Abattoir-Based Survey and Histopathological Findings of Lumpy Skin Disease in Cattle at Ismailia Abattoir

Ali Meawad Ahmed and Amina A. Dessouki

Abstract—A cross-sectional study on Lumpy Skin Disease (LSD) was conducted at Ismailia Abattoir, Egypt for determining the prevalence of LSD in cattle. The results showed that summer represented the highest season for slaughtering of the cattle (5468 animal) followed by autumn (4367) then spring (3421), and winter (2988). Out of 10055 slaughtered cattle, 101 male (1.0%) and 14 female (0.1%) that presented lesions diagnosed as specific LSD lesions. There was statistically difference (P<0.05) in prevalence of LSD in cattle between seasons. LSD could not be reported in buffaloes or calves. The highest prevalence of LSD in male cattle was observed in autumn 53 (2.01%) followed by winter 30 (1.7%). Similarly, the highest prevalence of LSD in female cattle was observed in autumn 7 (0.3%) followed by winter 5 (0.2%), summer 2 (0.1%). Histopathological examination of the suspected samples revealed presence of ballooning degeneration and intracytoplasmic inclusion bodies characteristic of LSD. The estimated annual loss from condemn carcasses was 13770 Egyptian Pound. In conclusion, abattoir records showed a wide spectrum data concerning LSD occurring in traditional Egyptian cattle. The highest prevalence of LSD in female cattle (5468 animal) followed by autumn (4367) then spring (3421), and winter (2988). Out of 10055 slaughtered cattle, 101 male (1.0%) and 14 female (0.1%) that presented lesions diagnosed as specific LSD lesions. There was statistically difference (P<0.05) in prevalence of LSD in cattle between seasons. LSD could not be reported in buffaloes or calves. The highest prevalence of LSD in male cattle was observed in autumn 53 (2.01%) followed by winter 30 (1.7%). Similarly, the highest prevalence of LSD in female cattle was observed in autumn 7 (0.3%) followed by winter 5 (0.2%), summer 2 (0.1%). Histopathological examination of the suspected samples revealed presence of ballooning degeneration and intracytoplasmic inclusion bodies characteristic of LSD. The estimated annual loss from condemn carcasses was 13770 Egyptian Pound. In conclusion, abattoir records showed a wide spectrum data concerning LSD occurring in traditional livestock herds. In order to overcome the economic loss, it should be development of effective vaccines derived from the original.

Index Terms—Lumpy skin disease, Egypt, cattle, histopathological, economic impact.

I. INTRODUCTION

Lumpy skin disease (LSD) is an economically devastating emerging viral disease of cattle that currently endemic in most African countries and has recently spread out of Africa into the Middle East region [1]. LSD is caused by the pox virus of the genus Capripoxvirus which causes acute, subacute or inapparent disease in cattle. The disease was first described in Northern Rhodesia (currently Zambia) in 1929 and then a rapid spread was observed in cattle over most of the African continent [2].

Lumpy skin disease has a worldwide distribution but the disease is very common in Africa reaching a level of 30-36% in Kenya, 20% in Guinea, 18% in Sierra [3]. A recent cross-sectional study across different agro-ecological zones and Oromia region in Ethiopia showed an overall observed LSD animal-level prevalence of 8.1% and 33.93% respectively, a mortality of 2.12% and 7.43% respectively [4, 5]. LSD is endemic in Egypt (Ismailia) since 1988 [6] with a marked increase in the prevalence of clinical disease reach level of 25.47% in 2008 [7]. Recent study by [8] was conducted on 500 cattle of different breed in Giza governorate, Egypt, revealed that the mortality and case fatality rates of LSD among examined Egyptian cattle were, 1.8%, and 1.8% respectively.

Histopathology can be an important tool to exclude viral, bacterial or fungal causes of nodular development in clinical cases and characteristic cytopathic effects (necrosed epidermis, ballooning degeneration of squamous epithelial cells and eosinophilic intracytoplasmic inclusion bodies) in cases of lumpy skin disease are well documented [9]. Histopathology of skin lesions provides a method to recognize the intracytoplasmic inclusion bodies of LSD virus-infected cells by using haematoxylin and eosin staining [10], [11].

The clinical effect of lumpy skin diseases on infected animals is economically important. It causes considerable economic losses due to emaciation, infertility in males and females, mastitis, loss of milk production and mortality of up to 40%, although mortality rarely exceeds 3% [12]. Economic losses may be high due to the condemnation of carcass arising from fever as well as the cost of inspecting meat. Moreover, severe and permanent damage can occur to hides, decreasing their commercial value [5].

Abattoir-based studies may be considered to be the most sensitive approach for the evaluation of animal health and economic impact of any infection diseases. However, lumpy skin disease and the associated financial loss in cattle studied by [13]. The study was done at main traditional abattoir of Ismailia city that present in Abo-Atoa district. This abattoir considered one of the largest and oldest province abattoirs in Egypt which built in 1956. Ismailia is a city in northeast Egypt, on the west bank of the Suez Canal, and is the capital of the Ismailia Governorate. It has a population (including surrounding rural areas) of approximately 750,000. It is located approximately half way between Port-Said to the north and Suez to the south. The Canal widens at that point to

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include Lake Timsah, one of the Bitter Lakes linked by the Suez Canal. It is located 140 km near the east of Cairo along the Canal. Ismailia geographical coordinates are 30-35° North, 32 16° East.

B. Study Population

The study animals comprised male cattle presented for slaughter from different localities in the Ismailia Abattoir. A total of 16244 cattle were slaughtered over one year and examined following ante-mortem and post-mortem inspection procedure. The prevalence of the gross lesions was collected on a monthly basis started from March 2010 to February 2011. It was not possible to get the exact records on breed, gender, weight and age for each slaughtered animals during the study period due to poor recording systems at the Ismailia abattoir.

C. Pre and Post Slaughter Inspection

Meat inspection was carried out at the Ismailia abattoir by trained veterinarians under close supervision of local authority. Each slaughtered animal is individually inspected by veterinarians in the course of their routine duties. All animals presented for slaughter were physically observed before or shortly prior to slaughter. Inspection of the animals was made while at rest or in motion for any obvious sign of disease. Post-slaughter examination involved visual examination of carcasses and organs with keen attention being directed to livers, lungs, hearts, gastrointestinal tract and skin. Through palpation and incision of suspected organs.

D. Macroscopic LSD Lesions

The records of the skin and organ lesion(s) that observed and condemned were noted by meat inspector based on Egyptian Guidelines for Inspection of Cattle [13]. Gross lesions on skin, tongue, lips, dental pad, lung, liver, spleen, kidney, feet and udder, teats were recorded and imaged by digital camera.

E. Laboratory Investigations

Representative pieces of skin nodules from all clinical cases were collected in sterilized containers. Samples were then fixed in 10% buffered formalin and transported to pathology section of VRC. The tissues were processed to obtain 4-5μ thick paraffin embedded sections and were stained with heamatoxylin and eosin [14].

F. Statistical Analysis

Data obtained from antemortem and postmortem examination, and laboratory findings were entered into Ms Excel and analyzed using SPSS version 12. The data showed in table by frequency and percentages (%). The figures of LSD lesion showed in colored imaged.

III. RESULTS AND DISCUSSION

A. Cattle Slaughter and Economic Impact

The study was a retrospective abattoir survey, undertaken for a period of one full year from March 2010 to February 2011. During this period a total of 16244 bovine species were slaughtered and inspected (Table I). A total of 642 female buffaloes, 175 female cattle, 3169 male buffaloes, 9880 male cattle and 2378 calve were slaughtered and their records formed a source of data for the current study. The frequency and percentages of female buffaloes, female cattle, male buffaloes, male cattle and calve slaughtered in autumn were 141 (21.9%), 37 (21.1%), 894 (28.3%), 2502 (25.3%) and 793 (33.3%) animals, respectively. For winter the same number were 85 (13.3%), 25 (14.3%), 647 (20.4%), 1737 (17.6%) and 494 (20.8) animals respectively. For spring, the slaughtered animals were 218 (33.9%), 75 (42.9%), 654 (20.6%), 1950 (19.7%) and 524 (22.1), respectively. Finally for summer, the number of slaughtered animals were 198 (30.9%), 38 (21.7 %), 974 (30.7%), 3691 (37.5%) and 567 (23.8%), respectively.

<table>
<thead>
<tr>
<th>Slaughter Animal</th>
<th>Male</th>
<th>Female</th>
<th>No. (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Season</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autumn</td>
<td>141</td>
<td>21.9</td>
<td>37</td>
</tr>
<tr>
<td>Winter</td>
<td>85</td>
<td>13.3</td>
<td>25</td>
</tr>
<tr>
<td>Spring</td>
<td>218</td>
<td>33.9</td>
<td>75</td>
</tr>
<tr>
<td>Summer</td>
<td>198</td>
<td>30.9</td>
<td>38</td>
</tr>
<tr>
<td>Total</td>
<td>642</td>
<td>100</td>
<td>175</td>
</tr>
</tbody>
</table>

-F means Frequency

Male cattle represented the most bovine species slaughtered in Ismailia abattoir followed by male buffaloes, then calves. Summer season represented the highest season for slaughtering of the cattle (5468 animal) followed by autumn (4367) then spring (3421), and winter (2988). This may due to the location of Ismailia as tourist city that attract many people during summer season, subsequently increased in their population and meat demand.

Based on the obtained data and the population number of Ismailia (average 750000), each person gain average 3.5 kg of meat per year. FAO (2001) recorded that at least 25 kg of meat per year is necessary for each person. In the current study, the low meat production from Ismailia abattoir may be interpreted as the economic status of Ismailia population and the possibility too much of the meat consumed is coming from the informal or illegal slaughter of the animals. In addition to, some of imported meat was marketed in Ismailia city.

Out of 10055 slaughtered cattle, 101 male (1.0%) and 14 female (0.1%) that presented lesions diagnosed as “specific” LSD lesions (Table II). There was statistically significant difference (P>0.05) in prevalence of LSD between seasons. The highest prevalence of LSD in male cattle was observed in...
autumn 53 (2.01%) followed by winter 30 (1.7%), summer 18 (0.5%). Similarly, the highest prevalence of LSD in female cattle was observed in autumn 7 (0.3%) followed by winter 5 (0.2%), summer 2 (0.1%). LSD could not be reported in buffaloes nor calves at the current study. Higher results was reported by [7], who recorded that LSD observed in all seasons: autumn, winter, spring and summer by 25.60%, 36.70%, 21.43% and 14.58%, respectively. The prevalence of LSD in this study was slightly in agreement with the findings of [8].

<table>
<thead>
<tr>
<th>Season</th>
<th>Male No.</th>
<th>Female No.</th>
<th>Male %</th>
<th>Female %</th>
<th>LSD No.</th>
<th>LSD %</th>
<th>LSD F</th>
<th>F E. P.</th>
<th>Total % Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autumn</td>
<td>2539</td>
<td>53</td>
<td>2.01</td>
<td>0.3</td>
<td>16</td>
<td>0.6</td>
<td>2720</td>
<td>59.3</td>
<td>81600</td>
</tr>
<tr>
<td>Winter</td>
<td>1762</td>
<td>30</td>
<td>1.7</td>
<td>0.2</td>
<td>7</td>
<td>0.4</td>
<td>1190</td>
<td>25.9</td>
<td>35700</td>
</tr>
<tr>
<td>Spring</td>
<td>2025</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Summer</td>
<td>3729</td>
<td>18</td>
<td>0.5</td>
<td>0.1</td>
<td>4</td>
<td>0.1</td>
<td>680</td>
<td>14.8</td>
<td>20400</td>
</tr>
<tr>
<td>Total</td>
<td>10055</td>
<td>101</td>
<td>1.0</td>
<td>0.1</td>
<td>42</td>
<td>0.3</td>
<td>4590</td>
<td>14.8</td>
<td>137700</td>
</tr>
</tbody>
</table>

*Average weight of cattle carcass was 170Kg. **Average market price for beef was 30 E.P. LSD did not detect in both of buffaloes nor calves. ~F means Frequency. Means with the same litter in the same column were not different (P > 0.05).

The Directorate of Veterinary Medicine in Ismailia has an immunization program against the LSD for all herds of cattle, however there is the emergence of many cases that difficult to interpret because no published data are available that deal with failure of beef cattle to develop immune resistance following LDSV vaccination. Beef cattle vaccination presents many technical and management difficulties, and the questions arise of whether these difficulties are responsible for the high proportion of beef cows with lesions and whether this high proportion is caused by vaccination or immunization failure [15].

The economic impact of LSD results from carcasses condemnation as the result of secondary infection and fever. The average price of un-deboned beef in Ismailia city was 30 Egyptian Pound. The estimated annual loss from carcasses condemnation was 13770 Egyptian Pound. Autumn and winter season represent the higher economic loss in comparison with other season. LSD constitutes a serious and major problem for breeders than for veterinarians, because of the major economic losses they cause, and the expenses of the care and control program.

Gross Lesions and Histopathological Finding

Nodules are present which involve all layers of the skin, the subcutaneous tissue and sometimes the adjacent musculature. There were disseminated cutaneous papules with necrotic centers (Fig. 1 and Fig. 2). Same grossly lumpy skin lesions reported by [8] as nodules 1 to 7 cm in diameter and occurred anywhere on the animal body. The hair stands erected over early skin lesions. The nodules involved the epidermis, dermis, and subcutaneous tissue and may even spread to the musculature.

The histopathological examination was aimed to exclude bacterial or fungal involvement in the formation of the characteristic nodules of LSD. The H & E stained section from different parts of the skin lesion showed hyperplasia of spinous cell layer (acanthosis), degeneration (Fig. 3). Lesion of Lumpy Skin diseases showed presence of eosinophilic intracytoplasmic inclusions bodies was easily recorded due to lumpy skin disease virus (Fig. 4). The study of [9] describe the Histopathological skin lesion of LSD on cattle as the epidermis was extensively necrotic, while in the intact areas, some ballooning degeneration of squamous epithelial cells with occasional intra-cytoplasmic inclusions were seen. Some lesions can be seen in the squamous epithelial cells of some of the hair follicles. Prominent lesions of vasculitic necrosis with cell debris and severe diffuse infiltration with inflammatory cells mainly neutrophils, were seen in the superficial and deep dermis. In some areas they also involved the muscular layers.

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**Fig. 1.** Progression of lumpy skin disease: note the necrotic nodules.

**Fig. 2.** Skin nodules have congestion, hemorrhage, edema, and vasculitis with consequent necrosis and involve all layers of the epidermis, dermis, subcutaneous tissue, and often adjacent musculature.

**Fig. 3.** Cattle skin showed hyperplasia of spinous cell layer (acanthosis), degeneration, H & E X 200.
In conclusion, this data should be considered to the concerned authority in their endeavors to control the lumpy skin disease. Histopathological examination is useful method for a rapid confirmation for the diagnosis of LSD. Egyptian buffaloes are more resistance to LSD than cattle. In order to overcome the economic loss and the continuous appearance of new cases of the LSD, it should be development of effective vaccines derived from the original.

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REFERENCES


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