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ASSESSMENT OF MICROBIOLOGICAL QUALITY OF BEEF FROM ASSOSA TOWN MUNICIPAL ABATTOIR, BENISHANGUL GUMUZ REGION, WESTERN ETHIOPIA

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Abstract: Microbial quality of beef samples from Assosa town municipal abattoir, was collected and estimated from September to May, 2023 with the objectives to assess microbial quality of meat scrap. The microbial analysis of scrap of meat sample study revealed that, from the entire 33.33 % positive samples, the presence of *Salmonella*, *E.coli*, *Staphylococcus*, *fungus* (yeast and molds) were (38%, 42%, 20.83%, 20.83%, 25%) respectively. Different bacterial isolates were detected by bacteriological methods from meat scrap sample collected from slaughtered house with higher isolation rate of microbial contamination in the form of mixed bacterial infection and has significant effect ($P < 0.05$). Besides this, mean microbial count were done. Accordingly, the mean S*almonella* count, *E.coli count*, *Staphylococci count*, yeast and mold count were 8.44±0.48SD, *1.594±0.51SD*, *1.013±0.46SD*, 3.8±0.414SD, 1.4±0.44SD respectively. In this study, disk diffusion was performed, and hence Cefoxitin and Tetracycline were resistance, however; Cloxacilin, and Gentamycin were sensitive in isolated Staphylococcus. In case of isolated *E.coli*, high resistance was tested in tetracycline and norfloxacilin whereas susceptibility were seen in kanamycin, nalidixic acid, and trimethoprime drugs. In salmonella isolates, tetracycline was resistance however; ciprofloxacilin, gentamycine, and chloramphenicol were susceptible. Therefore, in doing drug sensitivity test, resistance strains for tested bacteria will be cared. Drug management and proper use of drugs should be recommended in the areas and also the majority of the food samples were within acceptable and satisfactory quality range but still it indicates high microbial contamination of the raw meat especially those from butchers. Therefore, the town administration office and other concerned bodies should fulfill facilities and adequate training for butchers and abattoir workers on their hygiene, sanitation and handling of the raw meat.

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Key words*: Assosa town, Salmonella, e.coli, staphylococcus, molds, and yeast***.**

1. INTRODUCTION

1.1. Background

Agriculture plays a major role in the lives and livelihoods of most Ethiopian people. According to Tegegne and Feye (2020), the sector accounts for about 95% of agricultural production, 85% of all employment, and 90% of total export earnings, as well as contributes to 45% of the (GDP). Ethiopia is endowed with good livestock production potential mainly due to diversified natural resource availability, climate, and large populations of different livestock species (Duguma *et al.*, 2011). The country is believed to have the largest livestock population in Africa (Mwema *et al.*, 2021). It is a home to 70 million cattle, 95 million sheep and goats, 2.15 million horses, 10.80 million donkeys, 0.38 million mules, and about 8.1 million camels (CSA, 2021). The livestock sector is estimated to account for 10% of the GDP and employs over 30% of the agricultural labor force. Livestock also contributes to about 11% of all formal export earnings. However, when informal cross-border trade is considered, the contribution increases to about 24% (Asresie *et al*., 2015).

Meat is one of the most nutritious foods that humans can consume, particularly in terms of supplying high quality protein (amino acids), minerals (iron) and essential vitamins like B12, D and K. In Ethiopia, domestic consumption requirements for red meat was arise due to rapidly growing population, increasing urbanization, rising income, increase export of live animal and meat to generate foreign currency (Shapiro *et al*., 2015). The domestic meat is believed to increase with increasing literacy and family income. Meat consumption is often an indicator of economic status of a country or an individual. People with a higher social or economic status demand a greater amount of high-quality meat products. The per capital consumption of meat in developed/ industrialized countries is much higher than in developing countries. Countries whose population consumes the least amount of meat are

located in Africa and Asia. Developed countries consumed a consistent level of 77 kg of meat per capita annually, while developing countries struggled to maintain a diet with only 25 kg of meat per capital annually. Ethiopians remained slightly below the meat intake of all low-income countries and consuming 9 kg per capita annually (Borowski, 2007). In the country cattle are a very common asset which 70 % of the total population of households depend on it for their livelihoods and the country produces about one million tons of beef per year valued at US$5.1 billion (ASL, 2018). The annual contribution of ruminants to meat production in Ethiopia was estimated to be over 3.2 million tones representing over 72 % of the total meat production (Issack *et al*., 2017) from which beef accounted for over 70 % of the total red meat production (Wabalo and Anja, 2018).

In the developing countries, commercial abattoirs have sophisticated machinery (Gregory, 2005) while most municipal abattoirs have poor handling facilities (Ndou *et al.,* 2011). These differences are thought to have an effect on animal behavior at slaughter and the quality of the product. Slaughtering technology is becoming more important as it has a large influence on meat quality (Swatland, 2000). According to (Kagunyu *et al..*, 2011), in northern Kenya, majority of cattle and other animal slaughtering activities are carried out in the backyard, resulting in poor quality products. Based on (Kagunyu *et al..*, 2011), cattle and other animals are mainly slaughtered in homesteads during cultural and religious festivals and this, therefore, is scattered and periodic. Slaughter of livestock in rural slaughter slabs is done under very poor conditions. Cattle are mainly slaughtered in poorly equipped slaughter points where the infrastructure is sometimes a slab of concrete, under a tree or using poles for hoisting carcasses. The tools used in these facilities or in homesteads are usually rudimentary and cause damage to the hides during slaughter, resulting in poor prices of the skins (Wayua and Kagunyu, 2008). In Ethiopia, there are over 300 local slaughterhouses that supply meat for local consumption with different capacities and facilities, however all with low basic hygienic standards (Eshete *et al.,* 2018).

According to the World Organization of Animal Health, OIE, the veterinary service of the exporting country has ultimate responsibility for the certification of slaughtered animals (Thomson *et al.,* 2004). But this is still a critical problem in Ethiopia. Most commonly, animals were delivered to the lairage, from different markets to the center of Addis Ababa (Kera abattoir) where there was no shelter, which in turn keeps them from sun or heavy rain and where food and water provision depends on the costumer's request without consent of veterinarian. Throughout the slaughter, the animals were observed expressing stress-related behaviors, such as vocalization, head swings, and moving forward. The environment inside the slaughter hall is stressful for farm animals with high volume and lots of activity by humans and animals (Gronvall, 2013). During slaughter, the use of wet and slippery floors due to a constant water and blood flow was challenging and could be observed as a hygiene problem (Gronvall, 2013). The (FAO, 2013) reported that water in Ethiopia is contaminated with lots of bacteria's and shall not be in contact with the carcass. Use of water during slaughter can also be a health risk in itself, since wet slaughter has been shown to have a higher risk of letting bacteria's grow in the wet environment on the carcass. To avoid this, slaughter should be done in a dry environment, unfavorable for bacteria's growth. Another hygiene and health problem is step in which the carcass is divided into two, by using an axe and cut directly on the bone marrow. As soon as the bone marrow is touched, the risk of spreading possible Bovine Spongiform Encephalopathy (BSE) is very high (FAO, 2013). As a result of faulty practice during slaughter, large amounts of bruises could be detected in clotted blood collected as darker areas on the carcass in the back areas, around the upper back and on the hind limbs. The duration of slaughter is imperative in many aspects and can be an important factor for meat quality. Providing a very sharp knife and having competent personnel cutting of the carotid arteries are essential during the slaughter process (Gronvall, 2013).

Meat quality is becoming more important as consumers worldwide are increasingly demanding consistently higher quality meat(Scholtz, 2007).Which is because of beef industry is better in dealing with conversion and processing of live animals to different products and by products (Nebi, 2018). Meat quality can be defined by organoleptic evaluation parameters such as tenderness, juiciness, flavor, palatability, color, neatness (Beriain, 2001), pH, water holding capacity, and its proximate composition (Gusatvesuo *et al.,* 2011).The microbial quality and safety of raw meat products can be estimated by the use of indicator microorganisms, including total aerobic plate count, coliform count and Escherichia coli count (Kim and Yim, 2016). The microbiological contamination of meat can occur during processing and manipulation, such as skinning, evisceration, storage and distribution at slaughter houses. Fecal matter is a major source of contamination and could reach carcasses through direct deposition, as well as by indirect contact through contaminated equipment, workers, installations and air (Pal, 2007). In Ethiopia, the consumption of raw meat has associated with cultural practices and widespread raw beef consumption habit that can be a potential source for food borne illnesses (Getaneh *et al.,* 2019). Raw meat is available in open-air local retail shops

without appropriate temperature control and purchased by households and served at restaurants as raw, slightly cooked or well cooked (Siddiqui *et al.*, 2006).

1.2 Objectives

- To assess the microbial quality of beef from Assosa town municipal abattoir.

2. MATERIALS AND METHODS

2.1. Description of the Study Area

The study was conducted in cattle slaughter house of Assosa town, Benishangul Gumuz Regional State, west Ethiopia. According to CSA (2007), before a year, Assosa town (the capital city/town of Benishangul Gumuz Regional State) had four kebeles but currently, the town has changed its administrative structure to two districts (district-1 and district-2). Each district as five "ketenas". According to BGRSMSC (2020), the town is located at 10º 00'and 10º 03' north latitude and 34º 35' and 34º 39' east longitude. The total population of the town is 62,632 of which 32, 100 are male and 30,532 are female (projection made for the CSA, 2020). The total area of the town is 2361.34 hectares with an altitudinal difference that ranges between 1461- 1641 meters above sea level (BGRSEIB, 2020). The mean annual temperature of Assosa town ranges from a minimum of 14-33^{0}C. However, there is a slight variation of temperature by month. February to May is the hottest months while November to December is the cold months). The total amount of rain fall recorded at Assosa town during the last nine months of (2020) is 1,119 mm (BGRSMSC, 2020). The rainy season starts in March and extends to November with the highest concentration in June, July, and August. The population size of different livestock species in Assosa town are cattle 569, goat 1545, sheep 739, poultry 17676 donkeys 122, and pig 8 total 20,659 livestock populations are found in the town (ATAOA, 2020).

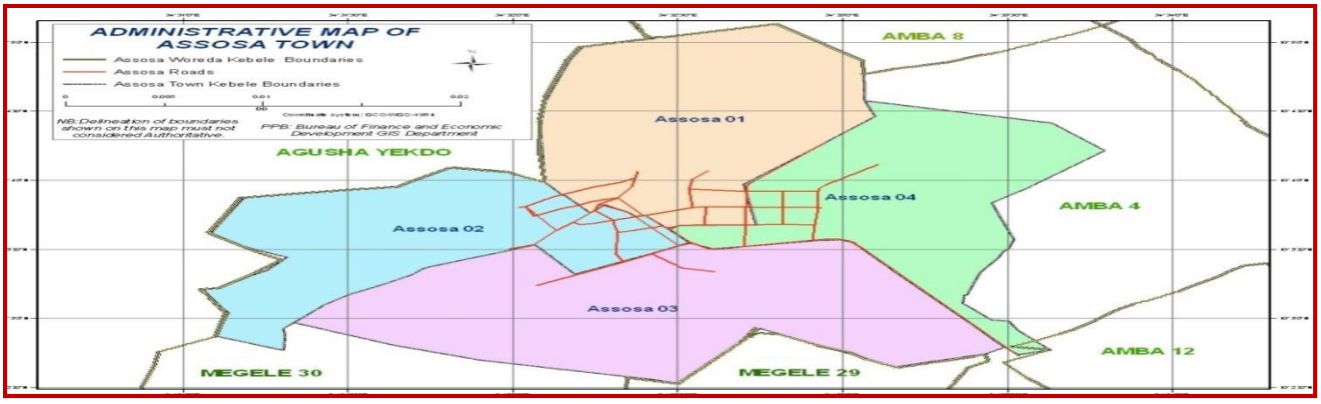


Figure 1: Administrative map of Assosa town (ATAO, 2021).

2.2. Research Design

A cross-sectional survey of laboratory testing method was used to identify microbial quality of beef to be slaughtered in Assosa town municipal abattoir from September to may 2023.

2.3 Target Population and Sampling procedure

The total sample size for microbial quality analysis was assigned according to statistical formula of (Thrust field, 2005). A 5% absolute precision at 95% confidence interval was used during determining the sample size. Since there is no previous work in the study area for microbial quality analysis of beef, the expected prevalence was take as 50%. Therefore, the total sample size for this study was calculated as follows:

$$n = \frac{(1.96)^2 x\ P\ (1-P),}{d^2}$$

Where: n = the total sample size
P = expected prevalence (50%)
d= desired absolute precision (0.05) at 95% CI

$$n = \frac{(1.96) \times (1.96) \times (0.5) \times (1-0.5)}{(0.05) \times (0.05)} = 384$$

Therefore to conduct beef microbial quality analysis a total of (n= 384) meat scrap samples was taken from different body parts of 10 slaughtered bulls. That means 38 beef scrap samples was taken from a bull.

2.4 Laboratory methods

2.4.1. Sample collection and transportation

A total of (n=384) beef scrap samples was taken from all bulls to be slaughtered within a day at Assosa town municipal slaughter house and was placed first in plastic bag and then into sterile insulated ice containers (icebox) and transported to Assosa, Regional Veterinary Laboratory. Up on arrival at the laboratory, the sample was kept in a +4^o_c until it was processed.

2.4.2. Sample : enrichment

Before processing, the samples were tanned at room temperature. 25 gram of meat samples was taken

and chopped in to smaller pieces using sterile knife and cutter board. This was blended with a blender and the sample was then transferred to a sterile flask filled with 225 buffered peptone water (BPW) (1: 9 ratio) and incubated at 37^0c for 24hrs (Quinn *et al*., 2002). Accordingly, each suspected case was enriched primarily in buffered peptone water (BPW) broth for coliform ***(****Escherichia coli)*, *Staphylococcus* and Rappaport-Vassiliadis Soy (RVS) broth for *Salmonella*, respectively (Quinn *et al*., 2000).

2.4.3. Standard plate count test

Standard plate count test is useful in assessing the number of total viable bacteria in the raw beef samples based on which the beef sample can be graded in to different categories according to bacterial content in the meat. Ten- fold serial dilution was prepared for each sample using 9ml of 0.85% sterile saline water. Serial 10 ml dilution rates was prepared first by taking 1 ml of the pre- enriched sample with a sterile pipette and transferring this to second test tube labeled 10^2, which was previously filled with 9 ml buffered peptone water. Further dilution rates was prepared with the same techniques until the dilution rate of 10^5 was reached. That is, serial ten-fold dilutions of the original fluids, containing bacteria, must first be made for each of the methods. Pour on plate method was used to prepare viable count by adding 1ml of diluted sample in to petridish then adding 15-20ml of sterilized molten standard plate count agar in to petridish with gentle rotation to mix the solution and allow the agar to solidify for 5 minutes. After incubation for 24-48 hours plate with different dilution having bacterial colony ranging from 30 to 300 was selected and counted using colony counter and the count for each plate was expressed as colony forming unit of the suspension (Quinn *et al*., 2002).

The colony forming was calculated using the following formulas as follows:

$$C = \frac{\varepsilon C}{n1.1 + n2.0.1} x \quad d$$

Where: C= is the mean coliform colony forming unit in one gram of beef meat

εC = the total number of coliform colony forming counts in petridishes considered in the count

n1= number of petridish with the lowest dilution rate

n2= number of petridish with the highest dilution rates

d= the lowest dilution rates (Quinn *et al*., 2000).

2.4.4. Determination of yeast and mold counts

Yeast count (YC) and mold count (MC) was determined using sterile Sabourd Dextrose Agar (SDA). One ml of homogenized meat sample was added into a sterile test tube containing 9 mL of sterile peptone water. After thoroughly mixing, the suspensions were serially diluted up to 10^{-7} and duplicate samples of 0.1 mL was spread-plated on pre-dried surfaces of media containing Sabourd Dextrose Agar (SDA). The plates was then incubated at room temperature 25ºC for 3-5 days. Creamy to white/gray colonies was counted as yeasts whereas; filamentous (fuzzy) colonies of various colors (yellow, green, light brown) was counted as molds (Yousef and Carlstrom, 2003).

Table1: Bacteriological standards of raw beef as prescribed by bureaus of Indian standards (BIS) (IS-1479, PART-3-1997)

Grade	Standard plate count per ml (10^5)
Very good	<2
Good	2-10
Fair	10-50
Poor	>50

Source: (Sherikar *et al*., 2004)

2.4.5. Culturing and biochemical test identifications

A sample 0.1ml of from each dilution rate 10^2, 10^3, 10^4, 10^5, 10^6 was, taken and transferred to two pairs of petridishes containing agar such as Mac Conkey agar, Manitol salt agar (MSA), Xylose - Lysine Deoxycholate (XLD), Saboraud Dextrose agar (SDA) for suspected *E.coli, Staphylococcus, Salmonella* and fungus (yeast and mold) as well respectively and incubated at 37°C for 24 hrs. Following this colony forming unites in each pairs of petridishes was counted using colony counter (Quinn *et al*., 2000).

Then, coliform *(E.coli)* was appear/ grow on Mac Conkey agar, it produced bright, pink colored, transparent smooth and raised colonies. Pink colored, rod-shaped, short chain, single or paired gram-negative bacilli was observed after Grams' staining. All *E. coli* isolates was tested for catalase, iodole, Methyl Red (M-

R), and Voges-proskauertes (V-P),citrate, motility and other sugar utilization tests (Quinn *et al*., 2002).

Salmonella species was inoculated and incubated from Rappaport-Vassiliadis Soy (RVS) broth on Xylose - Lysine Deoxycholate (XLD) incubated at 37°C overnight (18-24 hours). The suspected bacteria was identified by colony morphology and biochemical (to more specifically identify bacterial species using various types pure culture of the Gram stain) characteristics. A typical *Salmonella* colony has a slightly transparent zone of reddish color with black center.

Staphylococcus: loopfull cultured colony from blood agar and spread onto Manitol salt agar, and incubate at 37°C overnight (18-24 hours). The suspected bacteria was identified by colony morphology and biochemical characteristics. Atypical *staphylococcus c*olony is round, smooth, glistening and on blood agar tends to be opaque smaller translucent colonies with beta hemolisis.

2.4.6. Antimicrobial susceptibility test

Antimicrobial susceptibility testing of the isolates was performed with Kirby-Bauer Disk diffusion method, according to Clinical and Laboratory Standards Institute (CLSI, 2009) on Muller Hinton agar medium. The antibiotics that was used against the isolated organisms with their disc concentrations were Chloramphenicol 30 µg (CHL), Bacitracin10µg (B), Streptomycin (10µg), Gentamycin 10 µg (GEN), Kanamycin 30 µg (KAN), Cefoxitin (FAX) 30 µg, Tetracycline 30µg (TE), Cloxacillin (OB) 5µg, Ciprofloxacin (CIP) 5µg, Nalidixic Acid (NA) 30 µg, Norfloxacin 10 µg (NOR) and Trimethoprim 5µg (TMP) for anti-microbial susceptibility testing.

Approximately 3-5 colonies isolated from pure culture was transferred into a test tube of 5 ml nutrient broth and suspension was made and incubated at 37°c for 8 hours. The turbidity of the suspension was adjusted by adding 9ml saline water and/ or the turbidity of the suspension was adjusted comparing with that of 0.5 McFarland standards.

Muller-Hinton Agar plate was prepared and a sterile cotton swab was dipped into the suspension and swabbed on the surfaces of Muller-Hinton Agar plate. Then, the antibiotic discs was placed on the agar plate using disc dispenser/ sterile forceps and pressed gently to ensure the complete contact with the agar surface. The plate was read after 24 hours of incubation at 35 ^{0}C under aerobic condition. The isolates was classified in accordance with the guideline of the National Committee for Clinical Laboratory Standards (CLSI, 2006) as susceptible, intermediate or resistance for each antibiotic tested according to the manufacturer's instructions by measuring the diameter of the zone of inhibition around the antibiotic disc. This method allowed for the rapid determination of the efficacy of the drugs. Intermediate result was considered as resistant (Huber *et al*., 2011). Multiple antibiotic resistant (MAR) phenotypes was recorded for isolates showing resistance to two and more antibiotics (Rota *et al*., 1996).

2.5. Data Processing and Analysis

The data on the major variables were stored in Microsoft excel spread sheets to create a database. After checking data for accuracy, the coded data was analyzed employing descriptive statistics and using STATA version 13 (Statistical software for data science version 13). In all analysis, associations were considered to be significant when $p<0.05$. The data on microbial counts, which was expressed as colony forming unit (CFU) per ml, of each district was transformed into logarithmic scales (log10cfu ml^{-1}) and analyzed using the General Linear Model.

3. RESULT AND DISCUSSION

3.1 Microbial Quality

3.1.1 Determination of total viable Bacterial count

In present findings, from 24 slaughtered bulls 384 meat scrap samples were tested using culturing and biochemical methods, 8/24 (33.33 %) samples were positive. Besides this, microbial quality of meat was assessed using bacterial counting methods. In the present study, the microbial content, which was taken from meat sample slaughtered at Assosa slaughtered house, indicates the hygienic levels during evisceration that includes cleanliness of the slaughtering utensils, proper storage and transport as well as the wholesomeness of the beef and contamination of the carcasses with gastro intestinal microorganisms takes place, especially during slaughtering operation, Standard plate count (SPC) is one of the most commonly used microbial quality tests (Quinn *et al*., 2002).

Our result indicated that, the gram negative coliforms and gram-positive bacteria were present predominantly, and the fungus was the least frequent in the meat and meat samples. In view of the microbial implication in handling, slaughtering, dressing, processing and distribution of meat and meat products which may endanger human health, the study was undertaken to determine the extent of microbial contamination of meat in the commercial areas of Assosa. Contamination prevention rather than end-product testing to ensure the safety of meat is needed. As raw meats were heavily contaminated with microorganisms and are potential sources of food borne infections, therefore raw meat handlers should receive education in food hygiene. Meat and poultry processors and regulators should use process control techniques to ensure that performance standards for meat and poultry are met.

The present study evaluated the microbiological quality of raw meat and meat products in Assosa slaughtered house. The microbiological condition of safety and hygiene were then assayed using the methods recommended by ICMSF (International Commission on Microbiological Specifications for Foods). The total viable counts of raw meat and meat products were determined by standard method. The overall mean Bacterial count and Fungal (yeast and mold) count of meat scrap in the study area were $3.451x10^6$ cfu/ml and in Fungus ($52x10^3$ cfu/ml). So, the present microbial quality showed as, significant bacterial and fungus count which were identified in Assosa town municipal slaughtered house respectively as Table (1) indicated.

The mean *Salmonella, E.coli, Staphylococci, and fungal* count of positive sample were ($8.44x10^6$, $1.594x10^7$, $1.013 x10^7$, $5.2 x10^3$ cfu/ ml) respectively as indicated in Table(1). This research was comparable with the findings of (Tefera A. and Jerman M, 2021) who studied microbial quality of meat and swab from contact surface in Butcher shop in D/Berhan, indicated that, total aerobic mesophilic, *Staphylococci*, Enterobacteriaceae, total coliform, fecal coliform, aerobic spore formers, and yeasts and molds of the butcher shops of 5.47, 4.78, 4.84, 4.88, 4.94, 5.15, 5.07 log cfu/g, of mean microbial counts of afternoon samples respectively. Comparably high result was reported by Firew T *et al*. (2014) reported that, aerobic mesophilic bacteria, total coliforms, enterobacteriaceae, Staphylococci, lactic acid bacteria, yeast and moulds of 8.07, 4.71, 4.45, 6.74, 5.16, and 4.62log cfu/g) of total microbial counts (log cfu/g) of street vended raw beef meat samples respectively, in Jijiga town. Consistently, Mohammed T., (2021) indicated that, mean bacterial counts in beef has, significance difference. The range count of aerobic mesophilic bacteria at butchers shop and abattoirs was 2.75-7.52 log cfu/g and 2.49-5.16 log cfu/g, respectively. Similarly, the count ranges of *S.aureus* at the butcher shop and abattoirs was 2.74-4.84 log cfu/g and 2.71-4.71 log cfu/g, respectively.

In line with the previous report, Etenesh T. *et al*. (2020) indicated, overall, mean for total aerobic mesophilic bacteria, total coliform, yeast and mold, Staphylococcus spp., Bacillus spp. and psychrophilic bacteria count was 8.34, 4.69, 6.01, 5.36, 5.45, 4.26 log 10 cfu/g, respectively, around Addis Ababa city. The presence of high microbial count in this study might indicate improper meat handling and poor sanitary condition of slaughter houses, personnel, transportation and storage. Thus, to reduce the risks of food borne bacterial infections, there is a need to educate and be aware to practice good sanitation and safe meat handling techniques for butcher shops and personnel.

However, as compared to present findings, high microbial load was reported by Muhammed N *et al*., (2021) in west Hararghe zone, who indicated that, overall, the mean total *bacterial counts, coliform counts, Enterobacter and staphylococcus sp*p. values were 7.01±0.25 log10CFU/cm2, 6.02±0.29log10CFU/cm2, 6.950±0.16 log10CFU/cm2 and 6.36±0.2 log10CFU/cm2, respectively. This might be due to cross contamination through poor personal hygiene, lack of demarcation between dirt and clean met products in the slaughterhouses, evisceration, and dressing on an unhygienic floor.

In addition, the present finding were comparable with previous findings of (Tolessa and Asmamaw, 2017) in Asossa an average aerobic bacterial count of 7.08 log10 ($1.21x10^7$) to7.41 log10 *cfu*/ml ($2.65x10^7$). However, the bacterial count obtained from current result was higher than that of work done by (Ashenafi and Beyene,1994) reported as 6.32log10c*fu*/ml, (Ombui *et al.*, 1995) reported as 5log10 *cfu*/ml and (Bonfoh *et al.*, 2003) reported as 7log10 *cfu*/ml). This is because of microbial load has highly associated with the hygienic condition practiced during harvesting to distribution process since the source of contamination is most of the time from the external environment than within animals. Contamination of the carcasses with gastro intestinal microorganisms takes place, especially during evisceration.

Comparably, in their base line studies of bacteria in or on beef and poultry carcasses and ground beef, the U.S Department of Agriculture (USDA) findings as follows: *E. coli O157:H7* was found in 563 samples of ground beef; none in 1, 297 broiler carcasses, and none on the carcasses of 2,112 cows and bulls (Jay, 2000).

The incidence and prevalence of entero hemorrhagic *E. coli* strains in meat, milk, poultry and sea food are highly variable. Considerably more positive cases were found when DNA probes are used to detect for (Entero Haemorrhagic E.Coli-EHEC strains than when *E.coli O157: H7* is tested when used other test method are used alone although *E. coli O157: H7* were not be isolated from sausage in the United kingdom, A DNA probe gave positive results on 25% of 1845 samples for other EHEC strains. 'None were found in 112 samples from 71 chickens. In line with this, the following eight meat types poultry and sea food products gave the following positive results: 63 % of 8 veal, 48% of 21 lambs, 23 % of 60beef, 18% of 51 pork, 12 % of 33 chicken, 10% of 62fish, 7% of 15 turkey and 4.5 % of 44 Sheel fish (Jay, 2000).And also, it was consistent with the previous findings of (Asmamaw A, 2017), who indicated, the mean *coliform* count of ($5.25x10^3$cfu/gm) of retailed breast meat; which were contaminated with *coliform* with significance difference.

Consistently, a study on commercial broiler chicken by (Cason and Hinton, 2000) shows the mean *coliform* concentrations in tanks 1, 2, and 3 were 4.6, 2.5

and1.6 log10 (*cfu*/ml) respectively. *E. coli* concentrations followed the same pattern with means of 4.4, 2.1 and1.4 in tanks 1, 2 and 3 respectively with significance differences ($p<0.05$) in the concentration of both *coliforms* and *E. coli* between tanks. The whole poultry meat tends to have a lower microbial count than cut up poultry meat most of the organism on such products are on the surface, so surface count/cm^2 are generally more valid than counts in deep tissue (Jay, 2000). In the study of whole chickens from six commercial processing plants, the initial mean total surface count was log 3.30/cm^2. After the chicken were cut up, the mean total count increased to log3.81/ cm^2 and further increased to log 4.8 after packaging (Jay, 2000).

However, results of the present study showed the higher limit than the permissible limit as indicated by FAO/WHO (2005) and Codex (2011). Similar higher ranges of bacterial load was reported in Uganda and Egypt (Bhandare *et al*., 2007; Elsharawy *et al*., 2018). However, bacterial load in prescribed range by FAO/WHO (2005) and Codex (2011) was noticed in slaughterhouse of Bahir Dar, Adama, Jijiga and bisheftu towns of Ethiopia (Gebeyehu *et al*., 2013; Tafesse *et al*., 2014; Azage and Kibret, 2017; Bersisa *et al*., 2019). The reason for such higher limits of bacterial load could be due to the unhygienic conditions or improper handling carried out during slaughter as well as post slaughter activity. As per the FAO/WHO (2005) and Health Protection Agency (2009), meat and meat products are unaccepted for human consumption if coliform count is greater than 25log10CFU/cm2 and 4log10 CFU/g, respectively. The result of the present study, coliform count was less than the prescribed limits in slaughter house of Assosa towns of Ethiopia. Similar report was reported in Uganda and Ghana (Bogere & Baluka, 2014; Hughes *et al*., 2015).

The presence of bacteria in meat has been widely reported from different parts of the world (Holds *et al.*, 2007; Kinsella *et al.*, 2008). Some groups recognized the presence of bacteria especially gram negative organisms as an indicator of open air meat spoilage, while others argued this assertion and considered the presence of a high number of background organisms as pathogen-reduction strategy due to the organisms antagonistic effect against pathogenic bacteria and thus safe for meat quality.

Table 2: Dilution rate and average result of standard plate count test

Isolated species	N	Mean	Dilution(10^6)	mean ± SD	p-value
E.coli	24	*1594*	*1.594 x10^7 cfu/ml*	*1.594*. ± 0.51	0.001
Staphylococcus spp	24	1013	*1.013 x10^6 cfu/ml*	*1.013* ± 0.46	0.41
Salmonella spp	24	844	8.44 x106 *cfu*/ml	8.44± 0.48	0.25
Yeast	24	38	3.8 x103cfu/ml)	3.8 ± 0.414	0.36
Mold	24	14	1.4 x103cfu/ml)	1.4 ± 0.44	0.16

Table 3. Total viable *Salmonella* count/ ml of Beef sample

Woreda	Amount of scrap	N	Mean viable *Salmonella* Count	No. of *salmonella* count/ ml of beef sample	
				Dilution ratio	Viable count/0.1ml of original sample (*cfu*/ml)
Asossa	384	24	636	10^2	6.36x 10^5
			208	10^6	2.08x10^6
Mean salmonella CFU/ml			844		8.44 x 10^6

(As indicated in Table 3, the mean *salmonella* count of positive sample was 8.44 x 10^6*cfu*/ml)

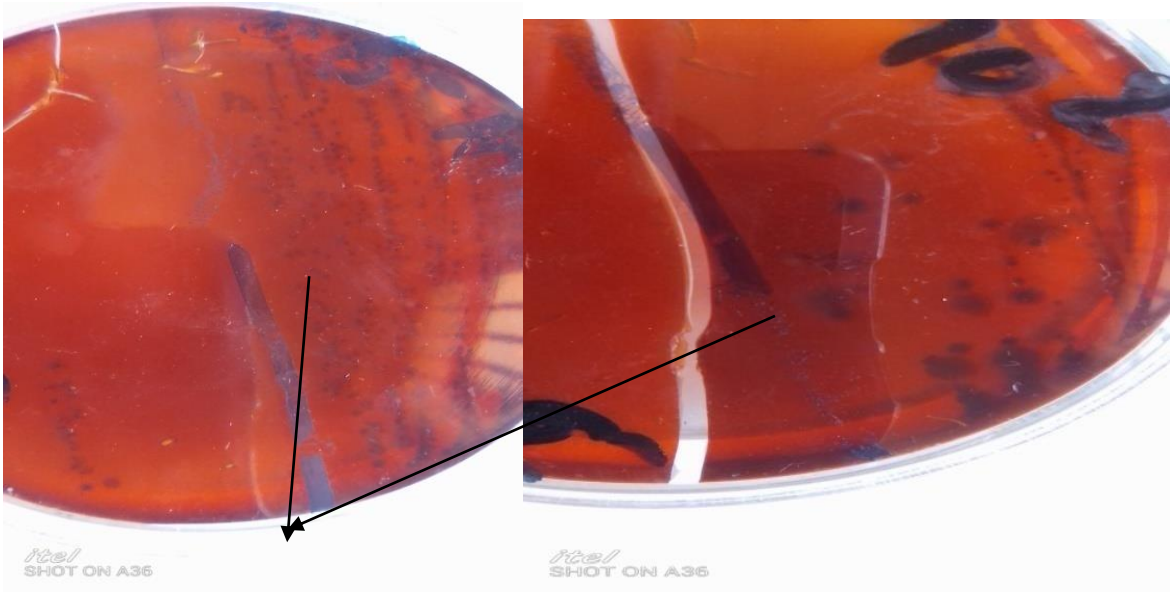
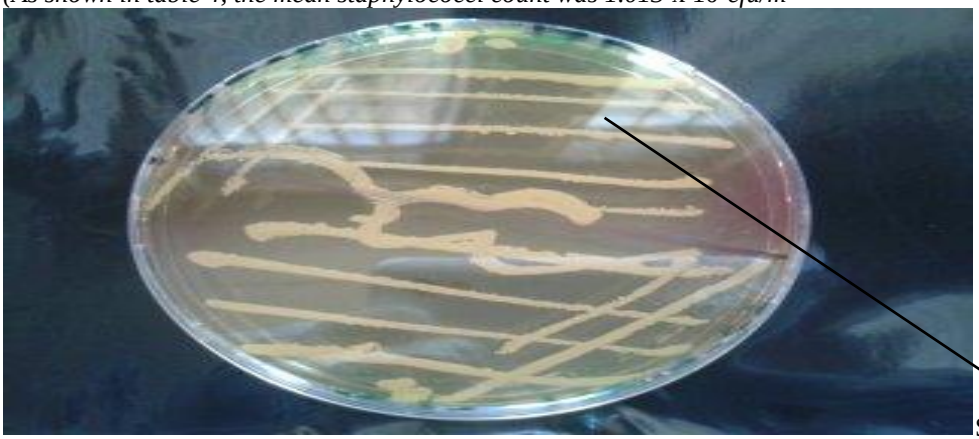


Fig2. Indicates salmonella colony on XLD Agar

Table 4. Total Staphylococcus count/ ml of beef sample

Assosa town	Amount of scrap	Sample (N) No. of bull	Mean *Staphylococci* count	No. of *Staphylococci* count/ ml of beef sample	
				Dilution ratio	Viable count/0.1ml of original sample (*cfu*/ml)
Assossa	384	24	708	10^2	708 x10^2
			305	10^6	305 x 10^6
Mean *CFU* staph count			1013		1.013 x 10^7

(As shown in table 4, the mean staphylococci count was 1.013 x 10^7*cfu/m*



Staph. Aurues colony

Fig3. indicates Staph. Aurues colony on MSA

Table 5. Total viable *E.coli count* / ml of beef sample

Assosa town	Amount of scrap	Sample (N) No. of bull	Mean *E.coli* count	No. of *Ecoli* count/ ml of beef sample	
				Dilution ratio	Viable count/0.1ml of Original sample (CFU/ml)
Assosa	384	24	985	10^2	985 x 10^5
			609	10^6	6.09 x 10^8
Mean *CFU* E.coli count			1,594		1.594 x 10^7

(As shown in the Table 5 the mean E.coli count was 1.594 x 10^7 *cfu/ml)*

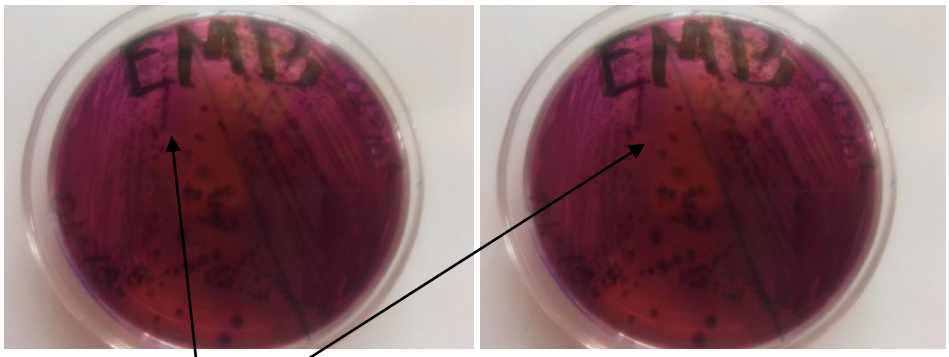


Fig4. indicates E.coli colony on EMB agar

Table 6. Total Yeast and Mold count/ ml of beef sample

Woreda	Amount of scrap	N	Mean *yeast* count	Mean mould count	No. of fungal count/ ml of beef sample	
					Dilution ratio	Viable count/0.1ml of Original sample (CFU/ml)
Assosa	384	24	48	16	10^2	6.4 x 10^3
			27	12	10^6	3.9 x 10^3
Mean *CFU* fungal count			38	14	10^2	52 x 10^3

(As indicated above Table 6, the total fungal count was 52 x 10^3cfu/ml**)**

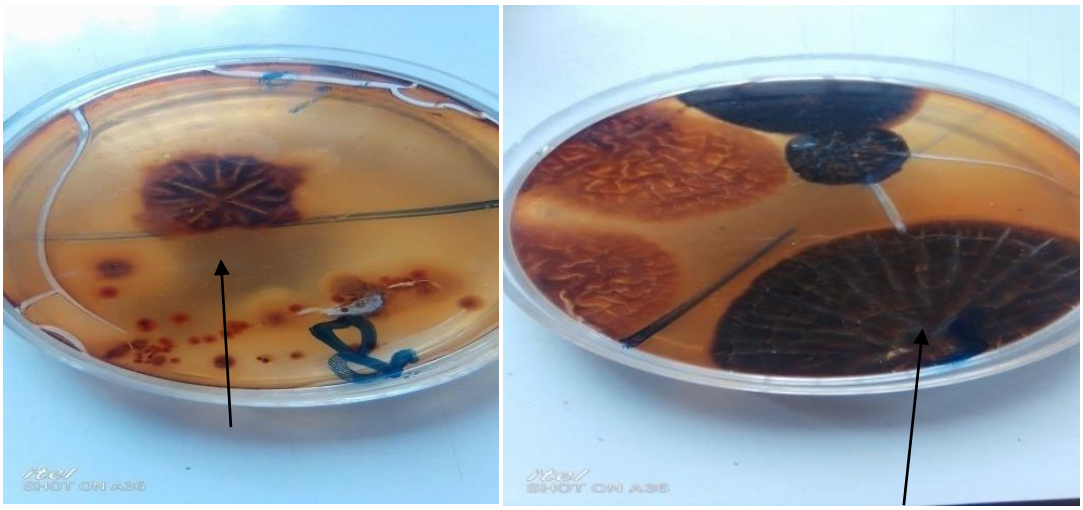


Fig 5A. indicates Yeast colony on Sabourd Dextrose agar

Fig5B. indicates mold on sabourd Dextrose agar

3.1.2 Risk Factors Associated with beef carcass contamination

Concerning on bacterial load found in meat samples collected in this study was failed to comply with the standard given for raw meat intended for direct human consumption. Cross contamination of carcasses that occurs during slaughtering/processing and handling, such as skinning, evisceration, storage, and distribution at slaughterhouses could be the probable reason of the cross contamination. However, reason of retail establishments and personal hygiene cannot be ignored for cross-contamination. In fact, slaughtered animals may have relatively few bacteria (Kagambèga *et al.*, 2011) but the meat surface exposed to contamination during slaughter, evisceration, and other post slaughter operations, transportation conditions and exposure during vending operations could lead to contamination (Kagambèga *et al*., 2011).

The rate of beef carcass contamination with bacteria was high from collected meat scrap that can be associated with risk factors. As the present findings indicated, significant contamination was observed from sanitary /hygienic/ condition of medium and poor categories of scrap of meat sample. Besides this; carcass sample taken from breast-lateral and thorax -lateral side was generated with high contamination infection, however; the association with infection and factors were non-significant (p>0.05) as indicated in table 6. Besides this, origin based contamination level of meat scrap in slaughtered cattle was investigated, and hence 11.97% of contamination rate was observed, which was statistically significant (P<0.05) as Table 7 indicated. This finding was in line with the previous finding of (Aki A *et al*., 2017) who reported significant bacterial contamination in breast meat. In spite of the fact that personal and environmental hygiene is a potential source of contamination; the workers by themselves can be a probable source due to illness.

Many scientific findings state that meat handlers are the main cause of microbiological contamination; hence wearing protective clothing protects the meat from contamination, which was similar to the report of Bersisa, *et al*. (2019) and Aynewa et al. (2021) from Bisheftu, Ethiopia. Comparably, Mohammed T., 2021 in Assosa Town, Benishangul Gumuz Regional State, Western Ethiopia indicated that, 56.25% of abattoir workers said as there was reason of food contamination while 43.75% of the workers noted as there was no reason for food / meat contamination.

This is because of evisceration of the beef that gastro intestine contents may contaminates the meat, besides this, sanitary level or hygienic condition of the personnel of the retailed beef workers and usable materials in butcher shops may prone to bacterial contamination. Evisceration that includes cleanliness of the slaughtering utensils, proper storage and transport as well as the wholesomeness of the beef and contamination of the carcasses with gastro intestinal microorganisms takes place, especially during slaughtering operation (Spreer, 1998).

Contaminated raw meat is one of the main sources of food borne illness (Bhandare *et al*., 2007; Podpecan *et al*., 2007). Edible tissues are exposed to contamination from a variety of sources within and outside animal and this may be during slaughtering and processing. During slaughtering, dressing and cutting, microorganisms came chiefly from the exterior of the animal mainly from the hide of the animal and the faeces and its intestinal tract but that more added from knives, cloths, air, carts and equipment in general (Pal, 2012). On the other hand, processed meat foods are more predisposed to contamination with pathogenic microorganisms during the various stages of processing. Meat and meat products are important sources of human infections with a variety of food borne pathogens.

Table 7: **Factors associated with Beef contamination**

Factor	Categories	N	No (%)	ChI^2	p-value
Site of sample taken	Flank/abdomen	8	3(37.5%)	0.60	0.74
	Thorax/lateral	7	3(42.85%)		
	Breast/lateral	9	4(44.44%)		
Sanitary status	Good	15	5(33.33%)	1.33	0.51
	Medium	5	3(60%)		
	Poor	4	2(50%)		

Table 8: Origin based contamination level from meat scrap in slaughtered cattle

Assosa town	Slaughtered bull and oxen	amount of scrap	Positive (%)	Chi2	P value
Assosa Abattoir	24	384	35 (9.11)	16.80	0.000
Overall	24	384			

As the Table8 above indicated, high bacterial contamination was reported in studied areas, which was significantly associated (p<0.000).

3.2 Bacterial Isolation and Identification in beef

In the present study, the overall isolation rate of meat scrap sample was 8/24 (33.33 %) at slaughtered place of Assosa town. This result is comparable with the prevalence ranging from 36.8 % to 47.6% on cloacal swabs of broiler meat and carcass swabs respectively from 100 chicken collected in abattoir in Chiang Mai and Thiland (Hanson *et al.*, 2002). A study on 212 retail chicken samples in greater Washington D.C, revealed, prevalence of *E.coli*, 82 (38.7%), while 11.9% of Turkey samples were *E. coli* positive (Bolton *et al.*, 1996).

With regard to the bacteriological analysis of scrap of beef sample, the work revealed that from the entire 33.33 % positive meat samples, the presence of *Salmonella*, *E.coli*, *Staphylococcus*, *fungus* (yeast and molds) were (38%, 42%, 20.83%, 20.83%, 25 %) respectively. Different bacterial isolates were detected by bacteriological methods from scrap of meat sample collected from slaughtered house with higher isolation rate of microbial contamination in the form of mixed bacterial infection and has significant effect ($P < 0.000$) as shown in Table 8.

Consistently, Mohammed T., (2021) indicated that, 13(37.1%) at abattoir and 17(48.6%) at retaile outlets were contaminated to e.coli whereas 9 (25.7%) and 12 (34.3%) of the sample from abattoir and retaile out lets were contaminated with salmonella spp., respectively. Coliforms were absent at 11 (31.4%) and 5 (14.3%) of the total samples from abattoir and retaile outlets, respectively. And 13 (38.71%) and 6 (17.14%) of the samples at abattoir and retailes outlets resp., were satisfactory for S. aurures.

However, this finding was higher as compared to the previous findings of (Shimelis, 2014) in Selale /Fitche, (Beshatu F,2014) in Dire Dawa muncipal Abattoir, (AsmelashT, 2015) at D/zeit ELFORA export abattoir (23.4%, 17.7%, 12.9%) isolates of *Staphylococcus aureus*, *Salmonella* and *E.coli* respectively. Similar species of microorganism were isolated by (Merhawit *et al.*, 2014) from Adigrat, Tigray, Ethiopia. *Staphylococcus aureus*, *E. coli* and non-coliform bacteria like *Salmonella* and *Shigella* are some of the main bacterial pathogens associated with food-borne infections. Similar bacterial contaminants have been reported by other investigators in food, water and environmental samples (Haftu *et al*., 2012; Haileselassie *et al*., 2012). However, the present finding was higher as compared to the previous findings of (Alemayehu, 2015) in Bahir Dar, (14.50%), isolates of *Staphylococcus*.

Another comparably, study has demonstrated that, the rate of microbial contamination of retail meats with *E. coli* ranged from 39% for chicken samples to 12% for turkey samples. The rate of *E. coli* contamination in different retail meats were not similar with the rates observed for *campylobacter* contamination. This may have been due to the frequency the presence of *E.coli* in the animal production and food processing environments. In fact, *E. coli* isolates identifies were part of the normal enteric flora that is present in animals and often identified in food production, processing and distribution environments (Brooks *et al*., 2001).

Table 9. **Identification and Isolation of Bacteria from study sites**

Bacterial isolates	N	Isolated freq.	Isolation rate (%)	Chi2	p- value
Staphylococcus spp	24	5	20.83	0.66	0.41
Escherichia coli	24	10	41.66	10.5	0.001
Salmonella	24	9	37.5	1.31	0.25
Yeast	24	5	20.83	0.84	0.36
Mold	24	6	25	1.97	0.16

3.3 In vitro Antimicrobial Susceptibility Test

The observations made in the present study unequivocally proved that *Staphylococcus* showed resistance to all antimicrobials tested. This shows that the existence of resistance of *Staphylococcus spp* to almost all commonly used antimicrobials in beef industry and human medicine. *Staphylococcus* has a tendency to rapidly acquire antibiotic resistance to different classes of antibiotics.

The present study showed that the resistance of *Staphylococcus* to Cefoxitin (66.7%), Tetracycline (58.3%), Streptomycin (50%), and Bacitracin (50%) observed in retailed beef meat samples as indicated in Table 10. Comparable research works were reported in various parts of Ethiopia by Biniam T. (2014) revealed resistance of *S.aureus* to Cefoxitin (71.8%), Tetracycline (69.2%), Streptomycin (66.7%), and Chloramphenicol (35.9%) in and around Wolaita Sodo, southern, Ethiopia**.** Besides this, Alemayehu (2015) indicated resistance of *S.aureus* to Cefoxitin (75.7%), Tetracyline (72.2%), Streptomycin (73.1%) and Vancomycin (52.4%). In the present study, the *in vitro*

Disc sensitivity test showed, *S. aureus* was found to be highly susceptible /less resistance/ to Cloxacillin (58.3%), Gentamycin 5(0%), and followed by Bacitracin, Streptomycin (33.3%). Similar results with the finding of Abera *et al.* (2013), Abebe *et al.* (2013) in Adama and Jaims *et al*. (2002) who reported, less résistance of chloramphenicol and sulphamethoxazole-trimethoprim. The reason why these antimicrobials were less resistant might be that they are not used in the study area in veterinary clinics or services and even not frequently used (infrequent use of therapeutics) perhaps in human medicine.

Closely Similar results have been published by Belayneh *et al*. (2013) and Abera *et al*. (2010) in Adama showing (90%) and (86.1%) susceptibility for Kanamycin and Ceftraiaxone respectively. 91.59% Susceptibility for Streptomycin was also reported by Joshi *et al*. (2014) in Nepal. The reason why these antimicrobials were less resistant might be that they are not frequently used in the study area in veterinary services. Similar suggestion was given by Jaims *et al*. (2002) that the development of antimicrobial resistance is nearly always as a result of repeated therapeutic or indiscriminate use of them. This multi drug resistance occurred might be due to administration of multiple antibiotics for prophylaxis or infection, lack of drug sensitivity tests in the farms, uncontrolled or discriminate use of antibiotics in the farms and another possibility is that cattle are being treated with antibiotics for other conditions, thereby selecting for resistant populations of *S. aureus* (Shitandi and Sternesjo, 2004).

Table 10: Resistance and susceptible of *Staphylococcus* isolates to different antimicrobials (n = 12).

Antimicrobial agents	**Disc content (µg)**	**No. of isolates**	**Resistance**	**Intermediate**	**Susceptible**
			No (%)	No (%)	No (%)
Streptomycin (S10)	10	12	6(50)	2(16.66)	4(33.3)
TTC(TE30)	30	12	7(58.3)	1(8.3)	4(33.3)
Cefoxitin(Fax 30)	30	12	8(66.7)	1(8.3)	3(25)
Bacitracin(B10)	10	12	6(50)	2(16.66)	4(33.3)
Gentamycin(CN10)	10	12	4(33.3)	2(16.6)	6(50)
Cloxacillin(OB5)	5	12	3(25)	2(16.6)	7(58.3)
Mean		12	34/6 (5.6)	10/6(1.66)	28/6(4.66)

Key: S- Susceptible, I- Intermediate, R- Resistant

Antimicrobial resistance emerges from the use of antimicrobials in animals and human, and the subsequent transfer of resistance genes and bacteria among animals, humans, animal products and the environment (Scott *et al*., 2002). In Ethiopia, there have been reports on the drug resistance of *E. coli* isolates from animal derived food products (Hiko*et al*., 2008; Bekele *et al*., 2104, Bula 2014, Mohammed *et al*. 2014, Taye *et al.*, 2013). With regard to the antibiogram of *E.coli* in the current study, 7 different commercially available antimicrobial discs were used and n=12*E coli* isolates subjected to antimicrobial sensitivity test were found to be susceptible to Kanamycin, Nalidixic acid, Streptomycin, Bacitracin and Trimethoprim antimicrobials but they were resistant against tetracycline, norfloxacin and streptomycin drugs as shown in Table 11.

The degree of susceptibility for *E.coli* isolates ranges from 16.6% up to 58.3%; however, resistance ranges from 25% up to 75 % in *E. coli*. The absence of resistance against kanamycin is not in agreement with the previous findings of Hiko *et al*. (2008) whose study showed all the isolates were resistant to kanamycin but it agrees with Taye *et al.* (2013) reported that all the *E. coli* isolates were found susceptible to Kanamycin.

Multi Drug Resistance is defined as resistance of an isolate to more than 2 antimicrobials tested (Dominic *et al*., 2005). Multiple drug resistance was also seen in 83.7% *E.coli* which is inconsistent with the findings of Dulo(2014) that showed the presence of multiple antimicrobial resistance of 3 *E. coli* O157against three (16.5%) and four (33.3%) antibiotics.

In the present study, all the 12 *E. coli* isolates were resistant against five drugs. From the mentioned antimicrobials, tetracycline, norfloxacin, and streptomycin were found in almost all of the MDR *E. coli* isolates as indicated in Table10. This finding was supported by Bekel *et al*. (2014); Hiko *et al.* (2008); Adetunji *et al*. (2014); Meng *et al*. (1998) and Schroeder *et al*. (2002) who reported the existence of multidrug resistant *E.coli*. This is correlated with Ahemed *et al*. (2006) who noted that multidrug resistant phenotypes have been spread widely among Gram negative bacteria. Furthermore, it is stated that studies in other developing countries have shown the trend in enteric pathogens is

toward increasing antimicrobial resistance (Hohe *et al*., 1998).

In general, the development of drug resistant in *E. coli, Staphylococcus, Salmonella,* strains can be linked to various aspects including the practice of indiscriminate use of antibiotics in food producing animals(Cosgrove and Carmeh, 2003) and due to the selective pressure to rampant use of antibiotics in the animal industry (Mohammed *et al*., 2014).

Table 11: Antimicrobial susceptibility test result for *E.coli* isolates (n = 12).

Antimicrobial agents	**Disc content (µg)**	**No of isolates**	**Resistance**	**Intermediate**	**Susceptible**
			No (%)	No (%)	No (%)
Tetracycline(TE)	30	12	9 (75)	1(8.3)	2 (16.6)
Bacitracin (B)	10	12	3(25)	5(41.6)	4(33.3)
Nalidixic acid (NA)	30	12	5(41.66)	1(8.33)	6(50)
Streptomycin(S)	10	12	6(50)	1(8.33)	5(41.66)
Kanamycin(K)	30	12	3(25)	2(16.66)	7(58.33)
Norfloxacin (NOR)	10	12	7(58.3)	2(16.66)	3(25)
Trimethoprim (TMP)	5	12	4(33.3)	2(16.66)	6(50)
Mean		*12*	***37/7(5.28)***	***14/7(2.0)***	***33/7(4.71)***

Key: S- Susceptible, I- Intermediate, R- Resistant profile of *E.coli* isolated from beef carcass sample.

All the isolates were susceptible to Ciprofloxacilin, Gentamycin and Chloramphenicol as indicated in Table 12. The reason why these antimicrobials were susceptible might be that they are not used in the study area in veterinary clinics or services and even not frequently used (infrequent use of therapeutics) perhaps in human medicine. This finding is similar with finding of Begum *et al*. (2010) on *Salmonella* isolates from chicken eggs, intestines and environmental samples**.** However, the current finding is not in agreement with results of Singh *et al*. (2013) from India, and Antunes *et al*. (2003) from Portugal, but different with resistant patterns. Disagreement may be due to different strains of isolates and/or difference in levels of strains' resistivity.

Accordingly, 50%, 41.6% were resistant to Tetracycline and Streptomycin, respectively. High resistant to Tetracycline, and Streptomycin, were in agreement with what Maria, (2010) and Jahan *et al*. (2012) found on poultry meat related resistant isolates. And also this finding goes with what Davies (1996) found that most of the *Enterobacteriaceae* family including *Salmonella* is resistant to the drugs including Aminoglycosides, Beta lactams, Trimethoprim and Chloramphenicol. However, spectinomycin, kanamycin and chloramphenicol were effective against most of the *Salmonella* isolate. Comparable result was reported by Beshatu F. (2014) in Dire Dawa municipal abattoir, who showed, highest level of resistance was observed for tetracycline (100%), nitrofurans (100%), streptomycin (81.8%) and kanamycin (79.5%). The effectiveness of gentamycin, ciprofloxacin, and sulphonamides in this study might be due to the difference in frequency of usage among the available antimicrobials, the nature of drugs, and their interaction with the bacteria. Different individuals reported antimicrobial resistant *Salmonella* isolates in previous studies from Ethiopia (Gedebou and Tassew, 1981; Ashenafi and Gedebou, 1985; Molla*et al*., 1999; Molla*et al*., 2003) and from other countries (D'Aoust*et al*., 1992; White *et al*., 2001).

Most isolates showed high level of susceptibility to Ciprofloxacin which is in agreement with Harsha *et al*. (2011) who described Ciprofloxacin as an increasingly demanded and successfully used to treat septicemic case in humans and *Salmonella* isolates resistance to Ciprofloxacin has been found occasionally and Drug sensitivity test revealed that, the isolated bacterium that were subjected to five different antibiotics found only non- resistant to ciprofloxacin.

Table 12: Antimicrobial susceptibility test result for Salmonella isolates (n = 12).

Antimicrobial agents	Disc content (µg)	No of isolates	Resistance	Intermediate	Susceptible
			No (%)	No (%)	No (%)
Tetracycline(TE)	30	12	6 (50)	2(16.6)	4(33.3)
Gentamycin(CN)	10	12	3(25)	2(16.6)	7(58.3)
Streptomycin(S)	10	12	5(41.6)	3(25)	4(33.3)
Chloramphenicol(C)	30	12	3(25)	4(33.3)	5(41.6)
Ciprofloxacin(CIP)	5	12	3(25)	1(8.3)	8(66.7)
Mean		***12***	***20/5(4)***	***12/5(2.4)***	***28/5(5.6)***

***Key**: S- Susceptible, I- Intermediate, R- Resistant profile of Salmonella isolated from beef carcass sample.*

4. CONCLUSION AND RECOMMENDATION

The microbial analysis of meat scrap study revealed that from the entire 33.33 % positive meat samples, the presence of *Salmonella, E.coli, Staphylococcus, fungus* (yeast and molds) were (37.5%, 42%, 20.83%, 20.83%, 25 %) respectively. Different bacterial isolates were detected by bacteriological methods from meat scrap sample collected from slaughtered house with higher isolation rate of microbial contamination in the form of mixed bacterial infection and has significant effect ($P < 0.05$). Besides this, mean microbial count were done. In line with this, the mean *salmonella* count, *E.col count, Staphylococci count,* yeast and mold count were 8.44±0.48SD, *1.594±0.51SD, 1.013±0.46SD,* 3.8±0.414SD, 1.4±0.44SD respectively. The microbial quality of meat in the study area was below standard set by WHO and European commission. Therefore, hygienic production and distribution of meat are vital to eliminate or reduce public health risks and prevent zoonotic disease and economic losses due to premature spoilage of meat caused by cross contamination. Besides, the concerned organizations should create awareness among meat handlers and slaughterhouse workers about the importance and ways of hygienic meat processing practices and proper handling. For isolated Staphylococcus, Cefoxitin and Tetracycline were resistance, but; Cloxacilin, and Gentamycin were sensitive. In case of isolated e.coli, high resistance was tested in tetracycline and norfloxacilin wheras *susceptiblility were seen in kanamycin, nalidixic acid, and trimethoprime drugs. In salmonella isolates, tetracycline was resistance however; ciprofloxacilin, gentamycine, and chloramphenicol were susceptible*. Finally the government should create awareness, establish standard slaughterhouse appropriate location outside the town with hygiene design facilities, large slaughter capacity, proper meat inspectorate services, and effective implementation of food safety measures through application of hazard analysis and critical control point and, and employ well train butchers so that cross-contamination at slaughterhouse level should be reduced.

Based on the above conclusion, the following points are forwarded;

- *Salmonella, e.coli, Staphylococcus, fungus* are detected and identified, so attention should be taken to food borne diseases;
- The degree of the risk of consumption of meat contaminated with *bacteria* should be assessed;
- The use of standardized procedures and applications like good hygienic practice, animal loading and un loading vechles, marketing origin,
- Good hygienic practices of carcass handling, and transportation to end users,
- Potential factors such as contamination levels, hygienic conditions, abattoir workers and meat handlers should be sensitized on issues,
- There were also some difficulties to achieve slaughtering in the working area due to a shortage of work-related facilities. .
- There should be improved hygiene practices at all levels in the¬ meat slaughtering and marketing in the meat stalls.
- Governmental and non-governmental organizations should¬ strengthen awareness campaigns on improved hygiene practices so as to reduce the public health risks and the rate of microbial infections with raw meat consumption.
- Accessing periodically health treatment and train about the section for abattoir workers.
- A standard abattoir with the following facilities should be provided by the state Government updating facilities, compartment lairage, stunning pen, evisceration section, bleeding section, Equipments sterilization facilities, veterinary laboratory, refrigerator, chilling room, by product collection room, hide and skin processing room hot water service and established HACCP facilities.

- Records all daily activities in abattoirs to generate all information for concern bodies.
- Creating awareness among traders and butchers on proper handling of cattle and good hygienic practice in an abattoir for quality beef production.

- *Salmonella, e. coli, staphylococcus, fungus* are resistant to most common drugs, attention should be taken in selecting antimicrobials in treating infection both in animals and human being so, drug selection should be based on antimicrobial susceptibility test;

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