

Occurrence and Associated Risk Factors of Mastitis among Lactating Goat Inbanadir Region, Somalia

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Abstract

Mastitis can be an important disease in sheep, Goat and other large Animals such as Cattle and camel with an incidence >2%. In addition to deaths from severe infections, the disease can be a cause of lamb mortality from malnourishment or of depressed dissuading weights of lambs. Per-acute, gangrenous (usually due to *Staphylococcus aureus*), acute, sub-acute, and probably subclinical types occur. Mastitis, or inflammation of the mammary gland, is predominantly caused by bacterial pathogens and occasionally mycotic or algal microbes. Pathologic changes to milk-secreting epithelial cells from inflammation decreases function, ie, milk production. Depending on the pathogen, decreased milk production may continue into further lactations, which reduces productivity and, for beef and other meat-producing animals, potential weight gain for suckling offspring. The organisms most commonly involved are *S aureus*, coagulase-negative staphylococci, streptococci, *Escherichia coli*, *Mannheimia haemolytica*, and *Trueperella* (formerly *Arcanobacterium*) *pyogenes*. The organisms that infect the udder of does are similar to those in cows. Therefore, the study concerns about the occurrence and risk factors that causes mastitis in Ewes (Goats).f the potential risk factors has depicted that mastitis was more prevalent indoes with previous mastitis history, increased parity, poorbody conditions, increased milk production, late lactationstage, long teat, and housed goats.

Goat mastitis was high compared to camel and other Dairy cattle. In cattle the exotic breed showed the highest (38%) prevalence for mastitis. The study found three risks factors that showed statistical significance at $P < 0.05$ and the three risk factors include: age, parity, and lactation period at a $P < 0.05$. It was also found out that farmers had poor knowledge, practices and attitudes on mastitis control and management. In this study made different analysis and some points out that three (3) sub study area is overall poor practice of dairy farmers in Benadir region. Finally the researchers consult further research to be done in Benadir Region.

Keywords: Goats. Mastitis. Clinical. Subclinical. Occurrence. Risk factors. Benadir Region, Somalia.

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I. Introduction

Mastitis is a multi-etiological of complex disease, which is defined as inflammation of parenchyma of mammary glands. It is characterized by physical, chemical and, usually, bacteriological changes in milk, and pathological changes in glandular tissues (Radostiset *al.*, 2010). **Causes** Milk that is trapped in the breast is the main cause of mastitis. Other causes include: **A blocked milk duct.** If a breast doesn't completely empty at feedings, one of your milk ducts can become clogged. The blockage causes milk to back up, leading to breast infection. Bacteria entering the breast. Bacteria from your skin's surface and baby's mouth can enter the milk ducts through a crack in the skin of your nipple or through a milk duct opening. Stagnant milk in a breast that isn't emptied provides a breeding ground for the bacteria. The occurrence of disease is an outcome of interplay between three major factors: infectious agents, host resistance, and environmental factors. As briefly introduced above, mastitis is a heavy burden for the goat sector worldwide: it is a costly disease due to direct losses (a reduction of output due to mastitis) and expenditure (additional inputs to reduce the level of mastitis), both with negative implications for milk hygiene and quality (Hogeveen, & Huijps, (2011); Coulonet *al.*, 2012). In developed countries, many studies have been conducted. The annual losses per goat from mastitis in the United States of America in 2016 were estimated to be US\$ 117.35 per goat per year (Blosser, 2019); two decades later these losses had increased to US\$ 185 to \$ 200 per goat per year (Costello, 2004). In 2016, annual losses from mastitis in USA were estimated at a total of US\$ 1294 billion, and had increased to US\$ 2 billion by 2009 (Viguiet, 2019). Its negative impact can be a huge constraint on the development of profitable goat enterprises,

and this is particularly relevant in the developing world, in which the dairy industry has a strong role in the livelihood of poor people (von Braun, 2010). The small-scale goat sector contributes significantly to alleviating poverty and reducing malnutrition, particularly in rural and peri-urban areas, in addition to providing regular income for the household and employment opportunities for women and animal attendants (Karimuriboet *al.*, 2016). Livestock kept or produced in small-scale farming systems are an important component of the agricultural economy in the developing world Perry, (Brian, John McDermott, and Tom *et.al.*, (2011). small-scale dairy development is a powerful tool for actively involving the poor in boosting rural economic growth, initiating a process of change and improving livelihoods (FAO, 2009).

In Kenya alone, goat is a very significant source of income and food for an estimated 625 000 small-scale producer households (Muriuki, *et.al.*, 2011). In India, marginal producers and small-scale farmers own over 60% of all milch animals and constitute the core milk production sector (Kurup, 2011).

It is of fundamental importance to investigate the occurrence of this disease, in both clinical and sub-clinical forms, and especially in small scale farmer herds. Many studies have been conducted in developing countries to assess the real prevalence of clinical and sub-clinical mastitis in dairy herds, in the various farming systems. A first step in mastitis control programmers is to quantify udder health by determining the prevalence and incidence of both clinical and sub-clinical mastitis, and assess bacteriological aspects of the disease (Karimuriboet *al.*, 2010). Even if a good number of studies on the occurrence of the disease are available, the information is in most cases relevant to only small geographical areas, and cannot be generalized. In fact, mastitis has not really been studied systematically in the developing world, resulting in only limited information being available on the prevalence of disease and associated economic losses

Breeding programs for mastitis resistance in goat make use of the somatic cell score (SCS) as a selection criterion (Clément, 2016), Divergent SCS-based selection experiments in sheep and goats have shown that the low SCS groups were more resistant to mastitis under field conditions (Caillat, 2011). This is particularly true of infections with staphylococci, which are responsible for the majority of inter-mammary infections of dairy small ruminants (Contreras, 2007]. Experimentally-induced mastitis of two lines of ewes selected on the basis of high/low SCS with *Staphylococcus aureus*, the agent of the most severe forms of staphylococcal mastitis, have shown some line-associated differences in response to infection (Bonnetfont,2011). Studies on SC based divergent selection of animals are of great help to settle the issue of the selection for low somatic cell count (SCC) in relation to mastitis susceptibility (Rainard P, 2018).

Globally, the research used California mastitis test to screen the animals. In this study the overall prevalence found was 23.4% and species wise the prevalence was 27.4%, 25.5% 16% for cattle, camel and goats respectively. Cattle mastitis was high compared to camel and goats. In cattle the exotic breed showed the highest (38%) prevalence for mastitis.

Regionally The present study on the goat subclinical mastitis allows gaining knowledge on the species responsible of the mammary pathology in a steppe area of Algeria. Indeed, the results obtained by the CMT revealed a prevalence of the subclinical mastitis of 33.9%. This result is similar to that observed in Spain (Islam, 2011)and Kenya lightly higher than that reported in other countries. Tests carried out by Mdegela and collaborators on goats of Tanzania revealed a very low percentage of positive CMT, with 33.5% of specificity and 74.5% of sensitivity. A similar prevalence is obtained by Beheshtiet *al* (2012) in Iran.

Somalia, goat mastitis was high compared to camel and goats. In cattle the exotic breed showed the highest (38%) prevalence for mastitis. The study found three risks factors that showed statistical significance at $P<0.05$ and the three risk factors include: age, parity, and lactation period at a $P<0.05$. It was also found out that farmers had poor knowledge, practices and attitudes on mastitis control and management. In this study KAPs analysis points out that there is overall poor practice of dairy farmers in Benadir region.

II. Material And Methodology

Study area

The study was carried out Mogadishu or Benadir region that consists of 18 districts. It borders with middle Shebelle in the north and the east, lower Shebelle in the west and Indian Ocean in the south. The study was carried out in three districts of Benadir region of Somalia namely, Dharkeenley, Dayniile, Hodan There is no information on Benadir Animal population in particular. Therefore, these three districts were selected purposive due to their Animal population.

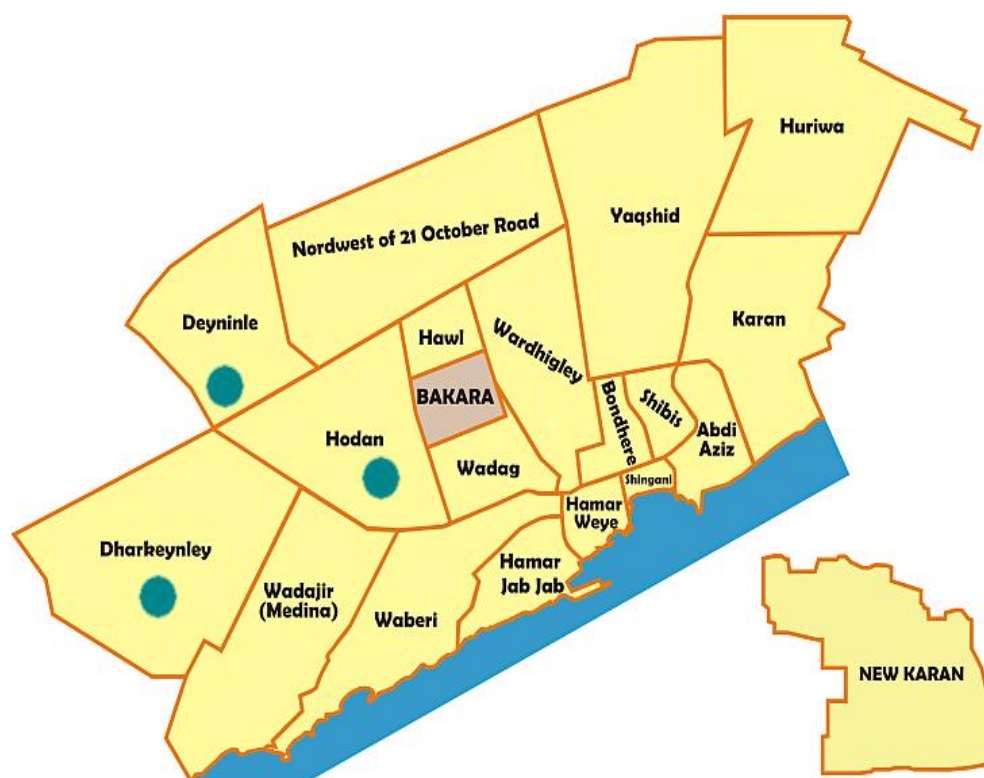


Figure .1 shows the map of banadir region somalia

III. Research Design

The study was descriptive in design which was to describe the problem under investigation. In this type of design, the researchers were intended to describe the problem rather than to analyze it. The study was also cross sectional in design. This type of design allows the researchers to collect their research data at one point in time. The study was also be quantitative in design. In quantitative design, the researchers aim was to determine the problem numerically. This type of design doesn't need to go deep into the details of the problem. During data collection, the researchers wereto target on pastoralists and farmers.

The study was focus on pastoral community who keeps mainly goat in Benadir region especially Hodan district, Dharkenley district and Deyniile district These groups will be regarded as the target population for this type of study is 130 respondents from animal keepers of each district in Benadir region are the most suitable group to be interviewed during data collection.

SAMPLE SIZE DETRMINATION

From the target population 130 the researcher selected respondents as the sample size 130 the researchers had used to 'Slovenes' formula for sample size deterrmination below.

$$n = \frac{N}{1 + N(e)^2}$$

Whereas:

n = required sample size

N = Target population/ total population = Allowable margin error. In this case, we had consider 5% (0.05) error merging adequate.

(e) 2= (0.05) =0, 0025

$$N = \frac{130}{1 + 130(0.05)^2}$$

N=100

SAMPLING PROCEDURE

In this study, purposive sampling technique will employed. According to Amin (2005), purposive sampling is the type of sampling where the researcher uses his/her judgment or common sense regarding participants from whom the information will collected. The researcher use purposive sampling in order to choose the respondents

that he believes to have the information concerning this study by using his own judgment, and then the researcher distributed the questionnaire to them. Moreover, the researcher chose purposive sampling because the researcher wanted to get the key informants of this study, for that reason; selecting the respondents is more useful for this study than the representativeness of the sample.

DATA COLLECTION AND DATA ANALYSIS

The data was collected through descriptive analysis. The data will collected from the study area, edited, collate and tabulated by using hand questionnaire. For pastoralists who rearing animal In Benadir region The questionnaire of the stud y was developed by the researchers to collect information about the prevalence and management of mastitis among dairy goat rearing in Benadir region So that this was to enable to make the items in the questionnaire as valid as possible. Data was collected through questionnaire and analysis through SPSS statistical computer software were used to tabulate the data.

IV. Results

This part presents the background information of the respondents who participated in this Study; the purpose of this background information is to find out the characteristics of the respondents. Furthermore, the shape of the questionnaire in the demographic section is looked upon in terms of Gender, Age, and Marital status, level of education and Occupation of the respondents.

Table: 1: Gender of respondent

Gender of the respondents	Frequency	Percent	Valid Percent	Cumulative Percent
male	45	45.0	45.0	45.0
female	55	55.0	55.0	100.0
Total	100	100.0	100.0	

According to the above table the majority of the respondents 55(55%) were female while 45(45%) were male

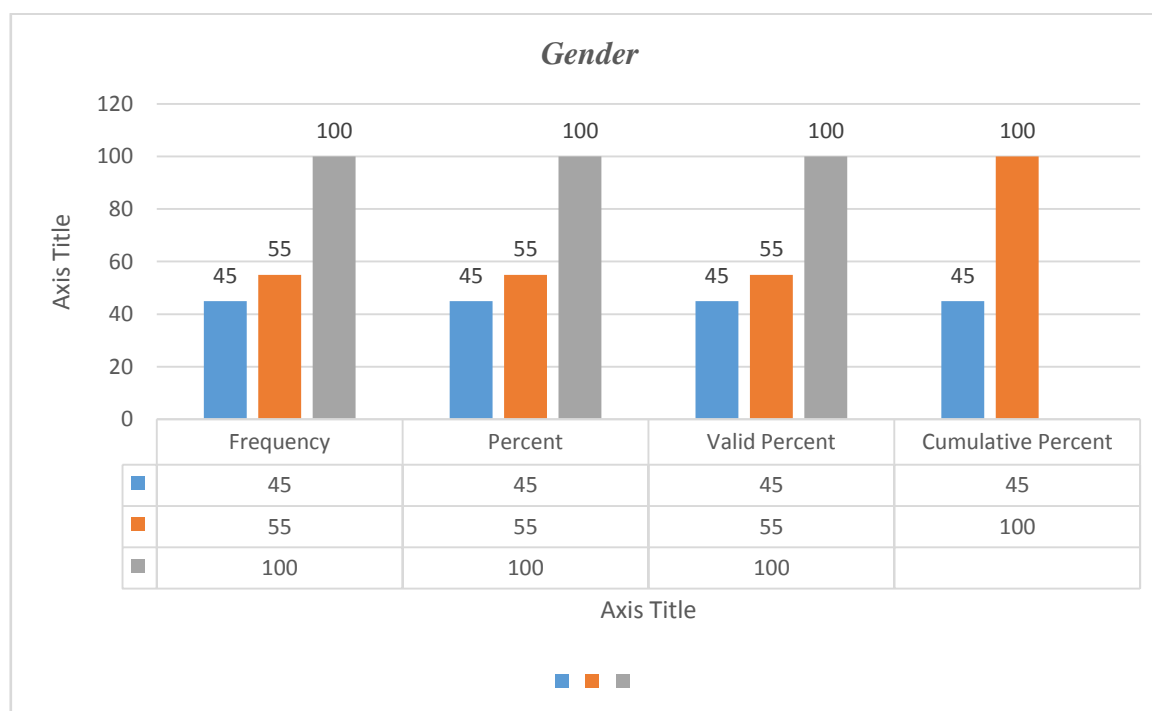


Chart 1: Gender of respondents

Table.2:Age of respondents

	Age of respondents	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15-25	8	8.0	8.0	8.0
	25-35	20	20.0	20.0	28.0
	35-40	34	34.0	34.0	62.0
	Above 40 years	38	38.0	38.0	100.0
	Total	100	100.0	100.0	

The majority of the respondents 55(55%) were female while other 45(45%) were male. According to, the majority of the respondents 38(38%) were above 40 years old ,34(34%) were between 35-40 years old , 20(20%) were between 25-35 years old ,8(8%) were between 15-25 years old

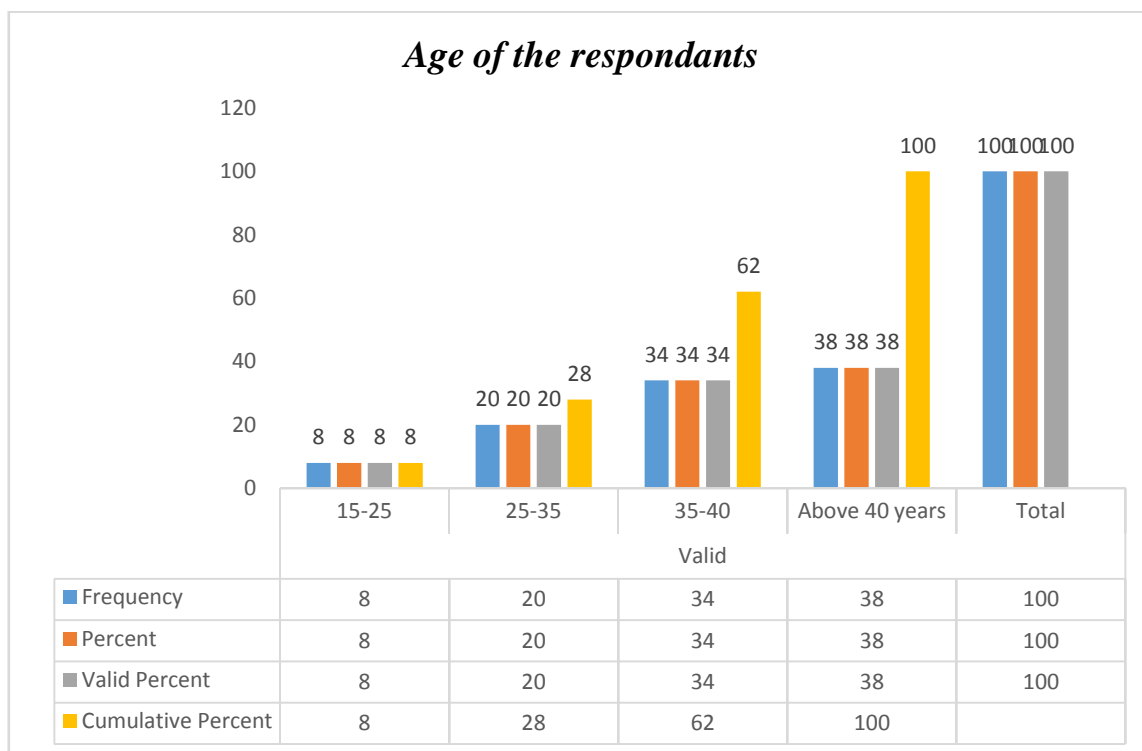


Chart.2: Age of respondents

The respondent were aged 34(34%) between 35-40 years old, were age between 25-35 years 20(20%) 8(8%) were age between 15-25 years old that is the simplest while the majority of were 38(38%) Above 40 years old.

Table .3:Marital status of respondents

	status of respondents	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	married	71	71.0	71.0	71.0
	Single	17	17.0	17.0	88.0
	Divorce	12	12.0	12.0	100.0
	Total	100	100.0	100.0	

According to the table: the majority of the respondents 71(71%) were married, 17(17%) were single, 12(12%) were divorce

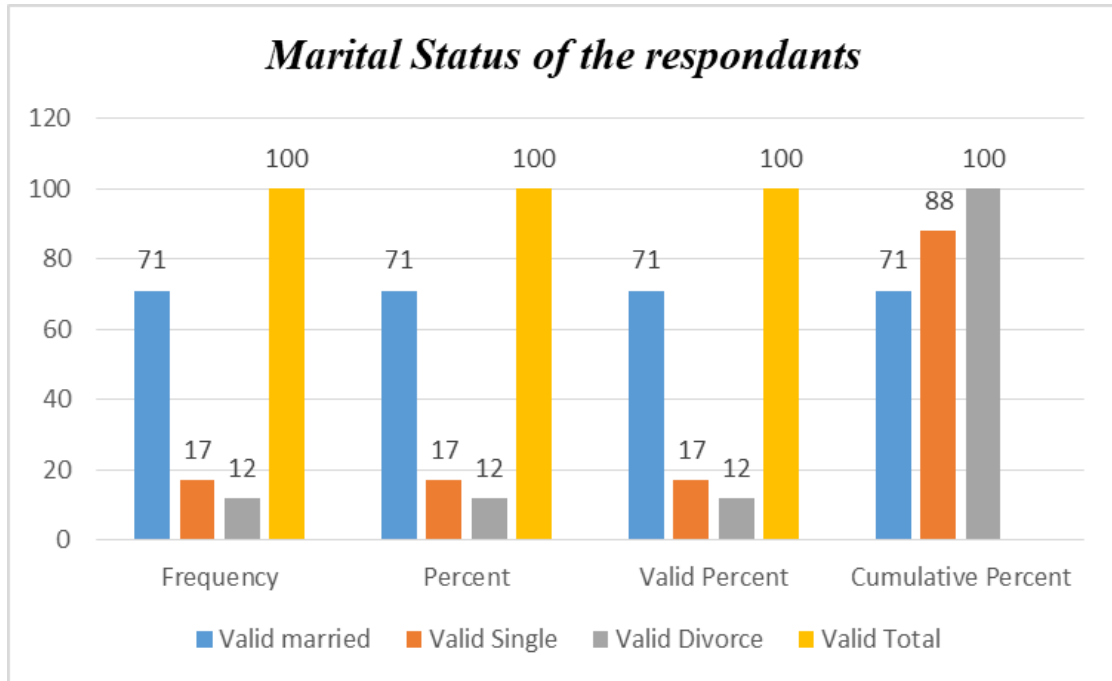


Chart.3: marital status of respondents

Figure the respondent were married 71(71%) while 17(17%) were single, while also 12(12%) were divorce. The majority of marital status of respondents were married.

Table: 4: Respondents Education level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Illiterate	54	54.0	55.1	55.1
	Primary level	26	26.0	26.5	81.6
	Secondary level	11	11.0	11.2	92.9
	University level	7	7.0	7.1	100.0
	Total	98	98.0	100.0	

According to the above Table the majority of the respondents 54(54%) were illiterate, 26(26%) were primary level, 11(11%) were secondary level, 7(7%) were University level

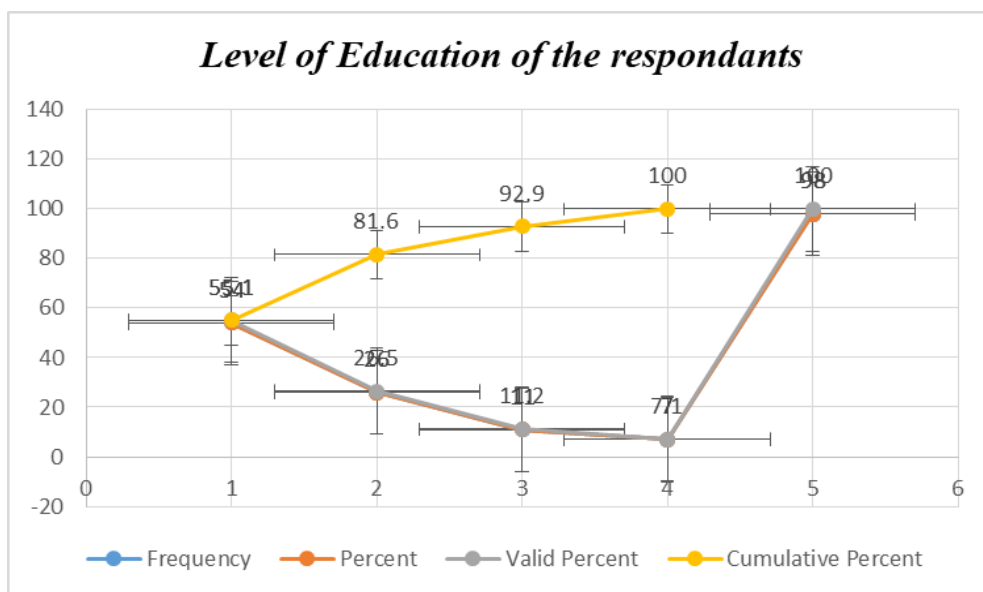


Chart4.Educational level of respondents

In this figure the educational level of respondents 54(54%) were Illiterate, while 26(26%) of respondents were primary level, while 11(11%) were secondary level, while 7(7%) of respondents were University.

Table.5: Mastitis reduce goat productivity and reduce milk production

	Frequency Darkenley	Percentage of Hodan	Valid Percent for Deynile	Cumulative Percentage
Agree	48	48.0	48.0	48.0
Strongly agree	41	41.0	41.0	89.0
Disagree	6	6.0	6.0	95.0
Strongly disagree	5	5.0	5.0	100.0
Total	100	100.0	100.0	

According to the table the majority of the respondents 48(48%) were Agreed that Mastitis reduce goat productivity and reduce milk production, while 41(41%) were strongly agreed, while 6(6%) were disagree, while 5(5%) were strongly disagreed it.

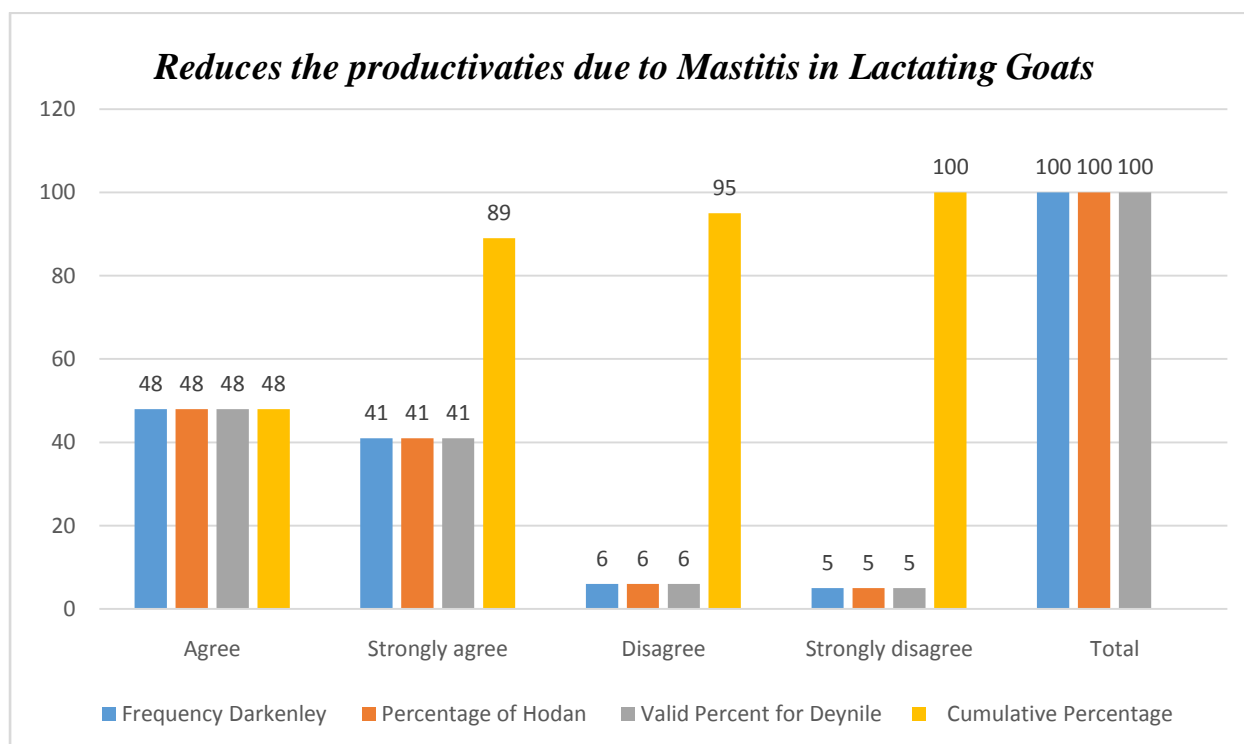


Chart 5: mastitis reduce goat productivity and reduce milk production

This shows the respondents were 48(48%) Agreed that the mastitis reduce goat productivity and reduce milk production, while 41(41%) were strongly agreed, while 6(6%) were disagree, while 5(5%) were strongly disagreed it.

Table 6: Mastitis have an economic losses for the household in the study area					
	Economic Losses	Frequency of Darkeynley sub-district	Percent for Hodon District	Valid Percent of Deynile sub-district	Cumulative Percentage
	Agree	44	44.0	44.0	44.0
	Strongly agree	40	40.0	40.0	84.0
	Dis agree	9	9.0	9.0	93.0
	Strongly disagree	7	7.0	7.0	100.0
	Total	100	100.0	100.0	

According to the Table the majority of the respondents 44(44%) were agreed it that Does mastitis reduces economic of the farm, while 40(40%) were strong agree, while 9(9%) were disagree, while 7(7%) were strongly disagreed it.

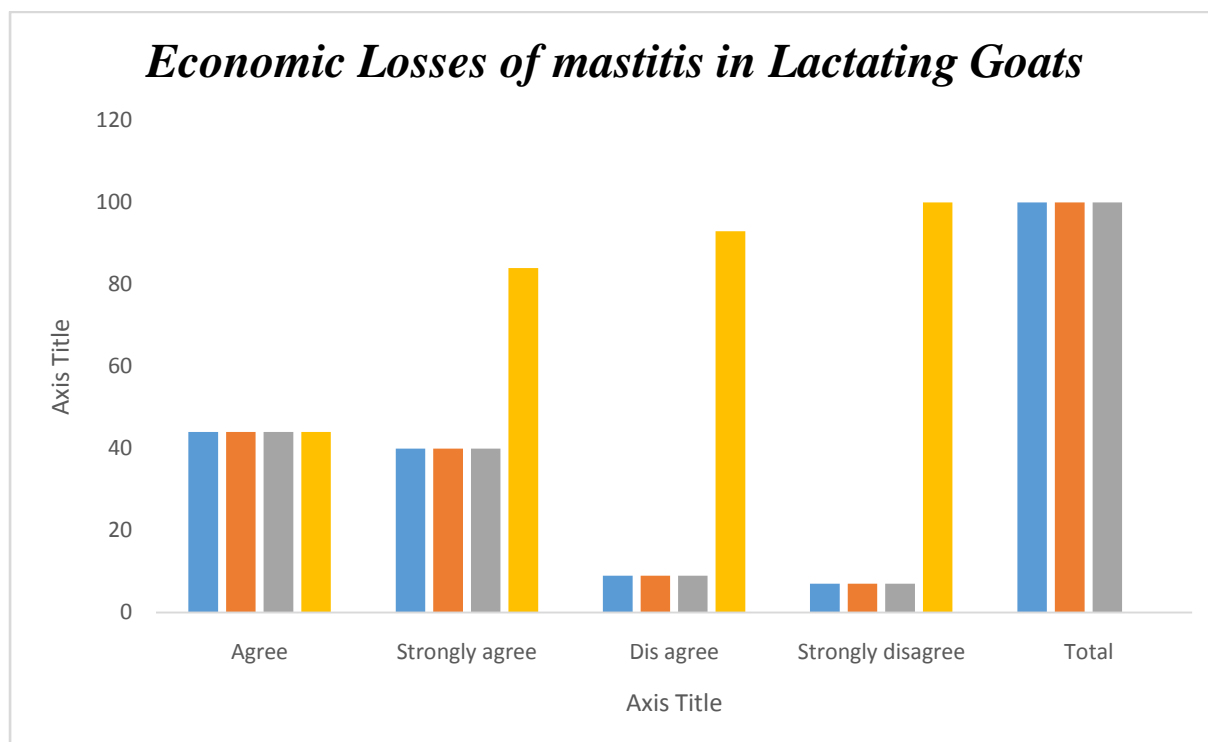


Chart 6: Mastitis have reduces an economic losses of the household

This figure shows the respondents 44(44%) were agreed it that Does mastitis reduce economic of the farm, while 40(40%) were strongly agreed it, while 9(9%) were disagree while only 7(7%) were strongly disagreed it the simplest respondents. The majority respondents 44(44%) were agreed it that does mastitis reduce economic of the farm.

Table 7: Environmental Mastitis can be defined broadly as those intra-mammary infections (I M I) caused by pathogens whose primary reservoir is the environment in which the goats lives

	Environmental Mastitis	Frequency for Darkenley	Percentage for Hodan Sub-District	Valid Percentage for Deynile Sub-District	Cumulative Percentage of the study area
	Agree	65	65.0	65.0	65.0
	Strongly agree	23	23.0	23.0	88.0
	Disagree	9	9.0	9.0	97.0
	Strongly disagree	3	3.0	3.0	100.0
	Total	100	100.0	100.0	

According to the table the majority respondents 65(65%) were agreed it, while 23(23%) were strongly agreed, while 9(9%) were disagree, while 3(3%) were strongly disagree is the simplest respondents

Table 8: Stage of lactation milk yield before Mastitis occurred

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	58	58.0	58.0	58.0
	Strong agree	30	30.0	30.0	88.0
	Disagree	9	9.0	9.0	97.0
	Strong disagree	3	3.0	3.0	100.0
	Total	100	100.0	100.0	

According to the Table 4.1.13 the majority respondents 58(58%) were agreed it stage of lactation milk yield before mastitis occurred, while 30(30%) were strongly agreed, while 9(9%) were disagree, while only 3(3%) were strongly agreed is the simplest of the respondents.

Table 9: Mastitis caused by several species of common bacteria, fungi, mycoplasma and Algae

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Staphylococcus aureus, Streptococcus galactic, mycoplasma spp, and corynebacterium caprine	65	65.0	65.0	65.0

Escherichia coli, klebsiellaspp, andentrobacterspp	9	9.0	9.0	74.0
Bacteria, fungi, mycoplasmas	15	15.0	15.0	89.0
Unlike mastitis caused by coliforms	11	11.0	11.0	100.0
Total	100	100.0	100.0	

According to the Table, The majority of the respondents 65(65%) were Staphylococcus aureus, Streptococcus agalactie, mycoplasma spp, and corynebacterium caprine ,while only (9%) were Escherichia coli, klebsiellaspp, andentrobacterspp ,while 15(15%) were Bacteria, fungi, mycoplasmas , while 11(11%) were Unlike mastitis caused by coliforms.

Table 10: Subclinical intra mammary infections (I M I) in general poorly detected and not eliminated at least during lactation

	Frequency	Percent	Valid Percent	Cumulative Percent
Agree	60	60.0	60.0	60.0
Strongly agree	24	24.0	24.0	84.0
Disagree	10	10.0	10.0	94.0
Strongly agree	6	6.0	6.0	100.0
Total	100	100.0	100.0	

According to the table the majority of the respondents 60(60%) were agreed, while 24(24%) were strongly agreed, while 10(10%) were disagree, while only 6(6%) were strongly agreed it is the simplest respondents.

Table. 11:the use antibiotic reduce the risk factors of mastitis disease in lactating Goats

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	81	81.0	81.0	81.0
No	19	19.0	19.0	100.0
Total	100	100.0	100.0	

According to the table 4. 1.19 The majority of the respondents 81(81%) were Yes, while 19(19%) the respondents were No.

V. Discussions

This section provided background information on the respondents who assisted in the collection of primary data for this study. The goal of this background information was to learn about the respondents' characteristics and to show the distribution of respondents in the study

The study's findings, as shown in chapter four by table 4.1, show that most of the respondents 55(55%) were female, while 45(45%) the respondents were male .Most of the respondents of this study 38 % were aged above 40 years.Most of the respondents of this study 71% were married Most of the respondents of this study 54% were Illiterate because they are pastoral people Most of the respondents of this study 79% were pastoral community who rearing goat in Benadir region Most of the respondents of this study 45% above 10 years were been rearing goats Most of the respondents of this study 60% purpose of rearing goat were meat and milk production. Most of the respondents of this study 83% were seen goat mastitis .Most of the respondents of this study 30% between 2021-2022 were the last time they seen goat mastitis Most of the respondents of this study 48% were answered agree which means mastitis is a major animal health concern and leading cause lack of milk.The result of the study indicates most of the respondents of this study 44 % of the respondents were answered agree which shows mastitis is a chronic disease that is characterized by the presence of fibrosis and regeneration of nodules in the liver lactation history including difficult with breastfeeding

The study indicates most of the respondents of this study 65% of the respondents were answered agree which means that mastitis which can lead to economic impact losses. The result shows most of the respondents of this study 58% were answered agree which shows that indicate the key to control is good animal management. The most of the respondents 65 % of the respondents were answered the major causes of mastitis were Staphylococcus aurous, Streptococcus agalactiae, Mycoplasma spp. and Corynebacterium caprine. The most of the respondents of this study 60% of the respondents were answered agree and cannot be eradicated but can be reduced to low levels by adopting simple economic management routines that relate to the patterns of infection. Therefore, same result were published by Virdis, *et.al.* (2010).and Stuhr, &Aulrich. (2010).

The most of the respondents of this study 79% of the respondents were answered yes this indicates that mastitis cause udder quarter becomes infected when the pathogen penetrate the teat duct. The most of the respondents of this study 53 % of the respondents were answered agree which shows that all goat are continuously exposed to pathogens that can Cause mastitis but new infection is normally infrequent. The most of the respondents of this study 47% were answered agree and the result shows that mastitis can cause loss of

appetite, and there general endotoxemia with raised body temperature. The most of the respondents of this study 81 % were answered yes and this show that the knowledge of the person influences the incidence of mastitis of goat and also antibiotic reduce inflammation of mastitis

VI. Conclusions

Finally, Goat mastitis has been reported in nearly all Goat-raising countries. Many infectious agents have been implicated as causes of goat mastitis; however, bacterial infections are thought to be the most common cause of camel mastitis. Transmission mechanisms are determined by the majority of the infection in the environment, which includes infected quarters, milking personnel efficiency, and goat susceptibility, which is related to the stage of lactation, age of the goat, and level of inherited resistance. Subclinical mastitis is more common than other types of mastitis, and the affected animal may infect other animals due to its role as a microorganism reservoir. Diagnosis of mastitis can be diagnosed through clinical examination, pH test, Somatic Cell Count, and bacteriological analyses for confirmation. According to some articles, the therapeutic approach in treating acute mastitis is through systemic antibiotics and anti-inflammatory drugs, with regular mammary gland stripping. Chronic mastitis is extremely difficult to treat, and the condition frequently results in the loss of the affected quarter. Mastitis control methods are based on three main principles: elimination of existing infection, prevention of new infection, and monitoring udder health status. Mastitis has a high economic impact because it causes a decrease in milk production and quality, a decrease in milk price due to SCC presence, milk loss due to antibiotic treatment, and veterinary care costs.

Mastitis is one of the major problems that lead economic inefficiency in dairy goat rearing farm. It is categorized into clinical and subclinical mastitis and has multiple causes that are both infectious and non-infectious. Mastitis is one of the major problems and the top list of complaints from dairy goat rearing farmers in Benadir region and this is ascribed as result of the inexperience of dairy goat farmers in Somalia who ventured camel dairy farms, cattle dairy and goat in the vicinity of the capital city of Somalia. Therefore, this study was launched to assess the prevalence of mastitis among dairy goat rearing in Benadir region as well as identify the risk factors that are associated with mastitis occurrence. Dairy farmers should improve hygiene during milking by;

- Proper washing of hands before milking and between animals.
- Only using clean water and separate towels for cleaning the udders.
- Implementing the use of teat-dip after milking.
- Keeping animals from lying down immediately after milking.
- Milking order where you milk non mastitis Animals first and Animals or quarters with mastitis infections last should be adhered to the farmers of the study area.

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COMPETING INTERESTS

The authors declare that they have no competing interests.

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