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Assessment of awareness and adoption of vaccination practices among goat farmers and its impact on the occurrence of Peste des Petits Ruminants (PPR) foot hill region of Jammu

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Abstract

Peste des Petits Ruminants (PPR) is a highly contagious viral disease causing significant economic losses in small ruminant production systems. Despite the availability of effective vaccines, the disease persists in many regions, primarily due to gaps in farmer awareness and adoption of preventive practices. The present study aimed to evaluate the level of awareness and adoption of vaccination practices among goat farmers and to determine their impact on the occurrence of PPR in the Jammu region. A cross-sectional survey was conducted among 250 goat farmers from Jammu, Kathua and Samba districts. Data were collected through a pre-structured questionnaire covering management practices, farmer awareness and animal health interventions. Descriptive statistics were computed using MS Excel and SPSS software and univariate analysis of variance was applied to assess the association between management practices and animal health outcomes. The study revealed that semi-intensive farming was the dominant production system with Beetal as the major breed. Most farmers maintained small herd sizes. Awareness regarding PPR, including its transmission and preventive measures, was found to be low. Adoption of vaccination, deworming, quarantine and sanitation practices was inadequate. Limited veterinary access, insufficient extension services and socio-economic constraints were major factors influencing poor adoption. These gaps contributed to the continued occurrence and spread of PPR in the study area. The findings highlight that improving farmer awareness, strengthening veterinary extension services and ensuring better access to vaccination programs are critical for effective control and eradication of PPR. Integrated herd health management strategies are essential to reduce disease burden and enhance small ruminant productivity.

Keywords: Peste des Petits Ruminants (PPR), goat farmers, vaccination adoption, disease awareness, health management

1. Introduction

Small ruminant production plays a crucial role in sustaining rural livelihoods, particularly among smallholder and landless farmers in developing countries like India. Goats, due to their adaptability, short generation interval and low input requirements, serve as an important source of income, nutrition and financial security for marginal farming communities (Devendra, 2013; Kumar *et al.*, 2019)^[9, 19]. In India, goat farming significantly contributes to the livestock sector by providing meat, milk and employment opportunities, especially in arid and semi-arid regions where crop production is uncertain (DAHD, 2022). Among the various constraints affecting goat productivity, infectious diseases remain a major challenge. One of the most devastating diseases is Peste des Petits Ruminants (PPR), a highly contagious transboundary viral disease caused by a morbillivirus belonging to the family *Paramyxoviridae* (Banyard *et al.*, 2010)^[3]. The disease is characterized by fever, erosive stomatitis, diarrhea, pneumonia and high mortality rates, particularly in young and immunologically naïve animals (Diallo, 2003; OIE, 2021)^[10, 30]. PPR has been reported widely across Asia and Africa, causing substantial economic losses due to mortality, reduced productivity and trade restrictions (FAO, 2015)^[13]. Vaccination is widely recognized as the most effective and economical strategy for the prevention and control of PPR. The availability of safe and potent live attenuated vaccines has

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made it possible to significantly reduce disease incidence when adequate coverage is achieved (Singh *et al.*, 2004; Mariner *et al.*, 2016) [26, 21]. In line with global eradication efforts led by Food and Agriculture Organization and World Organisation for Animal Health, India has implemented mass vaccination programs targeting small ruminants to eliminate PPR by 2030 (FAO & OIE, 2015) [12]. However, despite the availability of vaccines, outbreaks continue to occur in many regions, indicating gaps in vaccination coverage and implementation.

A critical factor influencing the success of vaccination programs is the level of awareness and adoption among farmers. Awareness regarding disease transmission, clinical signs and preventive measures directly affects farmers' willingness to vaccinate their animals (Kumar *et al.*, 2020) [16]. Similarly, adoption of vaccination practices is influenced by multiple socio-economic and institutional factors, including access to veterinary services, cost of vaccination, education level and extension support (Rathod *et al.*, 2012) [23]. Low awareness and partial adoption often result in inadequate herd immunity, thereby facilitating the persistence and spread of the virus within flocks. There is a need to establish a clear linkage between farmers' vaccination behavior and the actual occurrence of PPR in the field. While several studies have documented seroprevalence and epidemiology of PPR, limited research has focused on integrating socio-behavioral aspects such as awareness and adoption with disease occurrence (Balamurugan *et al.*, 2014) [1]. Understanding this relationship is essential for designing effective intervention strategies, improving vaccination coverage and strengthening disease control programs.

Therefore, the present study aims to assess the awareness and adoption of vaccination practices among goat farmers and to evaluate their impact on the occurrence of PPR. The findings of this study are expected to provide valuable insights for policymakers, veterinarians and extension agencies to enhance disease control strategies and move towards the successful eradication of PPR.

2. Materials and Methods

2.1 Experimental procedure

The overall experimental procedure of the present study has been presented table.1 Collection of data and information regarding PPR awareness and other managerial practices was done by interview method. Sample and data collection were done in rural areas of the above three districts from nomadic as well as small and marginal farmers.

Table 1: Experimental procedure for studying PPR incidence rate and its association with managerial practices

Study area
Data collection
Through questionnaire

2.2 Designing Questionnaire

A predesigned questionnaire was prepared for the interview of the farmers regarding their awareness, attitude and practices regarding the disease. The entire questionnaire was sectioned into three groups. Group I was based on managerial conditions of the goat rearing. It includes system of rearing (free range/semi-intensive/intensive) herd size, members of the herd, feeding management, browsing areas, migration status of the animal etc. Group II contains information regarding farmer and his awareness regarding peste des petits ruminants and related diseases. In section III the health

managerial practices were taken into consideration which includes quarantine measures, sick animal isolation, deworming of the animal, vaccination status of the animal, other infections (bacterial/parasitic/fungal), veterinary services etc.

2.3 Data collection and interview process

A total was 250 farmers were selected for the interview process with 90 samples from Jammu, 85 samples from Kathua and 75 Samples from Samba district. The questions in the questionnaire were asked to the farmers in their local language (mainly dogri) and the response was recorded in English. The person who mostly takes care of the animals was typically the one chosen for the interview, but wherever it was required, other pertinent family members' opinions were also included. All the standard and scientific terms were explained to the farmers in an easy language. The interview gathered data on the age, sex, education level, primary farming enterprise, and family size of the farmers, as well as information on the goat breed and herd sizes, common and prevalent diseases, management practices (housing, feeding, breeding, healthcare), awareness of PPR and rinderpest, the animal's vaccination status and other topics.

2.4 Statistical analysis

The data collected from interview through questionnaire was entered into MS Excel sheets. SPSS software was utilized for descriptive analysis of managerial variables. Univariate analysis of variance was used to assess impact of managerial practices on the animal's health parameters (Snedecor, & Cochran, 1994) [27].

3. Results

3.1 Distribution of breeds in the study area

In this study the two breeds viz. Beetal and Bakarwali were taken into consideration. The percentage of Beetal breeds among the study population in Jammu, Kathua and Samba were observed to be 62.2%, 55.3% and 65.3% respectively whereas the percentage of Bakarwali breeds in the study area were 37.8%, 44.7% and 34.7% respectively. The distribution of breeds over the three districts are shown in the following graph figure 1.

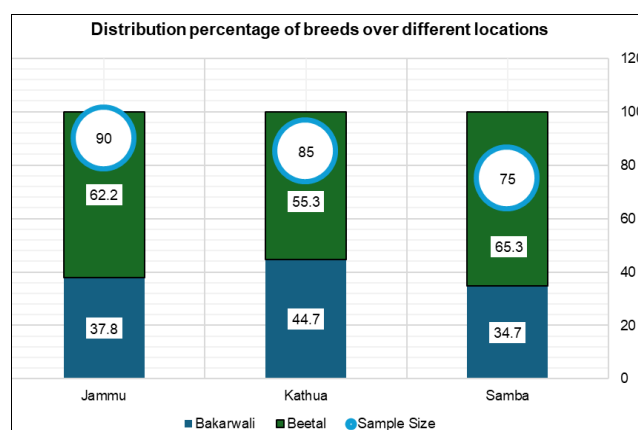


Fig 1: Distribution of breeds (Bakarwali and Beetal) over different locations.

3.2 Frequency distribution of breed and herd size in the survey

The overall population of Bakarwali and Beetal breeds in combined three districts were 39.2% (98/250) and 60.4% (152/250) respectively. The overall sample size was divided

into three groups based on the number of animals present in a herd reared by a single farmer. The three groups included large sized herd having more than 30 animals, medium sized herd having 10 to 30 animals and small size herd with less than 10 animals. The percentage of large, medium and small sized herd owned by the farmers were 7.6% (19/250), 29.2% (73/250) and 63.2% (158/250) respectively. The frequency distribution is depicted in the following graph figure 2.

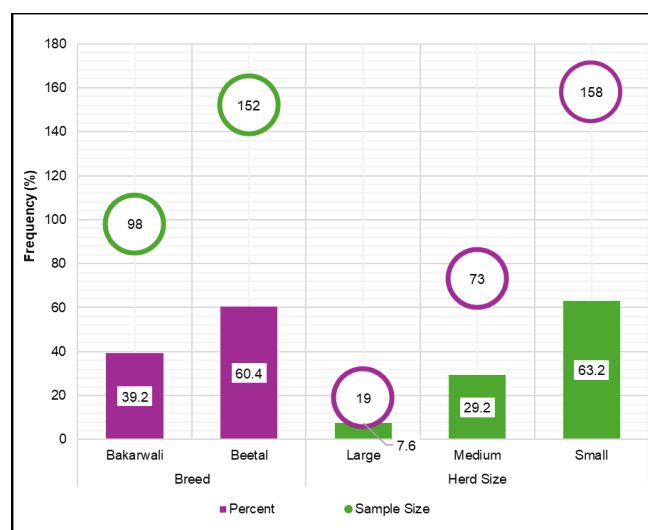


Fig 2: Frequency distribution of breed and herd size in the survey.

3.3. Frequency distribution of goat production system

It was observed that most of the farmers in the study were rearing goats along with other livestock species. Out of 250 goats, 75.6% (189/250) were reared in mixed farming while the rest 24.4% (61/250) were individually reared. This study also revealed that 65.6% (164/250) of the goats were reared under semi-intensive system of production with only 34.4% (86/250) goats being reared under free range system. The migration status of the animal noticed however was only 3.2% (8/250) and most of the goats 98.6% (242/250) were having no history of migration as shown in figure 3.

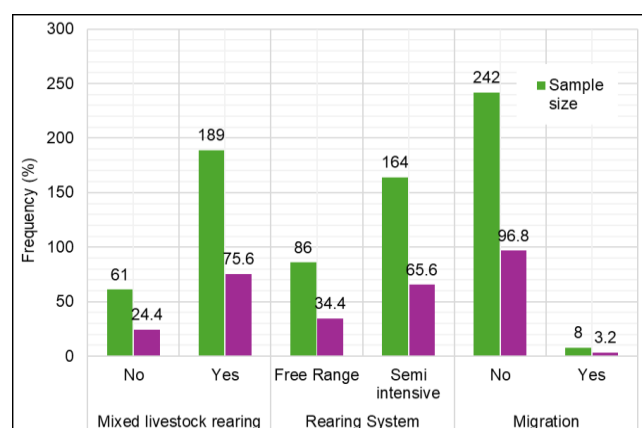


Fig 3: Goat production system in Jammu.

3.4. Rearing system of management of goats in three districts of Jammu region (Jammu, Kathua and Samba)

Goats were managed under three systems of rearing namely free range, semi-intensive and intensive systems. However, only two types of production systems were observed which were followed by the farmers i.e., free range and semi-intensive farming system. It was also observed that majority of the farmers in the study area used semi-intensive form of

rearing system. The percentage of semi-intensive farming in Jammu, Kathua and Samba observed were 61.1%, 63.5% and 73.3% respectively while the percentage of free-range system of management followed by the farmers observed were 38.9%, 36.5% and 26.7% for Jammu, Kathua and Samba respectively. The total samples from each district were 90, 85 and 75 respectively for Jammu, Kathua and Samba districts. The graph showing the management of goats under different rearing systems are shown in figure 4.

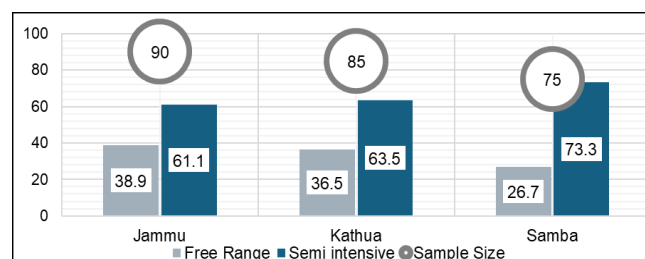


Fig 4: Rearing system of management of goats in three districts of Jammu region.

3.5. Feeding systems used in different herd sizes in Jammu region

There were three types of feeding management systems followed in Jammu region namely grazing, stall feeding and combination of both stall fed and grazing system. The graph here depicts that the grazing combined with stall fed type of feeding system was the most common in all three types of herd (large, medium and small sized). In large sized herd the percentage of grazing, stall fed and combined grazing along with stall fed system were 73.7%, 1.3% and 5.3% respectively in overall 19 sample size. In small sized herd the percentage of grazing, stall fed and combined grazing along with stall fed system were 67.1%, 19.2% and 96.8% respectively and in small herd it was observed to be 1.9%, 21.1% and 13.7% respectively figure 5.

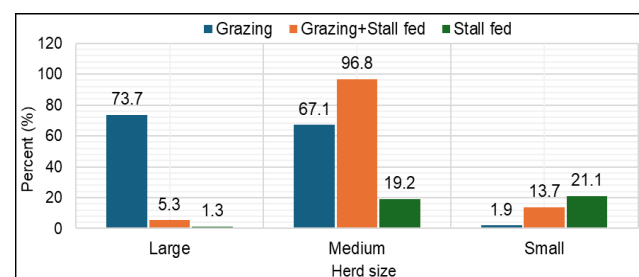


Fig 5: Feeding systems used among different herd sizes in Jammu region.

3.6. Feeding systems used in three districts of Jammu region

In the present study feeding systems which were used in the three districts were observed. It was noticed that in Jammu region, among feeding management, grazing combined with stall feeding was mostly practiced which was observed as 61.1% whereas the rate of practicing of grazing and stall feeding was 18.9% and 20%, respectively. In Kathua district, the pattern of feeding management including grazing, stall feeding and both systems were 34.1%, 2.4%, 63.5%, respectively out of the total of 85 samples. Similarly, the most preferred management system used in Samba district was grazing along with stall feeding 73.3% and 26.7% grazing out of the total 75 samples. The graph depicting the frequency of feeding systems in three districts of Jammu region is shown in

figure 6.

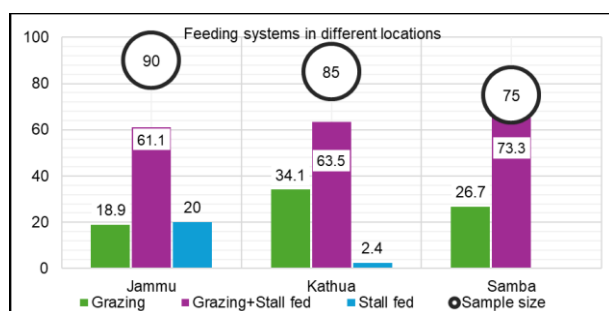


Fig 6: Feeding systems used over different locations in Jammu region.

7. Discussion

The findings of the present study clearly indicate a low level of awareness among goat farmers regarding Peste des petits ruminants (PPR) and its preventive strategies. Limited knowledge about disease transmission, vaccination schedules and biosecurity practices remains a critical barrier to effective disease control. Similar observations have been reported in different regions, where inadequate awareness among smallholder farmers significantly contributed to the persistence of PPR outbreaks (Chukwudi *et al.*, 2020; Balamurugan *et al.*, 2014) [8, 2]. The relatively better recognition of clinical signs resembling rinderpest may be attributed to earlier national eradication campaigns, which created residual awareness in farming communities (FAO, 2015) [13].

Vaccination remains the most effective strategy for controlling PPR however, adoption rates were found to be suboptimal in the present study. This aligns with previous reports indicating that socio-economic constraints, lack of access to veterinary services and insufficient extension support reduce vaccination uptake (Singh *et al.*, 2019; Kumar *et al.*, 2021) [25, 17]. Farmers often perceive vaccination as unnecessary unless disease outbreaks occur, reflecting a reactive rather than preventive approach to animal health management. Furthermore, irregular vaccination coverage can lead to the persistence of susceptible animal populations, thereby facilitating viral circulation within herds (Diallo *et al.*, 2007) [11].

The study also highlighted that parasitic infestations were highly prevalent alongside PPR, indicating poor overall herd health management. Chronic parasitic infections, particularly gastrointestinal parasites and coccidiosis, are known to suppress immune function and increase susceptibility to infectious diseases (Kumar *et al.*, 2014; Taylor *et al.*, 2016) [15, 28]. The low adoption of routine deworming practices observed in medium and large herds suggests a lack of structured herd health programs. This co-existence of parasitic burden and viral diseases underscores the need for integrated disease management strategies rather than focusing on single diseases.

Another important finding was the poor implementation of biosecurity measures, including quarantine, isolation of sick animals and farm sanitation. These practices are essential components of disease prevention but are often neglected due to lack of awareness or perceived inconvenience (OIE, 2019) [29]. Similar gaps in biosecurity adoption have been documented in small ruminant production systems across developing countries, where traditional management practices dominate (Rathore *et al.*, 2010; Chauhan *et al.*, 2018) [24, 7]. The absence of these preventive measures significantly

increases the risk of disease introduction and spread within herds.

The study further revealed that only a small proportion of farmers relied on qualified veterinarians, while the majority depended on paraveterinarians or self-medication. This trend reflects both the limited availability and accessibility of veterinary services, especially in remote areas. Despite India's relatively strong veterinary infrastructure, the ratio of veterinarians to livestock population remains inadequate, leading to gaps in service delivery (Bardhan *et al.*, 2015; DAHD, 2022) [4, 1]. In such situations, farmers often resort to unregulated use of veterinary drugs, which may result in improper dosage, drug resistance and treatment failure (Kumar and Gupta, 2018) [18].

Distance to veterinary facilities and associated costs were also identified as significant determinants influencing farmers' health management decisions. Studies have shown that farmers located farther from veterinary centers are less likely to seek professional advice and more likely to adopt self-treatment practices (Mirajkar *et al.*, 2011; Malsawmdawngliana & Rahman, 2016) [22, 20]. Additionally, the easy availability of veterinary drugs without prescription encourages irrational drug use, further complicating disease control efforts (Chauhan *et al.*, 2016) [6].

From a broader perspective, the findings emphasize that knowledge gaps, limited extension services and inadequate veterinary access collectively hinder the effectiveness of PPR control programs. The global eradication strategy for PPR, led by FAO and OIE, highlights the importance of achieving at least 70% vaccination coverage along with strong surveillance and farmer awareness to successfully eliminate the disease (FAO & OIE, 2015) [12]. Without addressing these socio-technical constraints, vaccination programs alone may not yield the desired outcomes.

Therefore, the study strongly advocates for strengthening veterinary extension services and farmer education programs. Awareness campaigns should focus not only on PPR but also on overall herd health management, including deworming, vaccination and biosecurity practices. Participatory approaches involving farmer groups, local leaders, and community-based animal health workers can enhance the adoption of recommended practices (Catley *et al.*, 2012) [5]. Additionally, mobile veterinary clinics and digital advisory platforms can improve accessibility of services in remote areas.

7. Conclusion

It is concluded that goat farmers have limited awareness regarding the economic importance and severity of Peste des petits ruminants (PPR). Knowledge about disease transmission, early symptoms and preventive measures was inadequate, leading to delayed action and increased disease risk. Adoption of essential health management practices such as vaccination, deworming, quarantine, isolation of sick animals and farm sanitation was also found to be low. This poor adoption is influenced by limited access to veterinary services, lack of extension support and financial and technical constraints. Farmers often depend on informal treatment practices, which may reduce the effectiveness of disease control.

Conflict of Interest

Not available

Financial Support

Not available

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