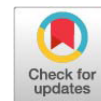


Research Article



Field-Based Prevalence of Peste Des Petits Ruminants in Goats in Kasur District, Punjab, Pakistan

MAAZ KHAN¹, AMJAD HUSSAIN MIRANI¹, ZAIN UL ABIDEEN², HASEEB ZAFAR², ABDUL KABIR^{3*}, MUHAMMAD SALEEM⁴

¹Department of Veterinary Medicine Faculty of Animal Husbandry and Veterinary Sciences Sindh Agriculture University, Tandojam, Pakistan; ²Livestock and Dairy Development Department Balochistan Quetta; ³Department of Veterinary Microbiology Faculty of Animal Husbandry and Veterinary Sciences Sindh Agriculture University, Tandojam, Pakistan; ⁴Saadat International Pvt. Lahore Pakistan.

Abstract | Peste des Petits Ruminants (PPR) is a highly contagious viral disease of small ruminants with major implications for livestock productivity and rural livelihoods. This cross-sectional, field-based study investigated the prevalence of PPR in goats in Kasur district, Punjab, Pakistan. A total of 165 goats of different breeds, ages, and sexes were clinically examined, and prevalence was analyzed across demographic categories. The overall prevalence of PPR was 29.7% (95% CI: 22.6–37.6). Breed-wise analysis revealed significant variation ($\chi^2 = 52.47$, $p < 0.001$), with the highest prevalence recorded in Teddi (86.7%) and Tappri (75.0%) goats, followed by Gulabi (60.0%) and Cross breeds (43.8%), whereas Beetal (10.7%), Pateri (16.7%), and Makhi Cheeni (18.2%) had lower rates. Age-wise distribution was significantly associated with infection ($\chi^2 = 11.48$, $p = 0.003$), with goats aged 7–18 months being most affected (39.8%), followed by <6 months (23.3%), and >18 months (11.9%). Sex-wise prevalence was higher in males (33.3%) than females (25.9%), though the difference was not statistically significant ($\chi^2 = 0.76$, $p = 0.38$). Clinical examination was used for diagnosis, without laboratory confirmation, which should be considered when interpreting the results. These findings highlight the substantial burden of PPR in specific goat breeds and younger age groups, underscoring the need for targeted vaccination and strategic control measures in endemic areas of Kasur.

Keywords | PPR, Small Ruminants, Prevalence, Kasur District, Risk Factors

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***Correspondence** | Abdul Kabir, Department of Veterinary Microbiology Faculty of Animal Husbandry and Veterinary Sciences Sindh Agriculture University, Tandojam, Pakistan; **Email:** kabirvet32@gmail.com

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INTRODUCTION

Peste des Petits Ruminants virus (PPRV) is a highly contagious transboundary pathogen of small ruminants, with goats being more severely affected than sheep (Kabir *et al.*, 2019, 2020). PPRV is an enveloped, single-stranded, negative-sense RNA virus belonging to the genus Morbillivirus in the family Paramyxoviridae (Fentahun *et al.*, 2012). Globally, four distinct genetic lineages (I–IV) have been identified, with lineage IV

predominating in Asia, including Pakistan (Abubakar *et al.*, 2017; Ullah *et al.*, 2022). Although sheep and goats are the primary hosts, spillover infections have occasionally been reported in cattle, buffalo, and camels (Abraham *et al.*, 2005).

Commonly referred to as goat plague, kata, or pseudo-rinderpest, PPR is characterized by high morbidity and mortality, with outbreaks sometimes affecting up to 90% of animals in a herd and causing 30–70% mortality

(Abdollahpour *et al.*, 2006). Clinically, PPR manifests as peracute, acute, or subacute forms, presenting with high fever, ocular and nasal discharges, necrotic stomatitis, pneumonia, diarrhea, and significant mortality among young animals (Kabir *et al.*, 2019; Radostitis *et al.*, 2007; Abubakar and Irfan, 2014; Zakian *et al.*, 2016).

Transmission occurs primarily via direct contact with infected secretions and indirectly through contaminated feed, water, and fomites (Abubakar *et al.*, 2015; Nour, 2020). First described in Côte d'Ivoire in 1942, PPR has now spread across Africa, the Middle East, and Asia and is endemic in more than 70 countries worldwide. In Pakistan, the disease was first reported in 1991 and confirmed in 1994 (Shaila *et al.*, 1996; Zahur *et al.*, 2006; Singh *et al.*, 2009; Mdetetele *et al.*, 2021). Despite its endemic status, limited epidemiological data are available from Kasur district, Punjab, underscoring the need for region-specific investigations.

MATERIALS AND METHODS

STUDY AREA AND DURATION

The study was conducted at the Veterinary Teaching Hospital, University of Veterinary and Animal Sciences (UVAS), Ravi Campus Pattoki, District Kasur, Punjab, Pakistan. Kasur is located about 50 km South of Lahore and shares borders with India to the east and southeast, Okara to the southwest, Sheikhpura to the northwest, and Lahore to the north (Figure 1). The district comprises four tehsils: Kasur, Chunian, Pattoki, and Kot Radha Kishan. The study period extended over six weeks, from 10 August to 25 September 2024.

STUDY POPULATION AND SAMPLING

A total of 165 goats were randomly selected from routine cases presented to the teaching hospital, regardless of breed, sex, age, or health status. Owner-provided information regarding animal history and management practices was recorded using a structured questionnaire and cross-verified with hospital records to ensure consistency.

CLINICAL EXAMINATION

Each goat underwent a systematic clinical examination to

assess signs of Peste des Petits Ruminants (PPR) Table 1.

CLINICAL DIAGNOSIS

Diagnosis of PPR was based on history, owner-reported complaints, and observed clinical signs, including inspection, auscultation, and respiratory assessment. Laboratory confirmation was not performed; therefore, findings are limited to clinically suspected cases.

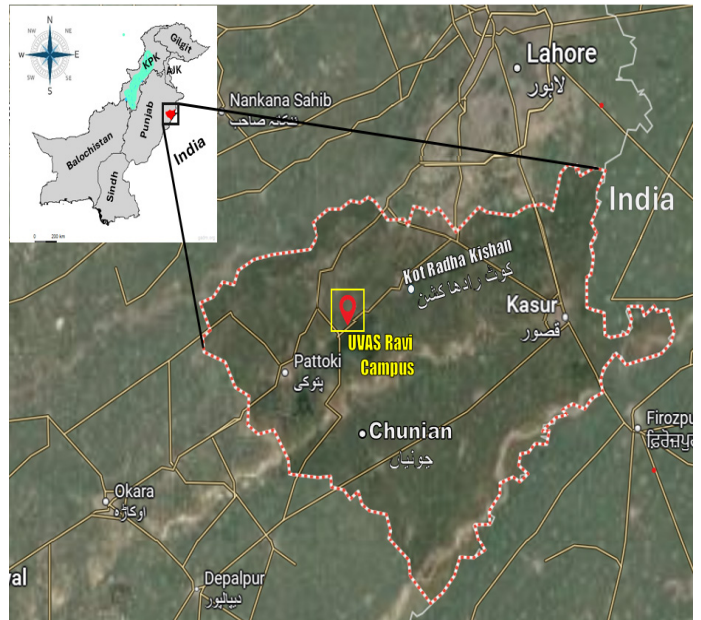


Figure 1: The location and geographic position of district Kasur in Pakistan, four tehsils of Kasur and location of University of Veterinary and Animal sciences Ravi campus in Pattoki.

RESULTS

GENERAL PREVALENCE

In this study total 165 goats was examined, 49 goats were clinically diagnosed positive for PPR infection through the clinical signs like fever (105-107°F), severe diarrhea, oral lesions, respiratory distress, oculo-nasal discharge, dull and dehydration as shown in Figure 2, and other 116 goats were observed negative for PPR infection, so the general prevalence of PPR in District Kasur is 29.70% (49/165) (Figure 3).

Table 1: Clinical parameters were organized in a table for clarity and conciseness.

Parameter	Method	Definition/Notes
Rectal temperature	Mercury thermometer	Fever defined as $\geq 40^{\circ}\text{C}$ (104°F) (Incorporates reviewer comment: temperature units standardized)
Respiratory system	Auscultation of lungs and trachea	Detection of respiratory distress
Dehydration status	Skin tent test	Assessed for degree of dehydration
Other clinical signs	Visual inspection and observation	Oculo-nasal discharge, diarrhea, oral lesions, respiratory distress, anorexia, depression, emaciation



Figure 2: PPR infected goats represented: A, Serous oculonasal discharge; B, cheesy material on oral membrane; C, Oral lesions; D, Severe diarrhea; E, Difficult breathing; F, Dehydration; G, Dull and depression; H, Emaciated.

BREED-WISE PREVALENCE

Out of 165 goats examined, prevalence of Peste des Petits Ruminants (PPR) varied significantly across breeds ($\chi^2 = 52.47$, $p < 0.001$). The highest prevalence was observed in Teddi (86.7%) and Tappri (75.0%) breeds, followed by Cross (43.8%) and Gulabi (60.0%). In contrast, Beetal (10.7%), Pateri (16.7%), and Makhi Cheeni (18.2%) showed relatively lower prevalence rates (Table 2).

Table 2: Breed-wise prevalence of PPR in goats from Kasur district, Punjab.

Breed	Examined	Affected	Prevalence % (95% CI)	χ^2	p-value
Beetal	56	6	10.7 (4.4–21.0)	52.47	<0.001
Makhi Cheeni	55	10	18.2 (9.1–30.9)		
Gulabi	5	3	60.0 (14.7–94.7)		
Tappri	12	9	75.0 (42.8–94.5)		
Teddi	15	13	86.7 (59.5–98.3)		
Pateri	6	1	16.7 (0.4–64.1)		
Cross	16	7	43.8 (19.8–70.1)		
Total	165	49	29.7 (22.6–37.6)		

Table 3: Age-wise prevalence of PPR in goats.

Age group	Examined	Affected	Prevalence % (95% CI)	χ^2	p-value
<6 months	30	7	23.3 (9.9–42.3)	11.48	0.003
7–18 months	93	37	39.8 (29.8–50.5)		
>18 months	42	5	11.9 (4.0–25.6)		
Total	165	49	29.7 (22.6–37.6)		

Table 4: Sex-wise prevalence of PPR in goats.

Sex	Examined	Affected	Prevalence % (95% CI)	χ^2	p-value
Male	84	28	33.3 (23.6–44.2)	0.76	0.38
Female	81	21	25.9 (16.8–36.8)		
Total	165	49	29.7 (22.6–37.6)		

AGE-WISE PREVALENCE

PPR prevalence was significantly associated with age ($\chi^2 = 11.48$, $p = 0.003$). The highest prevalence occurred in goats aged 7–18 months (39.8%), followed by <6 months (23.3%), while adults >18 months showed the lowest prevalence (11.9%) (Table 3).

SEX-WISE PREVALENCE

No statistically significant difference in PPR prevalence was observed between male (33.3%) and female (25.9%) goats ($\chi^2 = 0.76$, $p = 0.38$) (Table 4).

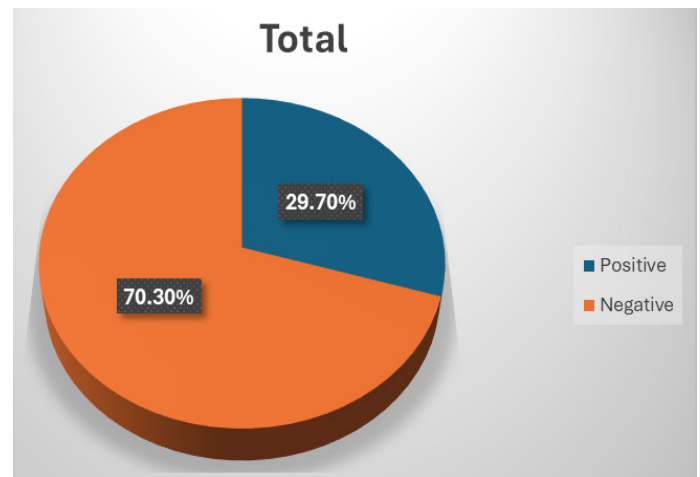


Figure 3: General prevalence of PPR, Red color indicates the Positive cases, while blue color indicates the Negative cases.

The breed-wise prevalence in this study ($\chi^2 = 52.47$, $p < 0.001$) demonstrated significant variation among goat breeds, with Teddi (86.7 %) and Tappri (75.0 %) showing exceptionally high prevalence, while Beetal (10.7 %) and Pateri (16.7 %) showed lower values. Such disparity may reflect breed-specific susceptibility, management, or husbandry practices. Similar differential prevalence among breeds has been reported elsewhere, indicating that local breed adaptation, immune competence, and biosecurity measures may influence infection rates (Abubakar *et al.* 2017). Our overall prevalence (29.7 %) is lower than some national pooled estimates in Pakistan, where a meta-analysis estimated pooled prevalence at ~51 % over 2004–2023 (Zafar *et al.*, 2024) but aligns with observations that PPR prevalence can vary widely by region and sampling method (Abubakar *et al.*, 2015).

Age-wise, the highest prevalence was in goats aged 7–18 months (39.8 %), followed by <6 months (23.3 %) and >18 months (11.9 %). This pattern is consistent with many studies showing that younger and growing animals are more vulnerable due to declining maternal antibodies and increased exposure as they join grazing herds (Kabir *et al.*, 2020). In Pakistan, prior studies also noted that PPR infection is more frequent in animals under two years of age (Jalees *et al.*, 2013).

Regarding sex, although male goats had a slightly higher prevalence (33.3 %) than females (25.9 %), the difference was not statistically significant ($\chi^2 = 0.76$, $p = 0.38$). This lack of sex-based disparity is in agreement with findings from similar epidemiological surveys, which often show no clear gender predisposition for PPR (Wendimu *et al.*, 2024).

The observed breed and age associations highlight potential targets for control. The particularly high prevalence in indigenous breeds like Teddi and Tappri suggests that vaccination and management strategies need to be breed-specific, addressing local husbandry practices and genetic vulnerability. Young goats (7–18 months) appear to be a critical risk group and may benefit most from timely immunization and enhanced monitoring.

Other factors likely also contribute to variability in prevalence: animal movement, agro-climatic conditions, vaccination coverage, and biosecurity practices. The national serosurveillance across Pakistan found that differences in sero-positivity among provinces were attributed partly to animal movement and ecological differences (Abubakar *et al.*, 2017).

Limitations of this study include reliance on clinical diagnosis without laboratory confirmation, which may

under- or overestimate true prevalence. Also, sample sizes for some breeds (e.g. Gulabi, Pateri) were small, leading to wide confidence intervals. Future studies should incorporate serological or molecular confirmation and consider multivariable risk modeling (e.g. logistic regression) to adjust for confounders.

In summary, this study indicates that PPR remains endemic in goats of Kasur district, with clear breed and age differentials in susceptibility. Effective control will require targeted vaccination, improved surveillance, and strengthening of biosecurity practices tailored to high-risk breeds and age groups.

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NOVELTY STATEMENT

This study presents the first field-based clinical assessment of PPR in goats from Kasur district, revealing significant breed- and age-related differences in disease prevalence. Teddi and Tappri goats, along with young animals (7–18 months), were most affected. These findings provide novel insights to guide targeted vaccination and control strategies in endemic areas of Punjab.

AUTHOR'S CONTRUBATION

AK conceived and supervised the study, analyzed data, and finalized the manuscript.

MK conducted fieldwork and data collection.

ZUA and HZ assisted in data analysis.

AHM contributed to study design and supervision.

MS helped revise the manuscript.

All authors read and approved the final version of the manuscript.

GENERATIVE AI AND AI-ASSISTED TECHNOLOGY STATEMENT

The authors declare that no generative AI or AI-assisted technologies were used in the design, execution, or interpretation of this research study. AI tools were not used to create, analyze, or modify any part of the manuscript. All content and intellectual input are solely the work of the authors

CONFLICT OF INTEREST

The authors have declared no conflict of interest.

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