SEASONAL PREVALENCE OF BOVINE TUBERCULOUS LESIONS IN CATTLE SLAUGHTERED IN YOLA ABATTOIRS

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ABSTRACT

Bovine tuberculosis is endemic in Nigeria. There is paucity of information on the prevalence of bovine tuberculous lesions in cattle slaughtered in Yola, Adamawa state. The annual prevalence and seasonal variation of bovine tuberculous lesions were assessed based on abattoir records of tuberculosis lesions from 2008 to 2012. The overall prevalence of bovine tuberculosis lesions from 2008 to 2012 ranges from 8.68% (6.03 – 11.33) in 2008 to 10.33% (8.63 – 12.03%) in 2012 with peak prevalence of 12.73% in 2011. Types of lesions were not recorded systematically, however, lesions that were observed ranges from TB granuloma, TB abscesses with yellowish pus, caseous necrotic tubercles, multiple necrosis to focal granulomas. Annual prevalence of bovine tuberculosis lesions recorded in Yola abattoirs differ significantly (p ≤ 0.05). Prevalence of tuberculous lesions in Yola abattoirs was significantly influenced by season (p < 0.05). Tuberculosis is endemic in cattle slaughtered in abattoirs meant for human consumption in Yola, therefore humans are at risk of acquiring zoonotic tuberculosis through consumption of contaminated meat.

Key words: Bovine tuberculosis, tuberculous lesions, Yola, prevalence, zoonotic

INTRODUCTION

Bovine tuberculosis (TB) is characterized by the development of granulomas (tubercles) where bacteria have localized. The granulomas are usually yellowish and either caseous, caseo-calcareous or calcified and often encapsulated (Rohonczy et al., 1996). Gross lesion were more in the thoracic cavity than in other regions of the body, the mediastinal lymph nodes are most commonly affected in TB confirmed animals while the tonsils are least affected (Liebana et al., 2008). In the lungs, the lesions are multiple coalescing foci of caseous necrosis surrounded by thin pale fibrous tissue capsule (tubercles) (Liebana et al., 2008). The lung parenchyma is almost entirely replaced by variably sized, coalescing, raised, pale nodules. Most of the lymph nodes are replaced by caseonecrotic debris with a laminated appearance reminiscent of caseous lymphadenitis (Rohonczy et al., 1996), in pigs the center of the lymph nodes is replaced by caseous, mineralized debris (Kaneene and Thoen, 2004), while the liver look pale and slightly raised granulomas are disseminated throughout all liver lobes (Anonymous, 2009). In bovine uterus, the endometrium contains numerous raised tubercles; the organism is also responsible for endometritis in women (Kumar et al., 2008). In some species such as deer, the lesions resemble abscesses rather than typical granuloma. Some tubercles are so microscopic that they cannot be seen with the naked eyes except with the aid of microscope in a sectioned tissue (Anonymous, 2009). Bovine tuberculosis is a disease caused mostly by the bacterium Mycobacterium bovis (Smith et al., 2006), Mycobacterium caprae (Brosch et al., 2002), Mycobacterium tuberculosis has been reported as the cause of tuberculosis in cattle (Cadmus et al., 2006) as well as other members of the MTbC (Cadmus et al., 2010; Jenkins et al., 2011). Mycobacterium bovis (M. bovis) can be transmitted by inhalation of aerosol, by ingestion or through break in the skin. The important of the routes varies between species (Anonymous, 2009). Venereal transmission through artificial insemination (AI) is possible (Wentink et al., 2000). Aerosol transmission occur usually where animals are in closed contact, thus animal density play a major factor in the transmission of M. bovis (Anonymous, 2013). Bovine tuberculosis is usually maintained in cattle populations (Anonymous, 2009), a few others can become reservoirs. Transmission of tuberculosis from cattle to human mostly occur through consumption of unpasteurized milk, closed contact with infected animal (Michel et al., 2010), air borne transmission (Vekemans et al., 1999; WHO, 2009) and consumption of infected meat (Anonymous, 2009). Tuberculosis in cattle is a disease of economic and zoonotic importance.

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The disease is distributed worldwide, with African and Asian countries ranking highest in terms of disease burden (WHO, 2009). In developed countries, bovine tuberculosis had been controlled through test and slaughter method (Cosivi et al., 1998; Ayele et al., 2004; Theon et al., 2006; Amanfu et al., 2006; Smith et al., 2006), although bovine tuberculosis is still endemic in some industrialized countries like Australia and the Caribbean Island (Tweddle and Livingstone, 1994). The situation of bovine tuberculosis is completely different in Africa; with the emergence of HIV/AIDS, poverty and other debilitating diseases. The prevalence of bovine tuberculosis continue to increase in animals, these situation have potential impact on human health directly and threat to human livelihood by compromising sustainable food supply, income and social status (WHO, 2006).

Abattoir meat inspection provides useful insight into the prevalence of many animal diseases (FAO 1994; Cassidy et al., 2008) including TB, although by their nature, abattoirs’ records are limited in detail in the data they provide (Aliyu et al., 2009), their importance cannot be over emphasized. In Nigeria, most of the studies were based on gross pathological examination at the abattoir (Igbokwe et al., 2001; Ameen et al., 2008; Aliyu et al., 2009; Ibironke and Fasina, 2010; Kwaghe et al., 2011) due to poor research infrastructure, funding and man power. There is paucity of information on bovine tuberculosis in Yola, Adamawa State, this study is therefore aimed at providing baseline information on the prevalence and seasonal variation of gross pathological lesions associated with bovine tuberculosis in cattle slaughtered in abattoirs in Yola, Adamawa State, Nigeria.

MATERIALS AND METHODS

Adamawa State is located at the North Eastern part of Nigeria (Figure 1). It lies between latitude 7 and 110° N and between Longitude 11 and 140° E. It shares boundary with Taraba State in the south and west, Gombe State in its North-west and Borno State to the North. The State has an international boundary with the Cameroon Republic along its eastern side. It has a land area of about 38,741 km² (Adebayo, 1999). The State is divided into 21 local government areas. Adamawa State has a tropical wet and dry climate. Dry season lasts for a minimum of five months (November-March) while the wet season spans April to October. Mean annual rainfall in the State ranges from 700 mm in the Northwest, to 1600 mm in the extreme southern part of the State (Adebayo, 1999). The State has low humidity and high temperature. The climate is also characterized by high evapo-transpiration especially during the dry season (Adebayo, 1999). Yola, the State capital being an urban centre has an estimated population of about 200,000 people.

Data collection

Abattoir data were collected, after a formal permission obtained from relevant authority at the Ministry of Agriculture and Natural Resources (MANR) Yola, Adamawa state. Meat inspections at abattoirs in Yola were carried out by qualified veterinarians who served as meat inspectors. Data collected include; number of cattle slaughtered monthly, number of cattle slaughtered that exhibit gross pathological lesions typical of bovine tuberculosis and their sex. These data were collected for a period of five (5) years (2008 – 2012). Post mortem examination of the carcass was done by meticulous visual examination, careful palpation and incision of the lungs, kidney, liver, lymph nodes, spleen, heart, and other part of the tissues/ organs of the body for condemnation. Affected parts are usually trimmed and the rest passed for consumption while generalized cases of bovine tuberculosis are usually seized and destroyed by the veterinarians (FAO, 1993). No pre slaughter test or ante mortem examination was carried out before slaughter.

Data analysis

Prevalence was calculated as the number of cattle with suspected bovine tuberculosis lesions divided by the number of cattle examined at post mortem within the specified period (Aliyu et al., 2009). Data obtained were further subjected to student t-test and ANOVA for the establishment of significance using SPSS version 16.
RESULTS
Annual distribution
Table 1 show meat inspection data for the number of slaughtered cattle and bovine tuberculosis lesions detection for a period of five years (January 2008 to December 2012). In 2008 a total of 16753 (22.62%) cattle were slaughtered, similar figure were slaughtered in 2009 but from 2010 to 2012 the number of cattle slaughtered in the abattoirs decreases drastically to 13152 (17.75%), there was a significant difference between the number of cattle slaughtered from 2008, 20009 and 2011 and from 2010 and 2012 (p > 0.05). Annual distribution of detection of tuberculosis lesions in cattle slaughtered in Yola show that the highest prevalence of TB lesions were detected in 2011 with a mean detection of 12.73% (95% CI: 8.2184 - 17.2499%) and is significantly different from the mean detection recorded in 2008 (8.68%) 2009 (7.30%) and 2010 (4.40%) (p < 0.05). An overall mean detection of 8.78% (95% CI: 7.5698 - 9.9852%) was recorded for the period of five years (Table 1 and Figure 2).
E. F. Ejeh and others

**Seasonal variation**

A total of 74079 cattle were slaughtered at the Yola abattoir from 2008 to 2012, during the late raining season more cattle were slaughtered 26170 (35.33%) than other season, although this figure is not significantly different compare to total number slaughtered during other seasons.

While total number of cattle slaughtered 11640 (12.71%) during the late dry season is lower compare to other seasons, also they were not different statistically (p > 0.05). The prevalence of tuberculous lesions among cattle slaughtered in Yola from early raining season to late dry season ranges from 10.62% (95% CI: 8.06 - 13.18) to 12.71% (95% CI: 7.70 - 17.73). Prevalence of tuberculous lesions recorded during the late dry season (12.71%) is higher compare to other seasons and is significantly different from the prevalence of tuberculous lesions recorded during the late raining season and early dry season (P < 0.05). The lowest prevalence was recorded during the late raining season 6.98% (95% CI: 5.46 - 8.50%) and early dry season 6.71% (95% CI: 5.71 - 7.71%).

<table>
<thead>
<tr>
<th>Year</th>
<th>No. Slaughtered (%)</th>
<th>No. with TB lesions</th>
<th>Prevalence % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>16753 (22.62)</td>
<td>1303</td>
<td>7.7 (7.4 - 8.2)</td>
</tr>
<tr>
<td>2009</td>
<td>16394 (22.13</td>
<td>1147</td>
<td>6.9 (6.6 - 7.4)</td>
</tr>
<tr>
<td>2010</td>
<td>13590 (18.35)</td>
<td>671</td>
<td>4.9 (4.6 - 5.3)</td>
</tr>
<tr>
<td>2011</td>
<td>14290 (19.29)</td>
<td>2088</td>
<td>14.6 (14.0 - 15.2)</td>
</tr>
<tr>
<td>2012</td>
<td>13152 (17.75)</td>
<td>1403</td>
<td>10.7 (10.1 - 11.2)</td>
</tr>
</tbody>
</table>

**Season**

- **Early Rain**: 18235 (24.62) 1997 10.9 (10.5-11.4)
- **Late Rain**: 26170 (35.33) 1931 7.4 (7.1 - 7.7)
- **Early Dry**: 18033 (24.34) 1242 6.9 (6.5 - 7.3)
- **Late Dry**: 11640 (12.71) 1422 12.2 (11.6-12.8)

**Sex**

- **Male**: 29629 (40.00) 2205 7.4 (7.1 - 7.7)
- **Female**: 44450 (60.00) 4407 9.9 (9.6 - 10.2)

**Total**: 74079 (100.00) 6612 8.9 (8.7 - 9.1)

Mean percentages with the different letter(s) in the same column were different significantly (p > 0.05)

**Sexual distribution**

The sexual distribution of bovine tuberculous lesions in cattle slaughtered in Yola from 2008 to 2012 is presented in Table 1. More female cattle were slaughtered 44450 (60.0%) than male cattle, there was statistical significant difference between male and female cattle slaughtered in Yola, Adamawa state (p < 0.05). Also the prevalence of tuberculous lesion in female cattle slaughtered in Yola (10.99%(5.62422 - 0.90845%) is significantly different from the prevalence of tuberculous lesions recorded in male cattle slaughtered in abattoirs in Yola (p < 0.05).
Monthly pattern of distribution of bovine tuberculosis.

The prevalence was high from January, during the late dry season and then increases from February and peaks in March which coincided with the driest and hottest month in Yola, it then drop in April. The prevalence of tuberculous lesions gradually peaks again in June and August and decreases more gradually from August to December (Figure 2).

Figure 2: Show the pattern of distribution of the average monthly prevalence of tuberculous lesions in cattle slaughtered in abattoirs in Yola.

DISCUSSION

The uses of secondary data to determine the prevalence of bovine tuberculosis is not a novel finding per se but it provide information in the overall context of disease surveillance and monitoring (Cassidy et al., 2008; Aliyu et al., 2009). In developing countries especially Nigeria where laboratory investigations are not been carried out at the abattoirs due to lack of laboratory infrastructures and implementation of Government policy, abattoir meat inspection for pathological lesions remain the best option for monitoring bovine tuberculosis and other important disease prevalence (Aliyu et al., 2009). The annual prevalence of tuberculous lesions in cattle slaughtered at the Yola abattoirs from 2008 to 2012 range from 8.68% (– 11.33%) in 2008 to 10.33% (6.63 – 12.03%) in 2012 with an overall annual prevalence of bovine tuberculosis lesions of 8.78% (7.57 – 9.99%). Similar prevalence (8.30%) was reported by Cadmus et al., (2003) in food Animals in Nigeria. These findings are higher than earlier reports of bovine tuberculosis in the area. In Adamawa a prevalence of 0.34% was reported by Aliyu et al., (2009) and other parts of Nigeria such as Ogbomoso, 0.55% (Ameen et al., 2008), 1.4% in Enugu (Nwata et al., 2011) except in Gombe State where the prevalence of bovine tubercululous lesions recorded in abattoirs was 12.27% (Aliyu et al., 2009). Researchers in other parts of African countries reported similar findings. In Chad a prevalence of about 9% bovine TB was reported in slaughtered cattle (Milan et al., 2000), and 6% prevalence in Cameron (Theon, 2009).
The reason for the high prevalence of tuberculous lesions in cattle slaughtered in Yola abattoirs is not clear but may be due to the fact that there is no active bovine tuberculosis control program in Nigeria and that movement of cattle across both local and international boundaries, this situation may promote the entrance of infected animals from neighboring countries such as Chad, Republic of Niger and Cameroon (Aliyu et al., 2009), another explanation for the high prevalence of tuberculous lesions in cattle slaughtered in Yola abattoirs could be due to absence of pre-slaughter examination and or test to separate cattle that are fit for slaughter from those that are not fit for slaughter. Season play significant role in the detection of bovine tuberculous lesions in cattle slaughtered in Yola abattoirs.

During the late dry season and early raining season, prevalence of tuberculous lesions were 12.71% and 10.62% while the prevalence was lower during late rainy season (6.98%) and early dry season (6.71%) respectively. This findings differ from the report of Awah – Ndukum et al. (2010) in Cameroon who reported that the detection of TB lesions was not influenced by season but was high during stressful periods such as inter season and peak – season periods. Also Ameen et al. (2008) reported similar finding in Oshogbo, Nigeria. Nwata et al. (2011) reported a prevalence of 13.2% during the rainy season and 12.5% during the dry season, which showed that variation in seasonal prevalence was not significant. Although these researchers do not consider the influence of various stages of the seasons such as early and late season on tuberculosis lesions detection. However, Bikom and Oboegbulem (2007) reported a strong association between tuberculous lesions and seasonal distribution. In a similar study in Egypt, Ahmed et al. (2013) reported significant difference between season and pathological finding in cattle slaughtered in Ismailia abattoir. The reason for the difference in seasonal variation and tuberculous detection observed in this study is yet unknown. There was strong association between sex and tuberculous lesions detected in cattle slaughtered in Yola abattoirs. These findings agree with that of Nwata et al. (2011) and Awah – Ndukum et al. (2010). Ameen et al. (2008) reported that there was no strong association between sex and tuberculous lesions detected in slaughtered cattle. Female cattle stay longer in the herd than male cattle for breeding purpose making them more exposed to Mycobacterium spp. (Milan et al., 2000; Ita et al., 2005; Nwata et al., 2011).

CONCLUSION

The result of this study indicates that bovine tuberculosis is endemic in cattle slaughtered in Yola abattoirs meant for human consumption, therefore human are at risk of acquiring tuberculosis through consumption of contaminated meat. Further studies should be carried out to investigate the species of Mycobacterium responsible for the lesions recorded in abattoirs in Yola. Study is also needed in humans who are at risk of zoonotic tuberculosis especially immunocompromised individuals, livestock rarer, abattoir workers, meat vendors and animal health professionals to determine the epidemiology of zoonotic tuberculosis. There is need for veterinarians to intensify effort to educate those who are involved in the meat industry on the danger of zoonoses especially tuberculosis.

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REFERENCES

Seasonal prevalence of tuberculosis lesion


