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Participatory Appraisal and Scanning Surveillance Based Contagious Diseases Risk Profile of District Rahim Yar Khan (Pakistan)

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ABSTRACT

Spatio-temporal prevalence and importance of contagious diseases of livestock in district Rahim Yar Khan (Pakistan) were investigated through conflation of data based upon participatory appraisal and scanning surveillance from January 2007 to August 2009. Results revealed that haemorrhagic septicaemia (HS) and foot and mouth disease (FMD) were the most important diseases of riverine and canal irrigated areas, while FMD and black quarter (BQ) were the most serious and prevalent diseases of Cholistan. FMD was the most prevalent disease of riverine and canal irrigated areas of the district during winter and spring, while FMD and BQ were the most prevalent diseases of Cholistan during winter and spring, respectively. Enterotoxaemia (ET) and *peste des petits ruminants* **(**PPR) were reportedly occurred during spring and summer. HS was reportedly the predominant disease of riverine and canal irrigated areas throughout the year. Out of the total recorded outbreaks, 79.5% occurred during the period from December through April. Maximum case fatality risk for HS (0.8), FMD (0.1), BQ (0.6), ET (0.3), contagious caprine pleuropneumonia (0.5), and PPR (0.3) was recorded during May, January through April, November, December through March, April and March through May, respectively. Case fatality was incessantly 1 in all the outbreaks of rabies. The highest prevalence of HS was recorded in Rahim Yar Khan city (16.2%), of FMD in Sadiqabad Sadar (16.7%), of BQ in Cholistan (33.3%), of rabies in Rajan Pur (20%), of ET in Rajan Pur (24.6%), of CCPP in Chak Jhumra (17.77%), of PPR in Zahir Pir (17.5%), of buffalo pox (BP) in Rahim Yar Khan city (50%) and Kot Samaba (50%), of camel pox (CP) in Cholistan (100%) and of goat pox (GP) in Rahim Yar Khan city (18.8%) and Rajan Pur (18.8%).

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INTRODUCTION

In the developing countries significant ramifications associated with epidemics of contagious and rampant diseases include food shortages, market destabilization and imposition of trade barriers. The key to success in handling and controlling animal disease epidemic is early detection of index case and prompt reporting about its occurrence to concerned quarters. Efficient disease reporting system acts as a *sine qua non* towards the fruition of national veterinary services. Good veterinary governance by national veterinary services at federal, provincial and district levels play a pivotal role towards a pragmatic global *commune bonum*. One World One Health strategy of the block of International bodies (OIE/FAO/WHO/UNICEF) working for global public good relates to the prevention and control of Trans-boundary Animal Diseases (TADs) and other contagious pestilences at the animal/human interface; since the disease events in animal population may have direct or indirect relevance to human health. Furthermore, animals may serve as sentinels of human health threats in the environment. Knowledge and understanding of the epidemiological profile of contagious diseases, *pièce de résistance*, is a bedrock to assess and address veterinary health needs of livestock population of a locale, as it enables World Organization for Animal Health (OIE) to devise strategies not only for the control and eradication of TADs and other important contagious diseases of livestock but also to evaluate the performance of

veterinary services and for gap analysis which are important elements in risk analysis process. The present study should not be naïvely considered *prima facia* as a parochial and preternatural approach; the trappings associated with it do have global implications. In the previous studies by Anjum *et al*. (2006), Farooq *et al*. (2007) and Awan *et al.* (2009), the importance of district Rahim Yar Khan as a geographical transport hub of Pakistan was not realized, *quod erat faciendum*, and the district was not included in the meta-analysis. Although a *fait accompli*, yet it was an egregious deviation from epidemiological praxis.

Participatory appraisal is a qualitative ethnographic approach of community participation in gleaning ontology and epistemology based data collection. On the other hand, scanning surveillance maintains a continuous watch over endemic diseases level in the population of a locale. As participatory method of disease surveillance has its own limitations (Parry and Wright, 2003), in the present study ethno-veterinary lore, gleaned through participatory appraisal, about spatial and temporal distribution and importance of contagious diseases of livestock was complemented with scanning surveillance of the livestock population of the district Rahim Yar Khan for the occurrence of contagious diseases. The conflation, in the present work, imbues a cornucopia of first hand intelligence required to generate a reliable contagious diseases risk profile of the area, which can be used to design better animal health projects and delivery systems, predicting potential disease outbreaks, ascertain hot spots, clusters and foci of infection, *raison d'êtres* for the occurrence of contagious diseases in a locale, more successful targeted surveillance, science based targeted intervention strategies for TADs or as new perspectives for innovative research hypothesis in ecological epidemiology and controlled leeway in livestock trade and movement.

MATERIALS AND METHODS

Study landscape and demography

District Rahim Yar Khan (11880 Km^2), which lies at latitudes 270 - 40' to 290 - 16' N and longitudes 600 - 45' to 700 - 01' E, is comprised of four tehsils with eight cities and 15 rural conurbations (Markaz in Urdu). Topographically, three different terrains with distinct geological features can be identified: These are the riverine area, the canal irrigated area and the desert area. The riverine area lies contiguous to the river Indus. It is arid-tropical continental with hot summer and mild winter. Livestock populations are of contiguous-static-shambolic type along the fluvial bed. To the southwest of this area lies the canal-irrigated area. It is also an arid sub-tropical continental area (Bukhari and Gee, 2008). Livestock population is exclusively of separated-open type. The desert area, called Greater Cholistan, lies in the south of the district. Climatologically, it is a torrid hyper-arid sandy desert. Livestock populations are exclusively of contiguous-dynamic type. In Cholistan two agro-pastoral systems *videlicet* nomadic and transhumance prevail. Under transhumance system pastoralists gravitate towards the fringes of the canal-irrigated area during spring (Ahmad, 2005; Nadiem, 2009). Livestock for sale at the markets of district Rahim Yar Khan come mostly from central and southern districts of the Punjab province. Recently, calved lactating buffaloes and fattened cattle are purchased from the Central Punjab for onward transmission to Karachi through ineluctable district Rahim Yar Khan. For sacrifice on *Eid-ul-Azha* goats are sent from district Rahim Yar Khan to Central Punjab. This mercantile binge of sacrificial goats is non-significant during the rest of the year.

Disease outbreak investigation and reporting

The participatory appraisal based data were gleaned through semi-structured critical inner dialogue maintained flexible interviews in patois, under rapport, with district-wide randomly selected livestock peasants, medicasters and locums (both grey and key stakeholders) with the collaboration of staff of Livestock and Dairy Development (L&DD) Department Punjab from January 2007 to August 2009. To impart rigour and for triangulation, techniques of matrix scoring, seasonal calendar and interview with key informants (local medicasters, quacks and veterinarians) were used. The *aide mémoire* included the temporal and spatial distribution and importance of contagious diseases of livestock. In parallel to this, scanning surveillance of the entire livestock population of the district was done through an avid network of L&DD Department Punjab, National Rural Supports Programme (NRSP) and Cholistan Development Authority (CDA). In scanning surveillance level of spatial aggregation (terrain polygons) was set at the level of cities and markazes within the district. The data generated through this scanning surveillance were transmitted to L&DD Department of the Punjab and Strengthening of Livestock Services Project of European Union *per mensem* on a prescribed pro forma.

Development and critique of data bank

The participatory appraisal based data were compiled and analyzed for spatial and temporal prevalence and importance of various contagious diseases of livestock. The parameters like geographical and seasonal distribution of contagious diseases were recorded and analyzed during scanning surveillance.

RESULTS AND DISCUSSION

Ethno-veterinary intelligence about contagious disease status

Results of local perception of disease recognition, matrix scoring and seasonal calendar are summarized in Tables 1 and 2. The ethno-veterinary pastiche gleaned through participatory appraisal revealed HS and FMD to be the most important and serious diseases of the livestock of riverine and canal irrigated areas *ad valorem* economic losses incurred because of these diseases. On the other hand, nomadic pastoralists of greater Cholistan considered FMD and BQ to be of more economic importance. FMD was the most prevalent disease of the area, followed by HS in riverine and canal irrigated areas and BQ in Cholistan. ET, PPR and CCPP were also endemic in occurrence throughout the district. Although pastoralists of Cholistan were aware of rabies, yet none of them claimed its occurrence in Cholistan. Prevalence of BQ

Table 1: Vernacular names of contagious diseases in district Rahim Yar Khan

English name	Demostic name in area		
	Riverine	Canal irrigated	Greater Cholistan
Haemorrhagic septicaemia	Gul Ghotoo	Gul Ghotoo. Oogoo	Gul Ghooto
Foot and mouth disease	Mohara	Maunkhur/ Mohara	Mohara
Black quarter	Chorah Mar	Chowrayh Mar	Karaali/Choray Mar
Enterotoxaemia	Peetay di bemari	Peeta wadh jana	Sut/ Peetay noh sut
Contagious caprine pleuropneumonia	Phaphri	Phaphri/Nazlah	Phaphri/Nazlah
Peste des petits ruminants	Mok Wali Phaphri	Zookam wali Mok	Thadi
Rabies	Cheetah, Halka	Halka Pun/ Halkah	Chetah
Camel pox	Maun Sari	Maun Sari	Maun Sari
Buffalo pox	Maun Sari	Maun Sari	
Goat pox	Maun Sari	Maun Sari	Maun Sari

Table 2: Participatory appraisal based spatial and temporal prevalence and importance of contagious diseases in district Rahim Yar Khan

Zone	Parameters	Season	HS[§]	FMD	BQ	PPR	ET	CCPP	R	CP	BP	GP
Riverine	SPP*		13.4	36.1	3.4	12.6	13.4	11	9.2	-	-	0.8
		Winter	8.8	55.9	2.9	-	5.9	14.7	11.8	-	-	-
	TPP*	Spring	6.6	36	4.9	24.6	13.1	6.6	8.2	-	-	-
		Summer	20	6.7	-	-	40	26.7	6.6	-	-	-
		Autumn	75	12.5	-	-	-	-	12.5	-	-	-
	IP*		26.4	21.1	20.2	16.5	8.6	5.5	1.8	-	-	-
Canal	SPP		25.4	39.8	2.4	8	8.7	6.3	5.4	0.5	0.4	3
Irrigated		Winter	15.3	51.2	0.5	1	10.8	7.9	5.4	-	-	7.9
	TPP	Spring	13.8	44	4.9	12.4	10.4	5.9	7.4	0.5	0.5	-
		Summer	63	1.8	1.8	22.4	-	1.8	5.6	1.8	1.8	-
		Autumn	94.2	5.8	-	-	-	-	-	-	-	-
	IP		33.6	25.3	11.7	14.4	10.3	2.5	1.1	0.1	0.2	0.8
Desert	SPP		3.3	43.3	26.7	10	6.7	3.3	-	6.7	-	-
		Winter		80	10		10	-	-	-	-	-
	TPP	Spring	5.2	26.3	36.8	10.5	5.2	5.2	-	10.5	-	-
		Summer	-	-	-	100	-	-	-	-	-	-
		Autumn	-	-	-	-	-	-	-	-	-	-
	IP		3	40.7	29.3	7.6	13	3.7		2.7	-	-

*SPP= Spatial Prevalence Percentage; TPP= Temporal Prevalence Percentage; IP= Importance Percentage. [§]HS = Haemorrhagic septicaemia, FMD = Foot and mouth disease, BQ = Black quarter, ET = Enterotoxaemia, CCPP = Contagious caprine pleuropneumonia, PPR = *peste des petits ruminants*, R = Rabies, CP = Camel pox, BP = Buffalo pox, GP = Goat pox

was reportedly low in riverine and canal irrigated areas as compared to Cholistan. It was transpired through ethno-veterinary intelligence that the prevalence of HS was low in Greater Cholistan and the sporadic outbreaks of HS reportedly occurred in Cholistani cattle only when migrated to the fringes of contiguous canal irrigated areas during spring.

Intelligence gleaned through participatory appraisal revealed that pastoralists of Cholistan only vaccinated their livestock when got taxed due to disease outbreak or when a gratis vaccination campaign was launched. In Cholistan, contagious disease outbreaks almost always rendered a huge death toll. In both riverine and canal irrigated areas, FMD was the most prevalent disease during winter. Other diseases that were reportedly prevalent in winter were CCPP, rabies and HS in riverine area; HS, ET, CCPP and rabies in canal irrigated area; BQ and ET in Cholistan. FMD was again the most prevalent disease of spring in both riverine and canal irrigated areas. On the other hand, in Greater Cholistan, BQ was the most prevalent disease of this season, followed by FMD, PPR and CP. In summer, ET, HS and PPR were reportedly the most prevalent diseases of riverine area, canal irrigated area and Cholistan, respectively. HS was reportedly the most prevalent disease of autumn in both riverine and canal-irrigated areas. It was recorded that the field veterinarians and quacks were well aware of PPR as a distinct disease and a jargon *Kata* was used to identify this insidious pestilence. The farmers on the other hand were not able to differentiate it and considered it to be a mixed infection of ET and CCPP. So, they ascribed vague demotic names to this plague.

Scanning surveillance based distribution of contagious diseases

Temporal and spatial distribution and impact of contagious diseases during the period of study is tabulated in Table 3 and Fig. 1, respectively. The highest Percent Relative Occurrence (PRO) of HS was in tehsil Rahim Yar Khan (47.9%), followed by tehsil Khan Pur (19.7%), Sadiqabad (16.9%) and Liaquat Pur (14.8%). In tehsil Rahim Yar Khan, most of the outbreaks of HS occurred in Rahim Yar Khan city (16.2%), followed by Chak Jhumra (14.1%) and Kot Samaba (11.3%). In tehsil Khan Pur and

Table 3: Temporal distribution and impact of contagious diseases

Month	HS	FMD	BQ	ET	CCPP	PPR	R	BP	CP	GP
January	6(0.7)*	57(0.1)	-	6(0.2)	6(0.3)	-	2(1)	-	-	13(0.06)
February	9(0.4)	33(0.1)	2(0.5)	14(0.3)	3(0.2)	1(0)	6(1)	-	-	3(0)
March	11(0.6)	99(0.06)	9(0.3)	29(0.3)	9(0.07)	1(0.3)	14(1)	-	1(0.09)	-
April	22(0.6)	17(0.1)	11(0.5)	1(0)	8(0.5)	41(0.3)	6(1)	1(0)	1(0)	-
May	5(0.8)	2(0)	-	-	-	13(0.2)	2(1)	-	-	-
June	9(0.7)	-	-	6(0.05)	5(0.08)	-	2(1)	-	-	-
July	11(0.5)	-	-	-	1(0)	-	-	1(0)	-	-
August	12(0.5)	-	1(0)	-	1(0.3)	-	-	-	-	-
September	12(0.5)	3(0.04)	-	-	-	-	1(1)	-	-	-
October	26(0.6)	-	-	-	-	-	-	-	-	-
November	8(0.3)	5(0.03)	1(0.6)	-	2(0.3)	-	3(1)	-	-	-
December	11(0.4)	36(0.04)	-	5(0.2)	10(0.07)	1(0.06)	4(1)	-	-	-

*Figures in parenthesis indicate case fatality risk associated with the outbreaks. §HS = Haemorrhagic septicaemia, FMD = Foot and mouth disease, BQ = Black quarter, ET = Enterotoxaemia, CCPP = Contagious caprine pleuropneumonia, PPR = *peste des petits ruminants*, R = Rabies, CP = Camel pox, BP = Buffalo pox, GP = Goat pox

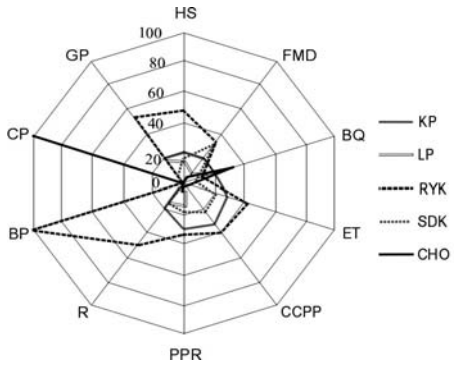

Fig. 1: Tehsil-wise spatial distribution of contagious diseases. HS = Haemorrhagic septicaemia, FMD = Foot and mouth disease, BQ = Black quarter, ET = Enterotoxaemia, CCPP = Contagious caprine pleuropneumonia, PPR = *peste des petits ruminants*, R = Rabies, CP = Camel pox, BP = Buffalo pox, GP = Goat pox; KP = Khan Pur, LP = Liaquat Pur, RYK = Rahim Yar Khan, SDK = Sadiqabad, CHO = Cholistan

tehsil Liaquat Pur, Bagh-O-Bahar (9.9%) and Liaquat Pur Sadar (11.3%), respectively, were at the top for the occurrence of outbreaks of HS. In tehsil Sadiqabad, PRO of HS at the highest (5.7%) in both Sadiqabad and Jamal Din Wali. PRO of HS was just 0.7% in Cholistan. The outbreaks of HS were observed throughout the year, however, the peaks were observed in the months of October (18.3%) and April (15.5%), while in January and May outbreaks remained exiguous. This observation is contrary to Sheikh *et al*. (1996), who reported the seasonal occurrence of HS. Maximum case fatality risk (CFR) of HS was recorded during spring and early summer.

Maximum outbreaks of FMD occurred during winter and spring with mean CFR of 0.3. The highest PRO of FMD was in tehsil Rahim Yar Khan and tehsil Sadiqabad (33% for both), followed by tehsil Khan Pur (20%), tehsil Liaquat Pur (9%) and Cholistan (5%). In tehsil Rahim Yar Khan, most of the outbreaks occurred in Chak Jhumra (15%), followed by Rajan Pur (8%). In tehsil Khan Pur and tehsil Sadiqabad, Khan Pur Sadar (14%) and Sadiqabad Sadar (17%), respectively, were prominent for the occurrence of outbreaks of FMD. Although the PRO of FMD was just 5% in Cholistan during the period under study, yet the autonomous perpetual peripatetic peregrination of Cholistani livestock during spring toward the canal irrigated and riverine areas and back towards their respective land during monsoon, *a posteriori*, constitute a state of flux for the status of FMD. An understanding and close monitoring of this to and fro trek of Cholistani livestock, and consequently of topotypes of FMD, would definitely play a pivotal role in devising a control strategy to control FMD *ab intra* and *ab extra* district Rahim Yar Khan.

Out of the total outbreaks of BQ, about 83% occurred during the spring. CFR was highest during spring. The highest PRO of BQ was in Cholistan (33.3%), followed by tehsil Liaquat Pur (25%), tehsil Khan Pur (20.8%), tehsil Rahim Yar Khan (12.5%) and tehsil Sadiqabad (8.32%). The loci of outbreaks were Taranda Muhammad Pannah and Liaquat Pur Sadar in tehsil Liaquat Pur; Bagh-O-Bahar and Khan Pur Sadar in tehsil Khan Pur; Rahim Yar Khan city, Chak Jhumra and Rajan Pur in tehsil Rahim Yar Khan; Sanjar Pur and Rahimabad in tehsil Sadiqabad.

The number of outbreaks of rabies was highest during spring. CFR was incessantly 1 in all the outbreaks. The highest PRO of rabies was in tehsil Rahim Yar Khan, followed by tehsil Khan Pur (20%), tehsil Liaquat Pur (15%) and tehsil Sadiqabad (15%). No case of rabies was recorded from Greater Cholistan. The major nidi of infection found include: Rajan Pur (20%), Chak Jhumra (17.5%), Rahimabad (10%) and Zahir Pir (10%).

About 71% of the total recorded outbreaks of ET occurred during late winter and early spring. Most (90%) of the outbreaks occurred during spring. There was gradual increase in CFR from mid winter to early spring. The highest PRO of ET was in tehsil Rahim Yar Khan (42.6%), followed by tehsil Khan Pur (29.5%), tehsil Sadiqabad (21.3%), tehsil Liaquat Pur (3.3%) and Cholistan (3.3%). The major loci of infection included Rajan Pur (24.6%), Khan Pur Sadar (14.8%) and Zahir Pir (11.5%). The geographical distribution of outbreaks revealed the fact that outbreaks of ET almost exclusively occurred in the rural areas.

An upsurge in the number of outbreaks of CCPP was noticed during mid winter and early spring. About 84% of

the total recorded outbreaks of CCPP occurred during winter and spring. This indicates the seasonal occurrence of this disease. Highest CFR was recorded during late spring. The highest PRO of CCPP was in tehsil Rahim Yar Khan (40%), followed by tehsil Khan Pur (33.3%), tehsil Sadiqabad (22.2%), tehsil Liaquat Pur (2.2%) and Cholistan (2.2%). Chak Jhumra (17.7%) and Jamal Din Wali (13.3%) were the major foci of outbreaks of CCPP.

About 95% of the total recorded outbreaks of PPR occurred during late spring and early summer with gradual decrease in CFR. This shows the correlation of occurrence of outbreaks of PPR with season. Zahur *et al*. (2008) and Abubakar *et al*. (2009) reported the high incidence of PPR in Sindh province during summer. They ascribed early migration of animals, due to drought, as *raison d'être*. District Rahim Yar Khan, being contiguous to Sindh province, the ratiocination demands the same for district Rahim Yar Khan. The highest PRO of outbreaks of PPR was in tehsil Rahim Yar Khan (33%), followed by tehsil Khan Pur (30%), tehsil Sadiqabad (18%), tehsil Liaquat Pur (14%) and Cholistan (5%). Zahir Pir (17.5%), Khan Bela (12.3%), Chak Jhumra (12.3%), Kot Samaba (12.3%) and Sadiqabad Sadar (10.5%) were the major infernos for the occurrence of PPR.

The two-recorded outbreaks of camel pox occurred exclusively in Cholistan during spring. The major foci of the outbreaks of goat pox, occurred exclusively during late winter, were Rahim Yar Khan city (18.8%) and Rajan Pur (18.8%). Majority of outbreaks of goat pox occurred in tehsil Rahim Yar Khan (5.6%) during late winter. The two outbreaks of buffalo pox occurred during late spring and early summer in Rahim Yar Khan city and Kot Samaba.

Juxtaposition of results obtained through participatory appraisal and scanning surveillance indicates that these two methods of surveillance are not only compatible and harmonious but are complementary to each other. So, the conflation of results obtained through these two methods of surveillance is more representative in its essence. Similar approaches were used by Zahur *et al.* (2008) and Klein *et al.* (2008).

Lack of disease reporting culture and procrastination has a pernicious and inimical influence on the success of national veterinary services. The *status quo* of national veterinary services demands paradigm shift endeavors to ameliorate and volte-face on the part of the political arbiters, top echelons of the Government, beneficiaries, academic savants and field veterinarians. The present work would go a long way in imparting edification in this regard. Entente between field veterinarians and local epidemiologist is a prerequisite to establish an efficient and percipient animal disease reporting and surveillance system within Pakistan. Although because of the geonautical disease risk and environmental matrix variables the prevalent and renascent contagious diseases risk profile of district Rahim Yar Khan is not an epitome of risk profile of Pakistan, yet it is not a pipedream that the present work would definitely prove to be benchmark in improving the lackadaisical epidemiological *modus operandi* of Pakistan *à la* developed countries of the world.

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