinical mastitis had 62.42 days (P<0.05).

Table (4): Effect of the occurrence and severity of mastitis on calving interval (day) of primiparous and multiparous cows.

Groups	Calving interval (day)		
	Primiparous	Multiparous	Overall mean
Control	$389.80±5.38^{Bd}$	$382.77±9.73^{Bc}$	$384.52±9.35^{Bd}$
Mastitis	$449.63±21.84^{A}$	$459.77±24.24^{A}$	$456.56±23.91^{A}$
Mastitis Groups:			
Subclinical	$437.06±17.69^{c}$	$450.88±21.60^{b}$	$446.94±21.37^{c}$
Clinical	$450.68±17.03^{b}$	$456.74±19.13^{b}$	$455.00±18.63^{b}$
Acute clinical	$463.40±24.03^{a}$	$486.90±21.96^{a}$	$476.83±25.42^{a}$

Means with different superscripts within columns differ at P≤0.05. A, B = Comparison between control and mastitis cows. a,b,c,d = Comparison between control and mastitis groups.

This is consistent with **Moore *et al.* (2005)** who noticed that, cows with an intramammary infection before artificial insemination by 35 to 41 days were twice as likely to lose the embryo from another cows. In addition, **Perrin *et al.* (2007)** evaluated whether mastitis was affecting fertilization of oocytes or early embryonic death, they indicated that, mastitis primarily affects ovulatory factors and oocytes, rather than products of conception (embryos).

Hertl *et al.* (2010) indicated that, intramammary infections often result in pathogen-specific release profiles of pro-inflammatory cytokines such as tumor necrosis factor-α and several interleukin molecules. These cytokines have been linked to embryo loss by inducing hyperthermia (fever), which inhibits oocyte function and embryo growth, or through increased prostaglandin production. Alternatively, these cytokines might be directly involved in functional luteolysis. The cytokines may originate in the mammary gland, or be produced elsewhere in response to signals from the mammary gland. Moreover, **Lavon *et al.* (2011)** concluded that, cows with chronic mastitis had a reduced probability of conception as compared with uninfected or cured cows. They also concluded that cows with greater SCC (SCC >10^6 cells/mL) had the least probability of pregnancy. **Isobe *et al.* (2014)** reported that, the recognition of bacteria progresses the intracellular cascade and induces RNA transcription, followed by the translation and secretion of some cytokines and antimicrobial peptides. Cytokines have various functions in inflammation. Cytokines have been shown to negatively impact hypothalamus-pituitary function, resulting in abnormal production of GnRH and gonadotropins. Therefore, follicular development and ovulation do not occur, which results in reproductive disorders such as anovulation at estrus, fertilization failure, and embryonic mortality. Administration of endotoxin to heifers near estrus was shown to inhibit the LH surge, cause anovulation and the formation of follicular cysts, or delay ovulation.

3. Effect of mastitis on culling rate:

The culling rate from herd was affected by mastitis (Fig. 2). Results revealed that culling rate was higher in cows with mastitis (14.63%) than the control cows (8.44%)**.** The primiparous control cows had culling rate (12.5%) more than multiparous control cows (7.10%)**.** Also the primiparous cows with mastitis had culling rate (21.15%) more than multiparous cows with mastitis (11.61%)**.**

When the mastitis cases were categorized according to the severity of the infection, culling rate was the highest for cows with acute clinical mastitis (28.57%)**.** Furthermore, the culling rate for primiparous cows was affected clear by mastitis more than multiparous cows Fig. (2) especially primiparous cows with acute mastitis (33.33%).

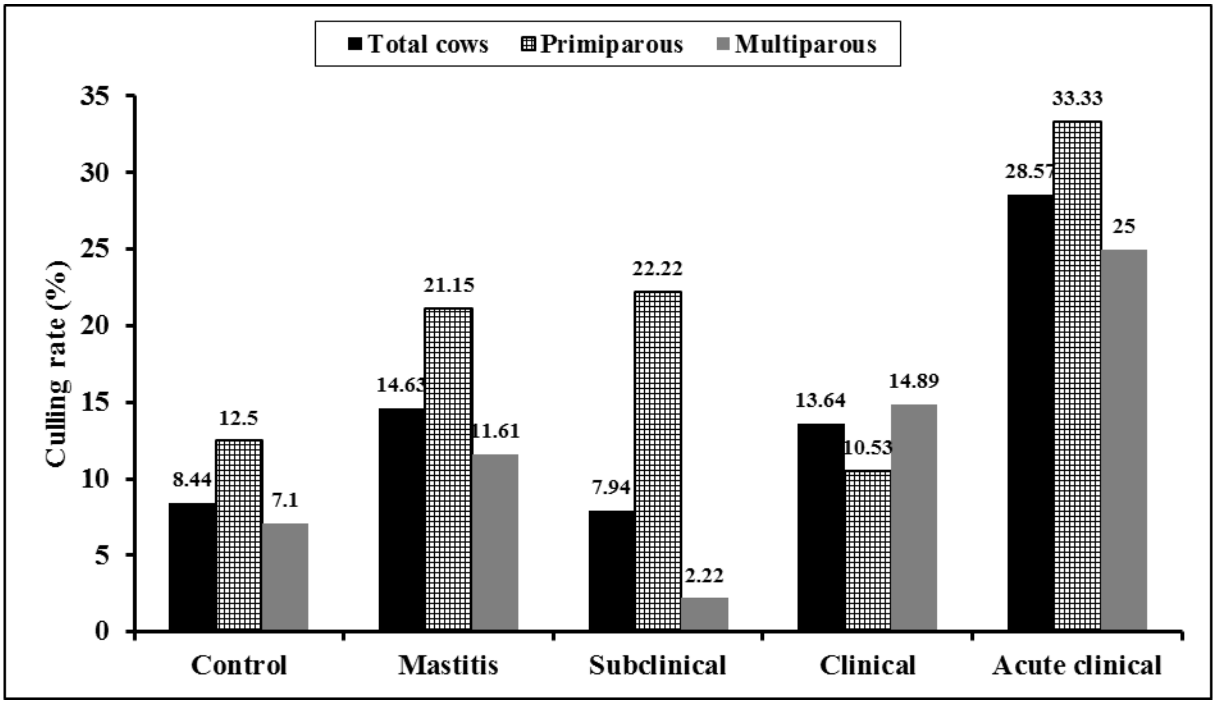

Fig. (2): Effect of the occurrence and severity of mastitis on culling rate primiparous and multiparous cows.

These results are in agreement with **Neerhof *et al.* (2000),** who found that, mastitis is an important culling reason in cows**.** In other study they found that acute mastitis in the first weeks of lactation has a significant effect on culling. Nearly 11% of primiparous cows that were treated for clinical mastitis before calving or within the first 14 days-in-milk (DIM) were culled within one month after treatment **(Waage *et al*., 2000)**. In addition, clinical and subclinical mastitis early postpartum have negative effects on reproductive performance **(Barker *et al*., 1998**; **Schrick *et al*., 2001)**. As a result, dairy herds with a large number of primiparous cows calving with infected udder quarters will suffer substantial economical losses. Moreover, elevated SCC in primiparous cows could be associated with an increased culling hazard during the first lactation. Also, **Caraviello *et al*. (2005)** indicated that**,** culling rates in cows with an average SCC 700,000 cells/mL were 3.4 times greater than those of cows with an average SCC between 200,000 and 250,000 cells/mL in herds with a low SCC average. In addition, **Hertl *et al.* (2011)** observed that all clinical mastitis cases during lactation increased the culling risk regardless of the number of cases and pathogen type. **Jamali *et al.* (2018)** indicated that, the risk of culling increased with the number of clinical mastitis cases, the odds of culling a cow after a third clinical mastitis event were 4 times higher than those of a cows without clinical mastitis.

CONCLUSION

From result of the present study, it is apparent that, the occurrence of mastitis in its various degrees affects the reproductive efficiency of dairy herds. The reduced reproductive performance of cows with mastitis was related to increased services per conception, prolonged days of first service, day's open and calving interval and decreased first service conception rate compared with the healthy cows.These findings also indicated that subclinical mastitis, before first artificial insemination have a negative effect on the reproductive performance of dairy cows. Hence, breeders should pay extra attention to mastitis prevention and control, not only from the point of view of production efficiency, but also reproductive efficiency.

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