Seroprevalence and risk factors associated with Crimean-Congo haemorrhagic fever and brucellosis in people and livestock in Baluchistan and Khyber Pakhtunkhwa Provinces, Pakistan.

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Introduction

Crimean-Congo Haemorrhagic Fever (CCHF) virus can infect humans and animals. Since first human case of CCHF in Pakistan was reported in 1976, the virus has become endemic with sporadic outbreaks reported from all Provinces. The annual reported incidence is still increasing, and under-reporting is suspected from poor and marginalised communities.

Brucellosis is one of the most important zoonoses worldwide, but reliable information about its occurrence in humans and animals in Pakistan is difficult to find. Seroprevalences of 10–20% have been reported among at-risk groups of people.

The development of surveillance, prevention and control programs for these two zoonotic diseases is being seriously hampered by a lack of empirical information about their occurrence and distribution.

Objectives

- Determine the seroprevalences of antibodies to *Brucella* species and CCHF in people, sheep, goats and large ruminants in a total of 24 villages from 12 union councils in 2 districts in each of Baluchistan and KPK provinces.
- Identify risk factors associated with seropositivity to CCHF and *Brucella* in both people and animals.
- Determine the spatio-temporal pattern of reported primary (not nosocomial) human cases of CCHF.
- Recommend measures to guide CCHF control policy in Pakistan.

Methods

This project is ongoing and comprises two studies: a cross-sectional survey to determine the seroprevalence of brucellosis and CCHF in livestock and humans; and a spatio-temporal analysis of reported primary cases of CCHF in humans in Pakistan.

The cross-sectional study is located in four districts, two in Baluchistan and two in Khyber Pakhtunkhwa (KPK). These districts were purposively selected based on historical records of CCHF cases. Within each district, six villages were randomly selected from two randomly selected Union Councils, and within each village 20 households were randomly selected.

The 480 selected households are being visited in order to collect blood samples from 1,500 humans, 3,000 small ruminants and 640 cattle. During these visits, questionnaires are used to collect human demographic, exposure, and knowledge, attitudes and practices (KAP) data related to CCHF and brucellosis.

To screen for brucellosis, sera are tested with the Rose Bengal Plate Agglutination assay (RBT), and RBT-positive samples are further tested using a competitive ELISA (cELISA). For CCHF, an IgG-based ELISA is used. All laboratory work is conducted at central laboratories of the National Institute of Health and the National Agricultural Research Centre.

Exploratory spatial and temporal analysis was conducted on non-nosocomial CCHF cases reported to the National Institute of Health from 2011–2013.

Figure 1. Sheep and goats in Baluchistan.
Photo: Azeem Baloch

Results

The number of samples collected in the study districts in Khyber Pakhtunkhwa and Baluchistan as of mid-November is shown in Table 1. At the current time, the collection of samples is continuing.

Based on samples collected to-date, the seroprevalence of households with one or more animals seropositive for brucellosis is 18% (95% CI: 13 – 23%; Table 2) with no significant difference between districts (p = 0.19).

The mean seroprevalence of brucellosis in animals was 4.2% (95% CI=3.2–5.5; Table 3), with no significant difference between species (p = 0.22).

Table 1. Number of households, people and animals that had been sampled as of mid-November 2013. BAL = Baluchistan; KPK = Khyber Pakhtunkhawa.

Province	District	Households	People	Animals
BAL	Killa Saif Ullah	101	121	514
	Sibi	58	126	268
KPK	Bannu	40	73	200
	Mansehra	38	93	181
Total		**237**	**413**	**1163**

Table 2. Household-level seroprevalence of brucellosis in animals.

District	Number of Households	Prevalence (%)	95% CI	
			Lower	Upper
Saif Ullah	101	17.8	11.5	26.6
Sibi	58	10.3	4.7	21.3
Bannu	40	27.5	15.8	43.5
Manshera	38	18.4	8.9	34.2
Total	**237**	**17.7**	**13.3**	**23.2**

Table 3. Seroprevalence of brucellosis by animal species.

Species	Number of samples	Prevalence (%)	95% CI	
			Lower	Upper
Sheep	310	3.9	2.2	6.7
Goat	510	3.5	2.2	5.5
Cattle	275	4.7	2.8	8.0
Buffalo	68	8.8	4.0	18.4
Total	**1163**	**4.2**	**3.2**	**5.5**

There was a significant association between history of abortion and brucellosis seropositivity in animals, with an odds ratio of 5.5 (p <0.001; Figure 2)
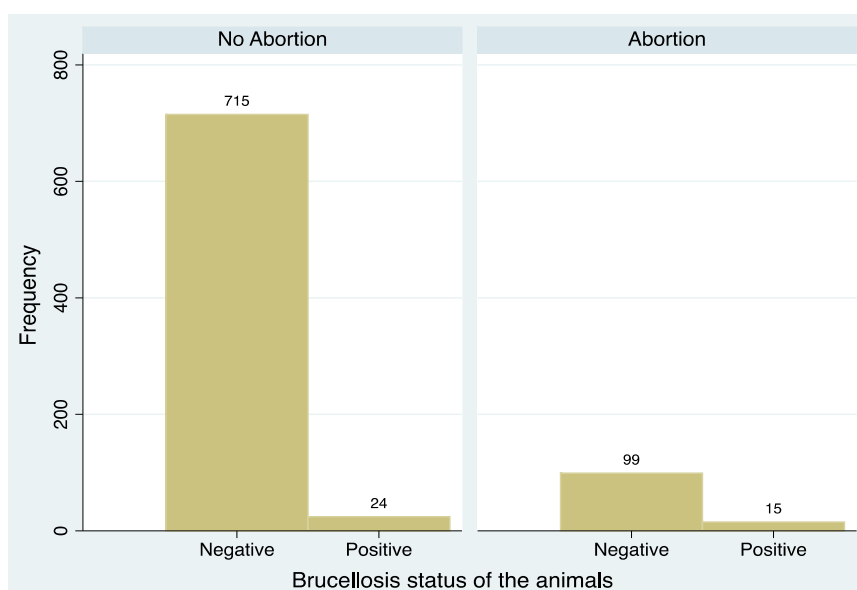
The mean seroprevalence of brucellosis in people was 2.7% (95% CI=1.5–4.8; Table 4), with a significantly higher prevalence in Bannu District, KPK (p= 0.004). People in households with one or more animals seropositive for brucellosis are 4 times (95%CI= 1.88–9.04) more likely to contract brucellosis than those in households with no infected animals.

Table 4. Seroprevalence of brucellosis amongst people by district.

District	Samples (#)	Prevalence (%)	95% (CI)	
			Lower	Upper
Saif Ullah	121	3.3	1.2	8.5
Sibi	126	0.0	NA	NA
Bannu	73	8.2	3.7	17.2
Manshera	93	1.1	0.2	7.3
Total	**413**	**2.7**	**1.5**	**4.8**

Discussion

The provisional results presented in this abstract indicate a relatively high exposure of people to brucellosis in animals, with 18% households having at least one animal that is seropositive for brucellosis.

People in households with one or more animals that were seropositive for brucellosis had a four-fold higher risk of being infected with brucellosis compared with those in households with no infected animals. The variation in seroprevalence amongst people suggests that implementation of brucellosis control measures can be prioritised in some districts.

CCHF diagnostic results were unavailable at the time of writing.

Recommendations

Recommendations will be formulated once sampling and diagnostic testing has been completed.

Acknowledgments

Figure 2. A comparison of the brucellosis serological status of animals with and without a history of abortion.