

PATTERNS AND DIRECT FINANCIAL IMPLICATIONS OF CONTAGIOUS PLEUROPNEUMONIA IN CATTLE SLAUGHTERED IN KUMASI ABATTOIR, GHANA

¹ATTOH-KOTOKU, Victoria, ²EMIKPE, Benjamin Obukowho, ¹OBUADEY, Douglas, ³ISHOLA, Olayinka, ¹OSAFU, Emmanuel Kwesi, ¹DONKOH, Ambrose and ²FOLITSE, Raphael

¹Department of Animal Science, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

²School of Veterinary Medicine, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

³Department of Public health and Preventive Medicine, University of Ibadan, Ibadan, Nigeria.

Corresponding author: Emikpe, B. O. School of Veterinary Medicine, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. **Email:** banabis2001@yahoo.com **Phone:** +234 8066486080

ABSTRACT

A cross-sectional survey was conducted on a five-year retrospective (January, 2009 – December, 2013) meat inspection record as well as active daily records (November 2013 to February 2014) from Kumasi abattoir, Ghana to determine the pattern and direct financial implications of contagious pleuropneumonia in slaughtered cattle. The influence of age, sex and breed of animals on pneumonia was investigated. The degree of pneumonia as percentage of the total lung infected was being determined using standard techniques. Retrospective data of 445,671 cattle between January 2009 and December 2013 showed 0.17 % prevalence with year 2009 having the highest prevalence. In the active surveillance, macroscopic examination of 1500 slaughtered cattle comprising Zebu 510 (34 %), Sanga 270(18 %), N'dama 225(15 %), West African Short Horn (WASH) 315(21 %), and White Fulani 180 (12 %) respectively revealed 36(2.4 %) cattle with contagious bovine pleuropneumonia, out of which 26(72.2 %) lungs were totally condemned and the remaining 10(27.8 %) were partially condemned. Animals within the ages 3 – 6 years (97.2 %), cows and WASH were observed to be more susceptible. The direct financial loss due to partial or whole lung condemnation was GH¢ 1,847.88 (\$560) for the 1,500 cattle slaughtered during the active abattoir survey. Consequently, the overall direct financial loss during the five years was estimated to be GH¢ 39,705.09 (\$12031.85). This reaffirms CBPP has one of the disease conditions that cause significant economic loss in cattle production in Ghana with sex, breed and age influence prevalence and pattern of pneumonia on slaughtered cattle.

Keywords: Cattle, Contagious bovine pleuropneumonia, Patterns, Financial loss, Ghana

INTRODUCTION

Ghana with a population of approximately 25 million people occupies a total land area of 238,533 square kilometers. Agriculture contributes 21.3 % to the national GDP of which the livestock sector accounts for 1.7 % (GSS, 2013).

Livestock provide an important source of protein and ready cash for emergency need (MOFA/DFID, 2002) contributing 7 – 9 % to agriculture GNP. This livestock sector provides 66,253 metric tons in the year 2000, of which beef contributed about 27 %, mutton 18 %, chevon and pork about 17 % each.

Animal health has been identified as one of the major constraints to livestock production in Ghana. A number of respiratory infections and parasitic diseases pose danger to the livestock industry in Ghana. These diseases include contagious bovine pleura-pneumonia (CBPP), zoonotic diseases like tuberculosis, brucellosis, anthrax and rabies.

Pneumonia is still major disease conditions limiting the development of cattle production in the tropics. The economic implication of pneumonia especially in meats breeds of cattle include cost of treatment / medications, deaths, decreased gain performance and decreased carcass value. To evaluate the financial loss associated with diseases, meat inspection could be handy, not only in determining the prevalence and extend of organ condemnation due to some zoonotic diseases (Jobre *et al.*, 1996; Abunna *et al.*, 2010) but also to assess the direct financial loss due to organ condemnation (Denbarga *et al.*, 2011). Studies from some African countries revealed that parasitic infection of livers, lungs (pneumonia), pericarditis and pyelonephritis are the major causes of organs condemnation (Yimam, 2003; Raji *et al.* 2012).

However, information on specific causes of lungs condemnation, prevalence of pneumonic diseases or conditions that lead to lungs condemnation and proper evaluations of direct financial losses due to lungs condemnation is scanty in Ghana. This study evaluates the prevalence, pattern and direct financial losses associated with contagious bovine pleuropneumonia in slaughtered cattle in Kumasi abattoir, Ashanti region of Ghana.

MATERIALS AND METHODS

Study Area: The Kumasi abattoir was visited between November 2013 and February 2014. The average number of cattle slaughtered per day was 200 (from available records at the abattoir). Cattle slaughtered at this abattoir are representatives of the various herds in Kumasi and neighboring countries in West Africa at large. Data was collected by regularly visiting the abattoir twice a week.

Study Design: The study involves both active abattoir survey and retrospective study.

Active Abattoir Survey: A cross-sectional study was conducted in the active abattoir studied to determine the pathologic causes of pneumonia. In this study, cattle were purposively sampled. Trained meat inspectors under close supervision of veterinarians inspected cattle meant for slaughter. This conducted from November 2013 to February 2014 using 1500 purposively selected cattle slaughtered at Kumasi abattoir to identify the major cause of lung condemnation and to estimate the direct financial loss due to the condemnation.

Retrospective Abattoir Study: A retrospective study was conducted using the postmortem meat inspection records of the abattoir from January 2009 to December 2013. Data were obtained by the help of an experienced team of veterinarians and information collected included number of cattle slaughtered and number of condemned lungs due to contagious pleuropneumonia

Gross Pathological Examination: During postmortem, lung examination was conducted by visualization, palpation, incision where necessary for other gross abnormalities. Lesions were differentiated and judged according to guidelines on meat inspection for developing countries (Herenda *et al.*, 2000). Gross pathological lesions on each diseased lung were recorded. Cards were designed to indicate the affected part of the lungs. Tissue samples were collected for detailed laboratory investigation.

Age, Sex and Breed Determination: The slaughtered cattle were grouped into three age groups: young (<2 years), young adult (3 – 6 years) and adult (> 6 years) and age estimation based on eruption of one or more incisor teeth (Pace and Wakeman, 1983). Sex was determined by observing the peritoneal region of the slaughtered animal while breeds were distinguished by their uniquely observable characteristics as described by (Ahunu *et al.*, 1995).

Assessment of Weight of Condemned Organs and Financial Losses:

The average price per kilogram of bovine lung was obtained through interviews conducted on the local butchers in Kumasi abattoir. The average weight of bovine lungs in Kumasi abattoir for animals of different ages and the average weight of a cattle lung was calculated using the method of Lamidi *et al.* (2004). The average price of lungs obtained from businessmen dealing with cattle meat at Kumasi town during this survey was GH¢ 13.33 per kilogram. The monthly condemnation was collated and used to estimate the number of lungs condemned and direct financial loss due to the disease condition.

Statistical Analysis: Collected data were subjected to descriptive statistics which was used to determine the level of organ condemnation as defined by the proportion of condemned organs to the total number of organs examined and expressed as percentages.

RESULTS

A total of 1500 cattle lungs were studied during the 4 month period comprising of Zebu 510(34 %), Sanga 270(18 %), N'dama 225(15 %), WASH 315(21 %) and White Fulani 180(12 %) respectively. A total of 36(2.4 %) cattle had contagious bovine pleuropneumonia (CBPP); out of which 26(72.2 %) lungs were totally condemned. The remaining 10(27.8%) parts of the affected lungs were trimmed. Gross pathology of normal and pneumonic lungs are shown in Figure 1.

From the Figure 2 it can be observed that West Africa shorthorn cattle were more susceptible to CBPP as compared with the other breeds which constituted 22(61.11 %) out of 36 cattle examined. Figure 3 showed 85.66 % of the pneumonia affected the right caudal of the lung, left cranial (1.14 %), left post cranial (1.33 %), left caudal (6.82 %), accessory (0.82 %), right cranial (2.58 %) and right middle (1.64 %) respectively. In this study the right lung of the cattle was mostly affected.



Figure 1: Normal bovine lungs (A) and pneumonic bovine lung (B) covered with fibrin deposits (contagious bovine pleuropneumonia) in Kumasi Abattoir, Ghana

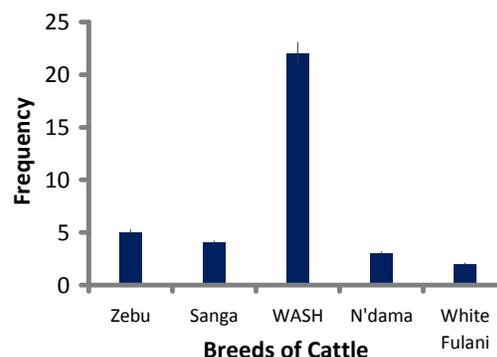


Figure 2: Prevalence of contagious bovine pleuropneumonia in different breeds of slaughtered cattle in Kumasi Abattoir, Ghana

The Figure 4 showed that female cattle were more susceptible to CBPP with 22(61.11 %) of cows being affected. Most of the pneumonia cases occurred in cattle within the ages of 3 to 6 years (Figure 5). Figure 6 indicated that the right lungs of cattle had more of contagious bovine pleuropneumonia in Kumasi Abattoir, Ghana.

Retrospective Abattoir Study: A retrospective data of 445671 cattle was collected from January 2009 to December 2013 and it was observed that the year 2009 had the highest pneumonia cases of 224(0.27 %) followed by 2011 with 196(0.21 %). The lowest number of cases 80(0.09 %) was found in 2012 (Table 1).

Assessment of Direct Financial Loss: The total direct financial loss incurred due to organs condemnation during active abattoir survey involving the 1500 slaughtered cattle was estimated to be GH¢1,847.88 (USD 469.15). From retrospective study, the overall economic loss during the five-year period was estimated to be GH¢39,705 (USD 10080.59) (Table1).

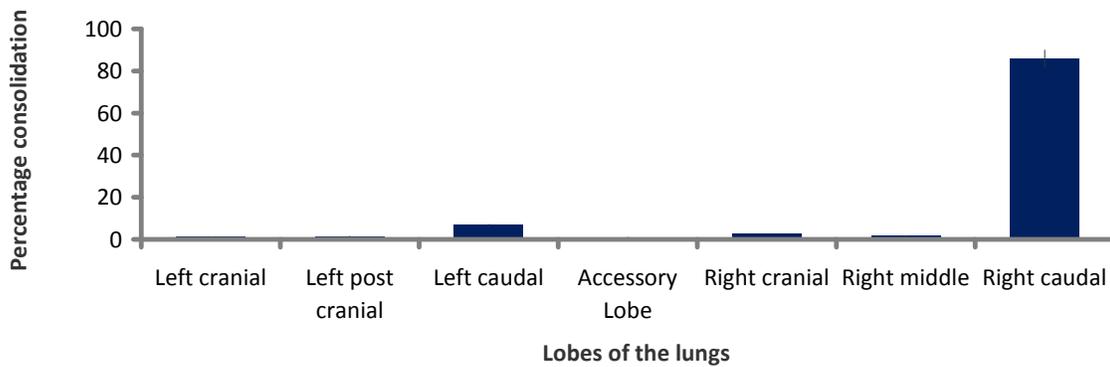


Figure 3: Lobar distribution patterns of contagious bovine pleuropneumonia in slaughtered cattle in Kumasi Abattoir, Ghana

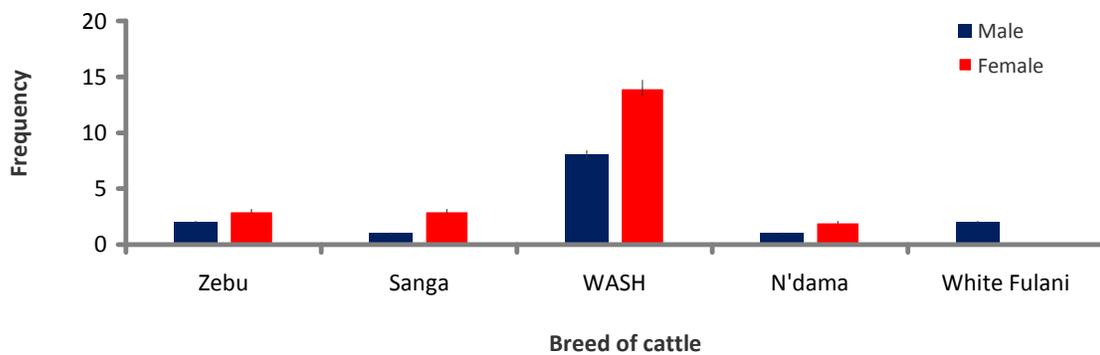


Figure 4: Sex influence on the prevalence of contagious bovine pleuropneumonia in different breeds of slaughtered cattle in Kumasi Abattoir, Ghana

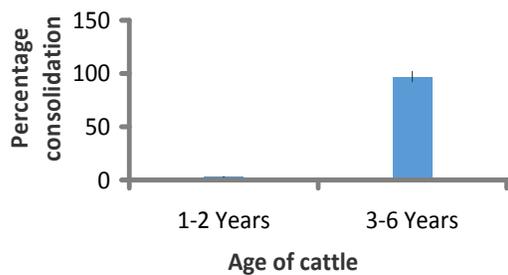


Figure 5: Age influence on of contagious bovine pleuropneumonia in slaughtered cattle in Kumasi Abattoir, Ghana

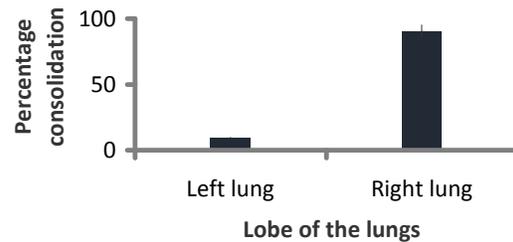


Figure 6: The lung consolidation percentage in type of lungs of cattle with contagious bovine pleuropneumonia in Kumasi Abattoir, Ghana

Table 1: Retrospective data on number of pneumonic lungs, percentage of organ condemnation and economic loss of slaughtered cattle with contagious bovine pleuropneumonia in at Kumasi Abattoir (January 2009 – December 2013)

Year	Organ condemnation	Direct financial loss (GH¢)
2009	224(0.27%)	11497.92
2010	165(0.18%)	8496.45
2011	196(0.21%)	10060.68
2012	80(0.09%)	4106.40
2013	108(0.12%)	5543.64
Total	773	39,705.09

Number in parenthesis = percentage condemnation

DISCUSSIONS

This study investigated the pattern and direct financial losses associated with CBPP in slaughtered cattle. The fact that 1.7 % of cattle examined had their lungs totally condemned clearly revealed that pneumonia remain the most common and economically important cause of organs condemnation in ruminants under different production systems and agro-climatic zones of Africa (Matovelo and Mwamengele, 1994).

The rejection rate of lungs observed in this study was lower than the report of Raji *et al.* (2012) and similar to 3.33 % in cattle slaughtered in Tanzania (Kambarage *et al.*, 2000) whereas, higher rejection rate of 31.02 % rate was reported for cattle slaughtered in Ibadan, Nigeria (Cadmus and Adesokan, 2009). Pneumonia occurrence in the cattle in this study could be due to exposure to dust and starvation. Moreover, penetration of lung by foreign body, adverse weather condition or accidental inhalation of liquid may predispose to this condition (Cadmus and Adesokan, 2009).

Breed has been observed to influence occurrence of CBPP in cattle. In this study, the West Africa Shorthorn (WASH) was more susceptible. Often, trypano-tolerant breeds such as WASH are prone to pneumonia as there had been established relationship between chronic trypanosomosis and bronchopneumonia in large ruminants (Damayanti *et al.*, 1994). With most of the CBPP cases being observed in cows, sex probably has influence probably due to the fact that the slaughtered cow are old and immune-suppressed.

The right lung had severe lesions than the left and rejection was more to the right lung because, the right lung especially the middle and cranial lobe are the most common sites of bronchopneumonia. The dorsal portion of the caudal lobes were also consistently and severely affected, with 85.6% affecting the right caudal lobe while only 6.82 % was seen in the left caudal lobe, but some degrees of exudation was present in 1.14 % in left cranial and 2.58 % right cranial lung lobes as well as accessory lobe and left post cranial lobe being 0.82 % and 1.33 % respectively. This could be associated with

bronchopneumonia often associated with *Mannheimia*, *Pasteurella* and *Mycoplasma*, as observed by Sorden *et al.* (2000).

The direct economic loss was GH¢1847.88 during the active survey while enormous loss GH¢ 39,705.09 was observed in the retrospective study, these losses were similar to those reported by other workers in Ethiopia (Denbarga *et al.*, 2011; Amene *et al.*, 2012). This amount was lower than reports from Iran where losses of 8.2 million and 13,880 USD have been reported (Borji *et al.*, 2012; Khaniki *et al.*, 2013). Variations in the amount of economic loss in different abattoirs was probably due to the differences in the prevalence of diseases, rejection rate of organs, slaughtering capacity of the abattoirs and local market price of organs.

Conclusions: The present study revealed that CBPP was found to be the major cause of lung condemnation in slaughtered cattle in Kumasi abattoir. Sex, breed and age influenced prevalence and pattern of pneumonia in slaughtered cattle. This further reaffirmed CBPP as a disease conditions that cause significant economic loss in cattle production in Ghana. It therefore recommended that lung loss due to CBPP can be reduced by avoiding overcrowding, removal of affected animals from the group, hosing of cattle in well ventilated and dry pens, effective dust control, antibiotic therapy, effective vaccine control and proper transportation method.

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