Punjab University Journal of Zoology

OPEN ACCESS

37(2): 143-148 (2022)
https://dx.doi.org/10.17582/journal.pujz/2022.37.2.143.148

Check for updates

Research Article

Participatory Surveillance of Infectious and Non-Infectious Diseases of Livestock in Pakistan

Muhammad Nadeem[1], Muhammad Rizwan[2,3*], Tanveer Ahmad[4], Muhammad Kashif[5], Aneela Zameer Durrani[2], Muhammad Ali[6], Asghar Abbas[7], Safder Imran[8], Sidra Saher[9], Syeda Fakhra Waheed[10]

[1]*Department of Pathology, Arid Agriculture University, sub campus, Khushab, Pakistan.*
[2]*Department of Veterinary Medicine, University of Veterinary and Animal Sciences, Lahore, Pakistan.*
[3]*Bahauddin Zakariya University, Multan, Pakistan.*
[4]*Department of Clinical Studies, Bahauddin Zakariya University, Multan, Pakistan.*
[5]*College of Veterinary and Animal Sciences, Jhang, Pakistan.*
[6]*College of Veterinary Sciences, Bahauddin Zakariya University, Sub Campus Layyah.*
[7]*Department of Pathobiology, Faculty of Veterinary and Animal Sciences, MNS University of Agriculture, Multan, Pakistan.*
[8]*Development of Animal Breeding and Genetics, Faculty of Veterinary and Animal Sciences, The Islamia University of Bahawalpur, Pakistan.*
[9]*Department of Epidemiology and Public Health, University of Veterinary and Animal Sciences, Lahore, Pakistan.*
[10]*School of Biological Sciences, University of the Punjab, Pakistan.*

Article History
Received: September 30, 2022
Revised: October 25, 2022
Accepted: November 14, 2022
Published: December 05, 2022

Authors' Contributions
MN, MR, TA, MK, AZD and MA planned and conducted this work. AA, SI and SS helped in manuscript write-up. SFW corrected the manuscript.

Keywords
Livestock, Prevalence, Theileriosis, Mastitis, Syndrome

Abstract | This study aimed to evaluate participatory surveillance of prevailing various infectious and non-infectious diseases in domestic animals under field conditions. For this purpose, study area was all tehsils of district Khushab and study population were all domestic animals. Diseases were diagnosed based on history of diseased animal, signs and symptoms, post-mortem findings, biochemical, and cultural characterization. Occurrence of significant trans-boundary animal diseases (TADs) was highlighted by adopting special parameters of participatory disease surveillance (PDS). Data analysis showed that FMD, theileriosis, and HS are the most important, of which FMD was found to be most common diseases in study area. Other main livestock health problems observed during study was respiratory syndrome, mastitis, enterotoxaemia, tick and mite infestations and pox disease. There was no proof of rinderpest occurrence since long in area of examination. Participatory disease surveillance presented to be a worth full technique to obtain trustworthy data that may be helpful in making most effective policies for control and eradication of livestock diseases in and Pakistan.

Novelty Statement | Participatory surveillance for infectious and infectious diseases of livestock is effective for diseases eradication program in Pakistan.

To cite this article: Nadeem, M., Rizwan, M., Ahmad, T., Kashif, M., Durrani, A.Z., Ali, M., Abbas, A., Imran, S., Saher, S., and Waheed, S.F., 2022. Participatory surveillance of infectious and non-infectious diseases of livestock in Pakistan. *Punjab Univ. J. Zool.*, **37**(2): 143-148. https://dx.doi.org/10.17582/journal.pujz/2022.37.2.143.148

Corresponding author: Muhammad Rizwan
mrizwan@bzu.edu.pk

Introduction

In early 1970's, it was firstly assessed that formal data-collection methods adopted were unable to provide gainful and consistent information in designing developmental projects in under developing countries. This dilemma was correlated with the protocols and approaches of researchers to realize issues of most deprived people in pastoral communities. To cope with these emerging circumstances, alternative systems of investigation have, since been developed and tried to be implemented. Rapid rural appraisal systems, participatory rural appraisal were introduced to define, analyze and solve their problems by involving their own active participation (Chambers, 2001). Participatory epidemiology is a promising branch of science that primarily on basis of implementation of participatory skills for bring in qualitative epidemiological brainpower enclosed within society interpretation, existing veterinary awareness and traditional background. It depends mainly on the extensively acknowledged methods of participatory rural consideration, ethno veterinary studies and qualitative epidemiology. Information obtained with these systems might be helpful in designing improved livestock health projects and relief systems, helpful in conduction of successful surveillance determination, and control measures or strategies or might open new horizons for ground-breaking research suppositions in ecological epidemiology.

PDS system was introduced and implemented in Africa as a precise and fastest way for rinderpest dynamics, identification and the distribution (Mariner and Roeder, 2003). This system enables the active participation of the livestock owner instead of being inert substrate, which can and have to convey intellectual assistance to development, if development has to be successful. Such various examples have been gain acknowledged in different countries, while participation of recipients in designing; executing, observing and analysis of a project amplify its success immensely. PDS system was firstly introduced under a FAO, Support for Emergency Prevention and Control of Main Trans-boundary Animal Diseases in Pakistan (Rinderpest, FMD PPR) during 2002–2005. In this task, 17 teams were comprised that investigate 6, 000 randomly chosen rural community all over the country.

Livestock has an important significant in National economy of country having contribution in National GDP as 11.8%, and 55.5% in agriculture sector's share of GDP. Livestock provides employment to peoples of rural areas, supporting to reduce variation in income. It is estimated that about 88% of farmers have 5 to 6 animals or less. This fulfills their need of meat, milk, and also provides cash income daily.

Khushab has four Tehsils including Khushab, Noshera, Quaidabad and Noorpur Thal. In district Khushab important livestock breeds are Cattle (Sahiwal breed), Buffalo (Nili Ravi breed), Goat (Teddy, Beetal breeds) Sheep (Kajli, Lohi breeds). The livestock population according to the data from 9211 systems are small animals (605641), large animals (474591), and poultry (438122).

The prevalent diseases of the area (Infectious and metabolic) are FMD, BQ_ mastitis, hemorrhagic septicemia (HS), red water and milk fever, respectively. All types of vaccination are done in the district against HSV, FMD, CCPPV, ETV, and HS. Another main issue is the movement of animals within and in between different districts is considered as source for the spreads of diseases in animals. Transport and movement of animals may also be the source of altering the pattern of existing disease and may introduce and new disease in the specified area. This study highlighted current scenario of animal infectious and non-infectious diseases in district Khushab, Pakistan.

Materials and Methods

Study area

This study was performed in all four tehsils of district Khushab, Pakistan.

Target animals and inclusion criterion

Target animals were all domesticated animals in study area, irrespective of age, breed, housing, feeding management, and vaccination. These animals were selected randomly.

Methodology

The field activities were planned as described previously (Noman *et al.*, 2006). In order to perform field activities veterinarians' team was comprised as facilitator, moderator and recorder. These activities were performed in collaboration with the Government Veterinary Officers, Assistant Diseases Investigation Officer/ private practitioners or assistants. This collaboration provided handful information and an opportunity to plan PDS activity in randomly selected areas in different tehsils of Khushab, according to the ease of the livestock owners' viz. availability of time, place, local influential personalities, clashes, weather. It was made to include all concerning persons directly or indirectly relevant to livestock at the visiting area/ farm. The interviews were focused mainly on identification of respondents and related questions about daily activates of farmers relevant to the health issues of animals in study area in general. To eliminate biasness, team did not point out any infectious and non-infectious diseases unless the beginning of topic by respondents. However, if a respondent specified the incidence of any disease viz. H.S, mastitis, PPR, FMD, milk fever, he was requested to explain disease as a part of substantiation process and other inquiring questions exclusively planned

to draw comprehensive information. If respondent failed to describe disease accurately, report considered nullified.

In PDS report, instead of questionnaire, a list of activities was planned which includes; introduction of PDS team along with participants, farm mapping, proportional piling for disease prevalence and seasonal calendar, matrix scoring to know impact of disease on owners, identification of active informants, key questions to accumulate information regarding animal diseases. During visiting farms/ areas the focus was also given on direct observations. Animals at farm/ area were examined and questions regarding number of animals, feeding patterns, vaccination and vaccination schedule, animal productivity and marketing of final products were asked. The farmers were motivated to draw their farm maps with the help of sticks on ground to access the availability of animal resources, outside animal's interactions and risks in the specified area.

With the help of beans/ pebbles, proportional piling was exercise to approximate relative prevalence of animal diseases in this area. For this, pebbles/ beans were provided to the animal owners and they were encouraged to create heaps in accordance with the relative occurrence of five mainly prevailing diseases. They were motivated to argue with each other to agree among each other. Parallel exercise was conducted to conclude relative significance of those five animal diseases in the specific area under observation. Likewise, proportional piling was also implemented to depict a seasonal calendar to highlight seasonal occurrence of different livestock diseases. Impact of domestic animal diseases on the livelihood of owners of area were estimated with the help of Matrix Scoring. For matrix scoring, 40 beans were provided to the owners and they were requested to create heaps in accordance with the impact of five mainly prevailing animal diseases that can directly influence their living. They were provided opportunity to argue and agree among them. Cross checked prevalence, and significant of those five diseases was also performed in the similar way. Highly motivated farmers or influenced personals such as; Siannas (local skilled persons), local progressive animals farmers, animal traders were identified to get secondary data about livestock diseases prevailing in the area. Collected data was reconfirmed and assessed again with the help of Government Veterinary officials and Disease surveillance officer i.e. Assistant disease diagnostic officers Khushab to have an authentication of data collection as they have now more reliable and accurate information regarding surveillance of diseases.

Results and Discussion

Primary assignment of surveyor team was to have complete knowledge of local diseases with their traditional names and clinical presentations. Local name of livestock diseases and photos with elaborated clinical picture of disease encouraged the farmer to explain about the diseases most prevalent at their areas. For example, photos presenting intensive salivation along with blisters motivated the farmers to share their experiences regarding the incidence of FMD in their farms/ area (Table 1).

As in district Khushab farmers are not well educated and lack the information regarding prevailing diseases in their areas especially regarding PPR. Farmers frequently confused PPR with mixed infections caused by ET and contagious caprine pleuro pneumonia (CCPP). However, they have clear information regarding FMD, HS and mastitis and respiratory diseases.

In case of proportional piling, it seems to be interesting exercise for the farmers to decide the incidence and significance of key livestock diseases in their area (Table 2). After elaborating the procedure to farmers, the farmers showed keen interest in it and presented a handful discussion regarding finalizing the prevalence of disease in the area. The technical staff members encouraged the farmer conversation in order to gain the exact information in a smooth way. Proportional piling results are presented in Figures 1 and 2. After discussion the farmers formally come to the point that FMD, HS (Respiratory syndrome confusing with HS), mastitis, milk fever, theileriosis, Babesiosis (red water disease), and parasitic infestation were the most important diseases regarding health and livelihood and need prior attention to be tackled. FMD,

Table 1: Livestock population in district Khushab.

Village wise censuses animal population in District Khushab						
Tehsil name	**Name of DCC/UC**	**No. of villages**	**Large animals**	**Small animals**	**Equine**	**Camel**
Noshera	Uchali	9	8691	8969	848	47
Khushab	Tilokar	7	10280	7967	233	47
Qaidabad	Bandial	10	14173	10369	268	195
Noorpour Thal	Jamali Balochan	4	6970	20383	271	1224
Khushab	DCS (LES Khushab)	7	9293	3798	745	78
Total		37	49407	51486	2365	1591

Disease and Diagnostic lab, Jauharabad, UC: Union council; DCC: Disease control unit, LES: Livestock Experimental station.

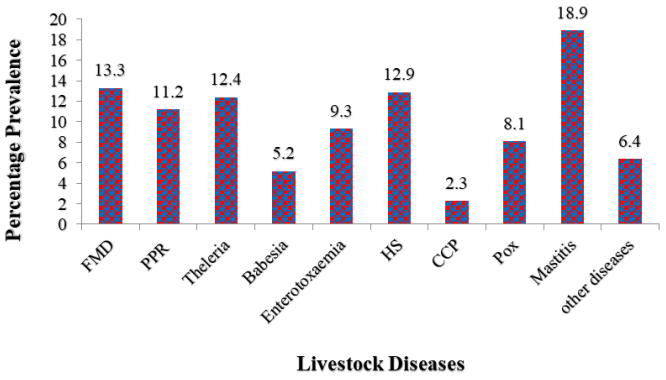

Figure 1: Proportional piling presenting percentage prevalence of important livestock diseases as estimated by farmers.

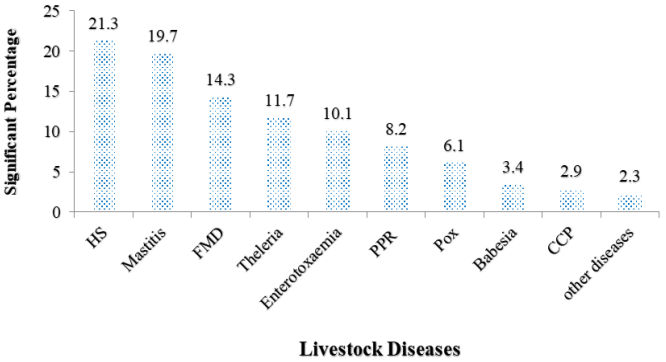

Figure 2: Proportional piling presenting ranking of significantly important livestock diseases as estimated by farmers of District Khushab.

HS and theileriosis was reported as most common diseases in the area. Regarding respiratory syndrome, farmers were unable to predict exactly about the outbreak but they all were agreed on the point of frequent occurrence of disease along with huge damages and similarities that are present in case of HS. Farmers/ owners totally agree with the absence of rinderpest and also no cases have been noticed either by farmers or Government Veterinary Officers/ assistants in the area since long. District Khushab has a large population of sheep and goats and is famous for Kajli (local sheep breed) all over the Pakistan especially people like it to slaughter on Eid ul Adha, and other celebrations. However, farmer's knowledge regarding PPR is limited and in previous years only few cases were came to know and farmers were unable to point of the prevalence of this disease in their area. Now PPR cases have been started reporting with the efforts of Livestock and Dairy Development Department Khushab and Disease Diagnostic laboratory Jauharabad (Khushab) and hopefully in coming days we will have more precise data regarding prevalence of PPR from farmers when they will be full trained and aware by the disease from above mentioned department. Other miscellaneous diseases pointed out by the farmers/ owner were mostly relevant to mal nutrition, ticks, mange, mites and managemental practices that ultimately result in obstetrics and theriogenological problems, lack of milk and meat production, indigestion, milk fever, red water disease and poor reproducibility. The seasonal calendar presented that intensity of livestock diseases change significantly in all seasons of Pakistan. To achieve this goal, piling exercise was conducted at various farms in different tehsils of district Khushab and results have been presented in Table 3 and Figure 3.

Table 2: Proportional piling for seasonal prevalence of main animal diseases.

Proportional prevalence of significant livestock diseases							
Seasons	**HS**	**FMD**	**Entero-toxaemia**	**Mas-titis**	**Theiler-iosis**	**Pox**	**Other diseases**
Spring	32	15	7	13	14	6	13
Summer	21	16	13	23	10	2	15
Autumn	12	13	9	24	19	5	18
Winter	17	13	12	14	11	2	31

Table 3: Matrix scoring scheme for livestock diseases effects on livelihood of livestock owners in District Khushab proposed by local farmers.

Parameters diseases					
Livelihood	**Mastitis**	**FMD**	**Enterotoxaemia**	**Pox**	**HS**
Milk	▪▪▪▪▪▪	▪▪▪▪	▪	▪	▪▪▪
Income	▪▪▪▪▪▪▪▪	▪▪▪▪	▪	▪▪	▪▪▪▪
Slaughtering		▪▪		▪	▪
Calves		▪	▪		▪
Result	13	11	3	4	9

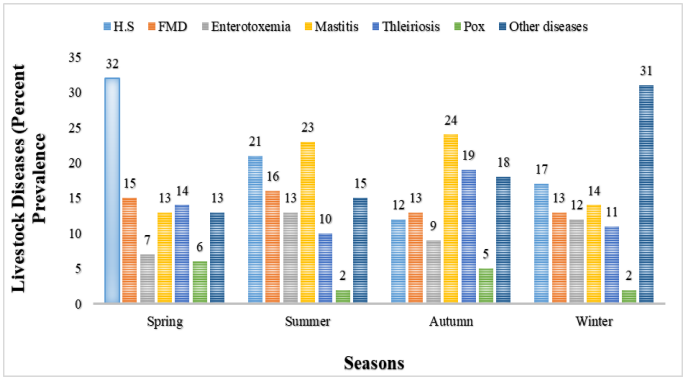

Figure 3: Seasonal calendar highlighting the prevalence of significant livestock.

During surveillance campaign, a near about 936 motivated farmers/owners, dairy farm breeders, local livestock traders and private practioners were questioned to have their opinion regarding prevalence of different diseases in their area. Data collected from these personals also highlighted the absence of rinderpest and commonly presence of FMD, HS and theileriosis in animals at their area all over the seasonal calendar. PPR in goats is prevailing in district Khushab and with efforts of Livestock and Dairy Development Department and Disease Diagnostic Lab., Jauharabad (Khushab) campaigning farmer are

getting aware about disease. Other notable diseases in the district pointed by motive farmers were H.S., mastitis, enterotoxaemia, pox and tick and mite borne diseases.

During visits to animal market at district Khushab, the motivated source persons highlighted the almost total rinderpest outbreaks and commonly presence of FMD cases/ outbreaks (as recently seen in the start of year 2017) all the year. Matrix scoring technique was implemented to validate results of proportional piling and commonly present diseases influence on livelihood of livestock (directly or indirectly) related persons. The data collected in the area clearly highlighted the mastitis and FMD are the most significant diseases affecting the lively hood of livestock owners.

PDS study conducted in district Khushab revealed the total absence of rinderpest in study area, as observed by Government Veterinary officers and information gathered from local farmers. FMD, HS, theileriosis and mastitis are the significantly major and prevailing diseases of livestock in district Khushab. As Khushab most of the population is settled in rural areas and have animals to fulfill their livelihood. As a source of income these animals are continuously traded among each other and in different cities of Punjab. This movement of livestock from one place to another place may be a source for new diseases or disease variability in relatively prone livestock population. Hemorrhagic septicemia has been declared the most prominent bacterial infection affecting ruminants in Pakistan. Data analysis have highlighted that FMD is most common disease prevailing in the area but livestock owners still consider HS and mastitis as most dangerous diseases of area in term of economic losses as HS is fatal to animals in a short time and mastitis leads to damage of mammary tissue and ultimately the animal loss its ability to produce milk. These diseases ultimately have drastic effect of the livelihood of livestock owners.

Although local rural farmers were not well educated but surveillance also found that they have sound knowledge regarding prevailing disease in their area due to continues interaction between animals and animals related health problems. Therefore, farmers were able to demonstrate the cordial signs of diseases along with clinical diagnosis. Results verified greatly common characteristics between livestock owners' information and scientific observation of the livestock disease. In case of respiratory syndrome, it was difficult to imagine completely that similar to HS, although animals were vaccinated against HS but some of them have shown to be affected and remained unresponsive to the medicine. Data analysis pointed out that disease might have manifold etiology including infection in cooperated with mal-nutritional and managemental practices and tension needed to be focused on its detailed investigation to have a solid conclusion.

Participatory surveillance technique for livestock disease information utilizing different exercises of proportional piling, disease seasonal calendar, information from proactive livestock relative persons etc. facilitate investigators to evaluate the results with diverse sources. Data was compiled only when stage of conformity was moderate to high. Although it was a participatory surveillance however, the study also provides the opportunity to also have quantification on the basis of collected data. Implementation of study techniques were valuable for have an idea about local prescription of livestock diseases, livestock diseases estimation along with their significance in the area and have a view regarding disease outbreak patterns in various seasons of the year.

Compilation of livestock diseases information by implementing participatory techniques is an emerging technique in Pakistan. In start of study due to certain reluctances the farmers were reluctant to share the information and showed no interest in group discussion but with elaborated demonstration from technical staff and working of L and DD department Punjab the farmers were motivated to demonstrate their knowledge regarding health problems related to their animals and showed active participation in group discussion about the livestock diseases in their area and helped to extract more reliable information regarding prevalent diseases in the area. PPR was present as a prevailing disease in the area. However, livestock owners always mixed it with CCPP and enterotoxaemia. But after proper guiding and evaluating the data from different sources (PPR disease symptoms presenting Pana-flex and information from progressive farmers etc.), it was simple to arrive at the final conclusion. Through the PDS study, also provide information to the concerned veterinarians that HS, mastitis and theileriosis were of great concern for livestock owners' livelihood than other diseases of transboundary concern viz. FMD, PPR, and RP. The PDS study also reinforced Pakistan as RP free country as also reported previously. This training has also encouraged and motivated the farmers that they should report the diseases incidence and outbreak to the relevant department at earliest without any reluctance.

Conclusions and Recommendations

The important data accumulated by PDS study along with cooperation of L and DD Punjab will assist to make improved strategies and implement measures for management, control and eradication.

Acknowledgements

We a greatly thankful for the cooperation of Livestock and Dairy Development Department Khushab (Punjab) and Diseases Diagnostic Lab., (Disease surveillance

center) Jauharabad (Khushab).

Conflict of interest

The authors have declared no conflict of interest.

References

Chambers, R., 2001. The origins and practice of participatory rural appraisal. *World Dev. RRA Notes,* **20**: 115 - 23.

Chambers, R., 2011. *Rural development putting the last first*. Longman Scientific and Technical, New York, pp. 246.

Livestock Census, 2021-222. Agricultural census organization, statistics division, Vol I, II (Part 2). Government of Pakistan, Gulberg–III, Lahore, Pakistan.

Mariner, J.C., and Roeder, P.L., 2003. Use of participatory epidemiology in studies of the persistence of lineage rinderpest virus in East Africa. *Vet. Rec.,* **152**: 641–647. https://doi.org/10.1136/vr.152.21.641

Munir, R.S., Akhtar, and Afzal, M., 1994. Evaluation of three oil adjuvant Vaccines against *Pasteurella multocida* in Buffalo. *Calves Rev. Sci. Tech. Off. Int. Epiz.,* **13**: 837–843. https://doi.org/10.20506/rst.13.3.806