

Assessment of Major Reproductive Health Disorders of Dairy Cattle in and around Nekemte town, East Wollega Zone, Ethiopia

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Abstract: Reproductive health disorder is one of the limiting factors to the production of dairy animals. A longitudinal and retrospective study was conducted from December 2014 to March 2015 with the objectives to identify major reproductive health disorders of dairy cows in smallholder dairy farms in and around Nekemte town. All dairy farms in Nekemte town willing for the follow up study were included. All the dairy farm owners (42) were interviewed and a 5 year retrospective data was collected. An average family size, land holding and herd size of the respondents were 6.07 ± 2.11 persons, 2.34 ± 1.9 hectare and 12.19 ± 7.6 heads of cattle per household respectively. Land shortage, seasonal feed scarcity, ineffective crossbreeding and disease prevalence were among the major constraints of smallholder dairy cattle production in the study area. From a total of 129 pregnant dairy cows monitored for major reproductive health disorders, 51(39.5%) of them were observed with one or more of reproductive health disorders. Retained fetal membrane was frequently observed with the magnitude of 26(51%) among the cases, followed by abortion 13(25.5%) and dystocia 10(19.6%). A retrospective clinical case based prevalence of reproductive health problems at Guto Gida and Getema veterinary clinics were 56(2.1%) and 164(7.13%) respectively. The effect of herd size and management system on the occurrence of reproductive health during this study was insignificant since the p-values of each factor is greater than the alpha value ($P > 0.05$). But level of parity and body condition of the animal significantly affects the prevalence of reproductive health disorders. Generally the prevalence of reproductive health disorders of dairy cattle in the study area is high accompanied by lack of improved breeding system. Interventions with improved dairy extension packages may minimize the constraints and improve milk production.

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1. Introduction

Naturally endowed with different agro-ecological zones and suitable environmental conditions, Ethiopia is a home for many livestock species and suitable for livestock production. Ethiopia is believed to have the largest livestock population in Africa [1]. An estimate indicates that the country is a home for about 53.9 million cattle, 25.5 million sheep and 24.06 million goats [2].

From the total cattle population 98.95% are local breeds and the remaining are hybrid and exotic breeds. The subsector contributes about 16.5% of the national and 35.6% of the agricultural GDP [3]. It also contributes 15% of export earnings and 30% of agricultural employment [4]. Human population in Ethiopia is projected to reach 140 million by the year 2025 and the urban population will rise to 40 million. It is, therefore, obvious that milk and its derivatives will be in short supply unless both horizontal and vertical expansions of the dairy industry will take place. Despite the role of cattle to the farming community in particular and to the national economy

at large, the sector has remained underdeveloped and underutilized [5].

The large population density of dairy cows, conducive and diverse agro-ecologies, makes Ethiopia to be a country with significant potential for dairy production [6, 2]. In spite of such a substantial potential, the dairy sector is not developed to the expected level. The annual growth rate in milk production of 1.2 percent falls behind the annual human population growth estimated at 3 percent. The traditional milk production system, which is dominated by indigenous breeds of low genetic potential for milk production, accounts for about 97 percent of the country's total annual milk production [7].

Despite the huge number of cattle and their economic importance, the productivity is low due to the constraints of disease, nutrition, poor management, lack of marketing facilities and opportunity, inadequate animal health services, uncoordinated development programs between various levels of government institutions and /or non-government organizations and poor performance of indigenous

breeds. These constraints result in poor reproductive performance of dairy cattle. In the last few decades, as the major epidemic disease, were brought under control, emphasis have increasingly shifted to economically important diseases to the dairy producers and reproductive health problem stands out as the most prominent. Reproductive disorder of dairy animals was broadly studied throughout the world, but studies in Ethiopia are limited and mainly located in central high lands and in some parts of Eastern and Northern parts of the country [8, 9).

Although, major reproductive disorders greatly responsible for high economic loss in dairy cows, there is paucity of research done on the prevalence of these problems in east Wollega zone. Therefore, the present investigation had been planned to assess: the major reproductive health problems of dairy cattle in and around Nekemte and possible risk factors that play a role in precipitating such problems in dairy farms of the area.

2. Materials and Methods

The study was conducted in urban and peri urban of Nekemte town of East Wollega zone, of Ethiopia from December 2014 to September 2015. The climatic condition of the area is characterized by heavy long rainy season (June to September) which alternates with short rainy season (March to May) and winter dry season (December to March). The altitude of East Wollega zone ranges from 1200-2500 m.a.s.l and classified in to three agro ecological zones, temperate (7.18%), midland (51.08% and low land (41.74%). Nekemte is the largest town of East Wollega zone and located 331 km west of Addis Ababa on the main road from Addis Ababa to Assosa. It lies between 9° 5'N and 36° 33'E, on an altitude of 2088 m.a.s.l. The human population of the district is about 174,412 from which 84,502 living in the town and 89,910 living in peri urban and rural area of the district (CSA 2007). The recent data of East Wollega zone Livestock Development and Health Agency estimates the livestock population of the zone to be more than 925,000 heads of cattle, 220,875 sheep, 146,775 goats, 2,988 horses, 4,551 mules, 84,711 donkeys, 794,484 chicken and beehive 176,532 [2]. The mean annual rainfall with values ranging from 1500 - 2200mm and average daily minimum and maximum temperatures range between 15 and 26° C, respectively. The major soil types are clay loam covering about 60%, sandy soil covering about 35% and about 5% clay soil. This area is suitable for both crop and livestock production. The dominant crops cultivated in the area include Maize (*Zea mays*), Sorghum (*Sorghum bicolor*), "Teff" (*Eragrostis tef*), Millet (*Elucine coracana*), "Noug" (*Guizotia abyssinica*), Wheat (*Triticum*

aestivum), Barley (*Hordeum vulgare*), Coffee, pulse and oil crops [10].

For this study, small holder dairy cattle found in and around Nekemte town were the study population. From all 28 registered smallholders dairy producers in Nekemte town, 22 farms willing to participate in the research activity were included. For peri urban smallholder dairy production, two (2) Pas namely; Gari and Dune Kane were purposively selected to represent peri urban smallholder dairy production site around Nekemte. For household questionnaire survey, 42 dairy producers were interviewed (peri urban 20 and Urban 22). Monitoring study was done on all pregnant cows and heifers in study farms. Thus follow up was done on 129 pregnant cows and heifers in 42 smallholders dairy producers found in and around Nekemte town.

Three different study designs were used; namely: cross-sectional, longitudinal and retrospective study designs. A cross-sectional survey was conducted by interviewing of dairy farm owners to collect data on reproductive health problems and associated constraints in and around Nekemte town. The second part of the study was longitudinal observational type of study through a regular follow up (monitoring) on pregnant dairy cows and heifers of urban and peri urban dairy herd/farms to collect data and establish the occurrence and measure the magnitude of major reproductive disorders in the selected herds/farms. A retrospective study was conducted at two veterinary clinics in and around Nekemte to determine the prevalence of major reproductive health disorders based on data recorded on clinic case book for five years.

A semi-structured questionnaire was used to interview dairy cattle owners in and around Nekemte town. A total of 42 dairy cattle owners (22 *urban* and 20 from peri urban) were interviewed. The questions mainly focus on management practices like breed and breeding system, feed resource available and feeding system, major cattle diseases type and occurrence of reproductive health disorders and constraints of cattle production in the area.

The follow up study was used to monitor the occurrence of major reproductive health disorders of dairy cattle. Regardless of the stage of pregnancy all pregnant dairy cows and heifers approved by AI technicians were used for the study. The longitudinal study consists of individual cow history recording and interview of the owner at the beginning of the study period with follow-up visits of the animals. Follow up of pregnant dairy cows and heifers for occurrence of reproductive health disorders was done at every two weeks and sometimes through telephone calls. At the beginning of the study 129 pregnant dairy cattle in and

around *Nekemte* town were identified in 22 accessible and willing smallholder dairy farms.

For retrospective study data was collected from two veterinary clinics (*Nekemte* and *Getema* veterinary clinics). Secondary data of 5 years (2009/10-1013/14) was used to study the prevalence of major reproductive health disorders registered at each clinic. Animals treated for different cases and reproductive health disorder were directly taken from each animal health case book during the monitoring period.

The raw data obtained from cross-sectional survey and regular follow up was coded and entered on a Microsoft Excel (2007) data spreadsheet for data management. Analysis was done using Statistical Package for Social Sciences version 20.0 (2011). The prevalence of reproductive health problems was determined by descriptive statistics as a proportion of affected animals out of the total animal examined. The association of different risk factors with over all prevalence of reproductive problems was calculated by using χ^2 (Chi-square) technique for screening significance as univariate analysis (p- value consideration as significant was calculated at alpha 0.05 or 95% level of confidence).

3. Results

A socio economic characteristic of dairy cattle owners like age and sex of respondents, type of production system, education background and land holding per house hold was assessed and analyzed. The majority of respondents 22(52.4%) were within age group of 36-50 years old. The other 20 (47%) of the respondents were from age group above 50 years and below 36 years (Table 1).

Table 1: Age group of respondents

Age group	Frequency	Percent
20-35 years	10	23.8
36-50 years	22	52.4
51-65 years	10	23.8
Total	42	100.0

The majority of the respondents were male headed households and only nearly 12% were female headed households (Table 2).

Table 2: Sex group of respondents

Sex group	Frequency	Percentage
Male	37	88.1
Female	5	11.9
Total	42	100.0

More than 50% of the dairy cattle owners were from *Nekemte* town and the others are from peri urban of *Nekemte* (Table 3).

Table 3: Proportion of the respondents from different production sites

Production site	Frequency	Percentage
Urban	22	52.4
Peri urban	20	47.6
Total	42	100.0

The respondents were from different educational status. Only 2.4% of the respondents couldn't read and write (Illiterate) and the majority 47.6% were secondary school complete. The others were either primary school or university or college level (Table 4).

Table 4: Educational background of the respondents

Level of education	Frequency	Percentage
Illiterate	1	2.4
Primary school	7	16.7
Secondary school	20	47.6
College/ University	14	33.3
Total	42	100.0

The mean landholding per household in urban and per urban was 2.22 and 2.15 hectares respectively (Table 5).

Table 5: Average Land holding of dairy cattle owners

Production site	Total observation	Mean	St. Deviation
Urban	22	2.22	2.52
Peri-urban	20	2.15	1.01
Total	42	2.18	1.93

Table 6: Prevalence of major reproductive health disorders of dairy cows in and around *Nekemte* town

Variables	Frequency	Percentage
1. Delivery with Reproductive health disorder		
Retained Placenta	26	51
Abortion	13	25.5
Dystocia	10	19.6
Still birth	2	3.9
Over all	51	39.5
2. Normal delivery with no history of reproductive health problem	78	60.5
Total observed	129	100

The monitoring study was conducted from December 2014 to September 2015. From the total of 129 pregnant dairy cattle observed, 78 of the animals gave birth normally with no history of reproductive and metabolic health disorder. The other 51 of them were observed with one or more of reproductive health disorders. According to this finding, the magnitude of reproductive health disorders was 39.5% (51/129). All

of the cases were reproductive health disorders and there was no metabolic case observed during the study period. From reproductive health disorders observed during the study period, retained fetal membrane was frequently observed with the larger magnitude of 26(51%) among the cases, followed by abortion 13(25.5%) and *dystocia* 10(19.6) (Table 6). From the total of 129 dairy cattle monitored, 23(18.01%) were affected by clinical mastitis with one or more teats blind.

In this study among the risk factors identified herd size, body condition score, parity and

management system were considered to assess its association with the occurrence of the reproductive health problems as shown in Table 7. Based on the result of this study, the effect of herd size and management system didn't show any significance since the p-value for each factor is 0.44 and 0.58 respectively; which is greater than the alpha value ($P>0.05$). But the effect of parity and BCS is significant since the alpha value for each factor is less than 0.05.

Table 7: The risk factors associated with major reproductive health disorders of dairy cows

Risk Factors	Category	Examined (N)	Affected (n)	Proportion (%)	X ²	P-value
Herd size	Small	22	5	22.72	5.85	0.44
	Medium	70	22	31.42		
	Large	37	24	64.86		
BCS	2.0	42	36	85.7	24.6	0.001
	2.5	36	6	16.6		
	3.0	27	2	7.4		
	3.5	16	1	6.25		
	4	8	6	75		
Parity	1	20	16	80	32.73	0.001
	2	32	14	43.75		
	3	31	8	25.8		
	4	4	2	50		
	5	34	11	32.35		
Management system	Good	19	4	21	4.67	0.587
	Medium	64	19	29.6		
	Poor	46	28	56.52		

N=Number, X²=Chi square, %=Percentage, P-value=level of significance at alpha=0.05(95% confidence level).

Table 8: Clinical cases of health problems at *Guto Gida* (Nekemte) vet Clinic (2009-2014)

List of clinical cases	5 Years data					Total (%)
	2009/ 10	2010/ 11	2011/ 12	2012/ 13	2013/ 14	
Parasitism	302	335	380	230	382	1629 (61.7)
Protozoal infections	33	44	74	11	24	186 (7.04)
Trypanosomiasis	18	26	8	63	60	175 (6.62)
Clinical Mastitis	6	22	26	27	30	111 (4.2)
Bloat	45	20	16	21	6	108 (4.09)
Wound	3	22	14	63	3	105 (3.97)
Septicemia	0	6	22	57	20	105 (3.97)
Black Leg	12	6	16	27	3	64 (2.42)
Reproductive health disorders	0	10	8	3	35	56 (2.12)
Neumonia	0	20	12	11	4	47 (1.78)
Pasteurellosis	6	2	6	9	6	29 (1.08)
Anthrax	7	5	4	3	6	25 (0.95)
Total	432	518	586	525	579	2640 (100)

N=total number of cases, %=percentage

Table 9: Clinical cases of health problems identified at *Getema* veterinary clinic (2009-2014)

List Of Clinical Cases	Years					Total N (%)
	2009/ 10	2010/ 11	2011/ 12	2012/ 13	2013/ 14	
Trypanosomiasis	102	140	172	70	40	524(22.78)
Parasitism	96	68	56	74	166	460(20.0)
Septicemia	66	60	30	32	22	210(9.13)
Reproductive Health Disorders	10	18	26	70	40	164(7.13)
Black Leg	40	26	30	15	38	149(6.48)
Clinical Mastitis	28	6	22	38	42	136(5.91)
Lumpy Skin Disease	4	14	18	60	32	128(5.56)
Pasteurellosis	42	12	22	14	4	94(4.08)
Babesiosis	6	4	2	8	62	82(3.57)
Bloat	14	6	14	37	10	81(3.52)
Dermatophyllosis	4	8	20	30	0	62(2.7)
Infectious Keratoconjunctivitis	8	4	6	5	38	61(2.65)
Dermatophytosis	4	10	0	20	0	34(1.48)
Actinomycosis	4	8	6	5	6	29(1.26)
Pneumonia	4	2	8	5	4	23(1)
Actinobacillosis	8	4	0	3	8	23(1)
Foot And Mouth Disease	6	0	4	6	6	22(0.96)
Anthrax	2	10	4	0	2	18(0.78)
Total						2300

N=total number of cases, %=percentage

A retrospective (secondary data) of clinical cases was conducted on *Guto Gida* and *Getema* veterinary clinics to see the prevalence of reproductive health disorders in the area. For this study, veterinary case book was used at both sites to collect all registered cases of five years back (2009/2010-2013/2014). According to this retrospective study result, there were 2640 and 2300 cases of health problems at *Guto Gida* and *Getema* vet clinics during the five year period respectively. The prevalence of reproductive health problems at the two clinics, *Guto Gida* and *Getema* was 56(2.1%) and 164(7.13%) respectively. Mastitis was also a problem in the area and the retrospective study shows that the magnitude of cases of clinical mastitis at *Guto Gida* and *Getema* vet clinic within five years period was 111(4.15%) and 136 (5.91%) respectively (Table 8 and 9).

4. Discussion

In the last few decades, as the major epidemic disease, were brought under control, emphasis have increasingly shifted to economically important diseases to the dairy producers and reproductive health problem stands out as the most prominent. When the function of the reproductive system is impaired, cows fail to produce a calf regularly. Among the major reproductive problems that have direct impact on reproductive performance of dairy cows are abortion, dystocia, Retained Fetal Membrane (RFM), pyometra, metritis, prolapse (uterine and vaginal), anoestrus and repeat breeder [11].

The results from questionnaire survey of the dairy cattle owners in the area show that, the majority of dairy farmers 22(52.4%) were within age group of 36-50 years old. The other 20 (47%) of the respondents were above 50 years and below 36 years old (Table 1). This was comparable with the average dairy farmers 47.6 years old reported by [12] and 47.35 years, by [13]. This shows the dairy cattle owners in the area are energetic working social group important for dairying.

This study revealed, that male entrepreneurs (88.1%) and educated ones (97.6%) cover majority of the dairy farm operations, showing that majority of dairying in Nekemte and the area is mainly male domain and almost all could read and write (Table 3 and 4). This is in agreement with the study of [14] in western Oromia and [15] where dairy farming was mainly a male domain (75.9%) and only 24.1% were women. Similar observations have been reported in Addis Ababa milk shed by [16] who revealed that the larger proportion of dairy farmers were male and well educated that expected to positively contribute to the success of peri-urban dairying activities.

The mean landholding per household in this study was 2.18 ± 1.93 hectares (Table 5). This finding is lower than a study by [17] 3.6 ± 0.3 , Burji Woreda. [18] reported 2.5 ha per household in central Ethiopia. Other research work reveal a total land holding per household of 2.96 ± 0.01 ha reported by [19] in southern Ethiopia. But the landholding per household of the current study was greater than the study by [20]

who indicated the average land holding size of the respondents in Bure district 1.33 ha.

According to the current study, the magnitude of reproductive health disorders of dairy cattle in the area was 39.5% (51/129). All of the cases were reproductive health disorders and there was no metabolic case observed during the study period. This figure is in agreement with the findings by [21] found 40.3% around Kombolcha and [22] found nearly the same magnitude of reproductive disorders 37.1% in East shoa reproductive health disorders. This finding was also greater than a study in different parts of the country [23] who found 33.59% reproductive health disorders in and around Jimma town [24] found 26.5% in and around Bedele area [25] from central Ethiopia found 33.6% and [9] investigated in and around Asalla 18.3% reproductive health disorders. There were studies that reveal a finding greater than the current figure. Adane et al 2014, found 43% in southern Ethiopia. A finding by [26] in and around Addis Ababa reported 67.8% and [27] identified 47.7% reproductive health disorders in Borana zone. These differences arise from different angles. The study sites, sampling techniques, sample size difference; duration of the study and management of the study animals might be attributable to the disagreement of the current finding and previous investigations done on reproductive health disorders in different parts of the country.

From reproductive health disorders identified during the study period, retained fetal membrane was frequently observed with the larger magnitude of 26(51%) among the cases, followed by abortion 13(25.5%) and dystocia 10(19.6) (Table 6). This finding is in agreement with the work done by [23] who reported Retained Fetal membrane and abortion the leading problems in Jimma town. Again [29], in southern Ethiopia found Retained Fetal membrane (RFM) and dystocia the major reproductive disorders.

Still birth was occurring at the rate of 3.9% which is in consistent with the result of [30] who reported 2.8% and [21] who found 3.01%. From the total of 129 dairy cattle monitored, 23(18.01%) were affected by clinical mastitis with one or more teats blind. The prevalence of clinical mastitis in the present study is fairly consistent with the findings of [21, 31 and 32] who revealed prevalence of 19.3; 21.7% and 19.9%, respectively. However this finding disagrees with the previous work by [27, 33 and 34] who found the prevalence of clinical mastitis higher than the current figure in different parts of the country. This difference is attributable to difference in breed of cows considered, management and study sites and sampling differences in the study area.

The factors that determine the occurrence of reproductive health disorders in the study area was

also assessed. According to the current study, four factors herd size; body condition score, parity and management system were considered. Accordingly the effects of parity and Body Condition Score (BCS) were found to be significant since the alpha value (P-value) for each factor is less than 0.05. Parity had significant ($p < 0.05$) effect on the reproductive health problems. The overall prevalence was higher in cows who had given more than two births than those who had given less than two. Those variations might be due to factors affecting reproduction in cows of greater parity. Aging cows and their reproductive systems probably involves more complex and permanent uterine changes than those cows with lower parities [21].

The retrospective study conducted to assess the occurrence of reproductive health disorders and clinical mastitis shows lower prevalence when compared with the follow up results. This is due to lack of registered cases at the clinics since most of the reproductive health cases and mastitis problems were not treated at the clinics. Therefore, the figure reported at the clinic level may not indicate the real problem of reproductive health disorders and incidence of mastitis.

By conclusion, the smallholder dairy production system in and around Nekemte is constrained by prevalent reproductive health disorders and mastitis. Improving the management and health care of dairy cattle is very important to get the intended benefit from the sector.

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