

Research Article

Seroepidemiology of Goat Pox Disease in District Layyah, Punjab, Pakistan

Faisal Masoud*, Muhammad Shahid Mahmood and Iftikhar Hussain

Institute of microbiology, University of Agriculture Faisalabad, Pakistan

*Corresponding author

Faisal Masoud, Institute of Microbiology, University of Agriculture Faisalabad, Pakistan, Tel: 92-332-7191863;

Email: drmasoud26@gmail.com

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Abstract

Goat pox is an endemic disease all over the world and goat pox virus (GTPV) is the causative agent of disease. This disease has significant issues in livestock industry in terms of morbidity and mortality which ranges from 70-90% and 5-10%, respectively. Along with this, goat pox has impact on the international trade by putting the restriction on import and export of affected animals and their byproducts. Due to importance of disease current study was planned to determine the sero-prevalence and associated risk factors of disease among the small holders of goats in district Layyah, Punjab Pakistan. Thirty herds were included in this study from the different tehsils of district and a total of eighty seven blood samples were collected. Serum was harvested and single radial hemolysis test was performed to assess the sero-prevalence. A questionnaire was designed to determine the associated risk factors of the disease. The results of this study showed that disease was more in female (18.36%) than male animals (15.78%). Similarly breed wise results showed that disease was more in Daira-Din-Panah (DDP) (22.72%) followed by Beetal (20%) Teddy (14.28) and Nachi (10.52%) breeds of goat. As for as age of the animals is concerned the disease was more in young animals (25%) than adults (12%). It was also observed that 33.33% disease was in nomadic herds and 10% in settled herds.

ABBREVIATIONS

DDP: Daira- Din- Panah; SRH: Single Radial Hemolysis

INTRODUCTION

Pakistan is an agricultural country and agriculture sector plays an important role in the economy of state. There are lot of sub-sectors in agriculture sector, including crop section, fisheries, forestry and livestock. Among these, livestock is an important contributor, accounting for about 11.8% share to GDP. Livestock includes the cattle, buffaloes, sheep and goats. Among these goats are important animal and considered as poor man's cow. Goats were the first animals domesticated by the mankind about 9000 years ago. 'Wild goats' and 'Bezoar' is the ancestor of recently domesticated goats [1].

Goats are found in all parts of world, this is due to their adaptability to varying conditions of environment and different feed regime, under which these animals evolve and maintain themselves. The current world population of goats in 2008 was 861.9 million heads. Highest number of these animals is found in Asian continent. Pakistan is 3rd biggest country regarding goat's population after china and India having 66.6 million heads. While Pakistan is at 4th position in goat's milk and mutton producing

countries with annual production of 822 thousand tons of milk and 657 thousand tons of meat, respectively [2].

Dairy goats are important species in reducing the poverty and economic development of the poor in the developing countries. There are several reasons which makes the goats attractive for these purposes including i.e require very small capital to start, easily handled by the women and children, occupy less space, require less nutrients and non-competitive behavior of food with mankind etc. Due to these reasons their number is increasing round the globe and they play important role in economy of country. Same thing was observed in Pakistan where goats uplift the income of small farmers. Goat population has increased from 63.1 to 66.6 million heads during 2011 to 2014, while gross production of milk increased from 779 to 822 thousand tons and goat skin increased from 24,237 to 25,664 numbers during this period [3].

Like other animal species goat's population is also threatened by a number of health hazards, which include infectious, metabolic and reproductive disorders. One of important infectious disease is goat pox [4]. The effect of goat pox appears in terms of mortality, reduced productivity and under quality wool and leather. This disease constitutes a major hindrance to the

intensive rearing of goats and sheep [5]. Goat pox is major threat to introduction of new breeds in endemic areas, because it is reported that mortality goes to very high in young and unaffected animals. It also hampers the international trade by putting the restriction on the export and import of susceptible animals as well as their by-products [6]. Goat pox is a contagious disease and office of the international epizooties listed it in group 'A' diseases

Keeping in view the importance of this disease, the present study was designed to gain an insight about the associated risk factors and seroprevalence of the disease.

MATERIALS AND METHODS

The present study was designed in district Layyah Punjab, Pakistan. The whole district is divided into three tehsils named, Layyah, Choubara and Karor. Sampling unit in this study was a fore mentioned administrative area of district layyah. Blood Samples were collected from the animal by using 5ml sterile syringes. A total of eighty seven samples were collected from thirty herds of goats. These herds have different production systems i.e Settled and Nomadic. Collection of samples and then harvesting of serum was done by adopting the standard protocol described by the OIE terrestrial manual [7].

Along with the collection of samples, observations were recorded on the questionnaire to determine the risk factors associated with spread of disease. The proforma was comprised of questions some related to herd status of animals, some due to production system and some related to individual animal. Then the serum was harvested from the blood samples and brought to microbiology lab, Institute of Microbiology, University of Agriculture Faisalabad. The entire serum sample were heated at 56°C for 30 minutes in a water bath to inactivate the Complement, non-specific antibodies and non- specific agglutinins, so that to avoid the false positive results.

A cell culture based live attenuated vaccine of goat pox (Gorjian strain) was procured from the Veterinary Research Institute (VRI), Lahore, Punjab, Pakistan. The antigen was prepared by adding the 100ml of normal saline to freeze dried virus. Guinea pig serum of good hemolytic titer was used as complement. Finally the processing of samples was done with Single radial hemolysis (SRH) as described by [8].

First of all 1% agarose gel was prepared in physiological saline. It was cooled to the 40°C then 1.2 ml of the GTPV coated sheep RBCs were added then 1.2 ml of complement with good hemolytic titer was added in the medium. Then medium was poured on the glass slides. After this sterilized filter paper discs of 6mm size were taken. These disks were soaked in the inactivated serum. A 6mm Whatman's filter paper no.1 disc absorb the 35 µl of serum. These disks were placed on the glass slides containing the agarose gel at equal distances. These plates were incubated for the overnight at 37°C with humidified condition. Then zone of hemolysis was observed on the next day around the positive sera. Data collected was analyzed by the chi-square test for independence.

RESULTS AND DISCUSSION

Sero-Prevalence

Out of 87 goat samples, 15 samples show positive results

through Single radial hemolysis (SRH) hence the overall seroprevalence recorded was 17.24%. The animals were declared positive on the basis results of this test. The characteristics pox lesions were also observed on the oral commissure, hairless areas like ears, under side of the tail, slight coughing and diarrhea.

Gender Based Sero-prevalence

When the data was analyzed gender wise it was observed that disease was more in female 18.36% than male 15.7% (Table 1). The probability of the chi-square test statistic was (chi-square=88.798) and p=0.001, which is less than the alpha level of significance of 0.05. This tells us that there is statistically significant association between gender and disease condition by SRH and support our research hypothesis.

Breed based sero-prevalence

Different breeds of goats included in the study were Teddy, Beetal, Nachi and DDP. Disease was more in DDP (22.72%) followed by Beetal (20%), Teddy (14.28%) and Nachi (10.52%) (Table 2). The value of the chi-square test was (chi square=98.501) and p=0.001, which is less than the alpha level of significance of 0.05. This shows that there is statistically significant association.

Age based sero-prevalence

The comparison of sero-prevalence of goat pox disease in different age groups of goats show the high sero-prevalence of disease in young animals (3-10 months) than in adult animals (11-24 months and above). In the young animals (3-10 months) the sero-prevalence was 25% and in adult animals (11-24 months and above) it was 12.72 % (Table 3). Similarly the value chi-square test statistic was 89.725 and 'p' value was 0.004, which is less than the alpha level of significance 0.05.

Table 1: Gender based seroprevalence.

Gender	No. of sample tested	SRH positive	Disease %
Male	38	6	15.78
Female	49	9	18.36

Abbreviations: SRH: Single Radial Hemolysis test

Table 2: Breed based seroprevalence.

Breed	No. of sample tested	No. of positive by SRH	Disease %
Teddy	21	3	14.28
Beetal	25	5	20
Nachi	19	2	10.52
DDP	22	5	22.72

Abbreviations: SRH: Single Radial Hemolysis test, DDP (Daira Din Panah), Teddy, Beetal and Nachi are breeds of goat

Table 3: Age based seroprevalence.

Age group in Months	No. of samples	SRH Positive	Disease %
3-10 months (Young)	32	8	25
11-24 months and above (Adult)	57	7	12.72

Table 4: Production system based seroprevalence.

Production system	No. sample tested	No. of positive	Disease %
Settled	60	6	10
Nomadism	27	9	33.33

Production system based sero-prevalence

Sero-prevalence of disease by the with respect to production system by SRH was more in nomadic herds (33.33%) and less in settled herds (10%) (Table 4). The probability of the chi-square test statistic was (chi-square=142.659) and p=0.005, which is less than the alpha level of significance of 0.05. This tells us that there is statistically significant association between production system and disease condition by SRH and support our research hypothesis.

DISCUSSION

The pox infection is a common ailment of sheep, goats and cattle round the world and causes huge economic losses to the small ruminant farming community, leather industry and national GDP. The infection of this disease in Pakistan mostly seen in the goats and sheep while less in the cattle. One of important pox infection is goat pox disease caused by goat pox virus (GTPV) which belongs to capripox genus of Poxviridae family This disease causes high morbidity and mortality in small ruminants due to which it is categorized in list 'A' by the office de international epizooties (OIE) [1].

Pox infection is a highly contagious, host specific and show more infection in particular gender of animals. As this fact was revealed in the study conducted by the selvaraju and Balasubramaniam, [9] in India among the sheep flocks. The observation made during that study shows that morbidity, mortality and case fatality rates were 16.53%, 3.24% and 19.66% in male and 5.94%, 2.30% and 38.78% in female sheep respectively. Similarly in the current study disease percentage in female was 18.36% and 15.78 in male by the SRH. Higher frequencies of disease in female may be attributed to the physiological stress during pregnancy and lactation as stated by Elshafie and Ali, [10].

The pox infection is some time more in one breed of species than the other one. Roy *et al.*, [11] investigated sheep pox outbreaks in Madras red and Mechery breed of sheep in Tamilnadu, India. Morbidity overall ranged from 46.66% to 75% and Mortality ranged from 2.66% to 37.5%. In the Madras Red breed, overall mortality was 20-28.57% while in Mechery breed sheep it goes upto (50%). Similarly when the results of current study were analyzed with respect to breed then results were in agreement with the above mentioned results. It was observed that disease was more in Daira- din Panah (DDP) (22.72%), followed by Beetal (20%), Teddy (14.28%) and Nachi (10.52%) when the samples were analyzed by the SRH test. The more disease in one breed supports the finding of Mondal *et al.*, [12] that the goat pox is more severe in non-indigenous breeds than indigenous one. Beside the breed susceptibility possible reason for more mortality rate may be involvement of a more virulent strain of virus which results in severe attack of disease.

One of the important factors which determine the severity of goat pox infection is the age of susceptible animal Elshafie and Ali, [10] conducted a participatory epidemiology study in Kassala state of Sudan among the sheep flocks. The collected 502 serum samples from the different localities of the state. Out of these 63.55% were positive for the Antibodies against the sheep pox. However a higher prevalence rate of SP was observed in the age group less than one year (65.63%, n= 233). The results of present study also reflected the same image about the disease pattern, that prevalence of disease was more in young animals (25%) followed by adult animals (12.72%) when the samples were analyzed by SRH. Possible reason for the more disease in young animals may be linked with less development of immune system in the animals.

Jindal *et al.*, [13] conducted the study in the outbreaks of sheep pox in Haryana state of India. This data was analyzed by the spatial and temporal distribution. In the results of spatial distribution it was noticed that migratory herds of sheep from Rajhistan to Haryana state is the major factor in spread of disease. These findings were confirmed during this study when results showed that disease was up to 33.33% in nomadic herds and 10% in the settled herds. One of the obvious factors involved in the spread of disease is that the common grazing areas and water sources for carrier animals and healthy one. Other reason for this fact is the throwing of carcass in open area without proper disposal which is the source for the spread of disease.

CONCLUSION

The results of this study showed that disease was more in female (18.36%) than male animals (15.78%). Similarly breed wise results showed that disease was more in Daira-Din-Panah (DDP) (22.72%) followed by Beetal (20%) Teddy (14.28) and Nachi (10.52%) breeds of goat. As for as age of the animals is concerned the disease was more in young animals (25%) than adults (12%). It was also observed that 33.33% disease was in nomadic herds and 10% in settled herds. After conducting the study we reach to a point that the major factor in the spread of the disease was movement of nomadic peoples along with their animals in different areas. It can be controlled by the carpet vaccination at the entry point and damping down vaccination in the endemic areas. Similarly a bivalent vaccine of capripox can give good results.

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