Pakistan Veterinary Journal

ISSN: 0253-8318 (PRINT), 2074-7764 (ONLINE)
Accessible at: www.pvj.com.pk

RESEARCH ARTICLE

Field Epidemiology of an Outbreak of Hemorrhagic Septicemia in Dromedary Population of Greater Cholistan Desert (Pakistan)

Fraz Munir Khan

District Diagnostic Laboratory, Livestock & Dairy Development Department, Government of the Punjab, Rahim Yar Khan, Pakistan
Corresponding Author: frazmunirkh@gmail.com

ARTICLE HISTORY

Received: January 24, 2011
Revised: April 21, 2011
Accepted: May 01, 2011

Key words:
Camels
Dromedary
Field Epidemiology
Greater Cholistan
Hemorrhagic Septicemia
Pasteurella multocida

ABSTRACT

An outbreak of a respiratory disease occurred in the dromedary population of Greater Cholistan desert, which was quite foreign to the locale. The duration of outbreak was more than a month (from the mid of November 2010 to the mid of December 2010). Prevalence, cumulative mortality and case fatality of outbreak were 0.79, 0.018 and 0.023, respectively. The disease was characterized by pyrexia (up to 107.4ºF), severe dyspnea due to choking of nasal cavity with thick gummy material and abortion during late gestation. The disease ran a clinical course of 5-7 days. Febrile carcasses showed congestion of all visceral organs, petechial hemorrhages on the serosal surfaces, serosanguineous fluid in the thoracic and abdominal cavities and pneumonia. Postmortem findings indicated septicemia. *Pasteurella multocida* subsp. *multocida* was isolated from representative clinical and morbid specimens. Treatment trial on clinical cases indicated ciprofloxacin, ceftiofur hydrochloride, gentamicin + tylosin and thiamphenicol + tylosin to be highly efficacious.

To Cite This Article: Khan FM, 2012. Field epidemiology of an outbreak of hemorrhagic septicemia in dromedary population of greater Cholistan desert (Pakistan). Pak Vet J, 32(1): 31-34.

INTRODUCTION

The one-humped camel or dromedary (*Camelus dromedarius*) is the only domesticated animal with eco-behavioral adaptations for torrid hyper-arid ecological zones like Cholistan. Camel rearing is the linchpin and a symbol of prestige in the mod cons free life of Cholistani pastoralists. Cholistani pastoralists raise camels for milk, meat, hides and as a transport or pack animal. Camel milk is highly nutritious (Meiloud *et al*., 2011). Utility of camel remained stable in almost all seasons because dromedaries use water economically in almost all metabolic functions and can assimilate poor quality forage with higher crude fiber far better than the other herbivores (Raziq *et al*., 2008).

Dromedary is comparatively less susceptible to many of the diseases that affect other livestock species in the same area e.g., foot and mouth disease, contagious pleuropneumonia and rinderpest (Dirie and Abdurahman, 2003; Raziq *et al*., 2010). On the other hand camels are more susceptible and manifest more severe signs in case of pox, enterotoxemia and mange than other ruminants (Megersa, 2010).

Respiratory tract diseases are among the emerging health hazards to camels worldwide that are incurring considerable loss of life and production (Bekele, 2008; Intisar *et al*., 2009; Abubakar *et al*., 2010; Kebede and Gelaye, 2010). On the basis of information gleaned through participatory appraisal hemorrhagic septicemia (HS) is transpired to be among the five important camel diseases *ad valorem* economic losses incurred by it (Mochabo *et al*., 2005; Mochabo *et al*., 2006). These losses are due to high fatalities, loss of productivity and heavy cost on compulsory medication and vaccination. A widespread outbreak of a HS occurred in dromedary population of Greater Cholistan from mid of November 2010 to the mid of December 2010. Greater Cholistan was not a nosoarea for HS. This paper presents the field epidemiological study of that outbreak.

MATERIALS AND METHODS

Study landscape and demography: Greater Cholistan lies in the far southeast portion of Punjab (Pakistan) between latitudes 27º42´ and 29º45´N and longitudes 69º52´and 75º24´E. It is a torrid hyper-arid sandy terrain. In Greater Cholistan nomadic and transhumant life-styles prevail for centuries. These agro-pastoral systems are characterized by mass migrations of people and livestock throughout the year in search of ground vegetation and

water. So livestock populations are exclusively of contiguous-dynamic type. The demo- graphic detail of camel population (almost exclusively of Marecha breed) of nosogenic territories is presented in Table 1.

Disease investigation and surveillance: The disease investigation was conducted in the months of November and December of 2010. The nosogenic territories of disease outbreak were Chah Islam Garh, Chah Bhai Khan, Chah Kalar Wala, Mullan Wala, Toba Bandalian and Toba Mungarian Wala. Disease investigations consisted of recording of clinical signs, their sequence of occurrence, postmortem examination, laboratory analyses and clinical response to antibiotics. Representative samples were collected both from diseased and deceased animals. From carcasses portions of lung, liver, spleen, kidney, long bone, blood present in the heart and thoracic fluid were collected. From untreated animals, in the initial and advanced stages of disease, samples of blood and nasal swabs were collected. The blood smears were stained with Gram and Giemsa stains (Quinn *et al.*, 1994). The samples were subjected to bacteriological analysis (Quinn *et al.*, 1994). The samples were inoculated on the nutrient agar. The plates were incubated at 37˚C for 72 hours and examined at 24 hours interval. Isolated bacterial colonies were inoculated into Triple Sugar Iron (TSI) slopes, blood agar and MacConkey agar and were subjected to Gram staining, Ziehl-Neelsen staining, potassium hydroxide test, motility test, biochemical and sugar fermentation tests and antimicrobial susceptibility testing. A questionnaire based cross-sectional survey was conducted to generate epidemiological data from 52 herd owners.

RESULTS AND DISCUSSION

Clinical Signs and Necropsy Findings: The onset of disease was marked by rise in body-temperature to 107.4˚F with depression, anorexia, watery nasal discharge, cough and lachrymation. The animal sat down and stretched its neck straight along the ground in an effort to inhale. The animal breathed with its mouth open and the nasal discharge turned mucoid within 24 hours. Within two days the animal started exhibiting severe respiratory distress due to choking of nasal cavity with tenacious-cloudy-mucoid material. At that stage, in some camels, a protuberance appeared in the poll region of head. In the terminal stage, the animal got recumbent with extended neck. The animal survived if the occluded material gushed out of nostrils or either of the ears or with the rupture of protuberance in the poll region; otherwise succumbed to disease. The disease ran a clinical course of 5-7 days. Abortion and premature births occurred invariably in pregnant camels in late gestation.

Postmortem examination conducted on four camels revealed the following findings. Febrile carcasses showed congestion of all visceral organs and petechial hemorrhages on the serosal surfaces throughout the body. Serosanguineous fluid was present in the thoracic and abdominal cavities. There was tracheal congestion, pneumonia with emphysema of borders of lobes and occlusion of nasal passage with thick gummy mucous. These findings indicated septicemia.

Laboratory Analysis: Giemsa stained blood smears revealed bipolar bacteria. No blood smear demonstrated the presence of hemoparasites. Culture on blood agar revealed moderate sized, round, raised, grayish, non-hemolytic colonies with a sweetish odor after 24 hours of incubation. The bacterial isolates were unable to grow on MacConkey agar. Staining of the isolates revealed that these isolates were Gram-negative non-acid-fast coccobacilli. Isolates were non-motile, urease-negative and catalase-positive. On TSI slopes, isolates showed reaction in the form of a yellow slant and butt with no gas or hydrogen sulphide production. The isolates fermented mannitol and sorbitol but were unable to ferment maltose and dulcitol. Antibiotic susceptibility testing revealed the isolates to be highly susceptible to ciprofloxacin, ceftiofur, enrofloxacin, norfloxacin, gentamicin, chloramphenicol and florfenicol; moderately susceptible to lincomycin, spiramycin and neomycin; least susceptible to oxytetracycline, sulphamethoxazole/ trimethoprim, penicillin G and metronidazole. On the basis of clinical signs, postmortem lesions and laboratory findings the disease was confirmed to be hemorrhagic septicemia (HS) caused by *Pasteurella multocida* subsp. *multocida*.

Response to Veterinary Interventions: Veterinary interventions were successful only when instituted before the choking of nasal passage. The prognosis was guarded to grave once the nasal passage got choked. The clinical efficacy of various antibiotics was gauged in terms of speed of abatement of clinical signs. The Ciprofloxacin, Ceftiofur Hydrochloride, Gentamicin + Tylosin and Thiamphenicol + Tylosin were proved to be the most efficacious followed by Lincomycin + Spectinomy-cin, Florfenicol and Oxytetracycline Hydro- chloride + Chloramphenicol. Spiramycin + Streptomycin Sulphate and Oxytetracycline Dihydrate showed low efficacy. Procaine Penicillin + Streptomycin Sulphate showed poor efficacy. The ancillary treatment included the use of corticosteroids, non-steroids anti-inflammatory/ antipyretic drugs, tonics and forced inhalation of steam loaded with vapors of tincture benzoin co.

The overall prevalence, cumulative mortality and case fatality risk of HS in camel population of Greater

Table 1: Demographic detail of camel population of nosogenic territories for hemorrhagic septicemia

Nosogenic Territory	No. of Herds	Total No. of Camels	Sex		Age		
			Male	Female	< 2 Year	2-4 Year	> 4 Year
Islam Garh	11	724	371	353	107	206	411
Bhai Khan	8	682	207	475	89	221	372
Kalar Wala	9	649	318	331	64	184	401
Mullan Wala	5	726	359	367	113	168	445
Bandalian Wala	12	707	397	310	77	157	473
Mungarian Wala	7	609	325	284	68	172	369
Total	52	4097	1977	2120	518	1108	2471

Table 2: Various epidemiological variables of hemorrhagic septicemia outbreak in dromedary population (n=4097) of greater Cholistan based on observations of 52 herd owners

Study Variables	Variates
Total number of sick	3247
Total number of dead	75
Prevalence (%)	79
Cumulative Mortality (%)	1.8
Case Fatality (%)	2.3

Cholistan was 0.79 (with range of 0.55 and standard deviation of 0.17), 0.018 (with range of 0.016 and standard deviation of 0.007) and 0.023 (with range of 0.028 and standard deviation of 0.009), respectively. As the camel population of Greater Cholistan is of contiguous-dynamic type and the standard deviation in the epidemiological variables in different nosogenic territories is non-significant, the magnitude and impact of occurrence of HS was uniform throughout.

Although *Pasteurella multocida* is not a common respiratory tract pathogen among dromedary (Al-Tarazi, 2001) yet HS is regarded as one of the five important camel diseases *ad valorem* economic losses incurred by it (Mochabo *et al*., 2006). According to Abubakar *et al*. (2010) and Zubair *et al*. (2004), the nasopharynx of apparently normal camels contains *Pasteurella multocida* as commensals, which reached there either through inhalation or during drinking. Stress factors like under-nourishment, unsanitary environmental conditions and changes in the macro- and microclimate lower the local immunity of the respiratory tract and the existing organisms like *P. multocida* get an opportunity to manifest the effects of their presence (Hassan and Mustafa, 1985; Khan *et al*., 2011). Retrospective study of the widespread outbreak of HS in the Greater Cholistan led to the revelation of events and determinants, which rendered the locale a nosogenic territory for HS. The sequence of those events is as under:

The long period of drought in Greater Cholistan forced the pastoralists to change their traditional nomadic way of living. Under the spell of that drought they moved their cattle, goat and sheep flocks to the contiguous irrigated areas of the district Rahim Yar Khan and stayed there even during flood-2010. During the flood-2010 heavy rainfall occurred in Greater Cholistan. For the ground vegetation to sprout and grow, pastoralists delayed their movement back towards their respective land for more than a month after rainfall. During that whole period (of drought, flood-2010 and post-flood) camels remained in the desert. Pastoralists drank them fresh ground water of wells. The dromedary population was susceptible to prevalent contagious diseases (Foot & Mouth Disease and Camel Pox) and for others like HS as were physically and immunologically weak due to lack of nutritious diet and immunoprophylactic support of vaccination. On the other hand, Cholistani cattle, goat and sheep populations, while in the canal-irrigated and riverine areas, were vaccinated against prevalent contagious diseases not only during pre-flood vaccination campaign but also during flood-2010. Immediately after flood the event of *Eid-ul-Azha* (17^{th} to 19^{th} of November 2010) arrived. For sale on this religious festival massive movement of livestock occurred. Camels from Greater Cholistan were also presented for sale on livestock markets. The unsold camels of southern part of Greater Cholistan while returning back to their respective communal rainwater reservoirs/ troughs (*Toba* in local dialect) encountered a disease of upper respiratory tract. The clinical signs of that disease were not typical of any one of the prevalent diseases of camel. Within the short span of a week this pestilence involved the whole dromedary population of the southern Greater Cholistan. All age groups and both sexes were equally susceptible. The disease very swiftly spread northward and by the mid of December the whole dromedary population of Greater Cholistan experienced the disease. It was transpired that although HS is not a true Transboundary Animal Disease (TAD) yet due to the presence of carrier animals, survival of the organism in the microclimate of communal rainwater reservoirs and extensive free grazing system of management the disease spread like a TAD.

The results of disease investigation and field epidemiology were communicated to the Government of the Punjab along with the proposed biocontainment measures. The proposed biocontainment measures with rationale of institution are as under:

P. multocida does not survive for too long outside the animal body. Moist conditions (damp soil and water) prolong its survival. Infection occurs by inhalation or ingestion of *P. multocida* (Benkirane and De Alwis, 2002). So the drinking of water from *Tobas* must be avoided. This would check the maintenance and dissemination of infection to dangerous contacts. The existing practice of extensive free grazing system of camel husbandry should be avoided. The locale with infected population should be closed i.e., intermingle of camels from infected and susceptible populations should be checked at all cost. The animals recovered from HS acquire a long lasting carrier status, which render the prevention of new outbreak rather difficult (Benkirane and De Alwis, 2002). In the light of above mentioned fact the camels of Cholistan region must not be sold/ transferred to other parts of the country unless found negative for the presence of antibodies against capsular antigen of *P. multocida* through indirect hemagglutination test (IHA). Other serological test that are of value include dot immunobinding assay, serum IgG-ELISA and nasal secretion IgG-ELISA coupled with serum biochemical profile. Polymerase Chain Reaction (PCR) can also be used for this purpose. Sanitary measures during outbreak include early detection of index case and isolation of diseased animals and their immediate treatment with antibiotics, deep burial of carcasses, antibiotic coverage to all dangerous contacts and controlled leeway of carrier animals to disease free areas. On the verge of epidemic of HS, decontamination of water of *Tobas* with sanitizers must not be attempted, as it will disturb the bio-equilibrium of ecosystem of *Tobas*.

In order to avoid any future epidemic vaccination of dromedary population of Greater Cholistan on a routine basis should be coupled with an efficient and percipient disease reporting and surveillance system. Pastoralists should be apprised of the mode of dissemination of HS. In order to avoid contact with carriers statutory control on movement of animals from endemic and non-endemic areas is the need of time.

REFERENCES

Abubakar MS, MY Fatihu, NDG Ibrahim, SB Oladele and MB Abubakar, 2010. Camel pneumonia in Nigeria: Epidemiology and bacterial flora in normal and diseased lung. African J Microbiol Res, 4: 2479-2483.

Al-Tarazi YH, 2001. Bacteriological and pathological study on pneumonia in the one-humped camel (*Camelus dromedaries*) in Jordan. Revue Élev Méd Vét Pays Trop, 54: 93-97.

Bekele ST, 2008. Gross and microscopic pulmonary lesions of camels from Eastern Ethiopia. Trop Anim Health Prod, 40: 25-28.

Benkirane A and MCL de Alwis, 2002. Haemorrhagic septicaemia, its significance, prevention & control in Asia. Vet Med Czech, 47: 234-240.

Dirie MF and O Abdurahman, 2003. Observations on little known diseases of camels (*Camelus dromedaries*) in the Horn of Africa. Rev Sci Tech Off Int Epiz, 22: 1043-1049.

Hassan AK and AA Mustafa, 1985. Isolation of *Pasteurella multocida* type B from an outbreak of haemorrhagic septicaemia in camels in the Sudan. Revue Élev Méd Vét Pays Trop, 38: 31-33.

Intisar KS, YH Ali, AI Khalafalla, EAR Mahasin and AS Amin, 2009. Natural exposure of dromedary camels in Sudan to infectious bovine rhinotracheitis virus (bovine herpes virus 1). Acta Tropica, 111: 243-246.

Kebede F and E Gelaye, 2010. Studies on major respiratory diseases of camel (*Camelus dromedarius*) in Northeastern Ethiopia. African J Microbiol Res, 4: 1560-1564.

Khan A, MK Saleemi, MZ Khan, ST Gul, M Irfan and MS Qamar, 2011. Hemorrhagic septicemia in buffalo (*Bubalus bubalis*) calves under sub-tropical conditions in Pakistan. Pak J Zool, 43: 295-302.

Megersa B, 2010. An epidemiological study of major camel diseases in the Borana lowland, Southern Ethiopia. Drylands Coordination Group Norway, Report No. 58, pp: 16.

Meiloud GM, IN Ould Bouraya, A Samb and A Houmeida, 2011. Composition of mauritanian camel milk: results of first study. Int J Agric Biol, 13: 145-147.

Mochabo KOM, PM Kitala, PB Gathura, WO Ogara, A Catley, EM Eregae and TD Kaitho, 2005. Community perception of important camel diseases in Lapur division of Turkana district, Kenya. Trop Anim Health Prod, 37: 187-204.

Mochabo KOM, PM Kitala, PB Gathura, WO Ogara, EM Ereqae, TD Kaitho and A Catley, 2006. The socio-economic impact of important camel diseases as perceived by a pastoralist community in Kenya. Onderstepoort J Vet Res, 73: 269-274.

Quinn PJ, ME Carter, B Markey and GR Carter, 1994. Bacterial Pathogens: Microscopy, Culture and Identification. In: Clinical Veterinary Microbiology. Mosby-Year Book Europe, London, pp: 21-66.

Raziq A, M Younas and MA Kakar, 2008. Camel - A potential dairy animal in difficult environments. Pak J Agric Sci, 45: 263-267.

Raziq A, K Verdier and M Younas, 2010. Ethnoveterinary treatments by dromedary camel herders in the Suleiman Mountainous Region in Pakistan: an observation and questionnaire study. J Ethnobiol Ethnomed, 6: 16.

Zubair R, A Ahmad, MZ Khan and MA Sabri, 2004. Pathology in camel lungs. J Camel Sci, 1: 103-106.