



Short Communication

Epidemiological Study of Foot and Mouth Disease in Livestock of District Lakki Marwat, Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

Foot-and-mouth disease (FMD) is an infectious viral disease of cloven-footed animals. It is widespread in Pakistan with huge economic losses. The chief objective of the study was to estimate the sero-prevalence of FMD in livestock in district Lakki Marwat, southern part of Khyber Pakhtunkhwa (KP) Pakistan. 376 blood samples were randomly collected from livestock (large and small ruminants) from December 2017 to April 2018 to examine the prevalence of FMD. The current study indicated that overall FMD in Livestock was 14.31% with 16.37% in small ruminants and 12% in large ruminants. A significant difference in sero-positivity was observed in small, young and adult of both small and large ruminants. The sero-positivity was highest in adult animals (20.33% in small ruminants and 13.63% in large ruminants) followed by young animals (15.45% small ruminants and 12.5% large ruminants). FMD viral activity both in small and large ruminants were high in the month of December (20% small ruminants and 16% large ruminants) followed by January, February, March, April and May. The Seroprevalence of FMD was significantly lower in both small and large ruminants having good health status (16.35% in small and 10% in large ruminants) while high in those having weak health status (17.91% in small and 15.7% in large ruminants). The higher sero-prevalence of disease has substantial economic implications which signify the need for devising effective control measures.

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Authors' Contribution

NU and AUR designed the study, collected samples and performed experimental work. AK, SIA, RN, SA, KJ, SNK, AN and UR helped in the manuscript writing. KU statistically analyzed the data.

Key words

FMD, Livestock, Ruminants, Economic loss

Foot-and-mouth disease (FMD), caused by Foot-and-Mouth Disease Virus (FMDV) a highly infectious and economically significant disease of cloven-hoofed animals including cattle, goats, sheep, pigs and also affecting more than 70 wild species worldwide (Wu *et al.*, 2018). The FMD virus belongs to Aphthovirus of family Picornaviridae with serotypes O, A, C, Asia-1, SAT1, SAT2 and SAT3 globally (Mason *et al.*, 1994).

Acute infection is characterized by fever, loss of appetite and formation of vesicles on the feet, udders and in the oral cavity. Mortality is usually low, however high morbidity results in economic losses due to decreased production in endemic regions as well as imposed trade restrictions consequent to outbreaks (Arzt *et al.*, 2011).

FMD generally involves mortality rates below 5%, but

even so it is considered the most important disease of farm animals since it causes huge losses in terms of livestock productivity.

FMDV rarely causes death in adult animals but cause severe lesion in the myocardium of young animals, leading to high mortality rates (Biswal *et al.*, 2012). Prevalence of carriers has been recorded to be >50% in cattle and 50–70% in African buffalo (Maree *et al.*, 2016).

The disease is endemic in the South Asian region. Historically, the disease has been common in the Indo-Pakistan subcontinent (Jamal *et al.*, 2010). FMD is most prevalent in Pakistan and three serotypes (A, O and Asia-1) caused outbreaks in buffaloes and cattle (Zahur *et al.*, 2006). In Pakistan FMD is more common in cattle (37.1%) compared to buffaloes (28.7%) (Abu-Bakr *et al.*, 2012).

Common diagnostic techniques used for FMD diagnosis in Pakistan are ICT and ELISA and in some advanced laboratories reverse transcriptase PCR is used. The ELISA procedure is used in many institutes and

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laboratories for detection of FMD antigen but still the margin of improvement in antigenic sensitivity is present (Zeeshan *et al.*, 2018). The estimate of prevalence is a basic requirement before going to implement any protective and control actions. So the current study was conducted to investigate the prevalence of foot and mouth disease in livestock (sheep and goats) in districts Lakki Marwat, KPK, Pakistan.

Materials and methods

The present study was carried out in the district Lakki Marwat, southern part of Khyber Pakhtunkhwa, Pakistan. District Lakki Marwat is situated at 70° 91 E and 32° 61 N situated at altitude of 200-1000m above the sea level, having cultivated area 116,900 km² of total area 3164 km². District Lakki Marwat shares boundaries with district Bannu in North-West, district Karak in North, in west South Waziristan agency, in South district Dera Ismail Khan and in South-West is district Tank.

A total of 376 blood samples (5ml) were randomly collected in sterilized vacutainer from both large (cow and buffalo) and small ruminants (sheep and goats) visiting different veterinary hospitals of district Lakki Marwat during December 2017 to April 2018 to examine the seroprevalence of FMD in livestock. Written consent was taken from animal owners before collecting the blood samples and a separate sheet was used to collect bio-data of livestock i.e. age, sex, health status etc.

Sera were separated by centrifugation at 5000 rpm for 15 minutes according to standard protocol and screening for FMD was done with the help of commercially available ICT kit for FMD. This is a rapid antibody to antigen interaction test for the qualitative detection of FMD antibodies in blood serum.

SPSS statistical software version 18 was utilized for data entry and analysis. The chi-square test was used to determine the significant association between two variables. P value was calculated, where p value 0.05 was considered significant at the 95% CI (Confidence Interval) level.

Results and discussion

Overall 326 animals both small and large ruminants were included in the study, out of which 200 were small and 126 were large ruminants. An overall 14.31% livestock were infected with FMD. Among these FMD positive ruminants 16.37% were small ruminants where as 12% were large ruminants indicating that FMD seroprevalence was higher in small ruminants as compared to large ruminants. The difference in sero-prevalence of FMD in small and large ruminants in our study could be due to inter species differences towards FMDV susceptibility. Similar findings of FMD sero-prevalence in small and

large ruminant were also reported by Jenbere *et al.* (2011).

In the present study the prevalence of FMD in live stock was determined with different parameters like age, gender, health status, vaccination status etc. When analyzed the prevalence of FMD in live stock based on their gender then we found that both in small and large ruminant female were more positive to FMD as compared to males. Gender wise both male and female animals were having equal chances of getting the disease. However, the diversity in infection status may be due to the longer captivity of female animals as compared to male animals, which are sold probably at an earlier age. Another possible explanation for this difference could be due to the physiological stress experienced by female animals due to pregnancy, lactation and nutrition. Similar explanation was also described by Farooq *et al.* (2017). The risk of getting FMD infection appears to be increased with age. A significant difference in sero-conversion was observed in small, young and adult of both small and large ruminants. The sero-positivity rate was higher in adult animals (20.33%) followed by young animals (15.45%) kids (14.03%) of small ruminants. Same finding was also observed in large ruminants of the study area as shown in Table I. Our study is in accordance with the study reported by Farooq *et al.* (2017).

It was also indicated in the present study that month wise FMD prevalence was higher in December both in small and large ruminants (20% and 16% respectively) followed by January, February, March, April and May. FMD prevalence decreased from cold to warm seasons. This is also in line with the study conducted by Anjum *et al.*, 2006. Health-wise seroprevalence of FMD was lower animals of both small and large ruminants having good health status (16.35% and 10% respectively) while higher in those animals having weak health status (17.91% and 15.7%, respectively). Similar findings were also reported by Anjum *et al.*, 2006. Based on vaccination status, livestock were grouped into two categories i.e. vaccinated and unvaccinated. Our results show that both small and large ruminants which were unvaccinated showed high positivity rate for FMD as compared to vaccinated ruminants as shown in Table II. The differences in prevalence of FMD in vaccinated and unvaccinated animals could be probably due the immunity produced by vaccination in the livestock of the study area.

Conclusion

The current study showed that small animals, kept in close contact with large animals may act as reservoirs of FMD virus and possible sources of infection for vulnerable livestock. The study also indicated that small ruminants were more likely to be positive for FMD compared to large ruminants. Female cattle were more proven to FMD as

Table I. Age wise prevalence of FMD in small and large ruminants.

Age groups (years)	Small ruminants	FMD positive (%)	Large ruminants	FMD positive (%)	P-value
1-3	57	8 (14.03)	46	4 (8.69)	0.1422*
4-8	110	17 (15.45)	88	11(12.50)	
Above 8	59	12 (20.33)	66	9 (13.63)	

*t- test.

Table II. Vaccination status wise prevalence of FMD in small and large ruminants.

Vaccination status	Small ruminants	FMD positive (%)	Large ruminants	FMD positive (%)	P-value
Vaccinated	58	5 (8.62)	54	4 (7.40)	0.3750*
Unvaccinated	168	32 (19.04)	146	20 (13.69)	

*t- test.

compared to male could be due to the physiological stress experienced by female animals due to pregnancy, lactation and nutrition.

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Statement of conflict of interest

The authors declare no conflict of interest.

Funding disclosure

None to declare

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