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Degenerative changes in kidney of goats

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Abstract

The current study was carried out between November 2020 and October 2021. During the study period total 638 kidneys of goats with different age groups, breeds as well as either sex were assessed. 158 of these representative samples showed gross lesions, which were assessed histopathologically. As a result, a variety of pathological conditions were found like Cloudy Swelling 5(3.16%), Hydropic degeneration 4(2.53%), Renal Amyloidosis 3(1.89%), Fatty changes 2(1.26%), Hyaline Degeneration 2(1.26%), Coagulative Necrosis 2(1.26%).

Keywords: Degenerative changes, goat, histopathology, kidney

Introduction

The goat is one of the most vital meat-producing animals in India. Chevon (Goat meat) is a rich source of iron, potassium and thiamine and a high-quality source of protein and minimum cholesterol as compared to other meats so it is generally preferred and widely consumed meat in the country. There is an increased demand for meat production throughout the world because it has a high biological value, which also makes it easier for the human body to resist virulent pathogens. Producers and consumers are concerned about maintaining the hygiene of meat as well as meat products (Ahmed *et al.* 2013) [1].

Kidney is a vital organ of the body which performs the various functions like excretion of metabolic products and other harmful materials. The kidneys of goat are of dark red-brown color and they are fixed in sub lumbar region by large amount of peri renal fat which acts as a cushion surrounding the kidneys. Renal diseases are common in food animals and data collected from abattoirs are valuable source for evaluating as well as for monitoring of renal disorders in animals (Lari *et al.*, 2007) [5].

Sheep and goat disease not only causes financial loss, but also poses an epidemiological and zoonotic threat, so both antemortem and postmortem examinations should be documented. Affections of kidneys include- developmental anomalies; growth, circulatory and metabolic disturbances; infarction and necrosis.

When tissues degenerate, they transform from a functionally active structure to a less active structure, or organs and cells become impaired because of a change in size. It is considered a true degeneration when chemical changes occur in the tissue. In addition to trauma and anoxia, immune mechanisms, toxins, viruses, as well as bacteria can cause cloudy swelling in the cell. The main feature of cloudy swelling is cell proteinaceous substances appear cloudy as well as the size of cells increase.

Cloudy swelling is frequently linked with fatty degenerative changes. The degenerated organs are appeared as pale, lustrous as well as softer than the normal organ, slightly increased in size as well as having the appearance of been boiled (Fig.1).

Fatty infiltration is due to when fat is accumulated in the kidneys. If the causative agent is removed, it may be disappeared from the tissues. Fatty degeneration occurs when fat accumulates in the affected damaged cell and it is irreversible process. The affected parts of kidney appears as patchy, spotted, clay-red colour, greasy on touch and pale in colour.

Materials and Methods

Goat (*Capra hircus*) kidney samples were obtained for the intended experiment from slaughterhouses in the Bikaner district and surrounding region. Additionally, tissue samples were taken from goat carcasses that were sent to the College of Veterinary and Animal Science in Bikaner for post-mortem investigation by the Department of Veterinary Pathology. 158 samples were collected in 10% buffered formalin for histological analysis, along with the

observed pattern and shape of the lesions. The portions of the afflicted tissue that were 2 to 5 mm thick and displayed the lesions alongside healthy tissue were used for fixation and additional histological analysis.

The acetone and benzoene procedure was used to mechanically prepare the tissue samples for paraffin embedding. Haematoxylin and eosin staining was used to cut and color the 4-6 micron thick tissue cut for histopathological analysis.

Results and Discussion

638 goats kidney samples in all, representing all ages, sex, and breeds, were analyzed in the current study. Out of these 638 samples, 158 kidney samples thought to have abnormalities underwent additional processing for histological analysis, which indicated numerous overlapping diseases.

1. Cloudy swelling

In 5 (3.16%) cases, this condition was found. Kiran *et al.* (2021)^[4] found a greater incidence, with 29.41% of cases.

Grossly, the kidneys appeared to have been par-boiled, pale (Fig.1). The sliced surfaces protruded. Kidney had a smooth, round border and was larger and lighter in color. Microscopically, the cells' enlargement caused the tubule lumen to narrow and lose its brush boundary. "Ground glass" look might be seen in the cytoplasm. The cells were hypertonic and rounded (Fig. 2). In the interstitial area, hemorrhages were seen. Mild degenerative abnormalities in the kidney, including the proximal and distal convoluted tubules, granular cytoplasm of the epithelial cells, necrosis and swelling of the epithelial cells, vascular congestion, and hazy swelling were all seen. In tubules, there was also albuminous material. These recordings closely matched the findings of Kiran *et al.* (2021)^[4].

2. Hydropic degeneration

This condition was reported in 2.53 per cent cases. Gurjar (2018)^[3] found that 2.54 percent of cases had a comparable incidence.

Grossly, kidney seemed swollen and pale. Eosinophilic material was visible under a microscope filled the tubules and capsular space. There were also glomeruli that had atrophied and deteriorated (Fig. 3). Desquamation of the epithelium and the entry of granular cast were both seen (Fig. 4). Tubule cytoplasm displayed a variety of small to big vacuoles, and the cytoplasm appeared hazy. Dispersing oedema of the renal tubules was visible in the kidney. The predominant alterations in the tubular epithelial cells were vacuolar degeneration, which ranged from mild to severe. The observations made above are in line with Gurjar's (2018)^[3] findings.

3. Renal amyloidosis

1.89 percent of cases were noted to have this condition. Gurjar (2018)^[3] noted a greater incidence in instances that made up 5.1%.

Grossly swollen, the kidney had a smooth to coarsely granular capsular surface and was colored pale to yellow. In certain instances, the capsule of the kidneys was tight and non-adherent. The cortex grew in size. Microscopically, the amyloid was deposited in the interstitial tissue's capillary walls and the connective tissue of the glomerular capillaries. Eosinophilic, homogenous granular material took the place of a section of the usual glomerular architecture. The tubules were dilated and had pink hyaline granular material. Glomeruli loops were enlarged in certain instances (Fig. 5).

The discoveries, both microscopic and gross, were consistent with Gurjar's (2018)^[3] findings.

4. Fatty change

1.26 percent of cases were reported to have this problem. Kiran *et al.* (2021)^[4] observed a similar incidence of 0.94 percent cases in sheep. Milicevic *et al.* (2009)^[9] noted a higher prevalence of 45.5 percent in pigs.

The kidneys were grossly enlarged, pale yellowish, and mushy. Kidney surface swelling was visible on the sliced portion (Fig. 6). Microscopically, hydropic degeneration was also visible in neighboring tubules, coupled with fat vacuoles in the tubular epithelium and a nucleus that was displaced at the periphery (Fig. 7). The observed gross and microscopic data matched Milicevic *et al.* (2009)^[9], Singh (2015)^[10], and Kiran *et al.* (2021)^[4].

5. Hyaline degeneration

1.26 percent of cases were reported to have this problem. Saini (2015)^[10] found a higher prevalence of 2.47 percent in camels.

Kidneys were grossly enlarged, pale, and swollen. The capsule did not adhere. The cortex was noticeably opaque on the surface that was sliced. Saini (2015)^[10] had also reported almost identical results. Microscopically, renal tubular epithelial cells exhibit eosinophilic hyaline droplets in their cytoplasm due to hyaline degeneration (Fig. 8). Hyaline droplets had accumulated in the tubule lumen and the epithelial cells were enlarged. The protein granules were tightly packed within the expanded epithelial cells. In the tubules and desquamated epithelial cells, hyaline casts developed. The glomeruli were completely transformed into hyaline balls. Nearly identical results have also been reported by Mandal *et al.* (2013)^[8], Saini (2015)^[10] and Sharma *et al.* (2020)^[11].

6. Coagulative necrosis

1.26 percent of cases were reported to have this problem. Dadhich (1996)^[2] estimated a higher incidence of cases at 2.51%.

Grossly, the afflicted kidney had mottling in a blackish gray color. The capsule (Fig. 9) has a pulpy texture. The cortex's thickness was reduced. The kidneys were bigger. The zone of hyperaemia separating the necrosed cortex from the medulla was present, and the cortex was uniformly pale yellow in color. Microscopically, tubule necrosis was present in certain cases; homogenous pink-colored tubules without nuclei were seen (Fig. 10). The cortex was necrotic, and the nuclei were missing from the tubules, which were coated with cell debris. Numerous glomeruli have blood engorged within them. Symmers *et al.* (1992)^[12] found these related findings.



Fig 1: Gross photograph showing swollen and enlarged kidney

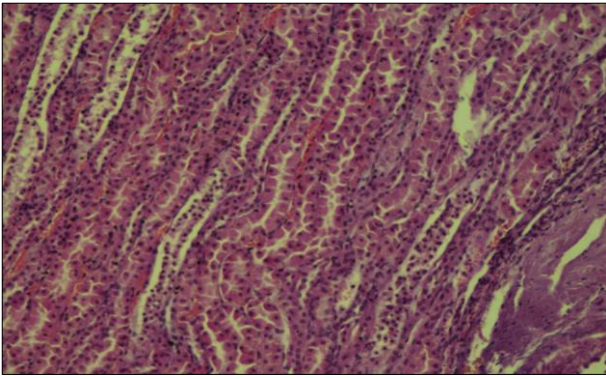


Fig 2: Photomicrograph of kidney showing cloudy swelling, the lumen of tubules narrowed, nucleus at periphery and the cytoplasm is ground glass like clear. H & E-200x



Fig 6: Gross photograph of kidney showing fatty change

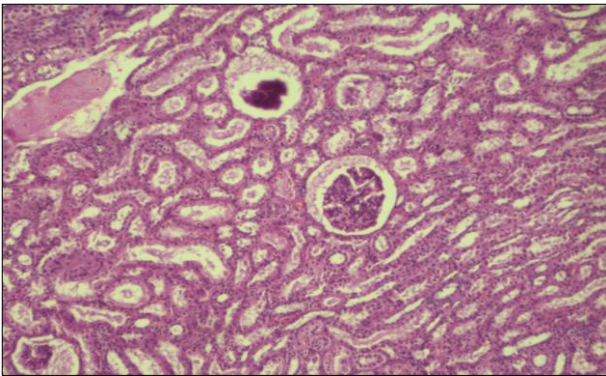


Fig 3: Photomicrograph of kidney showing hydropic degeneration and eosinophilic material filled in capsular space and tubules. Atrophied and degenerated glomeruli are also seen. H & E-100x

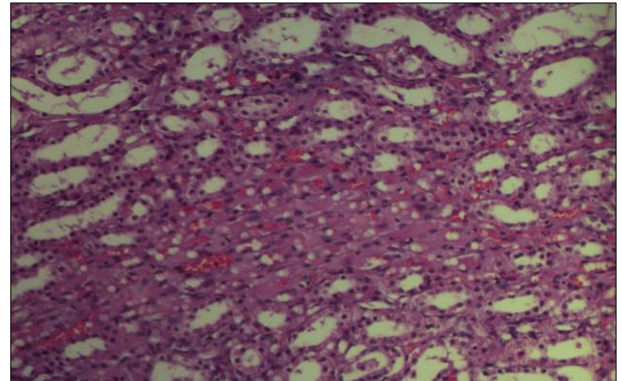


Fig 7: Photomicrograph of kidney showing fatty change, fat vacuoles present in tubular epithelium and nucleus displaced at periphery along with hydropic degeneration also seen in nearby tubules. H & E-200x

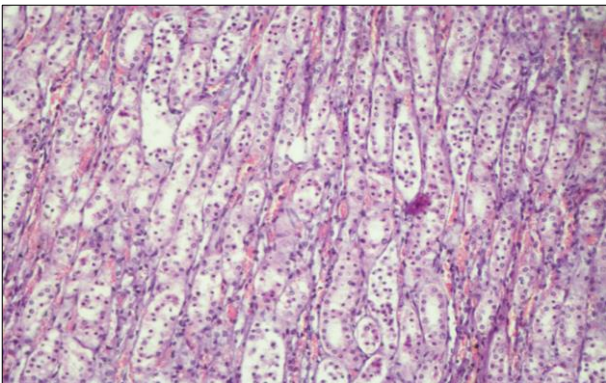


Fig 4: Photomicrograph of kidney showing hydropic degeneration, desquamation of epithelium and granular cast into lumen. H & E-200x

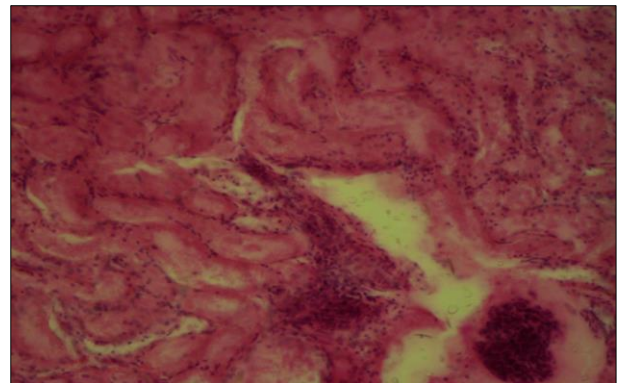


Fig 8: Photomicrograph of kidney showing hyaline degeneration, pink glassy material deposited in the cytoplasm of renal tubular epithelial cells. H & E-200x

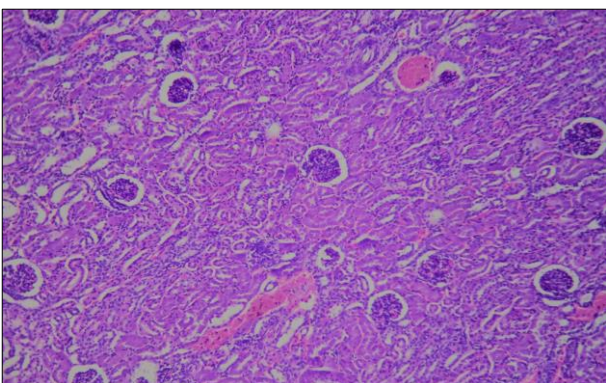


Fig 5: Photomicrograph of kidney showing amyloidosis. H & E-100x



Fig 9: Gross photograph of necrosed kidney showing blackish-grey mottling

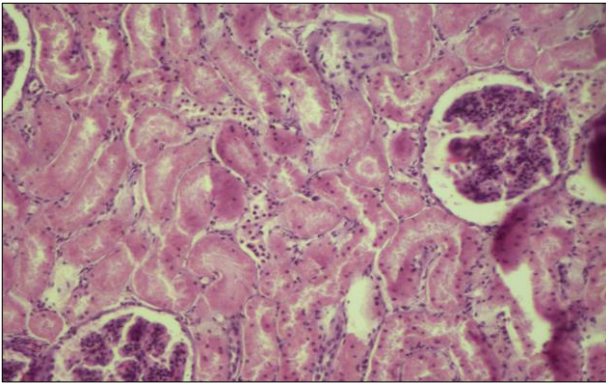


Fig 10: Photomicrograph of kidney showing coagulative necrosis of tubules, homogenous pink coloured tubules with absence of nuclei. H & E -200x

Conclusion

It is a severe condition of small ruminants that is responsible for causing huge economic losses (wool, milk and meat) worldwide. Therefore, it can only be prevented by a balanced diet. Eventually from the overall results of this investigation, it could be concluded that: In the present study, the predominant pathomorphological conditions in kidney were degenerative changes.

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