

Epidemiological Analyses of Foot and Mouth Disease in Pakistan

RUBINA ANJUM, MANZOOR HUSSAIN^{1,†}, AAMER BIN ZAHOR, HAMID IRSHAD AND UMER FAROOQ

Animal Health, Animal Sciences Institute, National Agricultural Research Centre, Park Road, Islamabad-45500, Pakistan

[†]*Food and Agriculture Organization, Islamabad, Pakistan*

¹Corresponding author's e-mail: manzoorh@isb.paknet.com.pk

ABSTRACT

Foot and mouth disease (FMD) was recorded by prevalence and importance percentages in Pakistan using various procedures of Participatory Disease Surveillance (PDS), during a period of 3 years (June 2002 - June 2005). A total of 17 PDS teams searched occurrence of animal diseases in randomly selected villages throughout the country. The data obtained were analyzed and utilized to identify the high risk and low risk areas of FMD in Pakistan. This information would help design future studies and ultimately development of a national policy for the control of FMD in Pakistan.

Key Words: Foot and mouth disease; Participatory disease surveillance; Epidemiology

INTRODUCTION

In Pakistan, livestock accounts for about 11.4% of total gross domestic product (GDP). Animal herd comprises of 26.3 million buffaloes and 24.2 million cattle (Pakistan Economic survey, 2004 - 2005). The role of livestock in rural economy may be realized from the fact that 30 - 35 million rural population is engaged in livestock raising having household holdings of 2 - 3 cattle/buffaloes and 5 - 6 sheep/goats per family, which help them to derive 30 - 40% of their income. Also every fifth family in Pakistan is engaged directly or indirectly in livestock farming (Pakistan Economic Survey, 2004 - 05).

Foot and Mouth disease (FMD), a highly contagious viral disease affecting primarily cloven footed animals, continues to be a major concern for world livestock industry. The virus belongs to the genus *apthovirus* of family *Picornaviridae*. In Pakistan, the most prevalent serotypes are O (70%), Asia-I (25%) and A (4.67%) causing a loss of Rs. 6.00 billions to farmers annually (Zulfiqar, 2003). In most parts of the world, including Pakistan, an elimination policy (stamping out) can not be persuaded because of cost, lengthy land borders and lack of regional program involving the whole region rather than individual country. Therefore, at present, vaccination is the only way to control the disease in Pakistan.

Participatory Disease Surveillance (PDS), an active type of disease surveillance, can be defined as the "Application of Participatory techniques to get qualitative disease information contained within the community observations and existing veterinary knowledge". It relies on traditional livestock owner's knowledge about the clinical, gross pathological and epidemiology of diseases that occur locally and gained respect for its ability to understand disease pattern leading to identification of an effective strategy.

The concept of PDS in Pakistan was introduced by

Food and Agriculture Organization (FAO, UN) under the project "Support for Emergency Prevention and Control of Main Trans-boundary Diseases in Pakistan". This trust fund Project was funded by European Commission and implemented by FAO. Seventeen teams comprised of 51 active field veterinarians searched trans-boundary animal diseases and other important diseases throughout the country by using various techniques of PDS. The introduction of PDS activity in Pakistan disease reporting system, greatly enhanced the sensitivity of disease reporting and information systems and created an alternative channel for livestock owner's voice to be heard (Mariner *et al.*, 2003). The data generated by these teams (2002 - 2005) have been analyzed and presented here. It would help to design future studies and development of a national strategy for the control of FMD in Pakistan.

MATERIALS AND METHODS

Disease intelligence. Seventeen PDS teams comprised of 51 active field veterinarians searched Trans-boundary Animal Diseases (TADs) and other important diseases through out the country. The data obtained were based on active surveillance including the knowledge of farmers, traditional and oral history. A total of 10% of the villages were randomly selected throughout each province including AJK and northern areas. Meetings and interviews were carried out by engaging the field veterinarians and Para-veterinary staff. For elaboration of the disease probing questions were asked to draw the conclusion. A check list comprised of proportional piling, mapping and seasonal calendar was followed. Interviews with key informants through open and close ended questions were carried out to collect information about Rinderpest, FMD, PPR and other important diseases in the area.

Development of data base and data analysis. The reports obtained by all PDS teams were analyzed. The data were

compiled for deduction of the information regarding FMD. Using this information, a data-base was developed. The parameters like the geographical distribution, prevalence and importance of the FMD were analyzed and recorded.

The data of outbreaks, species involved, number of cases found sick, number of deaths, clinical signs, differential diagnosis and laboratory confirmation was recorded during the reporting period i.e. July 2002 - June 2005.

RESULTS

The number of outbreaks of FMD recorded by PDS teams during the reporting period are summarized in Fig. 1. Most out-breaks were reported by the farmers in Punjab province followed by Sindh, NWFP Balochistan, AJK and Northern Areas. This also corresponds with the livestock population in these provinces and areas.

In Punjab, the highest (54%) prevalence was recorded in Sheikhupura district, while the lowest (10%) was recorded in Chakwal district. The highest (33%) importance was recorded in Khanewal district, while the lowest (0.5%) in Bahawal Nagar district. The percentages of importance and prevalence of FMD in other districts of Punjab are summarized in Fig. 2.

In Sindh, the highest (33.78%) prevalence was recorded in Sanghar district, while the lowest (12.09%) was recorded Ghotki district. The highest (36.20%) importance was recorded in Karachi district, while the lowest (10.04%) in Ghotki district. The percentage importance and prevalence of FMD in other districts of Sindh are summarized in Fig. 3.

In NWFP, the highest (37.33%) prevalence was recorded in Kohat district, while the lowest (19.35%) was recorded in Swat district. The highest (20.75%) importance was recorded in Haripur district, while the lowest (9.4%) in Manshera district. The percentage importance and prevalence of FMD in other localities of NWFP are summarized in Fig. 4.

In Balochistan, the highest (70%) prevalence was recorded in Chagi district, while the lowest (2.50%) was recorded in Gawader district. The highest (3.55%) importance was recorded in Lasbella district, while lowest (0.5%) recorded in Turbat district. The percentage prevalence and importance of FMD in other districts of Balochistan are summarized in Fig. 5.

In Azad Jammu and Kashmir (AJK), the highest (30.65%) prevalence was recorded in Mirpur district, while the lowest (6.64%) was recorded in Palandri district. The highest (12.77%) importance was recorded in Mirpur district, while the lowest (7.11%) in Rawala Kot district. The percentage importance and prevalence of FMD in other districts of AJK are summarized in Fig. 6.

In Islamabad Capital Territory (ICT), FMD was reported as the most prevalent disease having prevalence 25.5% and importance 19.2%.

Fig. 1. No. of outbreaks of FMD recorded by PDS teams in various provinces including AJK and North areas of Pakistan (2002-2005)

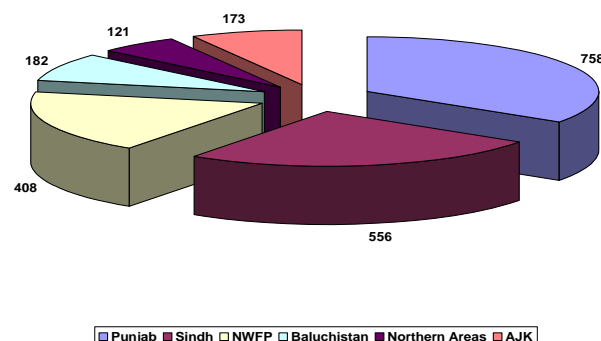


Fig. 2. Comparative percent prevalence of FMD in different districts of Punjab province

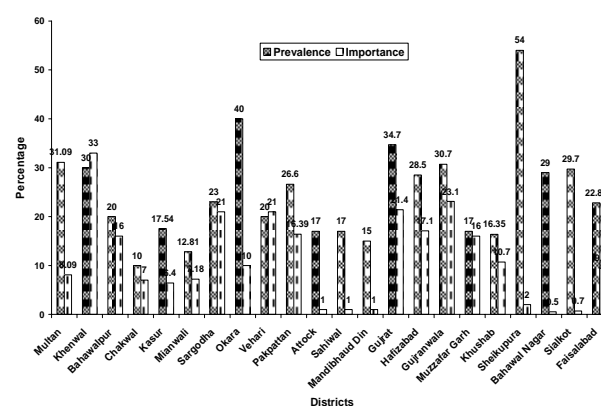
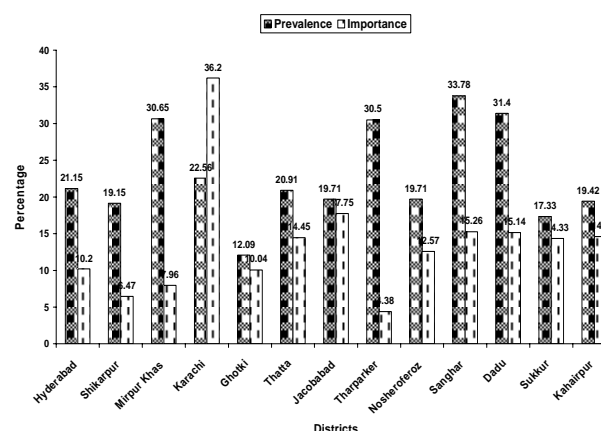
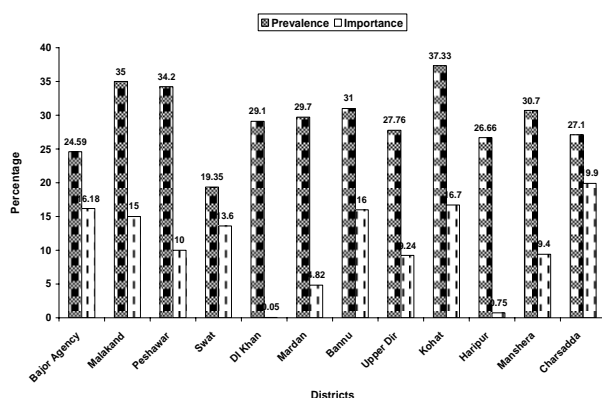
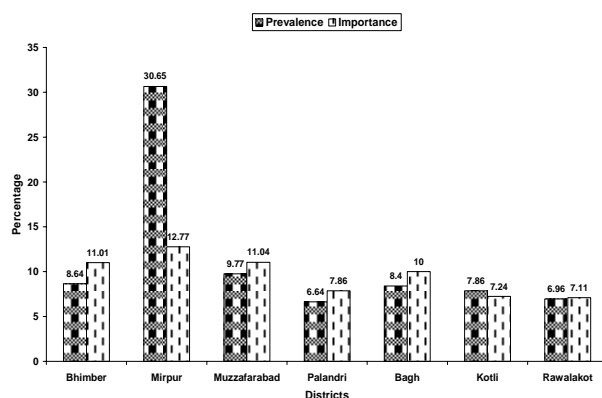
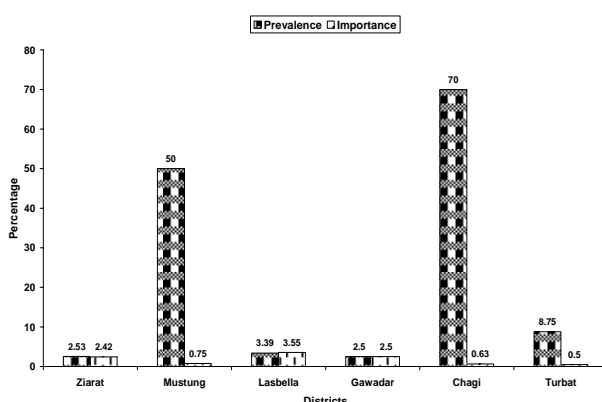


Fig. 3. Comparative percent prevalence and importance of FMD in different districts of Sindh province



According to the farmer's conception, frequency of FMD remained almost constant in all four seasons (22.6% in winter, 20.5% in spring, 21.0% in summer & 23.9% in fall).

Fig. 4. Comparative percent prevalence and importance of FMD in different districts of NWFP province**Fig. 5. Comparative percent prevalence and importance in different districts Balochistan province****Fig. 6. Comparative percent prevalence and importance of FMD in different districts of AJK**

DISCUSSION

The PDS activity performed in Pakistan during 2002 - 05 disclosed that FMD is the most prevalent disease of the dairy animals in Pakistan. Frequency of FMD remained

almost constant in all four seasons as reported by Hussain *et al.* (2005).

The PDS approach was developed in Africa as an accurate and rapid method to understand distribution and dynamics of Rinderpest in pastoral areas (Mariner & Roeder, 2003). The introduction of PDS activity into Pakistan disease reporting system has greatly enhanced sensitivity of the system and created alternate channel for livestock owner's priorities to be considered (Mariner *et al.*, 2003).

The total number of out-breaks of FMD in all provinces including AJK and Northern areas is 2198 during the period under report. Maximum out-breaks i.e. 758 occurred in Punjab, which might be due to larger animal population reared in the province. In Sindh 556, NWFP 408, Balochistan 182, Northern Areas 121 and in AJK the numbers of outbreaks were 173. These all occurred throughout the year in all seasons. Hussain *et al.* (2005) reported similar pattern of FMD occurrence throughout the year. These out-breaks might be related to the animal movement in all the province s relating to the production systems prevalent in country. Most of the out-breaks in the country occurred around Eid-ul-Azha festival again due to massive animal movement.

In Punjab, the areas with the highest prevalence rates are Sheikhupura district 54%, Okara district 40%, Gujrat district 34%, Multan district 31.09% and Gujranwala district 30%. The areas where farmers ranked the disease as the most important are Khanewal district 33%, Gujranwala district 23%, Gujrat district 21%, Sargodha district 21%, Vehari district 21% and Sialkot district 20%. In these areas, farmers have a sizeable land holding and they are affluent and they maintain pure bred cattle along with these areas of central Punjab harbor maximum number of buffaloes. The results revealed the buffaloes are more susceptible to FMD as compared to pure bred cattle. Also in these districts, farmers are mainly associated with commercial dairy farming and realize the losses incurred due to drop in milk yield, treatment etc.

In Sindh, highest prevalent areas are Sanghar district 33.78%, Dadu district 31.40%, Mirpur Khas district 30.65%, Tharparker district 30.50% and highest important areas are Karachi district 36.20%, Larkana district 19.31%, Mirpur Khas district 17.96% and Jacobabad district 17.75%. District Sanghar of Sindh province receives a large number of sheep and goat herds during winter months besides cattle herds from arid areas of Sindh and Balochistan, thereby, increasing the chances of FMDV transmission in the said area, where by in Karachi the dairy colonies surrounding the city are commercial based that's why the farmers are more conscious of the production losses due to FMD and disease is important to them.

In NWFP, highest prevalent areas are Kohat district 37.33%, Malakand district 35%, Peshawar district 34.2%, Bannu district 31% and the disease was found to be important to the farmers in Haripur district 20.75%,

Charsadda district 19.9%, Upper Dir district 19.24% and Kohat 16.7%.

In Balochistan, the highest prevalent areas are Chagi district (70%) and Mustung district (50%) and the most important areas are Lasbella district (3.55%) and Gawader district (2.50%). Chagi district is a bordering area with Iran and there is a lot of animal movement from and to Iran so this may be the possible reason of increased incidence of FMD in the said area.

In AJK, the highest prevalent areas are Mirpur district (30.65%) and Muzzafarabad district (9.77%) and importance-wise, Mirpur district (12.77%) and Muzzafarabad district (11.04%) were at top. In Mirpur district is adjacent to Punjab province and most of the farmers introduce animals into their herds particularly buffaloes from different areas of Punjab province. FMD was reported as the most prevalent disease in ICT, having 25.5% and importance 19.2% (Hussain *et al.*, 2005).

The single most important cause of increased incidence of FMD appeared to be the animal movement. Livestock markets especially the market held before the Eid ul Azha festival are playing important role in the spread of FMD in Pakistan due to large scale movement of livestock and sheep/goat for religious consumption i.e. sacrificing animals. In many reported out-breaks, there was a history of introduction of unsold animals from these markets into the flock when they were brought back.

Prior to seventies, the FMD used to be seasonal, particularly during wheat harvesting season in Pakistan (March-April) and also in September-October, related to animal movement. It used to be a mild or sub-clinical disease and affected animals recovered in a few days. Introduction of extensive exotic cattle blood and cross breeding in eighties led to availability of a very high susceptible population leading to change in the course of disease as well as its severity in Pakistan. Now the disease occurs almost round the year and is becoming more severe and damaging. With time, the movement of domestic animals within the country and across the border has increased and as such the disease continues to be present in mild or acute form in one part or the other throughout Pakistan (Zulfiqar, 2003).

Since its introduction in Pakistan PDS proved quite effective in determining the prevalence of different livestock diseases. The PDS program has greatly enhanced the sensitivity of active clinical Rinderpest surveillance and directly contributed to Pakistan's confidence in the decision to declare provisional freedom from Rinderpest to the OIE in January 2003. The valuable data occurred by PDS work have been appreciated by the project management and all livestock departments in the country. This priority of disease prevalence and importance set by PDS work would help better plan and execute measures for the control/eradication of livestock disease in different parts of country (Hussain *et al.*, 2005). It is strongly recommended that this activity should be taken up by the provincial livestock departments and should be carried out routinely utilizing already trained man power in this regard.

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