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## Gross Morphometric Study on Postnatal Development of Adrenal Gland in Gohilwadi Goat (*Capra Hircus*)

Vishnudeo Kumar<sup>\*</sup> and Anil Sharma

Department of Veterinary Anatomy, College of Veterinary Science & A. H.

Junagadh Agricultural University, Junagadh-362001, India

**Corresponding Author:** [drvishnudeo@yahoo.co.in](mailto:drvishnudeo@yahoo.co.in)

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### Abstract

A study was conducted on the adrenal gland of 20 Gohilwadi goats (*Capra hircus*), age ranging from day old to adult. Animals were divided in three age groups, viz., group-I (day old to 1 month), group-II (1 to 6 months) and group-III (above 6 months). The different gross and biometric parameters, viz., weight, length, width and thickness of both left and right adrenal gland were recorded. The left adrenal gland was roughly oval elongated and right was roughly triangular in shape in all the age groups. Different biometric parameters of adrenal gland increased significantly ( $P < 0.05$ ) from group I to group III. There was no significant difference ( $P > 0.05$ ) in various gross and biometric observations between left and right adrenal gland within the same group.

**Key Words:** Adrenal gland, Goat, Morphometry, Postnatal development.

### Introduction

The goat is a multi-purpose animal producing meat, milk, hide, fibre and manure. Goat has been described as a poor man's cow (or mini-cow) because of its immense contribution to the poor man's economy. The adrenal cortex secretes mineralocorticoids, glucocorticoids and sex steroids. The adrenal medulla secretes adrenaline and noradrenaline, which play a key role in the adaptation of the new born to the extra-uterine life. The adrenal gland in any individual is required for the beginning of the cyclic reproductive performance (Ali, 1982). Any change in the functioning of adrenal gland brings about a series of changes in other endocrine glands (Das *et al.*, 1965). No published information is available on gross and morphometric aspects of adrenal gland with advancement of age in Gohilwadi goat. Therefore, keeping this in view, the present study was carried out.

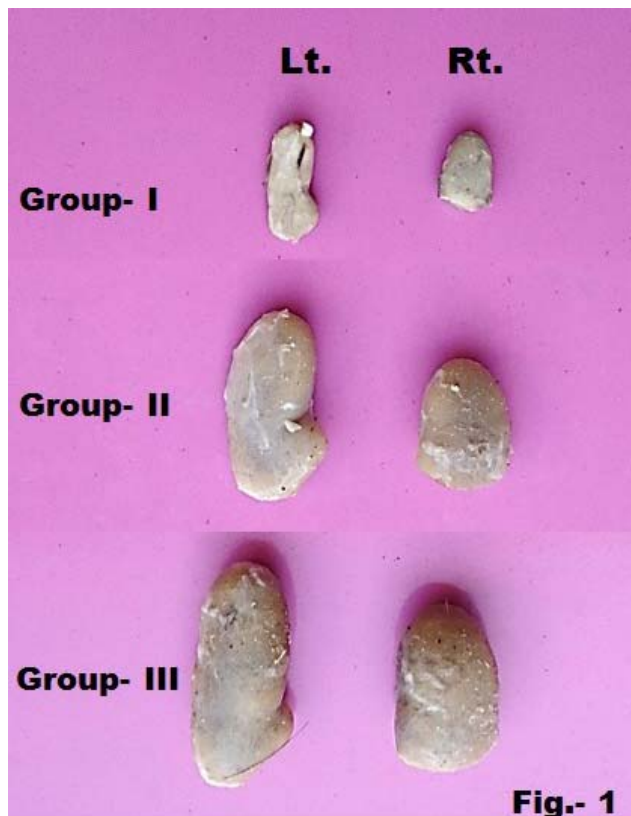
### Materials and Methods

The study was conducted on left and right adrenal glands of 20 Gohilwadi goats of different age groups. The fresh samples were collected from local abattoir. On the basis of age the animals were divided into three groups, viz., group-I (day old to 1 month), group-II (1 month to 6 months) and group-III (more than 6 months). Gross biometrical observations, viz., shape, weight, maximum length, maximum width and the average thickness of each adrenal gland were recorded to study the gross anatomy of the gland during various stages of postnatal development. The weight of each

gland was recorded with the help of analytical balance. Length and breadth were measured with the help of non-elastic thread and thickness was measured with the help of digital Vernier caliper. The average values of all parameters were subjected to statistical analysis (Snedecor and Cochran, 1994).

## Results and Discussion

Gross morphological observations revealed that in all age groups the left adrenal gland was roughly oval to elongated in shape situated at cranio-medial aspect of left kidney. Right adrenal gland was roughly triangular in shape and located on cranio-medial aspect of right kidney in close contact with liver in the renal impression (Photo 1). Similar observations were reported by Nwaogu and Francis (2009) related to location of gland in Kano brown goats; however, they observed that both left and right adrenal glands were oval in shape in both fetuses and adults.



**Photo 1: Gross photograph of adrenal glands in different age groups of Gohilwadi goat.**

The average weight of left adrenal gland was  $0.22 \pm 0.06$  g in group- I,  $0.78 \pm 0.08$  g in group-II and  $1.22 \pm 0.06$  g in group-III, respectively (Table 1). The data showed that in group-II left adrenal gland was three and half times heavier than the group-I, while in group-III the weight of gland was five and half times more than group-I; however, the gland of third group was only one and half times heavier than group-II, this indicates that there was a sharp increase in weight from group-I to Group-II as compared with that of group-II to Group-III.

The average weight of right adrenal gland was  $0.17 \pm 0.04$  g in group- I,  $0.64 \pm 0.06$  g in group-II and  $1.14 \pm 0.04$  g in group- III, respectively. These data revealed that in group-II the right adrenal gland was approximately four times heavier than the weight in group-I, while in group-III the weight of gland was six and half times more than group-I; however the gland of third group was two times heavier than group –I. This also indicated that there was a sharp increase in weight of right adrenal from group-I to Group-II as compared with group-II to Group-III. Overall observations showed that the weight of adrenal gland was significantly ( $P < 0.05$ ) increased from group-I to group-III. The left adrenal gland was heavier than the right adrenal gland in all three groups. Nwaogu and Francis (2009) recorded the average weight of adrenal gland in adult Kano brown goats as  $0.88 \pm 0.20$ g.

The average length of left and right adrenal gland was  $1.20 \pm 0.09$  and  $0.92 \pm 0.07$  cm in group-I,  $1.98 \pm 0.14$  and  $1.53 \pm 0.13$  cm in group-II and  $2.74 \pm 0.13$  and  $1.89 \pm 0.10$  cm in group-III, respectively. The data revealed that the length of left and right adrenal gland increased significantly ( $P < 0.05$ ) from group-I to group-III. The increase in length from group-I to group-II was approximately one and half times and from group-I to group-III was two times, while the increase in length from group-II to group-III was only 1.3 times. Panchal *et al.* (1998) observed the average length of left and right adrenal gland in lamb as 1.82 and 1.57 cm, respectively, and in adult sheep it was 2.17 and 1.83 cm, respectively.

**Table 1: Biometrical data (mean ± SE) of various parameters of right and left adrenal gland in different age groups of Gohilwadi goat**

Parameter	Group – I		Group – II		Group – III	
	Left	Right	Left	Right	Left	Right
Weight (g)	0.22 <sup>a</sup> ± 0.06	0.17 <sup>a</sup> ± 0.04	0.78 <sup>b</sup> ± 0.08	0.64 <sup>b</sup> ± 0.08	1.22 <sup>c</sup> ± 0.06	1.14 <sup>c</sup> ± 0.04
Length(cm)	1.20 <sup>a</sup> ± 0.09	0.92 <sup>a</sup> ± 0.07	1.98 <sup>b</sup> ± 0.14	1.53 <sup>b</sup> ± 0.13	2.74 <sup>c</sup> ± 0.13	1.89 <sup>c</sup> ± 0.10
Width (cm)	0.58 <sup>a</sup> ± 0.07	0.64 <sup>a</sup> ± 0.07	1.00 <sup>b</sup> ± 0.04	1.02 <sup>b</sup> ± 0.06	1.14 <sup>c</sup> ± 0.05	1.17 <sup>c</sup> ± 0.06
Thickness(cm)	0.37 <sup>a</sup> ± 0.03	0.40 <sup>a</sup> ± 0.05	0.57 <sup>b</sup> ± 0.02	0.59 <sup>b</sup> ± 0.03	0.69 <sup>c</sup> ± 0.03	0.74 <sup>c</sup> ± 0.04

Means with different superscripts (a, b, c) in a row differed significantly (P<0.05).

Average width of left and right adrenal gland was 0.58 ± 0.07 and 0.64 ± 0.07 cm in group-I, 1.00 ± 0.04 and 1.02 ± 0.06 cm in group-II and 1.14 ± 0.05 and 1.17 ± 0.6 cm in group-III, respectively. The data reveals that the width of both left and right adrenal gland increased significantly (P<0.05). from group-I to group-III. The data also indicated that the increase in width from group-I to group-III was 1.6 times and from group-II to group-III was 1.14 times, while increase in width of adrenal gland from group-I to group-III was approximately two times. Similarly, Panchal *et al.* (1998) found that the average width of left and right adrenal gland in lambs was 0.88 and 0.98 cm, respectively and in adult sheep it was 1.18 and 1.28 cm, respectively.

Average thickness of left and right adrenal gland was 0.37 ± 0.03 and 0.40 ± 0.05 cm in group-I, 0.57 ± 0.02 and 0.59 ± 0.03 cm in group-II and 0.69 ± 0.03 and 0.74 ± 0.04 cm in group-III, respectively. Similar to weight, length and width the thickness of left and right adrenal also significantly (p<0.05) increased form group-I to group-III. The increase in thickness from group-I to group-III was 1.5 fold and increase in thickness from group-II to group-III was 1.2 fold, while the increase in thickness from group-I to group-III was approximately two fold. Panchal *et al.* (1998) also observed that the average thickness of left and right adrenal gland in lamb was 0.63 and 0.60 cm, respectively, and in adult sheep 0.85 and 0.70 cm, respectively. The statistical analysis did not show any significant difference in thickness of left and right adrenal gland of same group. Kumar and Sethi (2008) also reported similar findings in buffalo calf.

**Conflict of Interest:** All authors declare no conflict of interest.

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