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Common Reproductive Disorders and Associated Impacts on Reproductive Performance in Dairy Cows in Ethiopia

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Abstract

Reproductive functions of dairy cattle are temporarily or persistently disturbed by reproductive health disorders. Reproductive health disorders are found to be a major reason for decreased reproductive efficiency in dairy cattle. These decreased reproductive efficiency results in heavy economic loss due to prolonged conception rate and calving interval, reduced fertility; drop in milk production, poor calf crop, early involuntary culling and replacement management as well as increased medication cost. Some of major reproductive health problems that have direct impact in reproductive efficiency and economy include: abortion, metritis, endometrits, pyometra, retention of placenta, vaginal and uterine prolapse, dystocia, anoestrus and repeat breeder. It is very difficult to diagnose these problems by one particular disorder or symptom because there is interrelation between predisposing factors such as management practice, nutrition and environment and the problems themselves are interrelated. The heavy economic losses and animal health problems can be reduced by appropriate diagnoses and treatment, and applying effective preventive measures. There are only few studies on prevalence of major reproductive health problems in Ethiopia and these studies show that they are common problems that need due attention. These problems can be prevented through strong extension service, which includes creating awareness to farmers. Moreover, further studies are needed particularly in rural areas where the majority of cows are found. Also compiling data on the subject in question at national level is of paramount importance for planning and application of good control and prevention approach.

Introduction

Reproduction is a complex process whereby individuals produce their off spring to perpetuate life. Regular breeding 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 [1], and leads to reproductive health problems that causes poor productive performance [2].

Reproductive health disorders can be defined as a status in which the reproductive function of female or male animals are temporarily or persistently suspended or disturbed and abnormal calves are produced. Reproductive efficiency plays a fundamental role in the profitability of cattle herds [3]. Reproductive disorder has been found to be a major reason for decreased reproductive efficiency in dairy cattle and it is the major determinant of lifetime productivity of cows. Poor reproductive performance is a major cause of involuntary culling and therefore reduces the opportunity for voluntary culling and has a negative influence on the subsequent productivity of a dairy herd [4].

Among the major reproductive problems that have direct impact on reproductive performance of dairy cows are abortion, dystocia, retained fetal membrane, pyometra, metritis, prolapse (uterine and vaginal), anoestrus and repeat breeding. The postpartum period is the most varied and vulnerable to problems, and that incidentally coincides with the peak of milk production, uterine involution, and resumption of ovarian activity, conception and greater risk to infection [5, 6], cited in [7]. The annual costs of bovine postpartum uterine infections were estimated to be around €1.4 billion in the Europe and around $650 million in the United States [8]. The reproductive health problems of dairy cattle result not only in heavy economic losses, but they have also public health concern [2].

It is very difficult to diagnose reproductive health 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 [9].

Table 1: Infectious causes of abortion

Bacterial cause	Viral cause	Protozoa cause	Fungal cause	Rickettsial cause	*Chlamydia*
Salmonella dublin, S. typhimurium,	Bovine virus diarrhoea/mucosal disease	*Neospora caninum*	*Aspergillus fumigates,*	*Coxiella burnetti*	*C. psittaci*
Bacillus lichenformis	Bovine herpes virus 1 (infectious bovine rhinotracheitis/infectious pustular vulvovaginitis)	*Toxoplasma gondii*	*Mortierella wolfii*	*Ehrlichia phagocytophilia* (tick-borne fever))	
Brucella abortus; B. melitensis		*Trichomonas fetus*			
Actinomyces pyogenes					
Listeria ivanovii, L. monocytogenes					
Leptospira hardjo					
Campylobacter fetus					

Source: [3,16-20]

Reproductive disorders of dairy cows are studied widely throughout the world. Studies in Ethiopia are limited in few areas and farming systems mainly focused on towns (urban) and their per-urban areas of central highlands [10]. However, these studies suggested that the problems are very common in the country with relatively high overall prevalence and incidence [10-14]. Studies conducted so far in Ethiopia revealed poor reproductive performance of dairy cows in the country. For feasible intervention of the poor reproductive performance of dairy cows needs investigation on the types and magnitudes of the existing problems [15].

Diseases related to the reproductive tract (dystocia, retained placenta, metritis, endometritis and others) are interrelated and can affect the length of calving interval, the number of days open, and the reproductive efficiency in general. These diseases can also affect the overall productivity of dairy cows by reducing milk yield [4]. Therefore, the objective of this paper is to review major reproductive health problems and their risk factors, and treatment and preventions of reproductive disorders. In addition to these, it is aimed to provide some information about studies on prevalence of reproductive health problems of dairy cows in Ethiopia.

Major Reproductive Disorders in Dairy Cows

Abortion

Abortion is the termination of pregnancy and it represents one important aspect of infertility in farm animals [16]. In dairy cattle, it is commonly defined as a loss of the fetus between the age of 42 days and approximately 260 days [17]. 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 [4]. 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 [17] (Table 1).

Causes and risk factors: 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 [18]. Noninfectious cause of abortion includes genetic abnormalities, toxic agents and Ergot alkaloids (*Claviceps purpurea*), stress, and malnutrition [16,17,19]. The infectious causes include viruses, bacteria, rickettsia, fungi, protozoa and Chlamydia [3,16-20].

Negative effect of abortion: Abortions cause significant economic loss, especially those occurring during late gestation. These losses can be attributed to loss of replacement calves, reduced milk production, costs of treatment, feeding of animals and premature culling of productive cows and heifers [17].

Diagnosis and prevention of abortion: Many times the reason for the loss is complex and difficult to diagnose [21]. Generally diagnosis of abortion in dairy cattle include history of the case and relevant epidemiological data, examination health and feeding records, careful examination of the affected dam, and collection of the expelled fetus and placenta for pathological and microbial examination. In addition to these, samples such as serum samples, urine, milk and vaginal swabs can also collect for analysis. The diagnostic rate in bovine abortions is very low due to the diverse range of pathogens involved, as well as the fact that factors affecting the dam, fetus and placenta may be involved [9,17]. Well-kept records can be very useful in the investigation of an abortion problem [4].

Eliminating causes and predisposing factors is the basis of treatment. In case of infectious abortion, hygienic management is important and vaccination is employed. Sound herd health management practices like biosecurity practices (quarantining purchased cattle or maintaining a completely closed herd, wear clean clothing and to disinfect footwear and any equipment), maintaining the general health & immune function and paying attention to health status of bulls have significant importance in preventing abortion problems [17].

Many diseases that cause abortion in cattle are caused by pathogens that can cause disease in people. Follow good biosecurity measures and use personal protective equipment such as latex gloves and a mask when handling the aborted fetus and materials. Use disinfectant or soap when washing after handling aborted materials [21].

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 [22]. 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 [23].

Uterine prolapse: Uterine prolapse 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 [16,21,24]. A uterine prolapse is usually seen immediately 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 [22]. Uterine prolapse is one of the most potentially dangerous complications associated with third stage of labour during calving of cow. A uterine prolapse can vary in size from about 18 inches to 3-4 feet in a large cow [25].

Risk factors: The cause of prolapse of the uterus is not clear, but there is no doubt that it occurs during the third stage of labour [1]. Various predisposing factors have been suggested for uterine prolapse in the cow. This includes hypocalcaemia, fetal traction, fetal oversize, retained fetal membrane and chronic disease [24, 26]. Conditions that cause abdominal pressure including tympany and excessive estrogen content in the feed, calving difficulty that causes injury or irritation of the external birth canal and severe straining during labor. Uterine prolapse may be avoided by reducing the predisposing factors [1,24,26].

Treatment: The prolapsed uterus washed carefully with warm saline. The fetal membranes are detached manually with fingertips from the maternal caruncles avoiding bleeding [1]. Then the uterine mass is again washed with saline and finally with 1:1000 potassium permanganate solution. Then, it replaced to its normal anatomical position. Rubbing the surface of the uterus with glycerol helps reduce edema and provides lubrication. An epidural anesthetic should be administered first. Then the uterus returned in to its normal anatomical position. To prevent further complications, intrauterine antibiotic treatment is also recommended [27]. Then the purse string suture with sterile cotton thread around anterior vagina could be performed.

The method of raising the rear end of the cow using a tractor was reported as a quick, easy and essentially practical method of dealing with a prolapse [26]. Uterine prolapse in cattle may be treated by reduction or amputation. The prognosis is grave, and it is doubtful if it can be justified on welfare grounds [1]. Euthanasia is the only option, where hemorrhage or other factors have resulted in a state of irreversible shock [28].

Vaginal prolapse: 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 [9]. Vaginal prolapse is more common than uterine prolapse, and typically looks like a pink bulge of tissue ranging in size from a large grapefruit to a soccer ball. The bulge often retracts when the cow gets up and pressure reduced. Prolapsed vagina exposed to environmental elements like dust, sun or manure and to potential infectious organisms [22].

Risk factors of vaginal prolapse, negative impact and prevention: 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 [29]. A vaginal prolapse occurs due to increased pressure in the abdominal cavity during the latter stages of pregnancy [27].

Vaginal prolapse are recurring problems [22]. 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. To help prevent vaginal prolapse, it is important to restrict cows from becoming overly fat during the last trimester of pregnancy [9,29].

Treatment: Although a vaginal prolapse is not in itself considered life threatening, it should be repaired as soon as possible. Once the vaginal tissue has prolapsed, the blood supply to the tissue is compromised. This leads to swelling, which makes it even more difficult to correctly reposition the exposed tissue [22]. If the prolapse increases in size, pressure is placed on the urinary passage, subsequently restricting the ability of the cow to urinate. The large urinary bladder further hinders the ability to reposition the prolapsed vagina. The vaginal tissue should be cleaned with warm water and disinfectant prior to placing it back into the animal to prevent irritation and/or infection. Epidural anesthetic and lubricant is used [1,27].

Once the tissue positioned correctly, several stitches can be applied around the vulva to keep the tissue in place. Near term, cows should be monitored regularly for signs of calving, as the stitches will need to remove to prevent calving difficulty. Once the cow has given birth, the increased abdominal pressure that caused the prolapse will no longer exist, so the stitches will no longer be needed [9,22].

Retention of the fetal membranes (RFM)

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 [30]. Retention of the fetal membranes comprises of failure of dehiscence and a lack of expulsion of fetal membranes within the

duration of physiological third stage of labour. 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 [31].

Retention of fetal membranes is one of the most common conditions occurring in dairy cows following parturition [31]. The incidence of Retention of fetal membrane is between 5 and 15 % in dairy cattle [27], but can be significantly increased when there is an increase in the number of twins, dystocia or in case there are certain infectious diseases such as bovine viral diarrhea [32].

Risk factor: There are a number of risk factors associated with retention of fetal membrane, including mechanical, nutritional, mangmental 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. Mangemental 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 [4,33,34].

4.3.2. Negative consequences: Retention of fetal membranes is a paramount risk factor for metritis and concomitant clinical diseases. Negative consequences related to retention of placenta are delayed uterine involution, increased time to first insemination, increased number of services per pregnancy, decreased pregnancy rates and increased days open. Furthermore, retention of placenta has been associated w ith a significantly increased risk to suffer from clinical diseases like metritis, endometritis, ketosis and even mastitis. Overall, this impaired situation brings costs to the farmer by decreasing fertility and increasing culling rates, while also a significant decrease in milk production has been mentioned in most but not all studies [32,35].

Treatment and preventions of RFM: Varieties of methods have used in the treatment of bovine RFM, although the efficacy of many of these treatments is questionable. Manual removal of the placenta remains a common practice despite numerous studies that fail to demonstrate a beneficial effect on reproductive performance. Manual removal can result in more frequent and severe uterine infections, when compared with more conservative treatment [36]. It is more likely that removal of an attached placenta causes damage to the endometrium and suppresses uterine leukocyte phagocytosis, both of which encourage bacterial invasion. In addition, it is difficult to ensure that the entire placenta has been removed, with necrotic portions left behind further contributing to bacterial invasion of the damaged endometrium [33].

Postpartum metritis is common sequelae of RFM, and the rationale behind antibiotics for RFM is to prevent or treat metritis and its subsequent negative effects on fertility. The use of intrauterine chlortetracycline found to be beneficial only in active cases of clinical metritis. Systemic antibiotics are believed to be beneficial in RFM cases [36].

The infusion of enzyme collagenase can be helpful in breaking the caruncle-cotyledon bond in RFM. Injection of 1-liter saline containing 200,000 IU of bacterial collagenase into the umbilical arteries of retained placentas caused earlier placental release than untreated contemporaries. If applied within 24 to 72 hours after calving, collagenase treatment shown to cause release of membranes in cows within 36 hours [31].

The most commonly used hormone products for treatment of RFM are prostaglandins and oxytocin. These products contribute to uterine contractions, and could therefore potentially be effective in treating RFM caused by uterine inertia [27,32]. Recently, new therapies have introduced without the use of antibiotics. The use of ozone gas is one of them. It has ability to inhibit the growth of microbes and fungi. The ozone gas has the ability of oxidative functions, which created by peroxides to destroy the microbes [33].

The control of retained placenta needs to focus on the control of risk factors like abortions, premature calving, calving difficulties, and vitamins and mineral deficiencies. Management objectives should consider as a way of preventing this disease. High producing dairy cows deal with severe physiological and immunological challenges and nutritional management in the prepartum period helps reduce other peri- and postpartum diseases. Evidence that decreases in immune function play important role in the mechanism of placental retention as well as supplementation of vitamin E and selenium in deficient cows reduces incidence of RFM, further highlight the importance of nutrition and stress management strategies [34,37].

Metritis

Metritis can be defined, as inflammation of both the endometrial and muscular layers of the uterus. Metritis is infection of the cavity, lining and deeper layers of the uterus. The deeper layers of the uterus are not affected by endometritis, so the uterus is not much bigger than that of a normal animal. It is most serious cases occur during the first 10-21 days post-calving and are sometimes referred to as toxic puerperal metritis [38,39]. Puerperal metritis is characterized by the presence of an abnormally enlarged uterus, a fetid watery red-brownish uterine discharge associated with signs of systemic illness and fever within 21 days in milk [40]. Affected animals are ill and exhibit varying degrees of depression, in appetence, and decreased milk yield [38]. Animals without systemic signs but with an enlarged uterus and a purulent uterine discharge within 21 days in milk may classify as having clinical metritis [40]. Metritis affects about 20% of lactating dairy cows, with the incidence ranging from 8% to >40% at some farms [41].

Risk factors and causes: Risk factors associated with metritis include dystocia, twins, retained placenta, stillbirth, abortion, prolapsed uterus, and ketosis [42,43]. The postpartum uterus is a good environment for bacterial growth because it is warm; fluid filled, and contains a variable amount of necrotic debris. Varieties of

bacteria had cultured from the uterus of postpartum cows. Infections commonly involve *Escherichia coli (E. coli), Trueperella* (formerly *Arcanobacterium pyogenes (T. pyogenes), Fusobacterium necrophorum (F. necrophorum), Bacteroides* species and *Prevotella melaninogenica (P. melaninogenica)* were isolated from cows with metritis. Mixed infections of *Fusobacterium* and *Bacteroides* species together with *Arcanobacter pyogenes* are common. These four main bacteria are believed to work synergistically to cause cases of persistent metritis and are associated with impaired fertility [41,43,44]. The role of viruses in uterine disease is relatively unexplored, although bovine herpesvirus 4 has been isolated from several outbreaks of metritis [40].

Negative effect of metritis: Economic losses occur due to decreased milk production, drug costs, milk withdrawal, impaired reproductive performance, and even death of the animal. Inappetent postpartum dairy cattle are also predisposed to develop a displaced abomasum; this is always a concern for producers and a common reason for seeking veterinary assistance. Veterinarians often feel compelled to try to do something for their clients and their animals in an attempt to reduce the severity of metritis and its sequel [38].

Diagnosis, prevention and treatment: Metritis can diagnose by a complete physical examination of the cow including attitude, hydration status, rectal temperature, and palpation of the uterus per rectum to evaluate uterine discharge. Cows diagnosed with metritis should be evaluated for concurrent metabolic or infectious disease (ketosis, displaced abomasum, mastitis, pneumonia, etc) since this conditions are associated [45].

Postpartum metritis commonly treated with antibiotics or hormones, alone or in combination [39]. The most common method of treatment is either intrauterine or systemic antibiotic administration. In more, severe cases, other symptomatic therapies such as anti-inflammatory agents and intravenous fluid therapy are also advocated [27]. For the treatment of metritis, different intrauterine therapies like antiseptics and antibiotics are infused into the uterus to eliminate the bacterial infection. The most routinely used intrauterine therapy is the infusion of iodine solution in water or saline and some advocated dextrose solution [39]. Systemic antibiotic therapies are reported to have many advantages. The drug withdrawal times are generally well established, better distribution inside the uterus, and they appears to have least harmful effect to the uterine environment [38]. Penicillin is one of the most preferred antibiotics for postpartum metritis because it penetrates into all the layers of the uterus, is less expensive, and most of the bacteria penetrating the endometrium-leading septicemia are responsive to penicillin [27].

Treatment with prostaglandins is very effective in evacuating the uterus by uterine contraction when Corpus Luteum is present in one of the ovaries. However, it is found that cows in early postpartum stage do not have a functional Corpus luteum, so their uses have a limited application. Prostaglandins can be useful when the cows are around 30–45 days in milk [39]. Ozone disrupts the cell membrane of the microorganisms and reported to diffuse through the protein coat of the nucleic acid of the viruses to kill them [33].

Metritis preventive approach definitely needs to include an early identification and treatment of cows with puerperal metritis in the postpartum period. Careful clinical examination of animals at risk is strictly necessary in order to detect affected animals in time. This should followed by a prompt and effective treatment. A correct nutrition during the dry off period and a normal calving process under hygienic conditions are the paramount factors in the prevention in risk factors [32,46].

Endometritis

Endometritis refers to inflammation of the mucus membrane of the uterus, with mucoid, muco-purulent to purulent discharge from the vulva that appears three weeks after parturition or later [40]. Postpartum endometritis of dairy cows continues to be a major cause of poor fertility and delayed conceptions. Two important types of endometritis have been recently recognized; the clinical and subclinical endometritis (with difficulty in diagnosing the latter [47]. Clinical endometritis is characterized by the presence of purulent (>50%) uterine discharge after 21 Days in milk or mucopurulent (50% pus, 50% mucus) after 26 days in milk, and affects about 20.0% of lactating dairy cows, with the prevalence ranging from 5 to >30% in some herds [43, 44, 45].

Subclinical endometritis is defined by the presence of >18% neutrophils in uterine cytology samples collected between 21 and 33 days in milk or >10% neutrophils between 34 and 47 days in milk, and is the most prevalent of all uterine diseases. It affects approximately 30% of lactating dairy cows, with the prevalence ranging from 11 to >70% in some herds. Subclinical endometritis is characterized by scanty exudates accumulated in uterus, resulting in complete lack of cervical discharge with pathogenomic property. These diseases have been associated with decreased pregnancy per artificial insemination (AI), extended interval to pregnancy, increased culling, and economic losses [32, 40, 43, 44, 45].

Risk factor and causes: Risk factors for endometritis include dystocia, twins, RFM, stillbirth, abortion, metritis, male, offspring, party, immunosuppression and ketosis [43,47]. *E. coli* increases the susceptibility of the endometrium to subsequent infection with *T. pyogenes* and, acts synergistically with *F. necrophorum* and *P. melaninogenica* to enhance the severity of uterine disease. Recent work has highlighted the importance of *E. coli* on the development of metritis and endometritis, especially the fact that it predisposes to infection with other pathogenic bacterium such as *F. necrophorum* and *T. pyogenes* increases the likelihood of developing metritis and endometritis, and decreases the likelihood of conception [41].

Diagnosis treatment and prevention: The diagnosis of clinical endometritis has been based on manual examination, vaginoscopy or ultrasonography. Under most clinical settings, presence of pus in the vaginal discharges or estrus mucus is considered sufficient evidence that the cow harbors infection [27]. In the diagnosis of Sub clinical endometritis is based on uterine cytology and ultrasonography. Most approaches utilizing uterine cytology for the diagnosis of subclinical endometritis differ in the cutoff percent of polymorphonuclear

leucocytes (PMNs) for establishing endometritis in cows at different days postpartum [47].

The principle of treatment for endometritis is to reduce the load of pathogenic bacteria, enhance uterine defense and repair mechanism, thereby halt and reverse inflammatory changes that impair fertility. Therapies advocated for endometritis include antibiotics and hormones. The principle of prevention is to optimize peripartum immune function, principally through management to encourage feed intake during the transition period. It has been stated that poor nutritional management of dairy cows particularly before and after calving leads to metabolic disorders, which predisposes the cows to gynecological disorders, thereby reducing reproductive efficiency [45,47].

Pyometra

Pyometra is characterized as the accumulation of purulent or mucopurulent material in the uterine lumen provoking a distension of the uterus, accompanied by the presence of an active corpus luteum. In pyometra, the cervix is often functionally closed, although its lumen is not always completely occluded, and some purulent material may discharge through the cervix, vagina or vulva [27,44]. Affected cows show no systemic signs of illness, but are infertile. The diseases are associated with reduced reproductive performance, reduced milk production, milk withdrawal and increased costs for treatment leading to economic losses. Pyometra accounts for 2%-5% of the clinical cases of uterine diseases in dairy cows [8].

Risk factors and cause: In most cases, pyometra develops as a consequence of endometritis because the postpartum animals with this problem ovulate and develop pyometra due to the presence of active corpus luteum. Therefore, the early postpartum ovulation may predispose the animals to this condition due to the presence of several kinds of bacteria like Gram-negative anaerobic bacteria (especially *Fusobacterium necrophorum* and *Bacteroides species*) and *Actinomyces pyogenes* remain in the uterus, whereas post service pyometra is due to *Trichomonas foetus,* a flagellate protozoan which colonizes in the uterus. It does not prevent fertilization but causes embryonic death at early stages of gestation, sometimes early embryonic death is followed by pyometra and persistent corpus luteum [48].

Diagnosis and treatment of pyometra: The diagnosis of pyometra can be done by rectal palpation and/or ultrasound. Pyometra is sonographically (ultrasound) characterized by mixed echodensity fluid in the uterine lumen with distension of the uterus, and a corpus luteum in an ovary [44]. Treatment is based on the injection of two doses of PGF2α with an interval of 11 to 14 days between the applications, with a fair rate of healing. The prognosis after PGF2, treatment is generally favorable, with a first service conception rate of approximately 30% and an expected pregnancy rate of 80% after three or four inseminations [36]. Evacuation of the uterus contributes to the success of further antibiotic therapy, which can done by repeated palpations of the uterus by the veterinarian and the use of hormones to expel the fluid or hasten the onset of estrus. When fluids are expelled, the effectiveness of antibiotics in clearing the remaining infection is improved [48].

Dystocia

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. 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 is dystocia. Depending on the degree and type of dystocia, it can result in a weakened/dead calf and injury or death to the dam [9,49].

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 [50]. Internationally, reported prevalence of dystocia in dairy cattle of severe or considerable difficulty in calving varies from just below 2% to over 22% internationally [4]. Maternal dystocia occurs less frequently than fetal dystocia and has recorded 85.5% of fetal dystocia and 14.5% maternal. Dystocia is more common in primipara than multipara and in male than female calves [24].

Risk factors of dystocia: Although there are many management and genetic factors that affect the incidence of dystocia in the cowherd, the most significant cause of dystocia is maternal/fetal disproportion [4,49]. 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 [1,9].

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. Primary uterine inertia that is due to excessive stretching is common in multiple pregnancies in cattle. Secondary uterine inertia is due to exhaustion of the uterine muscle secondary to obstructive dystocia [50]. Delivery may 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 maldisposition). Thus, fetal dystocia is reviewed according to fetal oversize and fetal abnormalities [1,51].

Sequelae of dystocia: The consequences of dystocia are numerous, and will depend upon the severity. Firstly, there are the financially unquantifiable effects on the welfare of dam and offspring. Secondly, there are the quantifiable financial consequences [1]. Dystocia results in: increased stillbirth rate and mortality of the offspring, increased neonatal morbidity, increased mortality rate for the dam, reduced productivity of the dam, reduced subsequent fertility and increased,

chance of sterility increased likelihood of puerperal disease in the dam and increased likelihood of culling. The biggest single economic loss is due to stillbirth and early calf mortality [1,4]. In order of descending financial importance, dystocia impacts production (41% of costs), fertility (34%) and cow and calf morbidity and mortality (25%), excluding costs associated with increased culling, veterinary costs and other management costs. Production losses are greatest in high yielding cows and in early lactation [50].

Diagnosis and prevention: The diagnosis of dystocia is frequently based on a high degree of subjectivity, since there are situations that one person will consider to be normal, but another will consider difficult [1]. Diagnosis should include inquiring of stock keepers about the number of times delivery, time that has passed since delivery , time that has passed since delivery, the prescence or absence of discharge of fetal fluid and actions that hve been taken to relieve dystocia. If long time has passed since dilvery on set the general condation of the dam shuold be examined carefully [9,27].

Disinfected fingers are inserted slowly thuogh brith canal to check for injuries, the degree of dialation of the cervix, states of fetal sac and fetal presentation and postion. The procedure include preforming reposation and assisting delivery if the cause is faulty fetal dispostion. When infeasible and when the cause is fetal gigatism and malformation , cesareean section is perfomed. When the fetus is dead, thefetus is delivered by means of fetotomy [9].

In order to prevent and treat dystocia one must know history of previous occurrences of difficulty calving for each animal, such as any previous zoonotic diseases which caused an early abortion and current gestation length and the length of time that the animal has been in labor are early predictors of dystocia. If heifer or cow exceeds an adequate amount of time for the first two stages of labor, then the dairyman should examine the animal. Since heifers are new to calving, they should be allowed longer time to give birth [4].

At the dairy industry level, control of dystocia is dependent upon genetic selection programmes with adequate weighting for calving ease and farmer education. At the herd level, control of dystocia is dependent upon specific sire selection, heifer growth, per parturient management and veterinary led investigation of high dystocia prevalence herds. At the animal level, control of dystocia is dependent upon periparturient management and the adequacy of obstetrical assistance [50].

Repeat breeder

One calf by cow and 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 [52].

According to Souza et al. [53], Repeat breeder (RB) has been defined as failure to conceive from three or more regularly spaced services in the absence of detectable abnormalities. Repeat breeder females return to service repeatedly after being bred with a fertile male. These cows exhibit normal signs of estrus every 18 to 24 days but require more than 3 services to become pregnant [34,54]. According to Katagiri [55], the syndrome is 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.

Negative aspect: The repeat breeder causes great economic losses for dairy farmers. The costs of herd management and rearing are increased by increment of expenses of unsuccessful frequent artificial insemination, extended length of the days open as well as culling and replacement of those cows that can't conceive. Additionally, treatment of the repeat breeding with antibiotics and hormones increases the expenses beside its public health hazard and its inconsistent results [53,56]. Repeat breeding is one of the major infertility problems of herds. The incidence of repeat breeding in dairy cows, worldwide, ranges from 3 to 10% [57,58].

Risk factors: Causes of infertility in RB cows are usually unclear, but probably include management, environmental and animal factors [55]. 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 [53,56,59]. Factors such as quality of semen and insemination technique, endocrine disorders, ovulation failures, and early embryonic death also cause repeat breeding [54,59]. Therefore, RB may involve a combination of many factors, such as genetic factors, abnormalities in the gametes, nutritional disorders, even inadequate luteal function [52]. It is expected that some other variables can affect the appearance of RB animals; especially those related directly to the cow, such as their parity degree, type of parturition and the season of calving [53].

Diagnosis and treatment: It is necessary to diagnose the etiology of reproductive failures (repeat breeding) in cows having an apparently normal clinical history and then, reduce the economic impact. First, a complete clinical history should be obtained at herd and individual level. Age, parity, milk yield, previous diseases, reproductive indexes, estrous cycles characteristics, insemination schedule, bulls, estrus detection, hormones, food and farm hygiene should registered. Now, anatomy, morphology and function of cows should be inspected. Sexual behavior must be evaluated to detect disorders, as muscle or claw lameness. Similarly, it is necessary to examine the behavior of bull and bull-cow interactions when natural breeding is carried out. Vulva, vagina, cervix, uterus, fallopian tubes and ovaries must be evaluated to diagnoses reproductive defects [52].

To reduce the negative effects of repeat breeding on the farm profitability, an effective therapy must be established after a proper diagnosis. Several different strategies for RB treatment have been reported [54]. Nutritional supplements have used to restore certain imbalances at herd level. Hormonal treatments, with GnRH, exogenous gonadotrophins and prostaglandins, have been traditionally used [52].

Anoestrus

Oestrus 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 estrus expression at an expected time [1]. According to Opsomer et al.[60], anoestrus is in fact a very broad term indicating the lack of typical estrus 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.

Animals remain anestrus 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 maceration and mummification [61].

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 [62].

Causes and negative impact of anoestrus: Anestrus, leads to economic losses through increased inter calving interval, poor net calf crops, production loss, treatment expenses and cost of replacing mature animal with first calving heifer [63].

Anestrus 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 [61].

Diagnosis will be based on the anamnesis, a general clinical examination, and an accurate gynaecological examination based on rectal palpation of the ovaries and the tubular genitalia, eventually aided by a vaginoscopical examination. Although rectal palpation is a valuable and cheap technique, more accurate techniques such as ultrasound imaging or progesterone analysis in milk or blood are required [62].

Diagnosis and treatment: Anestrus can be treated according to their cause, however; there is no single panacea to correct it. Various therapeutic agents including hormonal and non-hormonal compounds have been used extensively for the restoration of cyclicity in anestrus cattle and by several workers with varying degree of success. In order to ensure effective treatment, the health and nutritional status of the animals must be in good conditions. Besides deworming, the supplementation of vitamins, minerals and antioxidants in feed are useful to improve health status of the animals [61].

Status of Some 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 [10,64]. Reproductive disorders are one of the most important problems that affect the production and productivity of dairy cows in Ethiopia [65].

Reproductive disorders of dairy animals studied broadly throughout the world. However, studies in Ethiopia are limited to few areas and farming systems mainly focusing to towns and their peri-urban areas of central highlands and some parts of Eastern and

Table 2: Summary of overall prevalence of major reproductive disorders of dairy cows in Ethiopia

Study area	Overall prevalence (%)	Study type	Source
In and around Kombolcha town	40.3	Semi structured questionnaire interview	[69]
Debre Zeit town Central Ethiopia	44.3% (retrospective data) 33.6% (regular follow up)	Retrospective data analysis, survey	[70]
In and around Asella town	18.3%,	A cross sectional	[11]
Borena zone	47.7%	A cross-sectional	[12]
Urban and Per urban areas of Hossana town	43.07 %	Cross-sectional	[10]
Bako Agricultural Research Center	35.2% (cumulative incidence)	A prospective follow up	[69]
Mekelle City	25.44%	Questionnaire survey	[66]
WolaitaSodo Town	35.5 %	Regular follow up	[71]
Horro Guduru	39.5%	Questionnaire interview	[72]
In and Around Chencha Town	32.5%	The cross-sectional type	[73]
Bishoftu town	30.1%	A cross sectional study	[74]

Northern parts of the country [10]. Moreover, information from these studies has not yet compiled into figures that indicate the extent of reproductive disorders of dairy cows in Ethiopia [65].

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 [10,11,14,66,67].

Cross-sectional and prospective study conducted by Bassazin et al. [14] on major reproductive health problems of 384 dairy cows in Gondar town has shown that 44.7% of the observed cows were affected with one or more of the reproductive health problems of which anoestrus, repeat breeding and dystocia are major ones. A study conducted by Dinka [11] showed that 18.3% of dairy cattle have affected by either one or more reproductive disorders based on questionnaire interviews in and around Assella in Central Ethiopia. Another study conducted by questionnaire and observational survey in urban and per urban area of Hossana indicated that 43.07% of prevalence on major reproductive health problems of dairy cattle [10]. Tesfaye and Shamble [68] reported a prevalence of 40.3% at Kombolcha town in Notheast Ethiopia, with major clinical reproductive health problems of clinical mastits, abortion and dystocia. A prospective follow up study in Bako Agricultural research center, East Wollega Zone of Oromia National Regional State indicates that cumulative incidence of clinically observed major reproductive problems was 35.2% [69]. These and other studies in Ethiopia show that reproductive health disorders are common problems of dairy cattle with relatively high overall prevalence (Table 2, 3).

Conclusion and Recommendations

Regular breeding depends upon the normal function of the reproductive system. These normal functions are negatively affected by reproductive health disorders. Reproductive health disorders are the factors that affect reproductive function of cow by leading to poor performance or reproductive efficiency. Some of the reproductive health problems that have impact in reproductive efficiency and economy include abortion, metritis, endometritis, pyometra, and retention of placenta), prolapse (vaginal and uterine), dystocia, anoestrus and repeat breeder. These problems are difficult to diagnose by one particular disorder or symptom because there are interrelation between predisposing factors and problems themselves are interrelated. There are different predisposing factors, and some of them are environment, management, nutrition, diseases and mechanical. Negative impact of these factors related to decreasing or diminishing reproductive efficiency of dairy cattle by increasing calving interval, the number of days open, involuntary culling animal, loss of animal, cost of treatment, low milk production. In addition to these, some of the diseases related to reproductive health disordered have public importance. Postpartum uterine disease is the leading cause of reproductive inefficiency in dairy cattle. To reduce the negative effects of reproductive health on the farm profitability, an effective therapy must establish after a proper diagnosis and application of preventive strategies have very great importance. Regarding to Ethiopia, the studies related to these problems are few and limited to urban and peri-urban regions only. However, the

Table 3: Summary of commonly identified reproductive disorders of dairy cows in some of studies in Ethiopia

Disorders	Studies and Respective prevalences									
	[68]	[10]	[69]	[12]	[70]		[75]	[74]	[72]	[73]
					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%
Endometrits	-	-	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%

available studies strongly suggest that reproductive disorders are common problems of dairy cow. More over information from these studies has not been sufficiently compiled into figures that indicate the extent of reproductive disorders of dairy cows in Ethiopia.

Based on the above conclusion the following recommendations are forwarded:-

- Creating awareness of farmers about the causes, risk factors, prevention methods as well as public health importance related to reproductive health disorders is important.
- Owners of dairy farms need to work closely with veterinarians to reduce reproductive health problem by routine and periodical examination of cows during postpartum and prepartum period.
- Further studies are required on the occurrence, cause and risk factors of reproductive health problems, and the data generated thereof should be complied to provide overall picture of the problem at national level.
- Future studies should include the house hold dairy farms especially in rural areas of Ethiopia, because more livestock is kept at rural area
- Formulation and application of good control and prevention strategic procedure at farm level such as vaccination for some infectious diseases that causes reproductive problems, biosecurity (practicing good sanitations) and early diagnosis of any failure in reproductive efficiency is needed.

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