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Major Reproductive Health Problems of Dairy Cows at Horroguduru Animal Breeding and Research Center, Horro Guduru Wollega Zone, Ethiopia

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Abstract: Questionnaire surveys together with longitudinal study (regular follow-up) were conducted from November, 2011 up to April, 2012 on major reproductive health problems of Horro and Horro-Jersey cross bred cows. The aim of this study was to determine the prevalence of major reproductive health problems in HorroGuduru Animal Breeding and Research Center. From 402 (303 local and 99 cross breeds) assessed, employing questionnaire survey (n= 261) and regular follow-up (n= 141); 39.5 % (n=159) had at least one of the major reproductive health problems. The reproductive health problems according to their relative importance at the study site were; retained fetal membrane, dystocia, metritis, abortion, milkfever, pyometre, repeat breeder, uterine and vaginal prolapse with their respective prevalence rate of 10.0%, 9.2%, 7.0%, 4.42%, 3.73%, 2%, 1.24%, 1.7% and 0.5%. It wasfound that as age increases almost the prevalence of all the three most important reproduction problems shown to decrease. Specifically there was a significant association between age of 3- 5 years cow ($p < 0.05$, OR=5, CI (0.15, 0.88) and metritis. Similarly the effect of parity (lactation stage) on the prevalence rate of reproductive problems was assessed and there was non-significant ($P > 0.05$) association between prevalence rate of reproductive problems and the parity of the individual dairy cow. The reproductive problems were also assessed in relation to body condition score of the cows and the associations were found to be statistically not significant ($P > 0.05$). However, factors like hygiene practice at and around calving (HAC), was found to have an association with the occurrence of retained fetal membrane ($P < 0.05$) and statistical association indicates the presence of less exposure for retained fetal membrane for animals kept at good hygienic status (OR=8, CI (0.2, 0.76). This particular study showed that; clinical reproductive health problems, which include retained fetal membrane, dystocia and metritis, were one of the major reproductive problems responsible for the low reproductive performance of the Research Center and Kombolcha dairy cows, HorroGuduruWollega, West of Ethiopia.

Key words: Dyctocia · Horro Guduru · Metritis · Retained fetal membrane

INTRODUCTION

The goal of reproduction management is to have cows become pregnant at a biologically optimal time and at an economically profitable interval after calving. The general goal for postpartum reproductive health in dairy cattle is for the uterus to be completely involutes and free of infection and for cows to be cyclic by the time they enter the breeding period (after 50 to 60 days post partum) [1]. So, the reproductive goal that we need to follow are 12 months of calving intervals, 85 days open, 1.6 serves per conception rate and 85% of cows observed in estrous and recorded by 60 days fresh [2].

Albeit of this, various research works showed that, reproductive efficiency of dairy cows is influenced by different factors including genetic, season, age, production system, nutrition, management, environment and disease [3, 4]. Also, Abebaw *et al.* [5] reported reproductive health problems as one of the different production constraints, which mainly, form a bottleneck

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in the production process and productivity of the livestock sub-sector (small holder dairy production system) of Ethiopia.

Generally, it is accepted that bovine genital diseases, either specific or non-specific in nature, account for large number of pregnancy failure in cows [6]. Among the major reproductive health problems that have direct impact on reproductive performance of dairy cows are abortion, dystocia, retailed fetal membrane (RFM), metritis, prolapse (uterine and vaginal), anoestrus and repeat breeding. These could be classified as prepartum and postpartum reproductive problems [7, 8].

Currently the majority of published articles are focusing on reproduction abnormalities that mainly impair uterine immunity [9, 10]. Uterine function is often compromised in cattle by bacterial contamination of the uterine lumen after parturition; pathogenic bacteria frequently persist, causing uterine disease, a key cause of infertility [11]. The presence of pathogenic bacteria in the uterus causes inflammation, histological lesions of the endometrium, delays uterine involution and perturbs embryo survival.Sheldonand Hillary [12] described the effects of bacterial uterine infections on ovarian functions and subsequent reproductive wastages in dairy cows.

In Ethiopia dairy cattle are maintained under different production systems. The difference in management (production) systems and environmental conditions under which cattle are maintained could greatly affect the occurrence of reproductive health problems which result in poor reproductive performance [13]. Although, many works done so far depicts major reproductive disorders are greatly responsible for high economic loss and their reproductive performance in dairy cows, the research done on the prevalence, etiology and relative importance of these reproductive health problems in and around Wollega University HorroGuduru Animal breeding and Research Center was less. So this study was designed to investigate the magnitude of major reproductive disorders in Horro and Horro cross Jersey breed kept in and around Wollega University HorroGuduru Animal Breeding and Research Center. Therefore, the objectives of the study were; to determine the prevalence of major reproductive health problems in Horro and Horro cross Jersey bred dairy cows, to describe the occurrence of reproductive health problems in the dairy cows and assess their contribution for poor reproductive performance and to find out the associated risk factors affecting production and reproductive performance of dairy cows in the center.

MATERIALS AND METHODS

Study Area: The study was carried out from November, 2011 to April, 2012 in Wester Ethiopia, Horro Guduru Wollega, Guduru district, in Wollega University HorroGuduru Animal Breeding and Research Center (WUHGABRC) and Kombolcha Town. The center is located 282 km away from Addis Ababa and 262 km from Nekemte. The total land coverage of the district is 7971.32 hectares from which 764.09 hectares occupied by the center. The land of the district is covered by different farmstead structures and cultivated forage plants and seed crops. The research center is located at an altitude of 1500-2400 above sea level (a.s.l), 09°29' North latitude and 37°26' East longitudes. The mean annual rain fall in the area is 1500 mm in average. The mean seasonal temperature varies from 25-32°c from October to June and decline to a level of 18-32°c during the rest of the months [14]. The topography of the area is semi-highland (75%) and highland (21%). The vegetation of the habitat ranges from broad leaves savannah to woodland and open wooded grassland to forest types [15].

Study Population: In this study only dairy cows that were kept in the center were considered. The study involved different management systems (extensive and semi-intensive), as stated byRichard [16].

Table 1: The prevalence rate of reproductive problems in and around the center

Method of study	No. of cows examined	No. of cows positive (%)
Questionnaire survey	261	119 (45.6)
Regular follow up	141	40 (28.4)
Total	402	159 (39.5)

Table 2: The relative occurrence of major reproductive health problems and their prevalence rate

Type of reproductive Problems	Questionnaire survey No. (%)	Regular follow-up No. (%)	Total (%)
RFM	31 (11.87)	9 (6.38)	40 (10.0)
Dystocia	30 (11.49)	7 (4.96)	37 (9.2)
Metritis	16 (6.13)	12 (8.5)	28 (7)
Abortion	7 (2.68)	10 (7.09)	17 (4.42)
Milk fever	15(5.76)	0 (0.0)	15 (3.73)
Pyometra	6 (2.29)	2 (1.41)	8 (2)
Uterine prolapsed	7 (2.68)	0 (0.0)	7 (1.7)
Repeat breeder	5 (1.95)	0 (0.0)	5 (1.24)
Vaginal prolapsed	2 (0.76)	0 (0.0)	2 (0.49)
Total	119 (45.59)	40 (28.36)	159 (39.5)

Table 3: Factors associated with the occurrence of major clinical reproductive problems

		Reproductive health problems					
		RFM		Dystocia		Metritis	
Variables	No. (%)	Positive (%)	Negative (%)	Positive (%)	Negative (%)	Positive (%)	Negative (%)
Age	402						
1(3-5)	110	14 (12.72)	96 (87.27)	13 (11.81)	97 (88.18)	14(12.72)*	96 (87.27)
2(5-7)	114	10 (8.77)	104(91.22)	9 (7.89)	105(92.11)	5 (4.38)	109(95.60)
3(>7)	178	16 (8.98)	162(91.01)	15 (8.42)	163(91.01)	9 (5.05)	169(94.94)
Parity	402						
≤ 3	234	25(10.68)	209(89.31)	20(8.54)	214(91.45)	20(8.54)	214(91.45)
> 3	168	15(8.9)	153(91.07)	17(10.11)	151(89.88)	8(4.76)	160(95.23)
BCS	402						
< 3	290	30(10.34)	260(89.65)	25(8.62)	265(91.37)	21(7.24)	269(92.75)
≥3	112	10(8.92)	102(91.07)	12(10.74)	100(89.28)	7(6.25)	105(93.75)
HAC	402						
Good	365	125(34.24)**	237(64.93)	127(34.79)	238(65.20)	133(36.43)	241(66.02)
Bad	37	23(62.16)**	17(45.94)	21(56.75)	16(43.24)	15(40.54)	13(35.23)
MP	402						
Ext	295	0 (0.00)***	295 (100)	2 (0.67)	293 (99.4)	0 (0.00)	295 (100)
Semi-int	107	40(37.4)***	67 (62.6)	35 (32.8)	72(67.3)	28 (26.2)	79 (73.4)

NB. Numbers with '*' shows significant association between variables; Ext = Extensive, Semi-int = Semi-intensive

* is the significant association between age and metritis (P= 0.02); ** hygiene at calving and RFM (X^2 =8.17; P= 0.004) and *** is the significant association between management practice (MP) and RFM (P= 0.00).

Study Design and Methodology: Longitudinal or follow-up study and questionnaire survey were under taken on Horro breed dairy cattle and their crosses in the research center andKombolcha Town from November, 2011 to April, 2012 to assess the reproductive health problems and few reproductive performance parameters of dairy cows. Methods of data collection were based on structured questionnaire survey and regular follow-up format on the selected dairy cows and recorded data from the center.

Questionnaire Survey: A standard questionnaire format was prepared for this purpose and about 59 heads of the house hold were interviewed and a total of 261 dairy cows were included in this survey. During the study period, from the center, a total of 202 dairy cows were examined near and after calving. Upon clinical investigation through observation, vaginoscopy and rectal palpation were implemented to diagnose the cases. Besides data record sheets of the center also roughly checked to measure parity number of the animals.

Up on follow-up examination; regular follow-up was carried out on weekly basis on 130 selected pregnant dairy cows from the center and 11 from Kombolcha Town for any abnormality during pregnancy period, parturition and following parturition for about three weeks. During pregnancy animals were rectally palpated after 75 days of insemination and the parameters of reproductive tract including size of horn, uterine position, pelvic diameter and tonicity of uterus were examined. After calving cows has been clinically examined and rectally palpated on weekly basis for three week to determine uterine status, ovarian structures and reproductive problems until involution of uterus. Observation was made on retained fetal membrane (when retained longer than 12 hours after calving), uterine discharge, metritis, abortion, pyometra, dystocia, anoestrous and repeat breeder.

Sample Size and Sampling Method: This particular study, as a preliminary research on the center, will encompasses all first calf heifers and cows that have good reproductive and productive records and their reproductive problems encountered during study period. 95% level of confidence interval and expected prevalence of 50% prevalence with desired absolute precision of 5% and simple random sampling method was used [17]. However for this purpose a total of 402 dairy cows (261 questionnaire survey and 141 regular follow-up examinations) were included under the study which was handled under different management

system. Purposive and random sampling methods were employed on those animals which are at parturition and post-partum period during questionnaire survey and regular follow-up scrutiny.

Data Management and Analysis: The collected data were entered in to Microsoft Excel Spread sheet and managed accordingly. The data is analyzed by SPSS version 16 statistical software. Both descriptive and analytical techniques were used for data analysis. The prevalence and the relative frequencies of reproductive health problems were determined as the proportion of affected animals out of the total animals examined and the total number of cases, respectively. The association between dependent and independent factors (breed, parity, management practice and body condition score major reproductive health problems were analyzed using x^2 (chi-square) technique. The degree of association between parity and reproductive problems and the association between body condition and reproductive problems were analyzed by using odd ratio.

RESULTS

Atotal of 402 dairy cows were examined for major reproductive health problems by classifying the method of study as questionnaire survey and longitudinal study (regular follow up) (Table 1). Out of 261 cows that were scrutinized through owners questionnaire and instant visit, from the center and Kombolcha Town, 119 (45.6%) were diagnosed at least for one major reproductive health problems. In the same way, out of 141 cows which were under regular weekly follow up 40 (28.4%) of them were diagnosed to be positive for at least one of the major reproductive health problems. over all 159 (39.5%) cows were positive for at least one of the major reproductive health problems (Table 1).

The major reproductive health problems identified during the study period were; retained fetal membrane (RFM), dystocia, metritis, abortion, milk fever, pyometra, uterine prolapse, repeat breeder and vaginal prolapse were being the most problems in the area in their order of prevalence compared with the others. The problems are depicted with their prevalence in Table (2).

Comparison for the proportion of occurrence of one or more reproductive health disorder, showed as the higher prevalence of 41.9% for indigenous and 32.32% for cross breeds of dairy cows. However, in relation to breed there was non-statistically significant difference ($P > 0.05$) in prevalence of the reproductive disorder.

From the five risk factors considered in this research, the association between age and reproductive health problems were assessed. As it is depicted on Table 3, as age increases almost the prevalence of all the three most important reproduction problems shown to decrease, particularly there was a significant association between age of 3- 5 years cow ($p < 0.05$, OR=5, CI(0.15,0.88)) and metritis (Table 3).

The effect of parity (lactation stage) on the prevalence rate of reproductive problems was assessed and there was non-significant ($P > 0.05$) association between prevalence rate of reproductive problems and the parity of the individual dairy cow. The prevalence was higher in cows of parity ≤ 3 (57.8%) as compared to cows with parity >3 (41.5%) (Table 3).

The reproductive problems were also assessed in relation to body condition score of the cows and the association were found to be statistically not significant ($P > 0.05$) (Table 3).

Factors like hygiene practice at and around calving (HAC), was found to have an association with the occurrence of RFM ($P < 0.05$) and hygiene practice. Statistical association indicates the presence of less exposure for RFM for animals kept at good hygienic status (OR = 8, CI (0.2, 0.76)) (Table 3).

Out of the total study animals, 295 (75.4%) were kept under extensive management system and 107 (26.4%) of them were in intensive production system. When we correlate production system with the occurrence of reproductive health problems, a statistically significant association was found with RFM occurrence between the two management systems ($p < 0.05$) (Table 3).

DISCUSSIONS

In comparison relatively a lower prevalence (39.5%) rate of major clinical reproductive problems was obtained in this study. These lower prevalence were reported in comparisons with the values reported by Melkamu [18] (50.9%) donein Holleta and by Berisha [19] (74.8%) done around Addis Ababa. The lower prevalence rate were also reported around Kombolcha town by Tesfaye [20] (26.7%), Gebremariam [21] (26.7%), [13] (31.6%) and Berisha [19] (34.89%) respectively as compared with this study. This variation in prevalence rate could possibly be attributed to difference in management system, breeds of animals and environmental conditions.

The prevalence of dystocia, which is 9.2 % recorded in this study agrees with the prevalence reported by Kassahun [22] (9.61%). Lower incidence rate of 7.8%,

7.5%, 7%, 6.95%, 5.79% and 5.5% were also reported by Melkamu [18] in Holleta and Takele *et al.* [13] and Tigrie [23] and Tadesse [24] and Correa [25] and Mammo [26] and Yoseph [27] respectively. It is difficult to give exact figures on the incidence of dystocia because it is influenced by several factors such as nutritional status, age and parity of the dam, breed of the sire and the dam [28]. Inseminating cows with semen collected from large sire together with age of cows mentioned as an important factor in inducing dystocia.

The prevalence of metritis was 7% which is in agreement with Zewdu [29] around DebreZeit recorded the prevalence rate of 3.1%-9.9%. The higher prevalence rate were reported by Shiferaw *et al*. [7], Takele *et al*. [13], Gebremariam [21], Kassahun [22], Mammo [26] and Ebrahim [30] with 16.6%, 18.7%, 15.5%, 11.5%, 16.63% and 11.5-13.6% respectively. Furthermore, the higher prevalence rate were reported byRuder *et al*. [31] (67%) and Tackacs *et al*. [32] (50%). The reason for this significant variation might possibly be due to the difference in management system, breed and environmental factor. Additionally, the possible factors involved with metritis include; RFM, injury of the reproductive tract (due to difficult calving or excessive force used to assist at calving), injury at the time of breeding and uterine treatment and contamination of the reproductive tract during calving period [33].

The prevalence rate of abortion (4.21%) recorded in this study was similar to the result of Shiferaw *et al*. [7] and Mekonnen [34] and Zewdu [29] having prevalence rate of 5.33%, 5.4% and 1.5- 7.8% respectively. However, Gebremariam [21] and Yoseph [27] and Tekeleye *et al*. [35] were reported higher prevalence rate of 16.3%, 6.2% and 11.11% of abortion respectively. On the other way round, a prevalence rate of 2.23%, 3.19%, 2.2% and 3.19% respectivelywere reported [7, 36, 19, 30] which were lower than the current finding. Moreover, Forer *et al*. [37] documented prevalence rate of abortion ranging from 0.4-10.6% suggesting breed, geographic, study population, case definition and procedural differences as source of this differences. According to this study, the possible causes were poor management system, environment and disease condition.

Repeat breeder was also studied with a prevalence rate of 1.24% which is in agreement with the prevalence rate reported byBitew and Prasad [38] (3%) and Ebrahim [30] (3%) around Kombolcha town. In contrasta prevalence rate of 8.9%, 4.6% and 21.8% respectively were recorded previously [7, 24, 34]. The lower prevalence rate reported in this research was due to management system and health care provided for animals kept in the ranch. Repeat breeding can be caused by a number of factors, including sub-fertile bulls, endocrine imbalance, malnutrition, reproductive tract infections and poor management practice such as wrong time of insemination or faulty heat detection, inappropriate semen handling and insemination techniques [3].

The prevalence rate of retained fetal membrane in this study was 10%. This result slightly disagrees prevalence reported in and around DebreZeit by Mammo [26] (14.28%), in central highlands of Ethiopia by Tekeleye *et al*. [35] (7.1-28.9%) and in and around Holleta by Yoseph [27] (16.7%). But it is equivalent with reported prevalence by Tigrie [24] (10.6%). The variation in the incidence of RFM may be attributed to variation in predisposing factor in different site of study to which the animals are subjected to different condition, like; nutritional status and management. Furthermore, the increased risk factors for RFM with increased parity, twining, induction and premature births and direct association of RFM with milk fever can have its own role for the different records of prevalence at different area [24].

Attention was also given for the prevalence of prolapse cases in and around the Guduru research center and was found to be 1.73% with uterine prolapse and 0.5% of the cases were vaginal prolapse. These were approximate with the research of Melkamu [18] and Ebrahim [30] with 1.9% and 1.28% respectively. The possible factor may attribute to forced traction of fetus at parturition, puerperal disease and nutritional deficiency.

The prevalence rate of milk fever (3.73%) reported in this study was due to the fact that the lack of enough food and supportive management taken to animals. In addition disease prevalence also considered as the major cause as it results in energy depletion which causes emaciation, depression, immune deficiency and finally difficulty to partured.

This study revealed the higher prevalence of reproductive health problems on indigenous breeds (41%) as compared to the cross breeds (36.36%). However, there was no significant association between different breeds ($P > 0.05$) of cows. Crossbred found were having at most 50% exotic blood type and this will help them to cope up the tropical weather conditions and hence yield better result up on better management taken to them than indigenous breeds which found generally under extensive management system.

There was strong association between different age groups of cows and occurance of metritis. Cows with the age category of 3-5 years were highly affected ($P < 0.05$) (OR = 4) than others (> 5 years of age). This is due to the fact that as the animals age increase, their immunity to overcome disease condition became also increased.

The other reproductive problems obtained in this study with higher prevalence (58%) on primipara cows; with the absence of association (no statistical association between parity and reproductive health problems, $P > 0.05$). This is similar to the previous findings [7,21, 23, 24, 26, 36] and is possible due to the less adaptability of primipara cows to pregnancy and their less activities of their immunity against uterine infection that result in postpartum reproductive disease.

Body condition score was found to be non-significant statistically ($P > 0.05$). Prevalence rate between different BCS showed; lean (score < 3) (71.6%) and fat cows (score > 3%) (27.7%). This could be probably due to lean animals having less expensive force to expel out fetal membrane and hence secondary complications easily developed [24]. Moreover, animal with poor body condition may have poor defense mechanism. This prevalence difference further strengthened by the idea of Mukasa-Mugerwa *et al*. [39] as lactation and uterine involution require energy; the energy used by this process must be sufficiently supplied. Otherwise, it will meet from the cows body reserve/fat.

CONCLUSION AND RECOMMENDATIONS

A herd health program is critical in maintaining reproductive health and identifying potential problems in production and reproduction areas. In general, the cows in the center and Kombolcha townwere affected by different reproductive health problems with poor management and production system.Thus, this particular study tried to point out the magnitude of major reproductive problems and their relative importance.

In line with the above conclusion the following recommendations are forwarded; the results obtained insured that direct association of problems of metritis with predisposing factors like age, RFM with hygiene around calving and with management practice. Therefore, controlling of predisposing factor and improvement of management practice were forwarded to limits the prevalence of such diseases.

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REFERENCES

1. Plazier, J.C.B., G.J. King, J.C.M. Dekkers and K. Lissemore, 1997. Estimation of economic values of indices for reproductive performance in dairy herds using computer simulation. J. Dairy Sci., 80: 2775-2783.
2. Msangi, B.S., M.J. Bryant and P.J. Thorne, 2005. Some factors affecting variation in milk yield in crossbred dairy cows in smallholder farms in North-East Tanzania. Trop. Anim. Health Prod., 37: 403-412.
3. Arthur, G.H., D.E. Noakes and H. Person, 1996. Veterinary Reproduction and Obstetirics. Theriogenology 6th ed. Baillier Tindall UK, pp: 83-85.
4. Shiferaw, Y., B.A Tenhang, M. Bekana and T. Kasa, 2003. Reproductive performance of cressbred Dairy cows in different production system in the central highlands of Ethiopia. Tropical Animal Health and Production, 25: 551-561.
5. Abebaw, G., W. Frew and M. Shiferaw, 2011. Assesement of small holder dairy Production System and Their Reproductive Health Problems in Jimma Town, South Western Ethioppia. JimmaUniversity College of Agriculture and Veterinary Medicine, Jimma, Ethiopia. Intern J. App/Res Vet. Med. 9(1).
6. Sirohi, N.S., D.P. Monga and S.K. Knar, 1989. Microbiological studies on some reproductive disorders of cattle. Indian Journal of Animal Science, 59(5): 537-541.
7. Shiferaw, Y., B.A. Tenhagen, M. Bekana and T. Kassa, 2005. Reproductive disorders of crossbred dairy cows in the central highlands of Ethiopia and their effect on reproductive performance. Trop. Anim. Health Pro., 37: 427-441.
8. Lobago, F., M. Bekana, H. Gustafsson and H. Kindahl, 2006. Reproductive performance of dairy cows in smallholder production system in Selalle, central Ethiopia. Trop. Anim. Health, 38: 333-342.

9. LaBlanc, S.J., T.F. Duffield, K.E. Leslie, K.G. Betaman, G.P. Keefe, J.S. Walton and W.H. Johnson, 2002. Defining and diagnosing postpartum clinical endometritis and its impact on reproductive performance in dairy cows. Journal of Dairy Science, 85: 2223-2236.
10. Gilbert, R., S.T. Shin and C.L. Guard, 2005. Prevalence of endometritis and it is effect on reproductive performance of dairy cows. Theriogenology, 64: 1879-1888.
11. Sheldon, I.M. and H. Dobson, 2004. Postpartum uterine health in cattle. Journal of Animal Reproduction Science, pp: 82-83: 295-306.
12. Sheldon, I.M. and D. Hillary, 2004. Postpartum uterine health in cattle. Animal Reproduction Science, pp: 82-83, 295-308.
13. Takele, A., Y. Gizaw and M. Bekana, 2005. Major reproductive health problems of smallholder dairy production in and around Nazareth town, central Ethiopia. DVM thesis. Faculty of Veterinary Medicine, Addis Ababa University, Debrezeit, Ethiopia.
14. CSA, 2011. The Federal Democratic Republic of Ethiopia. Central Statistical Authority, Ethiopia.
15. Camper, J.P., 2004. Animal Identification and recording Systems the South African Development Community (SADC); Overview of the Current situation. October 2004. Proceeding of Workshop on Development of Animal Identification and Development System for Developing Countries, 29 May 2004. ICAR Technical Series No. 9.
16. Richard, W., 1993. Dairying Tropical Agriculturalist. 1stEdn.,Macmillan Press Ltd., London, pp: 56.
17. Thrusfield, M., 2005. Veterinary Epidemiology. 3rdEdn, Blackwell Publishing, Incorporated, Ames, Iowa.
18. Melkamu, T., 1999. Studies on major post partum reproductive problems in Holleta Research Station and small holder dairy cattle. DVM Thesis, AAU, FVM, DebreZeit, Ethiopia.
19. Berisha, K., 1990. Major conistrients of reproduction in small-scale dairy farms around Addis Ababa, Ethiopia DVM Thesis, FVM, Debre-Zeit.
20. Tesfaye, G., 1996. Survey on major peripartum and post partumreproductive problems of dairy cattle in Mekelle and its environs. DVM Thesis, FVM, AAU, Debrezeit, Ethiopia.
21. Gebremariam, T., 1996. Survey on major prepartum and postpartum reproductive problems of dairy cattle in Mekelle and it is Environs. DVM Thesis, AAU, FVM, Debrezeit, Ethiopia.
22. Kassahun, M., 2003. Major clinical reproductive problems of smallholder dairy cows in and around Awassa. DVM thesis.Faculty of Veterinary Medicine, Addis Ababa University, DebreZeit, Ethiopia.
23. Tadesse, M., 1999. Major postpartum reproductive problems in Holleta research station and smallholder dairy cattle. DVM Thesis.FVM, AAU, DebreZeit, Ethiopia.
24. Tigrie, W., 2004. Major clinical reproductive health problems of dairy cows in and around Holleta. DVM thesis. Faculty of Veterinary Medicine, Addis Ababa University, Debrezeit, Ethiopia.
25. Correa, M.T., S.K. Dougaland H. Erb, 1993. Path analysis for seven postpartum disorders of Holstein cows. Journal of Dairy Science, 76: 1305-12.
26. Mammo, T., 2004. Study on major postpartum reproductive problems of smallholder dairy cows in and around DebreZeit. DVM thesis. Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.
27. Yoseph, S., 1999. Fertility status of cross breed dairy cows under different production system in Holleta. M.Sc. Thesis, Central High Lands of Ethiopia, DebreZeit, Ethiopia.
28. Noakes, D.E., T.J. Parkinson, G.C.W. England and G.H. Arthur, 2002. Arthur's Veterinary Reproduction and Obstetirics, 8th ed., Elsevier Sci. Ltd, London.
29. Zewdu, H., 1992. Studies on post partum uterine infection in Zebu and Zebu crosses and the incidence rate of reproductive disease in DebreZeit, ILCA herd. DVM Thesis.FVM, AAU, DebreZeit, Ethiopia.
30. Ebrahim, O., 2003. Study on major reproductive health problem of small holder dairy farms in and around Kombolcha. DVM Thesis, AAU, FVM, DebreZeit, Ethiopia.
31. Ruder, C.A., R.G. Sasser, R.J. Williams, J.K. Fly, R.C. Bull and J.E. Butler, 1990. Uterine infections in the post partum cow, possible synergistic effects of *Fusobacteriumnecrophorum* and *c orynebacteriumpyogens.* Theriogenology, 15: 573-780.
32. Tackacs, J., T. Gathy, Z. Macanty and E. Bajmocy, 1990. Bacterial contamination of the uterus after parturition and its effect on the reproductive performance of cows of large scale dairy farms. Theriogenology, 3: 851-861.
33. Hatchinson, L.J., 1996. Troble shooting infertility problems in dairy cattleA review. BiritainVeterinary Journal, 143: 226-228.

34. Mekonnen, D., 2000. Study on major infertility problems of cross bred dairy herds in Ada'adistrict of central Ethiopia. DVM thesis. Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.
35. Tekeleye, B., O.B. Kasali and T. Gashaw, 1992. Reproductive problems in indigenous cattle of the Ministry of Agriculture-farms in central Ethiopia. Trop. Agr. (Trinidad), 69: 247-249.
36. Oumer Mohammed, E., 2003. Study on major reproductive health problems of smallholder dairy farms in and around Kombolcha. DVM thesis. Faculty of Veterinary Medicine, Addis Ababa University, Debrezeit Ethiopia.
37. Forer, A.I., J.M. Gay and D.D. Hancock, 1995. The frequency of endemic fetal loss in dairy cattle: A Review. Theriogenology, 43: 989-1000.
38. Bitew, M. and S. Prasad, 2011. Study on major reproductive health problems in indigenous and cross breed cows in and around Bedele, South West Ethiopia. Journal of Animal and Veterinary Advances, 10(6): 723-727.
39. Mukasa-Mugerwa, E., Ephraim Bekele and Taddese Tessema, 1991. Type and productivity of indigenous cattle in Central Ethiopia. Tropical Animal Health and Production, 1-2: 63-72 (in press).