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### Assessment of diffuse and focal interstitial nephritis incidence in sheep: A study in Udaipur and Adjoining districts, Rajasthan

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#### Abstract

The study spanned from January 2017 to December 2017, during which a total of 1075 sheep samples were examined, without discrimination based on age groups, sex, or breeds. Among these samples, 157 representatives with observable gross lesions in the kidneys were selected for further examination. The investigation revealed the occurrence of diffuse interstitial nephritis in various districts, with Udaipur, Dungarpur, Chittorgarh, and Rajsamand recording rates of 18.87%, 9.52%, 13.89%, and 11.54%, respectively, resulting in an overall occurrence of 14.01%. Similarly, focal interstitial nephritis was identified in Udaipur, Dungarpur, Chittorgarh, and Rajsamand at rates of 16.98%, 11.90%, 5.56%, and 3.85%, respectively, contributing to an overall occurrence of 10.82% in 17 cases.

**Keywords:** Interstitial nephritis, kidney, sheep

#### 1. Introduction

The livestock sector plays a pivotal role in the socio-economic development of rural households, constituting a multifaceted contribution. In India, a significant proportion, exceeding 70 percent, of rural households are engaged in livestock ownership, with the majority being small, marginal, and landless households. India boasts a diverse array of sheep, encompassing 44 distinct breeds distributed across various agro-climatic regions. Many of these breeds have naturally evolved over centuries, demonstrating adaptability to specific agro-ecological conditions—an essential attribute for sustainable sheep rearing. The kidneys, two bean-shaped organs, play a crucial role in extracting waste from the blood, maintaining fluid balance, forming urine, and contributing to other vital bodily functions.

The introduction of pathogenic organisms and toxins into the bloodstream can lead to damage in various organs, with a particular impact on the lungs, liver, and kidneys. Focal interstitial nephritis and pyelonephritis are the prevailing conditions in sheep, primarily caused by streptococcus (Sastry and Rao, 2001) [9]. While research has been conducted on kidney health in dogs, cattle, sheep, and goats, there remains a dearth of information regarding the incidence of renal lesions in sheep in the southern region of Rajasthan. Addressing this gap is crucial for a comprehensive understanding of sheep health in this specific geographical context.

#### 2. Materials and Methods

The study, conducted from January 2017 to December 2017, involved the examination of 1075 sheep kidneys, irrespective of age groups, sex, and breeds. Out of these, 157 representative samples of sheep kidneys exhibiting gross lesions underwent further histopathological examination. Tissue specimens for this investigation were collected from sheep carcasses, regardless of sex, age groups, and breeds, subjected to post-mortem examinations in various veterinary clinics and slaughterhouses in Udaipur, Dungarpur, Chittorgarh, and Rajsamand districts of southern Rajasthan. Additionally, kidney samples were gathered from carcasses submitted to the Department of Veterinary Pathology, College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur, during routine post-mortem examinations. Samples received from field veterinarians in the Department of Veterinary Pathology for histopathological examination were also included in the study. Gross examinations of all samples were conducted, assessing morphological alterations in terms of shape, size, color, consistency, odor, location, and type of lesions in individual parts of the kidney. Tissue color was noted immediately after collection and before fixation, covering all seasons during the study period. Following collection, all samples were properly preserved in 10% formal saline after being cut into individual parts. The parts of kidney tissue, measuring 2-5 mm in thickness and presenting lesions along with normal tissue, were used for fixation and subsequent pathological examinations. For histopathological

examination, tissue processing was conducted through paraffin embedding using the acetone and benzene technique (Lillie, 1965) [2]. Tissue sections of 4-6 microns were cut and stained with Hematoxylin and Eosin using the routine staining method (Luna, 1968) [3].

**3. Result & Discussion**

The present study was carried out from January, 2017 to December, 2017. During this period, a total number of 1075 samples of sheep irrespective age groups, sex and breeds were examined. An overall occurrence of various

pathological conditions was observed as 14.60 Percent. The investigation revealed the occurrence of diffuse interstitial nephritis in various districts, with Udaipur, Dungarpur, Chittorgarh, and Rajsamand recording rates of 18.87%, 9.52%, 13.89%, and 11.54%, respectively, resulting in an overall occurrence of 14.01%. Similarly, focal interstitial nephritis was identified in Udaipur, Dungarpur, Chittorgarh, and Rajsamand at rates of 16.98%, 11.90%, 5.56%, and 3.85%, respectively, contributing to an overall occurrence of 10.82% in 17 cases.

**Table 1:** Occurrence of Interstitial nephritis in kidney of sheep (*Ovis aries*) at Southern region of Rajasthan.

S. No.	Type of Lesions	Name of districts								Total No. of Samples (N=157)	%
		Udaipur (N= 53)		Dungarpur (N= 42)		Chittorgarh (N= 36)		Rajsamand (N= 26)			
		No. of conditions	%	No. of conditions	%	No. of conditions	%	No. of conditions	%		
1	Diffuse Interstitial Nephritis	10	18.87	4	9.52	5	13.89	3	11.54	22	14.01
2	Focal Interstitial Nephritis	9	16.98	5	11.9	2	5.56	1	3.85	17	10.82

**3.1 Diffuse Interstitial Nephritis**

The overall occurrence of this condition was noted in 22 cases, accounting for 14.01% of the examined cases. A lower incidence of 8.96% was reported by Mathur and Dadhich (2005) [5]. Grossly, the kidneys displayed signs of shrinkage and contraction, with adherent capsules exhibiting a granular surface. The cut cortical surface appeared narrowed, and cortico-medullary markings were obscured. Kidneys were characterized by contraction, granularity, smaller size, a pale-grey color, and hardness to cut, with capsules peeling with difficulty, particularly in chronic cases (Fig. 1).

Microscopically, acute cases showed edema and inflammatory infiltration of leucocytes, predominantly lymphocytes and plasma cells, along with a fewer number of neutrophils in the interstitial tissue. Leucocytic infiltration was diffuse and widespread in the cortex and outer medulla (Fig. 2). Some areas exhibited tubules being replaced by heavy infiltration (Fig. 2 & 3). Perivascular and periglomerular lymphocytic infiltration was observed at various locations (Fig. 3). The adjacent renal parenchyma showed fibrosis along with lymphocytic infiltration, with a large number of tubules being replaced by scar tissue, while some tubules were dilated. In certain cases, glomeruli were completely encircled with fibrotic tissue. The recorded gross and microscopic observations were consistent with those described by Sasikala *et al.* (2016) [8], Mathur and Dadhich (2005) [5], Aktar *et al.* (2015) [1], and Mahouz *et al.* (2015) [4].

**3.2 Focal Interstitial Nephritis**

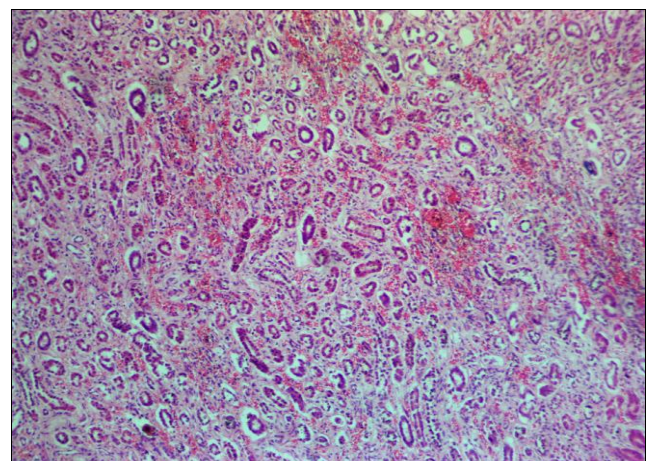
The overall occurrence of this condition was observed to be 10.82%. Comparatively higher occurrences were reported by Sarita *et al.* (2016) [7] at 11.38%, while a lower but similar occurrence of 11.37% was recorded by Mathur (2004) [6].

Grossly, the kidney exhibited greyish-white projecting nodules on the cut surface of the cortex. Microscopically, acute cases showed oedematous interstitial tissues infiltrated by lymphocytes and plasma cells. In chronic cases, there was a proliferation of fibrous tissues in the cortex, replacing the renal parenchyma (Fig. 4). Some cases displayed dilated

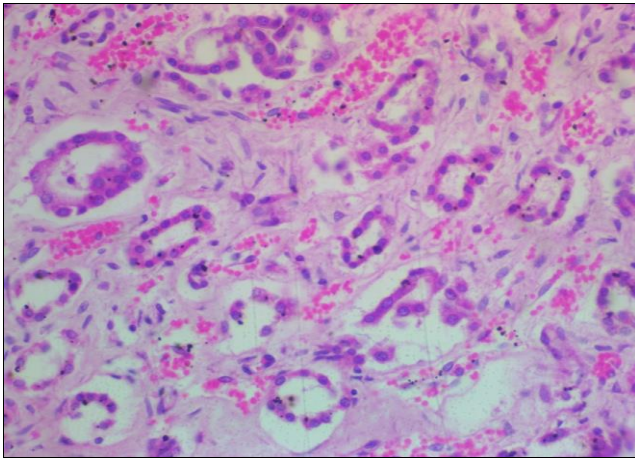
tubules containing proteinous casts or hyaline material. These observations align with the findings of Mathur and Dadhich (2005) [5].



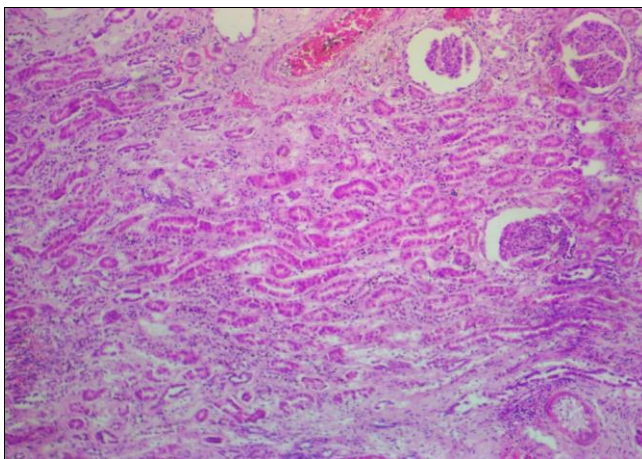
**Fig 1:** Gross photograph of kidney showing Diffuse Interstitial Nephritis, small and contracted Kidney



**Fig 2:** Microphotograph of kidney showing diffuse interstitial nephritis, large portion of the renal parenchyma in both cortex and medulla are replaced by collagenous connective tissue containing random collection of mononuclear. The tubules are dilated, hypertrophic and contained granular material-H&E-10x



**Fig 3:** Microphotograph of kidney showing Diffuse interstitial nephritis, large portion of the renal parenchyma in both cortex and medulla are replaced by collagenous connective tissue containing random collection of mononuclear. The tubules are dilated, hypertrophic H&E--40x



**Fig 4:** Microphotograph of focal interstitial nephritis, interstitial tissues are oedematous and infiltrated by lymphocytes and plasma cells, proliferation of fibrous tissues in the cortex replacing the renal parenchyma. H& E-10x.

#### 4. Conclusion

The present study was undertaken with the objective to find out the occurrence, aetiology, type and pattern of different pathological conditions of sheep kidney and the classify these conditions. An overall occurrences of various pathological conditions was observed as 14.60 Percent. Histopathologically, diffuse Interstitial Nephritis 14.01 percent and Focal Interstitial Nephritis 10.82 percent were recorded.

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