

RESPIRATORY SYNDROME: A MAJOR THREAT TO THE LIVESTOCK FARMERS AND ITS ECONOMIC IMPACT

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ABSTRACT

Epidemiology of a respiratory syndrome was studied at Landhi Dairy Colony (LDC), Karachi, Pakistan and its economic impact was estimated. Among 5889 buffaloes examined, 2.3% animals were suffering from this syndrome. From some of the sick animals, *Pasteurella multocida*, the causative agent of haemorrhagic septicaemia, was isolated. In the present study, an average loss of Rs. 0.2 million per farm was calculated and the extrapolated values for 0.2 and 0.8 million animals present in LDC and other dairy colonies in Karachi were Rs. 225.6 and Rs. 1128.1 million, respectively.

Key words: Respiratory syndrome, haemorrhagic septicemia, epidemiology, economic impact.

INTRODUCTION

Respiratory syndrome has emerged as a new health hazard, affecting cattle and buffaloes. It is progressively increasing in intensity particularly at Landhi Dairy Colony (LDC), Karachi, Pakistan. It has been playing havoc with animal population at dairy colonies and suburb of Karachi city since 2001-2002. The disease is seen throughout the year and animals of all ages, both lactating and dry, are equally affected (Afzal and Hussain, 2006).

Respiratory syndrome is an acute and frequently fatal respiratory tract infection of the cattle and buffaloes. Death follows within 12-18 hours after onset of the disease in untreated animals. The disease may continue for 7-8 days, if treatment is carried out with a variety of antibiotics and antipyretic drugs. If at all animal recovers, it never regains its peak milk production (Afzal and Hussain, 2006).

Keeping in view the magnitude of the problem, a study was carried out to ascertain the etiology, as well as epidemiology and economic impact of respiratory syndrome at LDC, Karachi, Pakistan. The study period was from September, 2003 to August, 2004.

MATERIALS AND METHODS

Disease intelligence

Structured interviews were conducted from the key informants including veterinarians, traders and farmers. Information on number of animals at the farm, number of animals affected, number of animals at risk, feeding practices, husbandry practices, vaccination history and vaccines used, sources of vaccines, symptoms and

lesions, clinical diagnosis, treatment, mortality, previous history of disease at farm, date of last outbreak, disease outbreak at nearby farms, source and number of animals introduced, quarantine period if any, deworming, production losses and cost of treatment was recorded.

Clinical and postmortem examination

The clinical examination of the affected animals was carried out by visiting 35 different farms identified by the local veterinary staff. A total of 5889 animals were kept at these farms with an average of 168 animals per farm. Animals at all farms surveyed had been vaccinated against haemorrhagic septicemia (HS). The sources of vaccines were Sindh Research Institute, Veterinary Research Institute, Lahore and some private vaccine producers. The postmortem examination was conducted when the diseased animals died or were slaughtered at the local abattoir in LDC. Samples showing gross abnormalities of internal organs including lungs, liver, spleen and heart blood were collected for laboratory analysis.

Laboratory confirmation

The samples were submitted to the Animal Health Laboratories, Animal Sciences Institute, National Agricultural Research Centre, Islamabad and Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad for confirmatory diagnosis. The organism was identified morphologically and by staining reaction and was characterized bio-chemically by using "API 20[®] NE" kit (bioMérieux, Inc, Durham, USA) (Wilson *et al.*, 1993).

Data analysis

The data were analyzed by partial budget technique for assessment of financial losses due to respiratory syndrome at Landi Cattle Colony, Karachi (Ellis, 1993).

RESULTS

Animals suffering from respiratory syndrome showed clinical signs including high fever (upto 107°F) during initial stages of the disease, followed by normal or sub-normal temperature, anorexia, sudden drop in milk yield, watery discharge from nasal and oral cavities, coughing, sometimes tympany or diarrhea, froth drooling out from mouth and open mouth breathing during terminal stages of the disease. The postmortem examination revealed pneumonia and generalized congestion of lungs, trachea, inter lobular spaces filled with froth, liver slightly inflamed and discolored and spleen hemorrhagic. All other organs were found normal. Photographs showing various clinical signs and postmortem lesions are shown in Fig. 1.

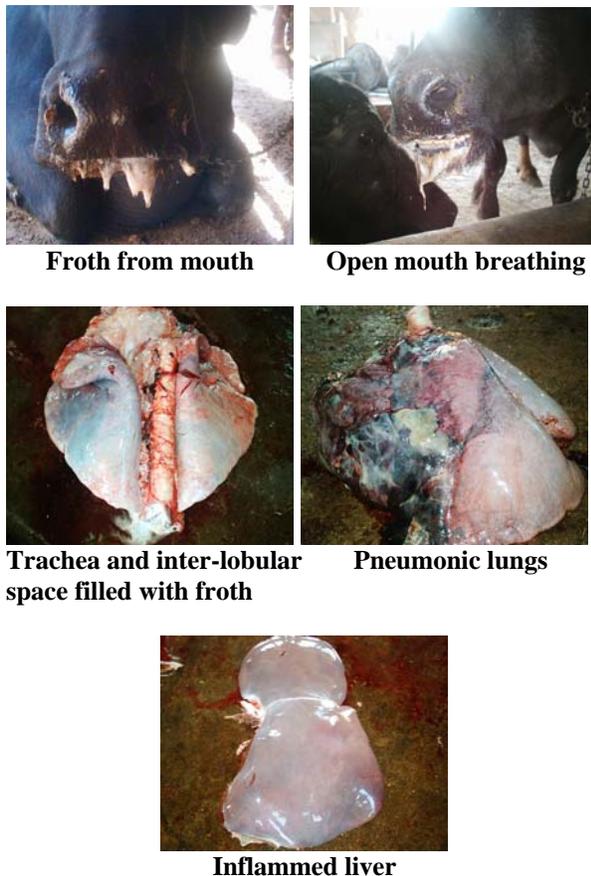


Fig 1: Clinical signs and postmortem lesions in animals suffering from respiratory syndrome

Laboratory analysis revealed the presence of *Pasteurella multocida* in the heart blood. Among 5889 animals examined during the study, 135 were affected, showing the morbidity rate of 2.3%, leaving 5741(97.7%) at risk. Different treatment regimens employed included antibiotics like chloramphenicol, gentamycin, enrofloxacin, tylosin, kanamycin and oxy-tetracycline along with some antipyretics and antihistaminic drugs. The mortality rate among animals studied was 1.4%, with the case fatality rate of 63%. A total of 17.8% animals showing symptoms of respiratory syndrome were slaughtered. These farms had no previous history of such a disease. In 80% of the farms, new animals were introduced with the induction rate of 4.2% per month. At 80% farms newly introduced animals were vaccinated against haemorrhagic septicemia and deworming was conducted at 77% farms. No quarantine was observed in farms at the time of new induction. The history of disease outbreak recorded at nearby farms was 5.7% (Table 1).

Table 1: Epidemiology of a respiratory syndrome (RS) studied at Landhi Cattle Colony, Karachi

Parameters	Total number	Percentage
Number of farms included in the study	35	--
Total number of animals at farms	5889	--
Number of animals suffering from RS	135	2.3
Number of animals at risk	5741	97.7
Mortality	85	1.4
Case fatality rate	85	63
Average disease period (days)	8	--
Number of affected animals slaughtered	24	17.8
No. of farms introducing new animals	28	80
No. of new animals introduced per month	250	4.2
No. of farms where new animals were vaccinated	28	80
No. of farms where de-worming was conducted	27	77
Disease outbreak at nearby farms	2	5.7
Quarantine period	Nil	Nil
Previous history of disease	Nil	Nil

Average milk loss of 10.07 liters per day per animal was observed due to respiratory syndrome. In recovered animals, the average milk loss (for 90 days) due to disease if an animal recovers was 533.79 liters and the value of milk loss per diseased animal was Rs. 14946 @ Rs. 28/- per liter (Table 2).

The total loss due to decrease in milk production in sampled animals was found to be 0.4 million. The results were extrapolated and losses for 0.2 million animals at Landhi and 0.8 million animals at other dairy colonies around Karachi were found to be Rs. 13.2 and 66.0 million, respectively (Table 3).

Table 2: Milk losses associated with a respiratory syndrome at Landhi Cattle Colony, Karachi

Parameters	Values
Average milk production before disease per day per animal (liters)	11.21
Average milk production during disease per day per animal (liters)	1.14
Losses of milk per day per animal per days	10.07
Average disease period (days)	8
Milk losses during the disease period (liters)	80.57
Average milk production per animal after disease (liters)	6.18
Milk losses till recovery (90 days)	453.21
Average milk loss due to disease if animal recovered	533.79
Price of milk per liter during study period	Rs. 28/-
Value of milk loss per diseased animal	Rs. 14946/-

Cost of treatment per affected animal was found to be Rs. 1760 and the total losses incurred on the treatment of sampled animals were Rs. 0.3 million. Extrapolated losses for total number of animals at LDC

and total number of animals in Karachi were Rs. 8.1 and Rs. 40.4 millions, respectively (Table 3).

The mortality among the diseased animals was 63% and it was 1.4% among the sampled animals. The overall losses due to mortality were found to be Rs. 5 millions (@ Rs. 59139 per animal) and extrapolated losses for total number of animals at LDC and total number of animals in Karachi were Rs. 170.7 and Rs. 853.6 millions, respectively (Table 3).

The percentage of sick animals sold for slaughtering was 17.8 and it was 0.41 among the sampled animals. The overall losses due to distress sale were found to be Rs. 1 million and extrapolated losses for total number of animals at LDC and total number of animals in Karachi were Rs. 33.6 and Rs. 168.1 millions, respectively (Table 3).

The overall losses due to respiratory syndrome in sampled animals were found to be Rs. 6.7 millions and extrapolated values for total number of animals at LDC and total number of animals in Karachi were Rs. 225.6 and Rs. 1128.1 millions, respectively (Table 3).

Table-3: Detail of losses due to respiratory syndrome at Landhi Cattle Colony and extrapolations for Karachi

Detail of animals	Parameters	Sampled animals	Animals at Landhi (No.)	Animals at Karachi (No.)
	Total animals	5889	200000	1000000
	Affected animals (No.)	135	4585	22924
	Animal affected (%)	2.3	-	-
Decreased milk production	Milk loss/animal (Rs.)	14946	-	-
	Animals recovered (No.)	26	883	4415
	Animals recovered out of affected animals (%)	19.3	-	-
Losses incurred on treatment	Total loss (million Rs.)	0.4	13.2	66.0
	Cost of treatment/ affected animal (Rs.)	1760	-	-
	Total Cost of treatment (million Rs.)	0.3	8.1	40.4
Losses due to mortality	Case fatality (%)	63	-	-
	Mortality among total sampled animals (%)	1.4	-	-
	Average price of one animal (Rs.)	59139	-	-
Losses due to distress sale	Total loss (million Rs.)	5	170.7	853.6
	Animals sold for slaughtering out of diseased animals (%)	17.8	-	-
	Animals sold for slaughtering out of total animals (%)	0.41	-	-
	Animals sold for slaughtering (No.)	24	815	4075
	Low price losses (Rs.)	41246	-	-
	Total loss (million Rs.)	1	33.6	168.1
Total loss due to respiratory syndrome (million Rs.)		6.7	225.6	1128.1
Loss per farm at study area (million Rs.)		0.2	-	-

DISCUSSION

In the present study, an effort was made to assess the financial losses due to respiratory syndrome at Landhi Dairy Colony Karachi, Pakistan. It is evident from the results that the overall losses among the sampled animals were Rs. 6.7 million. However, when the results were extrapolated to the total number of animals at LDC and Karachi, it appeared to be like a tip of an iceberg. Estimated loss of Rs. 2.17 billion annually only due to haemorrhagic septicemia in Punjab has been reported (Anonymous, 1996). Similarly, Khan *et al.* (1994) conducted a study in 10 of the 95 villages of Lahore district reporting haemorrhagic septicemia, foot and mouth disease and gastrointestinal diseases as the main causes of economic losses.

Study on the economic losses revealed that respiratory syndrome is causing considerable economic losses and is being rated by the farmers as the most serious health problem of dairy animals in the area. Dairy colonies, particularly in Karachi and Hyderabad, are maintained under Distinct Livestock Production system which is different from crop-livestock production system in other parts of the country. In this production system, stall fed high yielding animals are kept for milk production. Approximately 10-12% animals are replaced monthly. Most of the dairy animals are brought from livestock rich districts of Punjab and Sindh provinces. The LDC was the first dairy colony established in 1958 by the Sindh government in the suburbs of Karachi. Currently, this dairy colony houses about 0.2 million animals, mainly buffaloes (95%) and is considered as the largest buffalo colony in the world (Afzal, 2003). Intensive dairy farming at LDC is being carried out under inappropriate management practices, poor sanitary and hygienic conditions. These conditions, alongwith the high humidity in the area, provide conducive environment for the transmission and persistence of various animal pathogens, resulting in high incidence of infectious diseases.

The laboratory analysis of the samples indicated *Pasteurella multocida* as the causative organism of respiratory syndrome. Initially, it was thought that some bovine respiratory viruses may be playing a role in the pathogenesis of the disease. However, lack of sero-conversion in large number of paired sera against different respiratory viruses i.e., IBR, BVD, PI₃ and RSV indicated that these viruses did not have the significant role in the etiology of the disease, although many of the animals had the exposure to IBR and PI₃ viruses (Afzal and Hussain, 2006). As far as the role of Mycoplasmas as the possible cause of respiratory

syndrome is concerned, it is pertinent to mention here that contagious bovine pleuro-pneumonia (CBPP) has never been reported in Pakistan. The disease (CBPP) often runs a chronic course from its onset, although it can also occur in per-acute, acute and sub-acute forms. Moreover, the postmortem lesions pathognomonic for CBPP i.e., presence of yellowish fluid in the chest cavity, lungs covered with yellowish material and adhesion of lungs with chest walls were not observed. However, infection in the animals vaccinated against haemorrhagic septicemia and little response to the treatment created confusion. The possible causes of infection, in this case appear to be low quality HS vaccines, improper vaccination procedures, possible change in the pathogenicity of *Pasteurella multocida* and resistance against different antibiotics being used at the colony.

The vaccination failures could be attributed to various stress factors, like over-crowding (animals are provided only 3.5 to 4 feet wide space) coupled with un-hygienic conditions and humid environment. Moreover, there is no criteria in Pakistan for *in-vitro* efficacy evaluation of these vaccines. Supposedly, these vaccines are not meeting the required standards and this sub-optimal antigenic stimulus may have resulted in altered pathogenicity of *P. multocida*. During an ongoing trial on certain farms at LDC and Nagori Society, Karachi, animals were vaccinated against HS using an experimentally produced HS oil based vaccine. There were no reports regarding incidence of respiratory syndrome so far at the farms where this vaccine was used (Personal communication). In Pakistan, HS used to occur in a classical form with the affected animals clearly exhibiting edematous swelling at the throat region along with other clinical signs (Afzal and Hussain, 2006). However, in this case, no edematous swelling was seen in any of the affected animals, creating problems in clinical diagnosis of the disease. As far as the resistance against available antibiotics is concerned, there were questions about their quality. It was observed that the farmers used different drugs haphazardly on the basis of their personal experience and the veterinarians were generally approached when the disease severity was at the terminal stage, where usually no medication is effective. This irrational use of antibiotics may have resulted in the development of strains of *P. multocida* which were resistant to these drugs. Beside this, the role of steroids and abuse of hormones like oxytocin and bovine somatotrophin hormone (BST) in the possible change in the pathogenesis of the organism should also be investigated.

During the present study, morbidity, mortality and case fatality rates were found to be 2.3, 1.4 and 63%,

respectively. Afzal and Hussain (2006) reported morbidity, mortality and case fatality rates of 6.5, 1.5 and 22.4%, respectively due to respiratory syndrome on 10 farms (1512 animals) studied at LDC. This difference in the percentage of morbidity and case fatality rates may be due to the sample size and different time periods of the year. It was observed that only newly introduced animals were affected, having no immunity to the organism circulating at Landhi and other dairy colonies of Karachi. Moreover, there is a large scale movement of animals to and from the dairy colonies. It may be considered as the major source of spread of different animal diseases. Respiratory syndrome-like disease was also observed in a village near Dera Ghazi Khan district of Punjab province in September, 2004 (Personal communication) and in Islamabad Capital Territory during the year 2005 (Personal communication).

The confirmatory diagnosis during the present study and secular trends suggest the *P. multocida* as the causative organism of respiratory syndrome in buffaloes. However, further studies involving molecular epidemiology of *P. multocida* and gene sequencing are required to ascertain the change in the pathogenicity of the organism.

The core requirement in a disease control programme is that the benefits of the farmers should exceed all costs and inconveniences that they may have to bear. It was found that owners of valuable, high producing commercial dairy herds did not hesitate to pay for regular vaccination at LDC. However, the magnitude of the economic losses clearly indicates that there is a need to adopt proper remedial measures for the control of important animal diseases.

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