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## Exploring the occurrence of circulatory disturbances in sheep kidneys: A study in the southern region of Rajasthan

**Tripti Gurjar, Gunjan, Goverdhan Singh and Rohitash Dadhich**

### Abstract

The study, conducted from January to December 2017 in the southern districts of Rajasthan, aimed to explore the occurrence and pathology of various types of circulatory disturbances. The primary objective was to investigate the prevalence, types, and patterns of different pathological conditions arising from circulatory disturbances in sheep kidneys, along with the classification of these conditions. Gross-histopathological observations unveiled the following recorded percentages for circulatory disturbances lesions in sheep kidneys across different southern districts of Rajasthan: congestion at 9.55%, hemorrhages at 7.64%, infarction at 1.91%, and thrombosis at 1.91%. This research sheds light on the nuanced aspects of circulatory disturbances affecting the kidneys of sheep in the specified region during the mentioned time frame.

**Keywords:** Circulatory disturbances, kidney, sheep

### 1. Introduction

In the landscape of India's advancing agricultural economy, the indispensable contribution of animal husbandry is paramount for economic prosperity. Both agriculture and animal husbandry play equal roles in contributing to the national GDP. India holds a global leadership position in total milk production, supporting the livelihoods of approximately 30.5 million people. The domestication of sheep (*Ovis aries*) around 12,000 years ago in Southwestern Asia underscores their historical significance. Sheep farming remains crucial across India's diverse climates, from temperate to tropical regions, despite challenges such as limited feed, marginal land, and economic constraints. The kidneys, as integral components of the urinary system, perform multifaceted functions, including waste excretion, water level balancing, blood pressure regulation, red blood cell regulation, and acid regulation. Given the kidneys' susceptibility to pathogenic agents, particularly in the presence of circulating toxins, this study aims to explore various alterations in the kidneys under distinct pathological conditions.

### 2. Materials and Methods

The comprehensive study, conducted from January to December 2017, involved the meticulous examination of 1075 sheep kidneys without discrimination based on age groups, sex, or breeds. Within this sample, 157 kidneys exhibiting observable gross lesions underwent further detailed analysis through histopathological methods.

Tissue specimens for this investigation were sourced from sheep carcasses, disregarding factors such as sex, age groups, and breeds. These specimens were collected during post-mortem examinations conducted at various veterinary clinics and slaughterhouses in Udaipur, Dungarpur, Chittorgarh, and Rajsamand districts of southern Rajasthan. Additionally, kidney samples were procured from carcasses submitted to the Department of Veterinary Pathology at the College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur, as part of routine post-mortem examinations.

The inclusion criteria also extended to samples received from field veterinarians at the Department of Veterinary Pathology for subsequent histopathological examination. 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 documented immediately after collection and before fixation, capturing variations across all seasons during the study period.

Following collection, rigorous preservation procedures were adhered to, with all samples properly stored in 10% formal saline after being sectioned into individual parts. The kidney tissue sections, ranging from 2-5 mm in thickness and encompassing both lesions and normal tissue, were employed for fixation and subsequent pathological examinations.

Histopathological examination included tissue processing through paraffin embedding using the acetone and benzene technique (Lillie, 1965) [10]. Sections of 4-6 microns were skillfully cut and stained with Hematoxylin and Eosin, utilizing the routine staining method (Luna, 1968) [11].

### 3. Results & Discussion

The present study was carried out from January, 2017 to December, 2017. The occurrence and pathology of various types of Circulatory Disturbances were recorded as follows.

**Table 1:** Occurrence of circulatory disturbances in kidney of sheep (*Ovis aries*) at Southern region of Rajasthan

S.No.	Type of Lesion	Name of districts								Total no. of sample	% (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	%		
<b>Circulatory Disturbances</b>											
(a)	Congestion	6	11.32	3	7.14	4	11.12	2	7.7	15	9.55
(b)	Haemorrhage	5	9.43	4	9.52	2	5.56	1	3.85	12	7.64
(c)	Infarction	1	1.89	1	2.4	1	2.78	0		3	1.91
(d)	Thrombosis	1	1.89	0		1	2.78	0		2	1.27

#### 3(a). Congestion

The overall occurrence of this condition was observed in 15 cases (9.55 Percent) and individually occurrence of this condition was observed in Udaipur, Dungarpur, Chittorgarh and Rajsamand 11.32%, 7.14%, 11.12% and 7.7% respectively. A higher occurrence 11.37 Percent was recorded by Sarita (2016) [19] and a lower occurrence 2.62 Percent was recorded by Bhavya Priyanka *et al.* (2017) [4].

Grossly, the affected kidneys were enlarged and dark red in colour (Fig.1.). The cortico-medullary junctional zone was dark red. The radially arranged red lines were observed in the medullary region. Microscopically, the Intertubular blood vessels and capillaries of glomerular tuft and medullary region were extensively distended and engorged with blood (Fig.2). The bowman's capsule and intertubular space showed effusion of serum and some RBC's. The recorded observations are well in accordance with those described by Imam *et al.* (2016) [6], Ashrafihelan *et al.* (2013) [2], Omotainse and Anosa (2009) [13], Mathur *et al.* (2002) [12], Jubb *et al.* (2000) [8].

#### 3(b). Hemorrhages

The overall occurrence of this condition was observed in 12 cases (7.64 Percent) and individually occurrence of this condition was observed in Udaipur, Dungarpur, Chittorgarh and Rajsamand 9.43%, 9.52%, 5.56% and 3.85% respectively. A higher occurrence 6.16 Percent was recorded by Sarita (2016) [19], and a lower occurrence 3.33 Percent was recorded by Pajouhesh & Sazandegi (2017) [16].

Grossly, petechial haemorrhages were found just beneath the capsule and visible through it (Fig. 3). The shape and size of haemorrhages were much more irregular. Capsule was tense and peeled off easily. In some cases, the cut surface was severely congested in both cortex and medulla. In some cases, the site of lesions the capsule was adherent to the cortex and hemorrhages were over the capsule.

Microscopically, massive hemorrhages were seen on renal parenchyma just beneath the capsule. There were more or less red blood cells in Bowman's capsule but more particularly, in foci within the convoluted tubules and between the intertubular capillaries at the cortico-medullary junction (Fig. 4). Mild degenerative changes were seen in tubules. There was intact RBC's present within the intertubular space and

suprascapular region (Fig. 8). The areas showed a large numbers of macrophages among the RBC's. In some cases hemorrhages were present as accumulation of blood cellular elements in the inter tubular spaces. Mild degenerative changes were also seen in the convoluted tubules.

#### 3(c). Infarction

The overall occurrence of this condition was observed in 3 cases (1.91 Percent) and individually occurrence of this condition was observed in Udaipur, Dungarpur, Chittorgarh and Rajsamand 1.89%, 2.4%, 2.78% and 0% respectively. This was similarly 1.42% Percent recorded by Sarita (2016) [19].

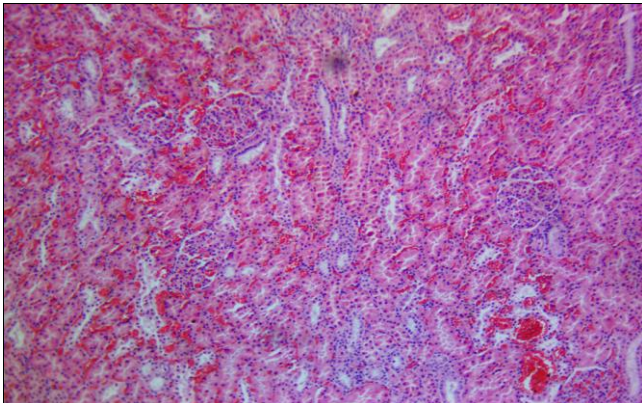
Grossly, pale yellowish lesions projecting slightly above the surface of affected kidneys were observed, which was surrounded by a hyperaemic zone. Cut surface showed yellowish wedge shaped areas with base of the wedge being of the surface and the apex directed towards the hilus. Microscopically, the tubular epithelium showed coagulative necrosis. The epithelial cells appeared homogenous and were devoid of nucleus. the glomeruli were also seen necrosed (Fig.5.). At periphery of the necrotic foci the intertubular and glomerular capillaries revealed congestion and intense infiltration of polymorphonuclear and mononuclear leucocytes. These observations were in agreement with those described by Aktar *et al.* (2015) [1], Ismail *et al.* (2007) [7], Rao *et al.* (2006) [17], Mathur *et al.* (2002) [12], Vegad (1995) [21].

#### 3(d). Thrombosis

The overall occurrence of this condition was observed in 2 cases (1.27 Percent) and individually occurrence of this condition was observed in Udaipur, Dungarpur, Chittorgarh and Rajsamand 1.89%, 0%, 2.78% and 0% respectively. The higher incidence 2% was recorded by Rahwe *et al.* (2014) [17]. Grossly, the affected part was red in colour and blood was stuffed into the vessels. Microscopically, there were layers of red blood cells alternating with fibrin and white blood cells in the renal blood vessels around the glomeruli and tubules (Fig.6.). Around the thrombosis there was coagulative necrosis of tubules. The recorded gross and microscopic observations to those described by Rahwe (2014) [17].



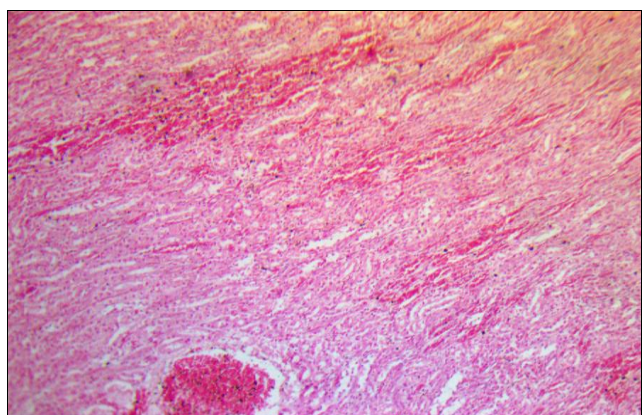
**Fig 1:** Gross photograph of kidney showing congestion, enlarged and dark red in colour



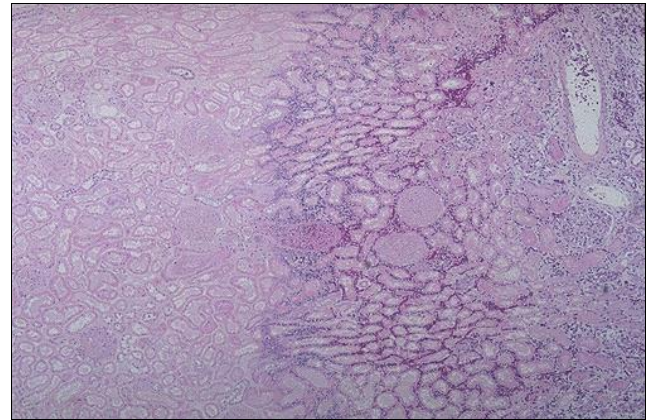
**Fig 2:** Microphotograph of kidney showing congestion, intertubular blood vessels and capillaries of glomerular tuft and cortical region are extensively distended and enlarged with blood. H & E 10X.



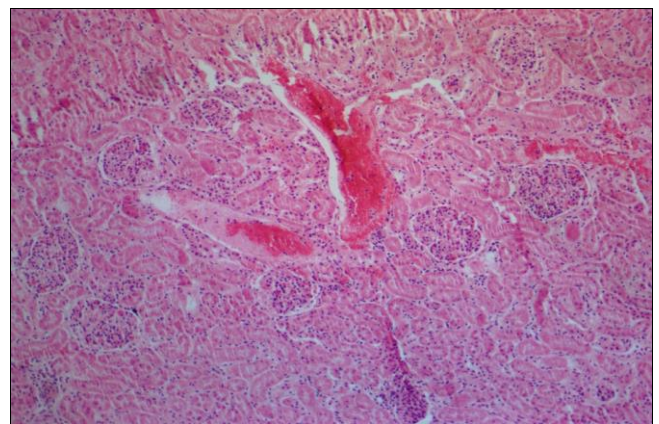
**Fig 3:** Gross photograph of kidney showing supra capsular haemorrhages



**Fig 4:** Microphotograph of kidney showing Hemorrhage, blood cellular elements in the inter tubular spaces with mild degenerative changes were also seen in the convoluted tubules - H&E 10x



**Fig 5:** Microphotograph of kidney showing infarction, tubular epithelium showing coagulative necrosis. At periphery of the necrotic foci the intertubular and glomerular capillaries revealing congestion and intense infiltration of polymorphonuclear and mononuclear leucocytes - H&E 10x



**Fig 6:** Microphotograph of kidney showing thrombosis red blood cells alternating with fibrin and white blood cells in the renal blood vessels around the glomeruli and tubules along with degenerative changes in tubules around - H&E 10x.

## 5. Conclusion

Histopathological observations revealed the following recorded percentages for lesions: congestion at 9.55%, haemorrhages at 7.64%, infarction at 1.91%, and thrombosis at 1.91%. Remarkably, the gross and microscopic findings associated with various kidney affections closely align with the findings reported by other researchers, as discussed in the text. This study meticulously documented and described detailed histopathological changes observed in each condition, providing valuable insights into the circulatory disturbances affecting sheep kidneys.

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