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Review on Prevalence and Associated Risk Factors of Bovine Mastitis in Ethiopia

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Abstract: Bovine mastitis is a major challenge in the dairy industry, known for its severe economic impact. It causes inflammation of the udder, presenting as either clinical or subclinical forms, with symptoms including abnormalities in milk and udder tissue. This review aimed to explore the causes, effects and management strategies for bovine mastitis, with a focus on the situation in Ethiopia.The disease is primarily caused by various bacteria and is influenced by factors such as management practices, herd size, bedding, milking methods, breed, age, lactation stage, milk yield, hygiene, udder position and tick infestations. Mastitis reduces milk production and quality, experiences high veterinary costs and raises concerns about antibiotic residues and zoonotic disease transmission. Milk from infected cows may be risky for human consumption. Diagnosis involves physical exams and laboratory tests, while treatment should address the specific bacteria. In conclusion, effective management includes good husbandry, sanitation and teat disinfection, treating during non-lactating periods and culling chronically infected cows.

Key words: Bovine · Mastitis · Udder · Milk · Risk Factors

INTRODUCTION

Ethiopia is in the tropical region and livestock production represents a major national resource and forms an integral part of the agricultural production system and livelihood of the society. The country's economy is highly dependent on agriculture, which involves crop and livestock production in the highland areas and mainly livestock production in the lowland areas [1].

The country has Africa's largest livestock population, with approximately 65 million cattle [1]. This sector is crucial to the Ethiopian economy, providing food, income, services and foreign exchange. It contributes 16.5% to the total GDP and 45% to the agricultural GDP [2, 3]. Additionally, it generates 12–15% of total export earnings, making it the second most important export sector [4]. However, milk production frequently falls short of meeting national needs due to various factors [2]. It is a complex, multifactorial disease resulting from interactions between the animal, pathogens and environmental and management conditions [6, 7]. Mastitis can present with either visible symptoms, known as clinical mastitis (CM), or without visible symptoms, known as subclinical mastitis (SCM). This disease is a significant issue that impacts farmers by decreasing their dairy production and income [8].

Mastitis is one of the most predominant and significant production diseases affecting dairy livestock globally [6]. The disease causes milk wastage due to contamination by pathogens, the use of antimicrobials, or changes in milk appearance, as well as, additional costs related to treatment. It also contributes to premature culling, diminished milk quality, increased expenses for prevention and health issues related to the disease and its zoonotic risks [9-11].

Integrating both field and clinic-based studies isessential to formulate evidence, rigorous and systematic disease control and prevention strategies for any disease. Despitethe economic and public health importance of mastitis, reliable information on mastitis is scarce in Ethiopia and is the focus of this review. Therefore, the objective of this review was to spot the lights on the prevalence and associated risk factors of bovine mastitis in Ethiopia.

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Definition of Mastitis: The term mastitis largely refers to an inflammation of the mammary gland, regardless of the cause. The classic meaning of the word mastitis is derived from the Greek word “Matos “meaning breast or udder and the suffix“itis”meaning inflammation. It is defined by physical, chemical and bacteriological abnormalities in the milk, as well as pathological changes in the udder glandular tissue. It is also known as mammary gland inflammation, which is caused by bacteria and their toxins. A potentially fatal mammary gland infection is most common in dairy cattle worldwide. It is a disease that is known to cause the greatest loss to the dairy industry [12].

Etiology: There is a large cohort of microorganism species that are known to cause mastitis. These range from viruses, mycoplasma, fungus and bacteria. Non-infectious agents are also involved in bovine mastitis development [13].

Bacterial Cause: The most important major pathogens involved in bovine mastitis worldwide are *Staphylococcus aureus, Streptococcus uberis, Streptococcus dysgalactiae, Streptococcus agalactiae, Escherichia coli and Klebsiella spp.*These bacteria can cause clinical mastitis, udder tissue damage and long-term or chronic subclinical infections. The major bacteria can be split into two categories:those that are cow-associated (or contagious) and those thatare environmental in origin. The cow- cow-associatedbacteria are *S. aureus* and *S. agalactiae,* while the main environmental bacteria are *S. uberis, S. dysgalactiae* and *coliforms*[13].

***Staphylococcus* spp:** Staphylococcus spp. is a Gram-positive bacteria that are common causes of mastitis. Within the mastitis diagnostic, Staphylococcus spp. is often divided into coagulase-negative (CNS) and coagulase-positive (CPS) staphylococci. S. aureus is a CPS and one of the most common causes of mastitis. This species is contagious and can cause everything from subclinical to severe clinical mastitis. Coagulase-negative staphylococcus consists of a large group of different species that commonly cause subclinical or mild clinical mastitis[14]. *S. hyicus* and *S. epidermises*are the most common CNS in subclinical mastitis [15].

***Streptococcus* spp.:** *Streptococcus spp*. is a genus of gram-positive bacteria where *S. dysgalactiae, S. agalactiae* and*S. uberis*are the most important mastitis pathogens [16].

***E. coli* and *Klebsiella* spp:** *E. coli* and *Klebsiella* spp. are gram-negative bacteria that often cause severe acute clinical mastitis, although the development of mild and moderate clinical mastitis is also common and subclinical infections can occur [17].

Viral Mastitis: Viruses are isolated from cows affected with bovine mastitis, although they are not regarded as common etiological factors. Some viruses, such as b*ovine* herpes virus (BHV), foot-and-mouth disease virus and *parainfluenza3*, have been associated with clinical bovine mastitiswithout the isolation of bacterial pathogens [18].

Fungal Cause: Fungal infection of bovine mammary tissue is attributable to superinfection by certain fungal species as a consequence ofa strict mastitis control program that rendersnatural udder immunity quiescent. Contamination of teat dips, intramammary infusions and moldy surroundings playa significant role. The important mycoticmastitis pathogens are *Aspergillusfumigatus* and *Candida albicans* [6].

Other Causes: Conditions that affect the milking process will increase the milking time and may predispose theudder to mastitis. Milk machine faults areresponsible and the severe forms can predispose to mastitis and/or the development of black spot. Injury and bruising are non- infectious mastitiscauses [19].

Epidemiology

Occurrence: Epidemiological aspects of mastitis depend on a balanced interaction between the host and its microbiota, which may contain microorganisms ranging from probiotic to potentially infectious [21].

In most countries, surveys of the incidence of mastitis, irrespective of cause, show comparable figuresas about 40% morbidity rate amongst dairy cows and a quarter infection rates as measured by an indirect test of about 25% [6]. On anannual basis 3 of every 10 dairy cows have clinically apparent inflammation of the mammary gland of the affected cattle, 7% are culled and 1% dies as a consequenceof the disease [22].

Transmission and Source of Infection: Depending on the causative agent, mastitis in cowscan be categorized into three main types: Contagious, Environmental and Summer Mastitis [23].

Contagious Mastitis: It is caused by bacteria living on the skin of the teat and inside the udder. Contagious mastitis

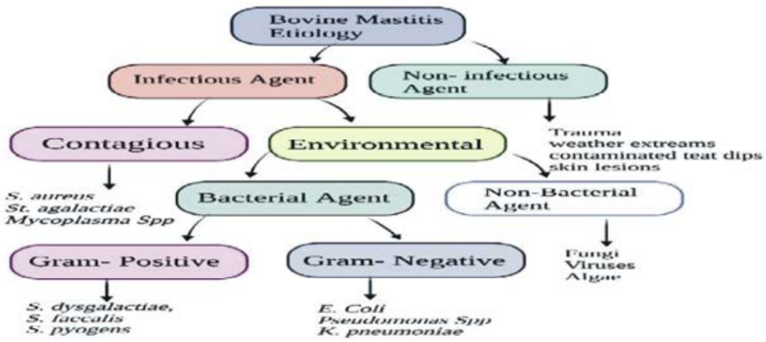

Fig. 1: Causative agent of mastitis [20]

is sometimes referred to as cow-to-cow mastitis because it is generally spread from cow to cow[24]. The primary habitat of bacteria causing contagious mastitis is on the udder and in teat lesions. These bacteria have poor survival in the environment when not associated with the skin or in the gland [25].

Environmental Mastitis: Environmental Mastitis is sometimes referred to as environment-to-cow mastitis. It is caused by organisms such as Escherichia coli which do not normally live on the skin or in the udder but which enter the teat canal when the cow encounters a contaminated environment. The pathogens normally found in feces bedding materials and feed [23].

Summer Mastitis: A third type of mastitis, referred to as summer mastitis, is an acute illness of dry cows and heifers, which causes extensive and painful damage to the udder. The infected quarter is permanently damaged, resulting in the early culling of the cow. Infection is more likely to occur when cows are in an environment where the teats can easily be exposed to damage and high fly populations. The clinical signs of summer mastitis are a hot, hard and swollen quarter in association with a thick secretion characterized by a foul smell [27].

Associated Risk Factors: There are plenty of/abundant predisposing factors that can impact the development of mastitis at individual and herd levelsin dairy cattle. The factors may be physiological, hereditary, pathological, or environmental (Many factors influence the incidence of mastitis, such as the production stages of a cow, lactation number, herd management, husbandry environment temperature, humidity, seasons, breeds and milking characteristics [28].

Host Related Risk Factors: For contagious pathogens, adult lactating cattle are most at risk for infection, either while lactating or during the dry period. Stage of lactation is one of the intrinsic factors that determine the level of infection. Particularly, the early stage of lactation is more prone to mastitis occurrence than the remaining stage of lactation. Age of cow is also a factor that is associated with the case of mastitis where commonly aged cows are more liable to mastitis than others [29].

Parity**:** Parity has a direct relationship with mastitis occurrence. The presence of mastitis increases with increasing parity number. The likelihood of mastitis is higher in multiparous cows having more calving compared with primiparous cows. This might partly be associated with the position of the udder in older cows that let exposure of the teat and udder to injury and pathogens easily so that makes it to be the most Susceptible one to mammary infections [30].

Breed**:** Breed of a cow is also another factor that determines presence or absence as well as the level of mastitis. Mostly high high-producingcows are more exposed to mastitis than low-level milk producers [31]. Studies conducted in Ethiopia generally show an increasing trend in the prevalence of Mastitis with increasing exotic blood levels. Accordingly, the prevalence is the highest in pure breeds, followed by crosses and indigenous zebu wasless frequently affected than others. The increase in prevalence in exotic breeds as opposed to local indigenous zebus could be because the indigenous zebu are low in milk production and higher-yielding cows are more susceptible to Mastitis [6].

Lactation stage**:** Stage of lactation affect Mastitis prevalence significantly as research conducted in Ethiopia implies. Early stage and the period of involution (late stage) of the mammary glands were the most susceptible stages. This is possibly due to absence of dry cow therapy regime that is considered major factor contributing to high prevalence at early lactation [6].

Milk Yield: A high 305-day previous-lactation milk yield was a significant risk factor for early lactation clinical mastitis and high yields increased the mastitis rate in low-bulk milk somatic cell count herds. A high milk protein content at the last milk test day before drying-off was found to be a risk factor for early lactation CM. This may reflect higher energy supplies to the udder and lead to delayed involution of the udder tissue. Cows with a fat to protein ratio of >1.5 at the first test-day after calving had higher risks for clinical mastitis and other production diseases [32].

Age of Cows: Studies conducted in different partsof Ethiopia by different authors indicated that age is considered as a potential risk factor to the prevalence of mastitis. As the age of the cow advances, the prevalence rate becomes higher (older cows were more affected by mastitis than younger cows), with prominent statistical variation ($P<0.05$) [33].

Pathogen Related Risk Factors: Includes bacterial viability, colonizing ability and susceptibility to antibiotics. Bacteria viability means the ability of the organism to survive in thecows' immediate environment, that its resistanceto environmental influence including cleaning, disinfection procedures is characteristics of eachspecies of bacteria. The causes of contagiousmastitis are relatively vulnerable to the externalenvironment than the cause of environmentalmastitis. Colonizing ability means the ability ofthe organism to colonize the teat duct, then toadhere to mammary epithelium and set up a mastitis reaction. Susceptibility to antibiotics means inherent or acquired resistance to antibioticstherapy, usually due to excess exposure to theAgent [6].

Management and Environmental Factors: Previously identified environmental and farm management risk factors that have a significant rolein the occurrence of bovine mastitis includedincreased herd size and number of lactating cows, intensive or semi-intensive rearing system, cow hygiene, poor farm hygiene and inappropriate and Milking techniques [34-36].

Nutritional Status: Under nutrition, reduced plasma levels of micronutrients, including zinc and vitamin A and antioxidants including selenium and vitamin E are associated with subclinical mastitis. Limited availability of the same antioxidants is a known risk factor for clinical and subclinical mastitis in dairy cattle. Dairy cows produce more milk than needed for their offspring and as a result, major nutritional imbalances can be observed, particularly at the onset of lactation, leading to a higher risk for mastitis. Cows around parturition and during early lactation often experience a negative energy balance. This status is caused by a reduced dry matter intake and increased energy expenditure in fetal growth and milk synthesis [37].

Pathogenesis: Inflammation of the mammary gland predominantly occurs via the teat canal except in the case of tuberculosis, leptospirosis and brucellosis, where the method of spread may be hematogenous. The development of mastitis can be explained in terms of three stages: invasion, infection and inflammation. The invasive stage refers to the time in which pathogens move from the teat end to the milk through the teat canal. The infection stage is the stage in which the pathogens multiply rapidly and invade the mammary tissue. The stage of inflammation is the stage with varying degrees of clinical abnormalities of the udder and with systemic effects from mild to per acute as well as gross and subclinical abnormalities of the milk [6].

The inflammatory response is initiated when bacteria enter the mammary gland and this is thebody's second line of defense. These bacteriamultiply and produce toxins, enzymes and cell-wall components, which stimulate the productionof numerous mediators of inflammation byinflammatory cells. The magnitude of theinflammatory response may be influenced by thecausative pathogen, stage of lactation, age, immune status of the cow, genetics andnutritional status [38].

Neutrophil leukocytesand phagocytes move from the bone marrow towards the invading bacteria and are attracted in largenumbers by chemical messengers (chemotacticagents) from damaged tissues. Masses of Neutrophil leukocytes may pass between milk-producing cells into the lumen of the alveolus, thus increasing the somatic cellcount (SCC) as well as damaging secretary cells. Somatic cells consist mainly of whiteblood cells [38].

Clinical Signs: Inflammation of the affected mammary tissue is characterized by gross abnormalities in the udder (swelling, heat, redness and pain). Persisting inflammation leads to tissue damage and the replacement of the secretory tissues with nonproductive connective tissues. There are changes in composition and appearance of milk. Abnormalities in milk may include flakes, clots, or a watery appearance [39].

Subclinical Mastitis: It is characterized by change in milk composition (SCC, leukocytes and epithelial cells, changes in milk pH and ion concentration) with no clinical signs of gross inflammation or milk abnormalities. In healthy lactating mammary gland, the milk SCC is often 1, 000, 000 cells/ml of milk during subclinical mastitis. The major factor affecting the SCC at the herd and individual level is the presence of intramammary infections (IMI). Chronic mastitis: It is an inflammatory process that exists for months and may continue from one to the other. It exists as subclinical but may exhibit periodical flare-ups sub-acute or acute form that last for a short period [27].

Clinical Mastitis: It is characterized by the presence of gross inflammation signs (swelling, heat, redness, pain). That is by visual clots or discolorations of the milk, often in combination with tender and swollen udder, sometimes in combination with fever, loss of appetite etc. Clinical mastitis can again be divided into Peracute mastitis which is characterized by gross inflammation, reduction in milk yield and changes in milk composition, Systemic signs like fever, depression, shivering and loss of appetite and loss of weight; Acute mastitis that is like per-acute mastitis but with lesser systemic signs like fever and mild depression and Sub-acute mastitis, the mammary gland inflammation signs are minimal and no visible systemic signs[6].

Diagnosis

Physical Examination of the Udder: Udder is examined for visible abnormalities, symmetry, size, consistency, presence of lesions and/or ticks. Clinical Mastitis isrecognized by some pathology in the udder, which is manifested by signsof inflammation like swelling, pain, redness and heat in the case of acute Mastitis. Whereas, hardening of the udder, blockage of the teats, atrophy or fibrosis and abscess formation are manifested in chronic Mastitis. Acute Mastitis is also recognized by a change in milk color and, presence of flakes and clots [40].

Measurement of pH: Normal milk has pH between 6.5 and 6.7. This figure approximates to that of the blood (7.2-7.4) when infection is present that it tends toward alkalinity with the use of reagent sodium hydroxide [41].

CaliforniaMastitis Test (CMT): The California Mastitis Test (CMT) is performed according to the manufacturer's instruction. In brief, a small sample of milk (approximately ½ teaspoon) is collected from each quarter into a plastic paddle that has 4 shallow cups marked A, B, C and D. An equal amount of CMT reagent is added to the milk and the paddle rotated to mix the contents. After approximately 10 seconds, the score is read while continuing to rotate the paddle. Results are recorded as T (trace), 1, 2 or 3 based on the level of precipitation coagulation [42].

Somatic Cell Count (SCC): The determination of SCC is widely used to monitor udder health. SC is normal Constituent of milk and only when they become excessive indicates the problem. When combined with bacteriological culture results the factor of great importance can be determined. When SCC is elevated, they consist primary leucocytes. During inflammation the major increases is SCC because of the influx of PMN into milk. The count in a healthy udder quarter of the cow should be fewer than 100, 000 cells/ml [38].

Bacteriological Examination of Milk: The laboratory procedure of inoculating standard volume of hygienically collected milk agar culture medium has been the standard diagnostic method for bovine mastitis. The resulting bacterial growth is observed, quantified and tested. In fact, use of milk culture is wide spread as a measure of determining udder health status. It has become the definitive standard diagnostic test [6].

Treatment: Treatment of mastitis should be targeted towards the causative bacteria whenever possible, but in acute situations, treatment is initiated based on herd data and personal experience. Rapid or on-farm bacteriological diagnosis would facilitate the selection of the most appropriate antimicrobial. Treatment protocols and drug selection for each farm should be made by veterinarians familiar with the farm.Treating subclinical mastitis with antimicrobials is generally not economical during lactation because of high treatment costs and poor efficacy [43].

Treatment is possible with long-acting antibiotics, but milk from such cows is not marketable until drug residues have left the cow's system. Antibiotics may be systemic (injected into the body), or they may be forced upwards into the teat through the teat canal (intra-mammary infusion). Cows being treated may be marked with tape to alert dairy workers and their milk is siphoned off and discarded. Vaccinations for mastitis do exist, but as they only reduce the severity of the condition and do not prevent new infections, they should be used in conjunction with a mastitis prevention program [44].

Treatment of per acute mastitis includes: stripping the gland frequently to remove organisms and toxins (at 1 or 2 hr. intervals), injecting oxytocin to facilitate milk letdown, IV infusion or oral administration of fluids, administration of anti-inflammatory drugs, analgesics, antipyretics (given systemic) and/or antibiotics (systemic or intra mammary) [44].

Treatment of acute mastitis includes: stripping frequently, administration of antibiotics (systemic or intramammary), administration of fluids if needed and administration of anti-inflammatory drugs, analgesics and/or antipyretics.Treatment of subacute mastitis includes intramammary antibiotic infusion and stripping the gland (after oxytocin injection) [45].

Dry Cow Therapy: Administration of specially formulated dry cow treatments will help to prevent new infections during the dry period and will eliminate many existing infections present at drying off. Dry treatment is more effective in eliminating infections than lactating treatment. During the first 2 weeks and the last 7-10 days of the dry period, cows are very susceptible to becoming infected. When cows are not dry treated, spontaneous cures have been very low. Dry cow antibiotic treatment is very cost-effective[46]. When a cow is dried-off, treat all quarters with a commercial dry cow product. To dry off, cows must be milked out completely, teats dipped in post-milking teat dip and blotted dry after 30 seconds contact time. Scrub teats with alcohol pads before partially inserting tube into teat (one-eighth inch). Teat dip again after treatment. Turn cows into a clean, dry environment [47].

The decision to treat all cows at drying off in contrast to treating selected cows during lactation is influenced by the type of organism causing the mastitis and the extent of the problem in the herd. Acute mastitis, such as that caused by coliform bacteria, endangers the cow’s life and requires the immediate attention of a veterinarian. Milking the affected quarter every 2-3 hours helps to eliminate toxins [48]. Treatment of clinical mastitis limits the duration and possible spread of the disease. When an antibiotic treatment is recommended, it is very critical to follow instructions, especially regarding the duration of treatment. Subclinical mastitis (high SCC in milk) should not be treated with antibiotics during lactation and they are treated at the time of drying off [45, 47].

Control and Prevention: Doing improved milking procedures like milk clean, dry teats, keep liner slips to a minimum, teat dip with an effective germicidal teat dip and maintain the milking system. Eliminating infections by treat all quarters of all cows at drying-off with antibiotic products specifically designed for dry-cow therapy and cull chronically infected cows. To prevent Environment by Keep the cow environment as clean and dry as possible, prevent cows from having access to manure, mud, or pools of stagnant water, knowingthat the dry-cow environment is as important as the lactating-cow environment, keep the calving area clean and properly design and maintain free stalls. Culling cows for mastitis is effective in eliminating mastitis in the herd. Cows that have been treated many times in a single lactation are prime candidates for culling because they may no longer be profitable as aresult of discarded milk and antibiotic costs. Carrying out preventive mastitis control procedures and culling only old, chronic cows is usually more profitable than trying to control mastitis by routine culling [49].

Prevalence of Bovine Mastitis in Ethiopia: Bovine mastitis remains a major prevalent disease in cattle and places a significant economic burden on the global dairy industry. The prevalence of bovine mastitis that were studied in different part of Ethiopia are indicated in the following table.

Impact on Economy: Mastitis is a worldwide problem highly affecting animal health, quality, quantity and the economics of milk production. It has been known to cause large losses in productivity and it can cause huge financial losses due to its impact on quantity and quality of milk yield, veterinary expenses, condemnation of milk due to antibiotic residues, culling of mastitis cows at an early age and occasional deaths [50]. Bovine mastitis is regarded as one of themost economically damaging diseases in the dairyindustry globally [51, 52].

Mastitis costs are also classified into two maincategories: Those occurring directly and indirectly [53]. Directcostsconsist of veterinary services, diagnostics, treatments, additional labor requirements anddiscarded milk (duringtreatment). Direct costs are defined as those that are not always obvious to the milk producer, also known as hidden costs. Indirect losses due to subclinical mastitis (SCM) are not well recognized by many farmers but include reduced milk yield, premature culling losses and reduced quality premiums [54].

The annual losses by bovine mastitis are estimated at$35 billion globally. In Ethiopia, annual losses in the dairy industry due to mastitis was approximately $2 billion, ofwhich subclinical mastitis wasresponsible for approximately 70% of these dollars losses [55].

Table 1: Prevalence of bovine mastitis in different parts of Ethiopia

Authors	Publication year	Region	Study design	Sample size	Case	Prevalence (95% CI)	CM prevalence (95% CI)	SCM prevalence (95% CI)	Diagnosis method used
Biffa *et al*.	2005	SNNPR	CS	974	340	34.9 (28.7, 40.9)	11.9 (7.7, 16.9)	23.0(13.6, 26.8)	CMT
Almaw *et al*.	2008	Amhara	CS	351	14	3.9 (0.82, 7.17)	1.4 (0.9, 3.2)	2.5 (1.3, 4.9)	CMT
Mekibib *et al*.	2010	Oromia	CS	107	76	71.0 (65.7, 79.3)	22.4 (18.2, 27.0)	48.6 (44.8, 55.3)	CMT
Moges *et al*.	2011	Amhara	CS	322	105	32.6 (27.5, 37.8)	0.9 (0.2, 1.8)	31.67 (23.2, 36.6)	CMT
Abera *et al*.	2012	Oromia	CS	422	75	37.1 (33.3, 38.7)	8.6 (4.2, 12.7)	28.6 (23.4, 34.8)	CMT
Yohannis and Molla	2013	SNNPR	CS	349	103	29.5 (24.7, 34.3)	2.6 (0.9, 4.3)	26.9 (22.2, 31.6)	CMT
Musse *et al*.	2014	Addis Ababa	CS	346	169	48.8 (44.2, 54.8)	10.9 (6.3, 15.7)	37.9 (33.8, 38.4)	CMT
Abebe *et al*.	2016	SNNPR	CS	529	331	62.6 (58.3, 66.7)	3.4 (0.5, 7.6)	59.2 (54.6, 64.8)	CMT
Herago *et al*.	2017	SNNPR	CS	320	84	26.3 (21.4, 31.1)	3.7 (1.8, 6.9)	22.5 (18.3, 27.3)	CMT
Mulshet *et al*.	2017	Addis Ababa	CS	390	192	49.2 (45.5, 58.7)	10.2 (7.3, 13.9)	39 (35.3, 45.8)	CMT
Tassew *et al*.	2017	B/Gumuz	CS	384	151	39.3 (34.7, 43.5)	11.5 (7.2, 16.4)	27.8 (21.3, 31.8)	CMT
Birhanu *et al*.	2017	Oromia	CS	262	105	40.1 (34.8, 46.3)	11.2 (7.4, 16.2)	28.9 (23.8, 33.5)	CMT
Etifu and Tilahun	2019	SNNPR	CS	111	81	73.0 (67.2, 83.5)	16.2 (12.5, 20.8)	56.8 (52.6, 63.9)	CMT
Abebe *et al*.	2020	SNNPR	CS	686	372	54.2 (50.5, 57.9)	48.1 (44.3, 55.8)	29.4 (24.6, 34.2)	CMT
Assefa	2021	Oromia	CS	126	36	28.6 (23.5, 32.7)	23.8 (13.7, 27.4)	4.8 (2.8, 8.4)	CMT
Fesseha *et al*.	2021	Oromia	CS	384	283	73.7 (67.1, 83.2)	21.4 (17.5, 26.2)	52.3 (45.4, 63.7)	CMT
Kidanu	2022	Amhara	CS	375	146	39.0 (33.3, 42.8)	9.0 (6.1, 12.7)	30 (25.4, 35.8)	CMT

Mastitis not only decreases the productive performance of cows but also reduces theirreproductive performance. Most estimates have shown a 30% reduction in productivity per affected quarter and a 15% reduction in production per cow lactation [6].

Impact on Public Health: Bacterial contamination of milk from affected cows may render it unsuitable for human consumption by causing food poisoning or interference with the manufacturing process or, in rare cases, provides a mechanism of spread of disease to humans. Zoonotic diseases potentially transmitted by raw cow milk include brucellosis, caseous lymphadenitis, leptospirosis, listeriosis, melioidosis, Q-Fever, Staphylococcal food poisoning, toxoplasmosis and tuberculosis [56; 6].

CONCLUSION AND RECOMMENDATIONS

Mastitis is a prevalent and significant disease affecting dairy cattle in Ethiopia.The rising occurrence of mastitis highlights its serious health problemfor dairy cows. Subclinical mastitis is particularly concerning because it often presents without obvious symptoms, allowing infected animals to produce normal milk while spreading infection within the herd.Age, udder conformation, multiple lactations, poor body condition, inadequate hygiene, high milk production, early lactation stage, previous mastitis exposure and blind teats are main risk factors for the occurrence of mastitis in dairy cows. Mastitis has also economic and public health impacts due to disease transmission, antibiotic residues in the milk, Dry cow therapy is more effective for the control and prevention of mastitis in dairy cows than lactating cows.

Based on the above conclusive remarks, the following points are recommended:

- Awareness should be created among veterinarians, dairy farm owners and dairy workers on the effect of mastitis
- Mastitis treatments should be preceded with identification of the causative agent and susceptibility test profile of pathogens to select effective antibiotics
- Regular investigation of mastitis, especially thesub-clinical form should be practiced
- Proper handling and management of dairy cows should be implemented
- Culling of old aged and repeatedly infected cows should be done
- External parasites especially tick prevention program should be applied
- Further investigation and molecular diagnosis on mastitis causative agents should be done to apply proper prevention and treatment scheme.

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