

## Research Article

# Study on Major Reproductive Health Problems of Dairy Cattle at Mekele

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## I N F O

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## A B S T R A C T

Study was conducted from December 2010 to April 2011 at Mekelle Veterinary Clinic with objective to assess the incidence of various reproductive disorders, identify the major reproductive disorders of dairy cows in study area and to suggest suitable remedial measures to the farmers. This study was under taken by applying questionnaire survey; data was collected from case book of clinics and examination of reproductive tract. Out of 239 cows that have reproductive disorders, 29.7%, 18.8%, 17.2%, 12.1%, 8.8%, 5.4%, 4.6% and 3.3% were found to have repeat breeder, Retained Fetal Membrane, abortion, anestrus, dystocia, uterine prolapsed, Metritis and vagina prolapsed, respectively. According to this study the effect of age ( $P=0.423$ ) and parity ( $P=0.742$ ) On Reproductive disorders were not statistically significant. On the other hand breed and service ( $P<0.05$ ) have Significant Effect on the Reproductive disorders of the dairy cows. Possible risk factors responsible for the occurrence of reproductive health problems were identified and included as age, parity, breed and type of service. Improvements in management systems (such as housing, feeding and health care), heat detection and proper selection of bull for breeding could help in minimizing reproductive health problems and improve the reproductive efficiency of small holder dairy cows. First of all, I would like to Praise the Almighty God for his help to live in my life. Much of the acknowledgment goes to my Advisors Dr. Berhane, M, Dr. Aboma R, Dr. BiranuBula and Dr. Guesh N. for their intellectual guidance, provision of material, comments, constructive suggestion devotion of their time in correcting this thesis and unreserved experience sharing. I would also like to express my heartfelt and unforgettable great thanks to my beloved family for their day to support and encouragement. Last, but not least, my best gratitude also goes to Dr. Yohannes H and Dr. Selamawit, Takelegn T. and my friends (Tamirat Y, Fisseha K, Tamirat Z, Mateyos, Hirphasa, Qabata and others) who supported me by sharing ideas and materials.

**Keywords:** Artificial Insemination, Breed, Dairy Cows, Reproductive Disorders

## Introduction

Ethiopia possess the largest livestock population in Africa continent with an estimated 30-33 million cattle (Alemayehu, 2003; FAO-STAT, 2003), 24 Million sheep, 18 million goats and of 7 million equines. The distribution and the quantity of each species are different according to the type of prevailing animal production systems and agro-ecological zones (Alemayehu, 2003). The country agro-climate is suited for livestock production the source of protein, fuel and animal products in general (Yohannes, 2007).

In contrast to huge livestock resource, the livestock productivity is however, found to be very low. The major biological and socio-economic factors attributing to the low productivity includes the genetic potential and performance, poor nutrition (in quality and quantitative terms), traditional way of husbandry systems and the prevailing of different diseases (Shitayee et al., 2007).

The poor Reproductive performance indicates the presence of reproductive problems resulted in considerable economic losses to small holder dairy farms and dairy industry (Robert, 1986; Bekanaet al., 1994a). Among the major problems that have a direct impact on reproductive performance of dairy cows, retained fetal membrane and the subsequent endometritis have been reported to be the most common clinical and economic problems (Murasa-Mugerula et al., 1991).

These have been implicated to cause a considerable economic loss to dairy industry due to slower uterine involution, reduced reproductive rate, prolonged inter-conception period and calving interval, high cost of medication, drop in milk production, reduced calf crop and early depreciation of potentially useful cows (Alberrom, 1983; Mekonnen, 2000).

Assessing the reproductive problems, measuring the fertility of dairy herd and establishing reproductive health problem were the most important measures that must be practiced in order to improve productivity (Roberts, 1986). Management practices like nutrition, sanitation and hygiene, breeding and reproductive health problem for dairy herds are practical and essential for successful herd management. The veterinarians play a highly important role as a consultant and advisor to the herd manager or owner in setting up reproductive health problem and maintaining the effectiveness to achieve the goal of calf per ever year (Roberts, 1986).

Reproductive system is the interaction of central nervous system, hypothalamus, pituitary gland, gonads and their target organs and lead to estrus, ovulation, gestation and parturition finally give living animals. This process was successful when there is no any reproductive disorder. The major problems that have a direct impact on reproductive performance of dairy cow are classified as before gestation

(infertility of anestrous and repeat breeder) during gestation (abortion, vaginal prolapse and Dystocia) and after gestation (retain placenta, endometritis and uterine prolapse). The ultimate manifestation of infertility is failure to produce offspring. In polyestrous animal, a subnormal number offspring also constitutes infertility. Female infertility may be due to failure cycle, aberration to estrus cycle and period, failure to conceive or prenatal and prenatal death (Susan, 1998).

Anestrus is not disease but symptom of different conditions like a period before puberty, the period of pregnancy, incomplete uterine involution and symptom of infertility. Anestrus which is symptom of infertility is a state of complete sexual inactivity with no manifestation of estrus for more than two month. The repeat breeding cows are one that have normal or nearly normal estrus cycle and estrus period and have been breed two or more times to fertile bull (semen) yet failed to conceive. Coworkers in a field of reproductive physiology have divided the cause of repeat-breeding into two groups (1) failure of fertilization and (2) early embryonic death (Noakes, 1986).

Other prefer a more detailed classification based on pathological and managerial causes of repeat breeding namely (1) congenital or genetic anatomical defects of the genital tract, (2) congenital, genetic and acquired defects of the ova, spermatozoa or early zygote (3) infectious or traumatic inflammatory process (4) endocrine dysfunctions, (5) management and nutritional deficiencies (Zemjanis, 1980).

Abortion is the expulsion of dead or recognizable fetus after organogenesis and before full gestation period (Roberts, 1986). Abortion cause by non-infection (Chemical, drug poison, hormones, nutritional disorder, trauma and genetics) and some genetically caused abortion may not have phenotypically recognizable. Abortion many also be caused by to infections agents like bacterial, viral, fungus and protozoa infections (Robert, 2002).

## Materials and Methods

### Study Area

The study was conducted from November 2010 to April 2011 at Mekelle veterinary clinic. Mekelle is the capital city of Tigray Regional state located at 783km from Addis Ababa. It is located at altitudes 200-2200 meters a.s.l and has a moderate zone climatic condition. Geographically, Mekelle city is found in 39° 38' east and 13° 23' North. The average annual rain fall and average mean temperature of the city is 250mm and 19°C, respectively. The study area belongs to mid altitude agro-ecological zone.

The dominant farming system in the study area is subsistence mixed crop livestock system small holder farmers that integrate crop and animals production to maximize return from their limited land and capital resources and minimize

production risk. The farm animals provide draft power and manure for crop. Dried animals manure is used extensively as a source of house hold energy. Crop residues are used as feed for livestock. Output from livestock such as milk and meat are important source of food for the family. Cash from the sale of crop product, Animal product and animals used to purchase farm input and cover expenditure for schooling, clothing and veterinary cost. Hence livestock serves as capital asset in the form of already available source of cash and means of saving.

### Study Animals

A number of dairy cow herds maintained under semi-intensive, intensive and extensive farms were included in the study. Reproductive disorders like abortion, retain fetal membrane, repeat breeder, dystocia, anestrus, metritis, uterine prolapsed and vaginal prolapsed were studied at Mekelleveterinary clinic.

### Study Design and Methodology

Study was conducted from December 2010 April 2011 to estimate the overall reproductive disorders. The study was under taken by applying questionnaire survey, collecting data from case book of clinics and physical examination of reproductive tract of cows.

### Questionnaire Survey

The questionnaire format was prepared and designed to obtain information from dairy cattle attendants, owners, veterinarians and AI technicians by interview in study area. In the survey, information on reproductive health

was conducted. The reproductive tract abnormalities or disorders, abnormal discharge from genitalia, previous exposure from any disorder, type of heat detection and pregnancy diagnosis were recorded.

### Data Analysis and Management

The data from questionnaire survey, case books and physical examination was entered into SPSS and analyzed. Results were considered significant at  $\alpha=0.05$ .

### Result

In the present study, of all the cows presented to the clinic with the complaint of reproductive problems, the major reproductive disorders were repeat breeder, Retain fetal membrane, Abortion, Anestrus and Dystocia with percentage of 29.7% (n=71), 18.8% (n=45), 17.2% (n=41), 12.1% (n=29) and 8.8% (n=21), respectively. Besides, Uterine prolapse 5.4% (n=13), Metritis 4.6% (n=11) and vaginal prolapse 3.3% (n=8) were recorded as minor reproductive disorders in the study area (Table 1).

### Reproductive Disorders Versus to Age

Abortion, Anestrus, metritis, Uterine Prolapse and Retained Fetal Membrane are related with age but Dystocia and Vaginal Prolapse are not related. Repeat breeder has high result in the high reproductive age (7-10 years old) and uterine prolapse was high in young and aged (7-10 years) animals. There was no significant difference of the occurrence of reproductive disorders with respect to age (Table 2).

**Table 1. Frequency of all reproductive disorders in the study area**

	Type of disorders								Total
	Abortion	Retained Fetal Membrane	Repeat Breeder	Metritis	Dystocia	Anestrus	Uterine Prolapse	Vaginal Prolapse	
Frequency	41	45	71	11	21	29	13	7	239
Percentage (%)	17.2	18.8	29.7	4.6	8.8	12.1	5.4	3.3	100

**Table 2. Reproductive Disorders with Respect to Age**

	3-6 Years		7-10 Years		>10 years old	
	Frequency	%	Frequency	%	Frequency	%
Abortion	19	8	22	9.2	-	-
Retained Fetal Membrane	18	7.5	24	10	3	1.3
Repeat Breeder	31	13	38	15.9	3	0.8
Metritis	5	2.1	6	2.5	-	-
Dystocia	12	5	9	3.8	-	-
Anestrus	11	4.6	18	7.5	-	-
Uterine Prolapse	2	0.8	11	4.6	-	-
Vaginal Prolapse	4	1.7	3	1.3	-	-
<b>Total</b>	<b>102</b>	<b>43.1</b>	<b>131</b>	<b>54.8</b>	<b>6</b>	<b>2.1</b>

Total =  $239 \chi^2 = 14.364$  and P-value 0.423

### Reproductive Disorders Versus Breed

Among these all disorders, repeat breeder, anestrus and retain fetal membrane are high in cross breeds and the others have higher percentage in local breeds than cross breeds. All these disorders were not significant except abortion and repeat breeder (Table 3).

18.8%, 17.2%, 12.1%, 8.8%, 5.4%, 4.6% and 3.3% were affected by repeat breeder, Retained Fetal Membrane, Abortion, Anestrus, Dystocia, Uterine Prolapse, Metritis and vagina prolapse, respectively. It is not in agreement with the study by Tsegaye (2004). The reason for this difference in result could be due to differential sampling methodology.

**Table 3. Reproductive disorders with respect to breed**

Breeds	Type of disorders									
		Abortion	Retained Fetal Membrane	Repeat Breeder	Metritis	Dystocia	Anestrus	Uterine Prolapse	Vaginal Prolapse	Sub Total
Cross	Frequency	11	26	48	5	9	19	4	4	125
	Percentage (%)	4.6	10.8	20.1	2.1	3.8	7.9	1.7	1.7	52.3
Local	Frequency	30	19	23	6	12	10	9	3	114
	P (%)	12.5	7.9	9.6	2.5	5	4.2	3.8	1.3	47.7

Total =  $239\chi^2 = 28.54$  and  $P\text{-value} = 0.000$

**Table 4. Reproductive Disorders with Respect to type service**

Service	Type of Disorders									
		Abortion	Retained Fetal Membrane	Repeat Breeder	Metritis	Dystocia	Anestrus	Uterine Prolapse	Vaginal Prolapse	Sub Total
AI	Frequency	17	18	43	4	13	29	8	3	135
	Percentage (%)	7.1	7.5	17.6	1.7	5.5	12.1	3.3	1.3	56.2
Natural	Frequency	22	23	23	7	6	-	5	4	90
	%		9.6	9.6	2.9	2.5	-	2.1	2.9	38.6
Both	F	2	4	6	0	2	-	0		14
	%	0.8	1.7	2.5	0	0.8	-	0		5.2

$X=255.488$  and  $p\text{-value}=0.00$  Total=239

### Reproductive Disorders Related to the of Type Service

The result in the table 4, indicates that repeat breeder, Uterine prolapse and dystocia have high percentage in the dairy cattle breed by artificial insemination and abortion, retained fetal membrane and metritis were high in dairy cattle breeds by natural service but anestrus was not affected by type of service (Table 4).

### Reproductive Disorders Related to Parity

The result in table 5, indicates that parity did not significantly affect reproductive disorders ( $p=0.472$ ). As shown in table 5, the occurrence of reproductive disorders is high in cows have lower calving.

### Discussion

Among all the 239 cows with reproductive disorders 29.7%,

He studied the entire positive and negative dairy cattle but in this study the sampled animals are positive dairy cattle in different reproductive disorder only.

From the complaints, abortion was higher in local breed (12.5%) than cross breed (4.6%). The reason for the high percentage in local breed than an exotic breed was due to poor management of pregnancy and low plan and due to different infections, lack of sanitation on feeding, breeding, watering and other activities. Based on service, high incidence of abortion occurs in natural service than AI (Artificial Insemination). Abortion high in natural service due to the absence of antibiotic in the semen which venereal disease transmission method and due to the great concentration of lethal genes.

Retain fetal membrane from all of the reproductive disorders complaints was 18.8%. Retained Fetal Membrane was high in cross breeds (10.8%) than local breeds (7.9%) the reason

was due to lack exercise which is important for the tonicity or contraction due to the intensive farm system for the most cross breeds and due to loss of high calcium with high of milk production it cause low uterine inertia after expulsion of fetus for the expulsion of placentas. Retained Fetal Membrane was high for natural service (9.6%) than AI (7.5%) due to the transmission of disease during service. Retained Fetal Membrane has high in the period of highly reproductive age such as in 3-6 and 7-10 years and in dairy cow calving of <2 and >3 times but statistically insignificant ( $p>0.05$ ). This result is agreement with Erb (1958) who reported a similar result.

Anestrus (12.1%) from the complaints collected in and around Mekelle. Anestrus was higher in cross breeds than the local breeds in study area from collected data because these cross breeds were heat stressed than the local breeds animals and during heat stress or sign of estrus reduced. So, the incidence anestrus was increased. The study agrees with the result of Gangwaret al., (1965). The prevalence of anestrus in different parity was higher in 3-5 calving than others. The prevalence of anestrus was high in cattle 7-10 years old than 3-6 years old. Anestrus was very high in aged animals because old age lactating animals have ability to masticate due to the loss of teeth which causes loss of body weight and debility. In this case

**Table 5. Reproductive Disorders with related to parity**

Type of Disorders	<2 calving		>3 calving		Total	
	Frequency	%	Frequency	%	Frequency	%
Abortions	10	4.2	31	12.9	41	17.2
Retained Fetal Membrane	20	8.4	25	8.4	45	18.8
Repeat Breeder	26	11.9	45	18.8	71	29.7
Metritis	6	2.5	5	2.1	11	4.6
Dystocia	8	3.3	13	5.5	21	8.8
Anestrus	12	5.9	17	7.1	29	12.1
Uterine Prolapse	4	1.7	9	3.7	13	5.4
Vaginal Prolapse	2	0.8	5	1.7	7	3.3
Total	90	38.9	149	61.1	239	100

$\chi^2 = 13.704$  and  $p\text{-value} = 0.472$

Dystocia was higher in local breeds (5%) than crossbreeds (3.8%) in the study area with statically insignificant ( $p>0.05$ ). It was not in agreement with the study by William (1943) and Vandiplasichet al., (1963). They reported that high incidence of dystocia in large and closely confined animals but the closely confined large animal cross breed was not feed a nutrition like developed countries to the accumulation of fat in the pelvic cavities and these breeds has very small pelvic size when compared to the cross breeds which increased the incidence of dystocia.

Dystocia was also found to be high in AI (5.5%) than natural service (2.5%). The size of the calf was high in AI due to this it is difficult to calving large fetus through the small pelvicsize. It is similar with the study by Van Dieten (1965) and John Son et al., (1988). Dystocia has indirectly proportion with age and parity in cattle. In primipara and young animals high incidence of dystocia due to small size of pelvic of dam. These conditions caused by breeding premature, poorly grown and under feed females that matured but the body grown have been greatly retarded due to the poor nutrition and other management factors. The study was similar with the idea reported by Witt bank (1961).

the old animal doesn't show good sign of estrus, then the incidence of anestrus increase. The study was agreement with the report of Labhsetwaret al., (1963).

Among all 239 cows with complaints of reproductive disorders, repeat breeder is (29.7%). All these complaints of RB animals were influenced by service type with statically is significant ( $p<0.05$ ). RB was higher in cow inseminated by AI than breed by bull. AI has many problems in heat detection (weak heat and substrus) timing of service, in care handling of semen and ability of insemination influence the incidence of repeat breeder. It was similar with the idea reported by Bane, (1964 ; Bearden, (1956).

Based on age the RB higher in 7-10 years old and <7 years old due to the absorption of high abnormal ova in older animals than young animals and due to the presence of high prevalence of different diseases. Repeat breeder was high in multiparous animals prevalence in parity >3 calving cattle with but statically insignificant ( $P>0.05$ ) similar with the report of Erb (1958).

Vaginal prolapse from all complaints of reproductive disorders at Mekelle Veterinary clinic was 3.3% of which are cross breeds, were higher than local breed. This is

because cross breeds have large calf due to this increase intra-abdominal pressure. These breeds cause loose high amount of calcium in milk. Then the storage of calcium and the lack of exercise in cross breed cause loss of vaginal muscle tone. Vagina prolapse was affected by age and parity but statically insignificant ( $p > .05$ ). The reason for high prevalent in pluriparous than primiparous cow were injuries and stretching of birth canal at the first or subsequent parturition predispose to prolapsed during following gestation period. It is similar with the idea reported by Stephen Robert (2002).

Endometritis from all of the reproductive disorders was 4.6% which is not similar with the result of Worku (2004) because most data was collected by questionnaire survey from farmers in the study area then even the presence of endometritis was high sign of endometritis was not differentiated from heat sign to the farmers. Due to this reason it has lowest prevalence. Endometritis was high in local breed which were mated by natural service due to low management of local breed and absence of antibiotic in natural service which cause abortion, fetal death and retain fetal membrane were the main cause for infection of uterine. The inflammation of uterus in the study area was high in highly reproductive age and  $<3$  parity.

Among all of the complaints or disorders study in this area uterine prolapse was 5.4% from these cows while complaints of uterine prolapse higher in local breeds (3.8%) than cross breeds (1.7%) and the incidence of uterine prolapse based on service was higher in AI (3.3%) than natural service (2.1%). This result agrees with report of Stainimattze (1952).

Because the cross breed were closely confined and highly feed but local breed in the range or in low plan nutrition and mostly affected by dystocia and due to the small pelvic size, the cows tired for uterine contraction and difficult to expel the fetus, then the force of traction applied for the expulsion of fetus could be expel the gravid uterus out of the abdominal cavity. Uterine prolapse affected by age and parity with the higher in age and age leads to low feed in take due to lack of teeth, increase weakness and uterine contraction resulted to prolapse. This is similar to finding of by Vardiplasseheet al. 1963).

### Conclusion and Recommendations

Reproductive efficiency is a critical component of a successful dairy operation whereas reproductive inefficiency is of the most costly problems facing the dairy industry today reproductive disorders occur frequently in lactating dairy cows and can dramatically affect Reproductive efficiency in a dairy herd. The present study aimed to know the occurrence of reproductive disorders in dairy cows possible risk factors responsible for the occurrence of reproductive health

problems were identified and included as age parity breed and type of service. The present study revealed that repeat breeding retain fetal membrane abortion and anestrus were the major reproductive disorders in dairy cows of Mekelle besides metritis. Dystocia uterine and vaginal prolapsed were observed in cross breeds than local breeds dystocia was more reported in small sized local breeds which were inseminated artificially than those mated by natural service improvement in management systems (such as housing, feeding and health care) heat detection and proper selection of bulls for breeding taking in to account the size of cows could help in minimizing reproductive health problems and hence improve the reproductive efficiency of small holder dairy cows in the study area. Based on the above conclusion the following recommendations are forwarded:

- Artificial inseminators should consider the size of the cow during insemination to reduce the incidence of dystocia.
- The veterinarians should try to create awareness on the animals' owners about management and heat detection the prevalence of silent estrus and repeat breeders.
- Provision of proper semen quality and quantity is important as well as veterinary clinics should be well equipped for accurate diagnosis of reproductive disorders.
- Abortion and endometritis were mostly present in local breeds in natural services may be due to venereal disease, so awareness should be created on the owners not, to use the same bull to many cows and to encourage the practice of AI.

### References

1. Alberro M. Comparative Performance of F1 Friesianx Zebu heifer in Ethiopia. *J Anim prod* 1983; 37: 247-252.
2. Alemayehu M. Country pasture forages resource profiles suttee. JM, Reynold S.g., (eds). 2006; 1-36. <http://wwwFAO.org>.
3. Bane A. Fertility and Reproductive disorders in Swedish cattle. *Brit Vet J* 1964; 120: 431.
4. Bearden J. Fertilization and Embryonic mortality rate of bull with histories of other low or high fertility in artificial breeding. *J Dairy Sci* 1956; 39(3): 312.
5. Bekena M, Ekman T, Kindhal H. Ultrasonography of Bovine post-partum cows with retain fetal membranes. *J Vet Med A* 1994a; 41: 653-662.
6. Erb R, Hinze P, Gildow et al. Retain fetal membrane. The effect on Prolificancy of dairy cattle. *J Anim Vet Med A* 1958; 133(19): 489.
7. FAO-STAT, 2003. FAO Statistics Database on the www. <http.apps.FAO.org>.
8. Jonhson S, Deutscher G, Hurst PA. *J Anim Sci* 1988; 66: 108.
9. Labshsetwar W, Lenbus K, Cassmidia L. Genetic and

- Environmental factors affecting quite ovulation in Holsteincattle JT: Delay during reproduction and their affection embryo and fetal, New England. *J Vet Med* 1963; 27: 28-37.
10. Mekonnen D. Study on major infertility problems of Crossbred Dairy herds in Ada'a District central Ethiopia. DVMThesis, Faculty veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia. 2000.
  11. Noakes D. Fertility and Obstetrics in cattle. Black Well. Sci. pub UK, 1986; 28-30.
  12. Roberts S. Veterinary Obstetrics and Genital disease. Theriogenology 3<sup>rd</sup> ed. Edwards's brothers, Inc, Michhigan, 1986; 48-104.
  13. Roberts S. Veterinary Obstetrics and Genital disease: good sign or estrus. England KB. 2002; 37-51.
  14. Shitaye J, Tsegaye W, Paulik I. Bovine Tuberculosis infection in animal and human populations in Ethiopia: A review. *Vet Med* 2007; 52(8): 332-417.
  15. Stainimatze J. Problems associated with Ai in cattle. In: Howard JL (ed). Current Veterinary Therapy. WB. Sounder Company, Philadelphia. 1952; 98-110.
  16. Susan S. Bayerisches land wirisch of fahrbuch. 1998; 65: 969.
  17. Tsegay B. Survey on Major Reproductive Problems in Zebu and Crossbred cattle in and Around Assela, DVM Thesis, Addis Ababa University, Debre Zeit, Ethiopia. 2004.
  18. Dieten SV. Still Birth in cattle. Thesis Univ, of Utrecht, Holland. 1965.
  19. Vendiplasich M, Markalo G, Maille SJ. Comparative Etiology and Pathogenesis of uterine prolapsed in domestic animals, Berl and munch, tieraztl, Wochcher. 1963; 76.
  20. Bank JW. The effect of fetomaternal disproportions in prevention of dystocia: Neb exp. Sth. asummer. 1961; 34-37.
  21. Worku T. Major ReproductiveHealth problems of Dairy cows in and around Holeta, DVM thesis, Faculty of Veterinary Medicine Addis Ababa Universty, Debre Zeit, Ethiopia. 2004.
  22. Yohannes T. Major Animals Health problems of market oriented livestock development in AlamataWoreda. DVMThesis, Faculty of veterinary Medicine, Addis AbabaUniversty, Debre Zeit, Ethiopia. 2007.
  23. Zemjanise H. Repeated Breeding in current Veterinary Therapy in Theriogenology, (ed), Philadelphia Nob Sounders. 1980; 205-213.
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