



Major Causes of Poultry Carcass Condemnation at Commercial Slaughterhouses in Bishoftu, Ethiopia

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Abstract: A cross sectional study was conducted on poultry slaughter houses at ALEMA and ELFORA farms in Bishoftu, Central Ethiopia from November, 2014 to April, 2015. The aim of this study was to identify and determine major causes of poultry carcass condemnation and to estimate the direct financial losses attributed to the condemned carcass. During the study period broilers were selected by systematic random sampling using regular interval to quantify the rate and reason of condemnation. Out of 850 broilers slaughtered, 25 (2.9%) carcass was rejected. The overall average of bruising was (0.82%) per total slaughtered broilers. The other causes of condemnation were cachexia, dead on arrival, poor bleeding, cellulitis, over scalding, septicemia, fracture and contamination. From these bruising is the most frequent reason for poultry carcass condemnation in this study. During the study standard inspection procedures were followed and daily condemnation records were used as the sources of data. The average direct economic loss incurred annually as a result of condemnation of poultry carcasses was estimated to be 193,4200 ETB per Annam, rendering them unfit for local market and considering their zoonotic risks to human beings. Descriptive statistics, percentage was used to determine the rate of carcass condemnation. Losses at processing can be reduced by improving the management of harvesting and transportation as well as the adjustment of the equipment used at slaughter.

[Yohannes Hailemichael, Gezahegne Mamo Hassen muhamed Negesse Welde. **Major Causes of Poultry Carcass Condemnation at Commercial Slaughterhouses in Bishoftu, Ethiopia.** *J Am Sci* 2020;16(10):1-6]. ISSN 1545-1003 (print); ISSN 2375-7264 (online). <http://www.jofamericanscience.org>. 1. doi: [10.7537/marsjas161020.01](https://doi.org/10.7537/marsjas161020.01).

Key Words: Poultry Carcass, condemnation, economic loss, slaughterhouses, Bishoftu, Ethiopia

1. Introduction

Over the last decades, poultry meat production has been developed greatly in all aspects throughout the world. This industry has become popular due to the relatively low cost of production, low fat content and the high nutritional value of poultry meat. Increase in poultry meat consumption cannot be solely attributed to its low cost, but product diversification and wholesomeness has also contributed to increase in broiler meat consumption (Fletcher, 1999) (Chouliara *et al.*, 2007).

According to Ethiopian Central Statistics Agency (CSA) (2013) the poultry population in Ethiopia at around 58.3 million with native chicken of none descriptive breeds representing 96.9%, 0.54% of hybrid chicken and 2.56% exotic breeds of chickens mainly kept in urban and peri-urban areas. Among these Oromia region habitats about 34.4% of the total national chicken population and contribute 36% of the total annual national egg and poultry meat production. However, several private large scale commercial poultry farms in and in the vicinity of Addis Ababa,

the majority of which are located in Bishoftu. ELFORA, Alema and Genesis are the top 3 largest commercial poultry farms with modern production and processing facilities. ELFORA annually delivers around 420,000 chickens to the market of Addis Ababa. Alema poultry farms is the 2nd largest commercial poultry farms in the country delivering nearly half a million broilers to Addis Ababa market each year. It was registered in 1993 (1985 in the Ethiopian calendar) to address the shortage of protein for human consumption in Ethiopia by developing improved animal production programs. The farm has its own broilers parent stock, feed processing plants, slaughter houses, cold storage and transportation facilities. There is also a third sector, keeping dual purpose chickens of exotic breeds at the government owned poultry breeding and multiplication centers. The centers distribute fertile eggs, baby chicks and pullets and cockerels for the farming communities (Solomon, 2007).

Commercial poultry production is one of the flourishing ventures of animal production in Ethiopia. It has been providing to the demands of proteins at least to the urban population, though concurrent health constraints are hampering its intended potential. In modern poultry production, it is apparent that broiler chickens are confined in large numbers under intensification. As a result, infectious and noninfectious diseases of various etiologies and management problems are becoming the major constraints of broiler production (Lobago *et al.*, 2005; Namata *et al.*, 2008). However, according to the Food and Agriculture Organization of the United Nations (FAO), Ethiopia produced only 60,000 tons of poultry meat in 2012. Annual per capital poultry meat consumption stands at only 0.6kg.

In the poultry production industry, various diseases and many pathological changes can affect the carcass characteristics. This leads to economic losses due to total or partial condemnation of carcasses or viscera following veterinary evaluation at the time of slaughter. Sometimes these diseases threaten public health with zoonotic disease (Gracey *et al.*, 1999; Ansari-Lari and Rezagholi, 2007).

Currently in Ethiopia there is lack of information on specific causes of broilers carcass condemnation and prevalence of their disease or conditions that lead to carcass condemnation and proper evaluations of financial losses due to carcass condemnation resulting from various conditions at slaughter houses. In present study we identify the major cause of poultry carcass condemnation and to estimate the magnitude of direct financial losses to condemned broiler carcass at ALEMA and ELFORA farms poultry slaughter house in Bishoftu, central Ethiopia.

2. Materials and Methods

The study was conducted in Bishoftu town, central Ethiopia. It is located 45 km south east of Addis Ababa. It lies 9°N latitude and 40°E longitude at an altitude of 1850m above sea level central high land of Ethiopia. It has an annual rainfall of 866 mm of which 84% is in the long rainy season (June to September). The dry season extends from October to February. The mean annual maximum and minimum temperature are 26°C and 14°C respectively, with mean relative humidity of 61.3% (Adardo, 2007).

A Cross sectional study was conducted at poultry slaughter houses of ALEMA and ELFORA farms to determine the major cause of broilers carcass condemnation from November 2014 to April 2015. During this study period the number of broilers found dead at arrival at the plant and the number of carcass condemned per slaughtered broilers and reasons of condemnation was considered. A retrospective study

was used to evaluate the direct financial losses of broiler carcass condemnation.

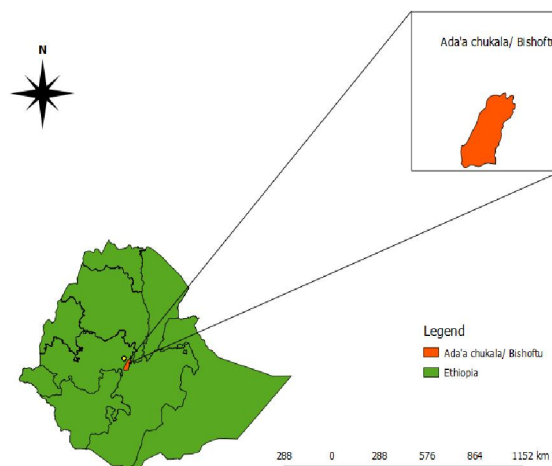


Fig 1: Map of study area

Broilers were selected by systematic random sampling technique and the required sample size was determined based on 50% of expected prevalence of condemnation of slaughtered broilers as there was no previous study done on this respect, 95% confidence level and 5% desired absolute precision ($d=0.05$) was used and the formula given by Thrusfield (1995).

$$N = \frac{(1.96)^2 p_{\text{exp}} (1 - p_{\text{exp}})}{d^2}$$

Where n= required sample size

P_{exp} =expected prevalence (50%)

d = desired absolute precision

1.96= the value of Z of 95% confidence level.

Therefore, according to the above formula, 384 broilers should be sampled, however, to improve precision, the sample size was increased and a total of 850 broilers were sampled in this study.

In this study mature broilers slaughtered for the purpose of chicken meat in farms slaughter houses were included. They were selected by systematic random sampling technique from the broilers population at the slaughter points. The broilers were originated from broiler population of different farms.

During this study period broiler were selected by systematic random sampling using regular interval to study the rate and reason of condemnation in slaughter houses. The causes of carcass rejection have been studied in broiler slaughterhouses.

Poultry meat decisions were made for carcass condemnation on the basis of visual inspection of carcass and viscera. All affected carcasses were rejected from local market since partial approval was not practiced in the farms. The annual slaughter rates

were estimated from retrospective slaughter houses record. The analysis was based on the average weight of the carcass, average carcass prices in local market and the rejection rates of carcass. So the direct economic losses due to poultry carcass condemnation were calculated by the following formula, and procedure:

$$DFL = C \times P \times W$$

Where: DFL - Direct Financial Loss; C - Number of Condemned poultry carcass; P - Average poultry carcass Price (birr/Kg); W - Average Poultry Weight (Kg). The Average weights of poultry carcasses (W) were determined by weighting 40 poultry carcass. The average weights were calculated as 1.6 kg in the farms. The average sell price (P) for each kilogram of poultry carcass was 95ETB, acquired by interviewing local super markets in and around Addis Ababa during in the time of study.

Data Management and Analysis: The data collected was entered and scored in Microsoft excel worksheet. Before subjected to statistical analysis, the data was thoroughly screened for errors and properly coded. For analysis descriptive statistics, percentage was used to determine the rate of carcass

condemnation. The association between condemnation rate of carcass and reason and number of carcass condemned assessed by Pearson chi-square.

3. Result

In this study, a total of 850 broilers were examined at ALEMA and ELFORA farms slaughter houses. Inspection was carried out on all broilers for the detection of any abnormalities that cause carcass condemnation. This study revealed that the total rate of carcass condemnation was 25 broilers (2.9%). Bruising was the main reason for carcass condemnation, corresponding of 0.82% of total slaughtered broilers and resulting in 28% of total carcass condemned in the period of study. The second important cause of condemnation was cachexia with a rate of 0.47% of total slaughtered broilers. The other causes of condemnation and percentage per total slaughter respectively were: pre slaughter mortality, poor bleeding and cellulitis with similar rate of 0.35%, over scalding 0.23% and septicemia, contamination and fracture with rate of 0.12%, Average annual direct economic loss due to broiler carcass condemnation was estimated to be 1934200ETB. The number and percentage of main causes of condemnation are given in Table 1.

Table 1: Causes of poultry carcass condemnation from November 2014 to April 2015

Cause of Condemnation	of No. of condemnation	of carcass % of condemnation	of total % condemnation of total slaughtered poultry
Bruising	7	28.0	0.82
Cachexia	4	16.0	0.47
Dead on arrival	3	12.0	0.35
Poor bleeding	3	12.0	0.35
Cellulitis	3	12.0	0.35
Over scalding	2	8.0	0.23
Septicemia	1	4.0	0.12
Fracture	1	4.0	0.12
Contamination	1	4.0	0.12
Total	25	100	2.9

Direct Financial Loss: The annual slaughter rate of the farms for the last three years were 415000, 452000 and 431 000 in 2011, 2012 and 2013, respectively. So the direct annual financial loss due to rejection of carcass was calculated based on the price

of carcass from super markets in and around Addis Ababa. By using necessary information and formula, the annual direct financial loss incurred due to condemnation of carcass was calculated to be 1934200ETB (Table 2).

Table 2: Average annual estimated financial loss due to carcass condemnation

slaughter rate	Causes of condemnation	rejection rate	carcass weight	carcass price
432666	Bruising	3563	1.6 kg	95.00ETB/kg
	Cachexia	2036		
	Dead on arrival	1527		
	Poor bleeding	1527		
	Cellulitis	1527		
	Over scalding	1018		
	Septicemia	509		
	Fracture	509		
	Contamination	509		

4. Discussion

The results of present study showed that the total percentage of carcass condemnation was 2.9%. Thus this rate of condemnation of poultry carcass could bring about paramount economic importance and causes loss of production. The present finding is higher than the report of (Hosseini *et al.*, 2011), who reported 0.67% of rate carcass condemnation in Nowshahr Poultry Slaughters (North of Iran), Ansari and Rezagholi (2006), who reported 0.87% of rate of total condemnation in Western France and (Fatemeh *et al.*, 2011), who reported 0.33% of rate of carcass condemnation in abattoir of Tehran province. This high rate of carcass condemnation might be attributed to high stocking density resulting in high contamination rate of the poultry house with several diseases and scratching with each other during feeding and drinking of water. The other contributing factor could be lack of standard poultry harvesting, transportation, and processing equipment when compared to other developed countries. Overall 9 causes for rejection of carcass were detected in the present study. The main cause of carcass rejection was bruising which accounted for 0.8% of all birds slaughtered and 28.0 % of TCR. This finding is higher than finding of (Hosseini *et al.*, 2011), in their respective study on causes of broiler carcass condemnation in Nowshahr Poultry Slaughters, who reported 0.053% and (Fatemeh *et al.*, 2011), study on poultry carcass condemnation in abattoirs of Tehran province, who reported 0.025% and 7.36 % of TCR. The present finding is contradictory to what has been found in other countries. Difference in these rate may be due to lack of standard equipment and paying low attention during harvesting, transport time, waiting time, type of transportation boxes, and density per cage, harvesting period and temperature of transportation time. The second most frequent rejection cause found in this study was cachexia with the rate of 0.47% of all of the birds slaughtered and 16.0% of TCR. It is higher than finding of Ansari-Lari and Rezagholi (2007) and (Fatemeh *et al.*, 2011), who reported 0.28% and 0.15% respectively. The carcasses condemned for these conditions were emaciated (cachexia) or much lighter in weight than normal birds. These may be due to incidence of longstanding diseases, conditions which should have been obvious in the living animals. These birds should have been culled and not shipped to the plant. In addition to this cachexia occur as result of the space that the birds occupy and the feed they consume on the farms. Continued effort is required to encourage producers to reduce these losses by routinely culling sick or disabled broilers.

The next causes carcass rejection in present study were pre slaughter mortality, incomplete bleeding and cellulitis with similar rate 0.35% of all of the birds slaughtered and 12% TCR. This finding is higher than finding of (Hosseini *et al.*, 2011), who reported dead on arrival, incomplete bleeding and cellulitis with rate of 0.172%, 0.005% and 0.008% respectively. These may be due to poor or incorrect neck cutting and insufficient bleeding time and density of bird in farm, thus the density of birds seen in farms was about 18 to 19 poultry m⁻², verified during the visit to the production sheds which provided chickens for their own slaughterhouse. These densities was higher when compared to the standard established by Oliveira and Carvalho (2002) which was 13 to 14 birds m⁻² density in the growth sheds.

According to Fallavena (2003) lesions by cellulite are related to the occurrence of injuries, especially scratches which happen with inappropriate management practices within farming systems. These include high population density, food restriction programs and lighting, which increase competition for food, so the present study is in agreement with this author.

The present study shows that pre slaughter mortality may be due to several factors such as trauma due to inappropriate transportation equipment, temperature of transportation time, this agree with the report of (Hosseini *et al.*, 2011) in which they pointed the high percentage of dead on arrival could be explained by the high environmental temperature and relative humidity of the area. However, in another study (Nijdam *et al.*, 2004) it was found that the risk of death during transport or liorage increases as time increases. This could be due to the efficient environmental control system adopted in the holding area of the processing plant considered in the present study.

The next cause of carcass rejection was over scalding with rate of 0.23%, this is higher than finding of (Fatemeh *et al.*, 2011) who reported 0.014%. This may be occurring due to a break in the line or poor adjustment of the scald temperature and line speed. Carcasses that are cooked are condemned. Many times, these carcasses would also be machine-mutilated by picking machines. According to UK agricultural extension the skin of an affected carcass feels slimy to the touch and slips from the underlying meat which is much whiter than usual. This also considered in present study.

Others, septicemia, fracture and contaminations are least causes of carcass rejection in this study. In present study septicemia account 0.12% condemnation of total slaughtered birds, this result was higher than the report of (Fatemeh *et al.*, 2011) which was 0.062%.

These variation was due to the availability of disease infections, poor nutrition, failure to thrive, immunosuppressive diseases in the area that pre dispose birds to septicemia. It was found that, in slaughter house, the contamination accounts (0.12%) of total slaughtered birds. This usually happened after the passage through the evisceration line and after removal of the cloaca, which is in agreement with Costa and Costa (2001). The present study reveals the regulation of equipment and the large amount of birds slaughtered daily, as the main factors responsible for carcass contamination. The other causes of condemnation were due to fracture, which represented 0.12% of the slaughtered poultry, a relatively low number when compared to the other causes, but high enough to be of concern when the total number of birds condemned was evaluated. This finding agree with Farsie *et al.* (1983) and Ekstrand (1998), who reported that poultry reach the processing plant with about 0.022 to 25% of contusions/fracture compared to the total slaughter.

The direct financial loss incurred as result of condemnation of carcass in the present study was 1934200ETB. However, it is lower than 1,621,605 USD per annum due to carcass condemnation reported by Fatemeh *et al.* (2011) at abattoirs of Tehran province, Capital of Iran. This may be due to small numbers of birds slaughtered annually when compared to abattoir of Tehran province.

In general, carcass condemnations have been reported in this study impact negatively on the economic status of the chicken meat production and poultry farms at large. Abnormal carcass was condemned and rendered unfit for human consumption, there exist some public health threats from broilers slaughtered at the abattoir due to the possibility of some missed cases as a result of poor cooperation between operators and meat inspectors and other malpractices including hiding of abnormal carcass from meat inspectors to avoid economic losses on their side. Indeed, the condemnation of carcass at slaughterhouses represents a significant economic loss. Some of the conditions described however can be prevented. Cases of bruising could be reduced by improving harvesting and transportation since the major cause of condemnation is due to traumatic case.

Some of the limitations however, encountered in this study included the use of only gross pathology in the diagnosis of the diseases, thus only those diseases with gross pathological lesions that are visible to necked eye were likely to be diagnosed. In spite of the limitation mentioned, the public health implications of the quantity of abnormal carcass condemned at slaughter on the consumers and the role which post-mortem inspection plays in safeguarding the health of the public cannot be overemphasized. Therefore, there

is a need for adequate meat inspection in slaughter houses in order to reduce wastages, identify diseases and thereby minimize associated public health risks. As the result of present study, bruising can be regarded as one of the most important causes of condemnation of meat chickens, awakening interest in terms of the economical losses it carries for producers. It can be caused by damage during growing, catching, transportation or handling at processing, incorrect cutting and insufficient bleeding time. Therefore, the losses with bruising and fractures can be reduced by improving the management of harvesting and transportation as well as the adjustment of the equipment used at slaughter. The sanitary control and operational management of slaughterhouses should be improved, since they are crucial in the quality of the final product

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10/2/2020