

Review on: Major Reproductive Health Problems of Dairy Cattle in Ethiopia

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Abstract: Reproduction is a basic requirement for efficient cattle production to continue or cease; whereas, reproductive disorders are the leading cause of economic loss in the cattle industry. Reproductive disorders have been found to be a major reason for decreased reproductive efficiency in cattle and consequently reproductive efficiency is the major determinant of lifetime productivity of cows. 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, repeat breeding and these results, in considerable economic loss to the dairy industry due to slower uterine involution, reduced reproductive rate, prolonged inter-conception and calving interval, negative effect on fertility, increased cost of medication, drop in milk production, reduced calf crop and early depreciation of potentially useful cows. It is very difficult to diagnose those problems by one particular disorder or symptom because there is interrelation between predisposing factors such as management at calving, hygiene and parity, stage of gestation, nutrition and environment. The objective of this paper is to review the main problem of reproductive disorder cow and its' causative factor.

Key words: Abortion • Dairy Cow • Dystocia • Ethiopia • Reproductive Disorder

INTRODUCTION

Ethiopia ranked first in cattle population in Africa. However, the dairy industry is not as developed as that of east African countries. Consequently, national milk production remains among the lowest in the world even by African standard [1]. Despite the huge number of cattle in the country, productivity is low due to constraints of disease, nutrition, poor management and poor performance of endogenous breed. This constraint results in poor reproductive performance of dairy cattle and lower economic benefit from the sector [2].

Dairying is practiced almost all over Ethiopia involving a vast number of small, medium or large-sized subsistence or market-oriented farms. Based on climate, land holdings and integration with crop production as criterion, dairy production systems are recognized in Ethiopia; namely the rural dairy system which is part of the subsistence farming system and includes pastoralists, agro-pastoralists and mixed crop-livestock producers; the peri-urban and urban dairy systems [2].

Regular breeding of cow depends upon the normal function of the reproductive system. In order to breed regularly, the cow has to have functional ovaries, display

estrous behavior, mate, conceive, sustain the embryo through gestation, calve and resume estrous cyclicity and restore uterine function after calving. The sexual activity of the adult bovine female, non-pregnant and in good health condition, is cyclic and the cycle lasts 17 to 24 days. When the function of the reproductive system is impaired, cows fail to produce a calf regularly [3] and leads to reproductive health problems that causes poor productive performance [4]. Dystocia, vaginal prolapse, uterine prolapse, endometritis, anoestrus, repeat breeder, abortion, retained placenta, stillbirth and metritis are the most common reproductive disorders that have direct impact on reproductive performance of dairy cattle. These diverse disorders are similar in that they all can result in impaired reproductive function [5].

Reproductive efficiency plays a fundamental role in the profitability of dairy cattle herds [6]. It is a critical component of a successful dairy operation and acts as an important component of a profitable dairy farm, whereas reproductive inefficiency is one of the most-costly problems facing the dairy industry today. Reproductive problems occur frequently in dairy cows and can dramatically affect reproductive efficiency in a dairy herd. They have been implicated to cause

considerable economic loss to the dairy industry. This is due to slower uterine involution, 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 [5]. The reproductive health problems of dairy cattle result not only in heavy economic losses, but they have also public health concern [4].

There are some prevalence studies of reproductive health disorders in Ethiopia that indicates the presence of problems relatively with high prevalence. However, studies regarding lower incidence in Ethiopia included Hawassa dairy farms. Reproductive health problems in intensively managed dairy cattle in Ethiopia have been reported to affect almost as high as 70% of cows [7, 8]. Infectious diseases are one of the factors that affecting reproduction in cattle causing losses throughout reproductive cycle [6]. In Ethiopia, few studies were conducted on seropositivity of infectious causes of reproductive health problems and their associations. The seropositivity and association with reproductive health problems of viruses including infectious, brucellosis, bovine rhinotracheitis virus (BHV-1), bovine viral diarrhoea virus (BVDV) and Schmallenberg virus (SBV) and protozoan (*Neospora caninum*) are conducted in Ethiopia [8-10]. Therefore, the objectives of this paper were to highlight the overall aspects of reproductive health problems and their causes in dairy cows.

Major Reproductive Health Problems of Dairy Cattle: Dystocia, vaginal prolapse, uterine prolapse, endometritis, anoestrus, repeat breeder, abortion, retained placenta, stillbirth and metritis are the most common reproductive disorders that have direct impact on reproductive performance of dairy cattle. These diverse disorders were similar in that they all resulted in impaired reproductive function [5].

Abortion and Stillbirth: Abortion is the termination of pregnancy and it represents one important aspect of infertility in farm animals [11]. In dairy cattle, it is commonly defined as a loss of the fetus between the age of 42 days and approximately 260 days [12]. Pregnancies lost before 42 days are usually referred to as early embryonic deaths, whereas a calf that is born dead between 260 days and full term is defined a stillbirth [5]. A low rate of abortion is usually observed on farms and 3 to 5 abortions per 100 pregnancies per year are often considered as normal. However, the loss of any pregnancy can represent a significant loss of (potential) income to the producer [12].

There are a number of factors that cause proportion of pregnancies to terminate with an abortion. It may be idiopathic (occurring without known cause) or hormonal abnormalities, nutritional deficiencies, trauma, toxicities, or infectious processes [13]. Non-infectious cause of abortion includes genetic abnormalities, toxic agents and Ergot alkaloids (*Claviceps purpure*), stress and malnutrition [11, 12, 14]. The infectious causes include viruses, bacteria, rickettsia, fungi, protozoa and Chlamydia [6, 11-15].

Prolapse of Genital Organs: A prolapse is the abnormal repositioning of an organ from its normal anatomical position. Cattle occasionally develop problems with prolapse near the time of calving. Two distinct types of prolapse occur in the reproductive tract of cattle: vaginal or uterine. While both types require medical attention and correction, timing of occurrence and prognosis differ [16]. Genital prolapse is a major but not very common reproductive disorder in cattle. It is regard as an emergency condition and should manage before excessive edema, mucosal trauma, contamination and fatal hemorrhage lead to a grave prognosis [17].

Uterine Prolapse: Uterine prolapse is one of the most potentially dangerous complications associated with third stage of labor during calving of cow [18]. It is partial or complete turning inside- out of the organ, in which the inside comes to the outside through the lips of the vulva and hangs down, sometimes as far as the hocks [11, 16, 19]. The uterus is prolapsed usually following or within a few hours of calving. It is considered as medical emergency. This condition is life threatening. If the affected cow not treated quickly, she could go into shock or die from blood loss. If the uterine prolapse repaired properly, the cow may maintain a normal reproductive existence. However, a secondary infection of the replaced uterus may make the cow slow to rebreed or unable to breed back at all [16].

The cause of prolapse of the uterus is not clear, but there is no doubt that it occurs during the third stage of labor [3]. Various predisposing factors have been suggested for uterine prolapse in the cow. This includes hypocalcaemia, prolonged dystocia, fetal traction, fetal oversize, retained fetal membranes and chronic disease [19,20]. Uterine prolapse may be avoided by reducing the predisposing factors [3,19,20].

Vaginal Prolapse: The vaginal prolapse refers to a condition in which part or the entire vaginal wall protrudes from the vulva. It tends to occur during mid to

late gestation period, sometimes after delivery [21]. Vaginal prolapse is more frequent than uterine prolapse and typically looks like a pink bulge of tissue ranging in size from a large grapefruit to a soccer ball. Precipitation of prolapse of genital organs suggested multiple etiologies but placental estrogen during second half of gestation in cattle causing relaxation of pelvic ligament; vulva and vulval sphincter muscle are most feasible proposition although hereditary predisposition may not be undermined [22]. A vaginal prolapse occurs due to increased pressure in the abdominal cavity during the latter stages of pregnancy [23].

Vaginal prolapse were recurring problems [16]. It can be an inherited trait, as result it leads to cull cattle with vaginal prolapse and restriction of using their offspring (both male and female calves) for breeding purpose. Older cows, cows carrying twins and cows with *Bos indicus* ancestry are more prone to have vaginal prolapse. Cows limited to grazing clover pastures could also be at a higher risk of vaginal prolapse due to phytoestrogens that may be produced by that forage type [21, 22].

Retention of the Fetal Membrane: Retention of the fetal membrane comprises of failure of dehiscence and a lack of expulsion of fetal membranes within the duration of physiological third stage of labor. Primary retention of fetal membranes results from a lack of detachment from the maternal caruncles whereas secondary retention is related to a mechanical difficulty in expelling already detached fetal membranes e.g. uterine atony [24]. Retention of the fetal membranes or retention of placenta in the cow is defined as the condition in which the fetal membranes are not expelled within a period of 12 to 24 hours after expulsion of the fetus [25]. Retention of fetal membranes is one of the most common conditions occurring in dairy cows following parturition [24].

There are a number of risk factors associated with retention of fetal membranes, including mechanical, nutritional, managemental and infectious factors. Dystocia, caesarean section, uterine torsion, abortion, stillbirth, induced parturition and twin are mechanical risk of retention of the fetal membranes. Nutritional causes may be due to deficiency of proteins, selenium, iodine, vitamin A and E and calcium deficiency during pregnancy. Managemental causes include stress, hereditary, inbreeding and obesity. Infectious diseases like brucellosis, leptospirosis, salmonellosis, listeriosis, IBR virus and BVD virus are associated with retention of placenta. Such retention creates a number of problems by allowing microorganisms to grow in uterus [5, 26].

Uterine Infection: Uterine diseases were highly prevalent in high producing dairy cows [27, 28]. The bacterial infection of uterus may occur, during or immediately after parturition, coitus or while carrying out artificial insemination. The severity and persistence of infection in the uterus depends on the degree of contamination, uterine defense mechanism and presence of substrates for the growth of the microbes such as devitalized tissues [29]. Postpartum uterine disease caused reproductive inefficiency in dairy cattle [27, 28]. Metritis, endometritis, pyometra, Retention of fetal membranes and some non-specific infections of the uterus are important factors causing infertility in the dairy cattle. Many times, these postpartum reproductive disorders have common etiology, predispose to each other and share a common therapeutics regime [29].

Parturition, uterine involution, regeneration of the endometrium, return of ovarian cyclic activity and the control of pathogenic bacteria in the uterus is required before cows are likely to conceive again. However, pathogenic bacteria often caused uterine disease in modern dairy cattle, decreased productivity and reduced fertility [30]. Bacteriological contaminations of the uterus after parturition and metabolic changes in the transition period were important etiological factors for the occurrence of metritis and endometritis. Negative energy balance is known to influence the number as well as the functional properties of immune system [31]. Retention of fetal membrane was a paramount risk factor for metritis and concomitant clinical diseases [27].

Metritis is the infection of the cavity, lining and deeper layers of the uterus. On the other hand, endometritis is a localized infection of the lining of the uterus, which is inflamed with white pus mixed with mucus discharging from the uterus into the vagina. The deeper layers of the uterus were not affected by endometritis, so the uterus is not much bigger than that of a normal animal [29]. Clearly, metritis is a much more severe disease than endometritis, requiring a different therapeutic approach. Firstly, it was much more urgent to identify cows with metritis promptly and, secondly, these animals need systemic treatments to counter the uterine infection and alleviate the generalized ill health [32]. Pyometra implies accumulation of pus within the uterine lumen associated with a closed cervix and a corpus luteum. There was often a corpus luteum present in animals with endometritis but the cervix was patent, often with pus discharging from the uterus into the vagina [32, 33].

Dystocia: The number of calves produced each year within a cow-calf operation depends on two main factors: success of cows and/or heifers to conceive and maintain the pregnancy and birth of viable and healthy calves. Within the many factors affecting calf survival, the most important was dystocia [34]. The dystocia refers to condition during the delivery process in which the first stage (opening period), or the second stage (expulsion periods) is so prolonged that delivery is difficult or impossible without assistance. Depending on the degree and type of dystocia, it can result in a weakened/dead calf and injury or death to the dam [21, 34]. Dystocia occurs when there is a failure in one or more of the three main components of calving: expulsive forces, birth canal adequacy and fetal size and position [35].

Although there are many management and genetic factors that affect the incidence of dystocia in the cow herd, the most significant cause of dystocia is maternal/fetal disproportion [5, 35]. For purpose of formulating a clinical management plan for an individual animal, it is convenient to divide the causes of dystocia into those of maternal origin and those of fetal origin [3, 21]. Problems with the dam that impede or prevent delivery include a lack of expulsive force and abnormalities of the birth canal. The absence of uterine contractions or inertia may be primary or secondary [21].

Primary uterine inertia that is due to excessive stretching is common in multiple pregnancies in cattle. Secondary uterine inertia was due to exhaustion of the uterine muscle secondary to obstructive dystocia [35]. Delivery may be inhibited by inadequate size of the maternal pelvis, pelvic deformities, incomplete dilatation of the cervix and uterine torsion. Stenosis of the vulva and vestibule may be the result of immaturity or may be a heritable defect in some breeds. Generally, the fetal origins of dystocia in cow can be divided into those caused by either excessive fetal size relative to the maternal pelvis (Feto-pelvic disproportion), or by abnormalities of the fetus (Fetal monsters, fetal diseases and fetal mal disposition). Thus, fetal dystocia is reviewed according to fetal oversize and fetal abnormalities [3, 36].

Repeat Breeder: One calf by cow in a year is the reproductive objective in dairy cattle. It means that cows must get pregnant after insemination, maintain the pregnancy, have parturition after 270 days approximately and wait for a period of 40-50 days to successfully inseminate again. Nevertheless, this not always attained and cows must re-inseminate during several consecutive

cycles [37]. According to Souza *et al.* [38], Repeat breeder (RB) has been defined as failure to conceive from three or more regularly spaced services in the absence of detectable abnormalities. It has long been considered as one of the most important reproductive disorders in cattle. Repeat breeder females returned to service repeatedly after being bred with a fertile male. These cows exhibit normal signs of estrus every 18 to 24 days but required more than three services to become pregnant [39]. According to Katagiri [40] the syndrome was of a major concern in dairy farms because after only a few unsuccessful inseminations cows are culled without further investigation on the cause of repeat breeder syndrome.

Risk factors of infertility in RB cows are usually unclear, but probably include management, environmental and animal factors [40]. The repeat breeding can be increased by estrus detection errors, insemination of cows that are not in estrus; inflammation or anatomical impediments in the female reproductive tract, obstructed oviducts; poor oocytes; anatomical defects of reproductive tract, uterine and/or cervical/vaginal infections; and subclinical endometritis [41,42]. Factors such as quality of semen and insemination technique, endocrine disorders, ovulation failures and early embryonic death also cause repeat breeding [39,42]. Therefore, RB may involve a combination of many factors, such as genetic factors, abnormalities in the gametes, nutritional disorders, even inadequate luteal function [37].

Anoestrus: Estrus can be defined as a type of sexual behavior near the time of ovulation, which is characterized by the acceptance of the male. Anoestrus indicates the lack of this typical estrous expression at an expected time [3]. According to Opsomer *et al.* [43] anoestrus is in fact a very broad term indicating the lack of typical estrous symptoms near the time of ovulation, it cannot be seen as a disease but it rather reflects the presence of some suboptimal (e.g. management or nutrition) or pathological (e.g. chronic debilitating diseases or uterine and ovarian diseases) conditions. Anoestrus is a result of many interacting factors; managerial, physiological, pathological and nutritional factors. These include age, breed, pre-and postpartum nutrition, body condition of animal, lactation, suckling, calving season, presence or absence of the bull, delayed uterine involution, dystocia, genotype, parasitic infestation and general health status of animal [18].

Animals remain anestrous during certain physiological stages, which does not relate to infertility: before puberty, during pregnancy, lactation and early postpartum period. It is a normal phenomenon in association with some physiological conditions (e.g., before puberty and during pregnancy), but becomes pathological when the duration exceeds the generally accepted average. The condition may be associated with uterine pathology such as pyometra, fetal resorption, maceration and mummification [18].

One of the annoying problems in dairy industry is postpartum anoestrus. In fact, post-partum anoestrus can define as the lack of estrus symptoms (despite of effective estrus detection) within 60 days after calving, while normal cows in the same conditions already have been seen in heat. Physiologically postpartum anoestrus cannot be escaped because it is helpful in involution of uterus within 15-45 days after parturition most of the dairy cows recommence heat [18].

Status of Reproductive Disorders of Dairy Cows in Ethiopia: Ethiopia has the largest livestock population; however, dairy industry is not developed as that of other east African countries such as Kenya, Uganda and Tanzania, due to constraints of nutrition, poor management practices, diseases and reproductive disorders. In addition to these, 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 result in poor reproductive performance of dairy cattle [7]. Reproductive disorders are one of the most important problems that affect the production and productivity of dairy cows in Ethiopia [10].

Reproductive disorders of dairy animals studied broadly throughout the world. However, studies in Ethiopia are limited to few areas in Ethiopia [7]. Studies on major reproductive problems of cattle in different parts of the country have shown the presence of the reproductive problems. In these studies different types of risk factors are considered (for example, age, parity, body condition, production system, mating system, breed, etc) and these risk factors show a significant association with over all prevalence of major reproductive disorders in one or another study [2, 7, 44, 45], but most of these studies focuses on prevalence rather than incidence.

There are several studies conducted about infectious causes of reproductive health problems worldwide; however, such studies are less in Ethiopia. Some of the reproductive diseases are caused by viruses including infectious bovine rhinotracheitis virus (BHV-1), bovine viral diarrhea virus (BVDV) and Schmallenberg virus (SBV), bacteria (brucellosis), protozoan (Neospora caninum) [8-10] are conducted in Ethiopia. Still the most of infectious causes of reproductive health problems are need to be further investigated.

CONCLUSION AND RECOMMENDATIONS

Reproductive efficiency plays a fundamental role in the profitability of dairy cattle herds. It is a critical component of a successful dairy operation and acts as an important component of a profitable dairy farm, whereas reproductive inefficiency is one of the most costly problems facing the dairy industry today. Reproductive problems occur frequently in dairy cows and can dramatically affect reproductive efficiency in a dairy herd. They have been implicated to cause considerable economic loss to the dairy industry. This is due to slower uterine involution, prolonged inter-conception period and

Table 1: Summary of overall prevalence of major reproductive health problems of dairy cows in Ethiopia.

Study area	Overall prevalence (%)	Study type	Source
in and around Kombolcha town	40.3	Semi structured questionnaire interview	[1]
Debre Zeit town	44.3% (retrospective data)		
Central Ethiopia.	33.6% (regular follow up)	Retrospective data analysis, survey	[46]
in and around Asella town	18.3%,	A cross sectional	[44]
Borena zone	47.7%	A cross-sectional	[47]
urban and per urban			
area of Hossana town	43.07 %	Cross-sectional	[7]
Bako Agricultural research center	35.2% (cumulative incidence)	A prospective follow up	[48]
Mekelle City	25.44%	Questionnaire survey	[45]
Wolaita Sodo Town	35.5 %	Regular follow up	[49]
Horro Guduru	39.5%	Questionnaire interview	[50]
In and Around Chencha Town	32.5%	The cross-sectional type	[51]
Bishoftu town	30.1%	A cross sectional study	[52].

Table 2: Summary of commonly identified reproductive health problems of dairy cows in some of studies in Ethiopia.

Reproductive health disorder	[53] (kombolicha city)	[7] (in around hosanna)	[48] (CI) bako	[47] (borana)	[46] (Debrezeit)		[45] (mekele city)	[52] (In Bishoftu Town)	[50] (Horro Guduru)	[51] (in and around Chencha city)
					Retrospective	Survey				
Abortion	9.05%	2.56	5.9%	12.2	6.6	6.7		7.5%	4.42%	4.7%
Anoestrus		10.26	0.3%	10.3	12.9	12.5		3.7%		1%
Dystocia	7.75%	5.9	6.7%	3.4	4.2	2.9		3.5%	9.2%	5.2%
Endometritis	-	-	4.0%	-	-	-			7%	3.7%
Metritis	-	-	-	-	3.5	-				
Mastitis	19.3%	-	-	21.3	-	-				
Pyometra	-	-	1.6%	-	-	-			2%	
RFM	7.32%	7.18	8.3%	7.6	3.5	3.8		10%	10 %	12.2%
Repeat breeder	3.87%	13.08	3.5%	10.3	11.4		7.29%	7.7%	1.24%	1%
Stillbirth	3.01%	-	4.8%	-	-	-		1.9%		
Uterine prolapse	0.43%	0.76	-	2.7	0.7(both)	1.9(both)		0.8%	1.7%	
Vaginal prolapse	-	2.05	-	-	-	-		0.6%	0.49	
Mixed								5.2%		4.2%

calving interval, high cost of medication, drop in milk production, reduced calf crop and early depreciation of potentially useful cows. The reproductive health problems of dairy cattle result not only in heavy economic losses, but they have also public health concern. Based on the above conclusion the following recommendations are forwarded:

- ✓ Constraints of nutrition, poor management practices, diseases and reproductive disorders should be overcome.
- ✓ In addition to these, 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 should be improved.

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