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Dr. Mansi Shukla

Assistant Professor, Department of Veterinary Anatomy, Co. V. Sc & A. H., N.D.V.S.U., Jabalpur, Madhya Pradesh, India

Dr. SK Karmore

Professor, Department of Veterinary Anatomy, Co. V. Sc & A. H., N.D.V.S.U., Jabalpur, Madhya Pradesh, India

Dr. Rajesh Ranjan

Assistant Professor, Department of Veterinary Anatomy, Co. V. Sc & A. H., N.D.V.S.U., Jabalpur, Madhya Pradesh, India

Dr. Shailendra Singh

Assistant Professor, Department of Veterinary Pathology, Co. V. Sc & A. H., N.D.V.S.U., Jabalpur, Madhya Pradesh, India

Comparative age related biometrical observations on bursa of fabricius of Kadaknath and Narmada Nidhi birds

Dr. Mansi Shukla, Dr. SK Karmore, Dr. Rajesh Ranjan and Dr. Shailendra Singh

Abstract

Bursa of fabricius, in Kadaknath and Narmada Nidhi breeds of birds under study, was found to be an unpaired blind pouch like organ, attached to the dorsal wall of the proctodeum of the cloaca by a small stalk. Colour and number of plicae in Bursa of fabricius varied amongst the birds of both the breeds. On an average, the gross biometrical values for weight, volume, diameter and thickness of wall of Bursa of fabricius in Narmada Nidhi birds were found to be higher in each age group under study. Regression of the organ was seen to start early in Narmada Nidhi birds at the age of 16-18 weeks onwards whereas in Kadaknath birds it started at about 24-28 week onwards. The gross biometrical values indicated significant ($p < 0.05$) variation in each age group amongst the two breeds which might be due to breed difference.

Keywords: Bursa of fabricius, Kadaknath, Narmada Nidhi, gross anatomy

1. Introduction

Kadaknath is considered as a native breed but its meat is priced three times more than that of broiler chicken. Locally, it is called Kalamasi-the fowl with black flesh. This chicken is found in the tribal-dominated Jhabua district, Madhya Pradesh. This breed of chicken is believed to have medicinal properties in it with 25-27% protein and low-cholesterol (0.73-1.03%) content. Narmada Nidhi is an improved location specific breed of chicken developed by the College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur, Madhya Pradesh. The breed has been developed by crossing chicken breed Jabalpur Colour (coloured broiler) with Kadaknath (native). The final crossed breed has 75% inheritance of Jabalpur colour breed and 25% inheritance of Kadaknath breed. The lymphoid tissue plays an important role in the defence mechanisms against all pathogens. The lymphoid system of poultry consists of spleen, thymus and the Bursa of fabricius and is divided into two morphologically and functionally distinct components (Cooper *et al.*, 1966) [1].

2. Materials and Methods

The present study was conducted in the Department of Veterinary Anatomy, College of Veterinary Science and Animal Husbandry, Rewa (M.P.). Total 72 unvaccinated chicks (0 day old), 36 each of Kadaknath and Narmada Nidhi breeds were reared separately at College Poultry Farm, Rewa, from day old to above 32 weeks of age. These birds were divided into six groups, *viz.* 0-2 weeks, 2-4 weeks, 4-8 weeks, 8-16 weeks, 16-32 weeks and above 32 weeks and each group contained six birds of both the breeds. After getting permission from the ethical committee of the parent institute, birds were sacrificed ethically at respective age intervals and whole samples of Bursa of fabricius were taken after noting the position of the aforementioned organs *in situ*. Bursa of fabricius of both the breeds under study was then analysed for gross biometrical measurements. In each age group, weight of the organ was measured with the help of digital weighing balance. Volume of Bursa was noted by using water displacement technique at each age interval. Diameter and thickness of the wall of Bursa of fabricius was measured by using Vernier callipers.

3. Results and Discussion

Bursa of fabricius, in both the breeds of birds under study, was found to be an unpaired blind pouch like organ, attached to the dorsal wall of the proctodeum of the cloaca by a small stalk, which was in accordance to the findings of Kanasiya *et al.* (2017) and Yadav *et al.* (2020) [2, 3] reported that in Kadaknath birds, the Bursa of fabricius was single lympho-epithelial organ located at dorsal diverticulum of the proctodeal wall of cloaca.

Corresponding Author:

Dr. Mansi Shukla

Assistant Professor, Department of Veterinary Anatomy, Co. V. Sc & A. H., N.D.V.S.U., Jabalpur, Madhya Pradesh, India

It was observed to have a slit like diverticulum in the wall (Plate No.1a). The shape was oval in both the breeds of birds which were similar to the findings of Karadeg *et al.* (2015) [4] who quoted as the Bursa of fabricius of the long-legged buzzard to be oval in shape. The organ was greyish black in colour in Kadaknath (Plate No.1b) whereas it was creamish white colour in Narmada Nidhi birds (Plate No.1a). The variation in colour of the organ amongst the two breeds may be attributed to more melanin deposition in the organs of Kadaknath birds. The mucous membrane was found to be thrown into folds which had villi like projections known as plicae (Plate No.1a &b). These plicae were found to be 17-18 in Kadaknath birds (Plate No.1a) and 15-16 in Narmada Nidhi birds (Plate No.1b) whereas the number of plicae in Bursa of fabricius in quail were 14 as reported by Hassan *et al.* (2011) [5] and about 12-14 in helmeted guinea fowl (Onyeausi *et al.*, 1993) [6] and about 11-13 in the chicken (Betti7 *et al.*, 1991) [7]. Difference in the number of plicae amongst the two breeds might be due to breed variation. Mucosal folds were arranged parallelly along the longitudinal axis and occluded the lumen in the present study. This was similar to the observations of Gulmez and Aslan (1999) [8] in geese and Karadeg and Kurtdede (2007) [9] in turkeys reported that the plicae were of different lengths and thicknesses and prolongate towards lumen.

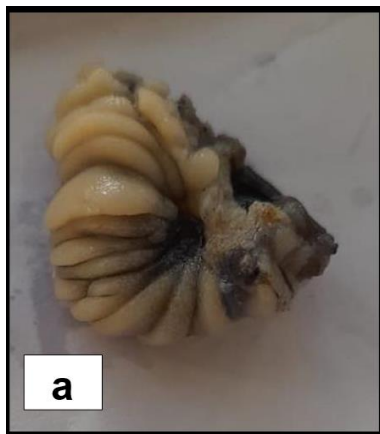


Plate No 1(a): Photomicrograph of Bursa of fabricius of 8-16 weeks old Kadaknath bird

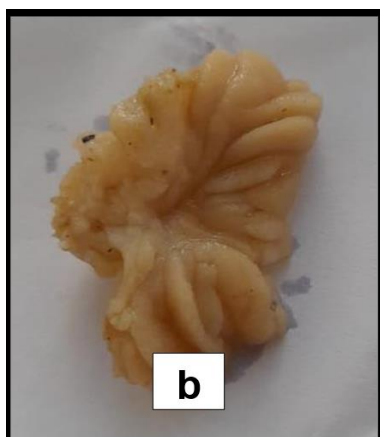


Plate No 1(b): Photomicrograph of Bursa of fabricius of 8-16 weeks old Narmada Nidhi bird

The average weight of Bursa of fabricius in Kadaknath birds of 0-2 weeks of age was found to be 0.05 gm whereas in Narmada Nidhi, it was 0.06 gm. The average weight of the organ increased to 1.78 gm and 1.8 gm in Kadaknath and

Narmada Nidhi birds, respectively, at 4-8 weeks age. Gradually, with the advancement of age the connective tissue and adipose tissue deposition increased. The weight was measured to be 0.27 gm and 0.38 gm in Kadaknath and Narmada Nidhi breeds of poultry respectively, at 16-32 weeks age. The average weight of Bursa of fabricius in each age group between the two breeds of poultry under study was found to differ significantly ($p < 0.05$). (Table No.1).

Table 1: Age wise mean weight (in gm) of Bursa of Fabricius of Kadaknath and Narmada Nidhi breeds of poultry

Group	Kadaknath	Narmada Nidhi
0-2 weeks	0.0533a±0.0033	0.0550a±0.0022
2-4 weeks	0.3650c±0.0056	0.4667c±0.0042
4-8 weeks	1.7817d±0.0054	1.7983d±0.0040
8-16 weeks	2.4200e±0.0037	3.1700e±0.0044
16-32 weeks	0.2683b±0.0091	0.3783±0.0040
> 32 weeks	-	-
Total	0.978A±0.002	1.179B±0.002

The average volume of Bursa of fabricius in Kadaknath birds of 0-2 weeks of age was found to be 0.17+0.02 cc whereas in Narmada Nidhi, it was 0.27+0.02 cc. The average volume of the organ increased to 2.95+0.04cc and 2.97+0.06cc in Kadaknath and Narmada Nidhi birds, respectively, at 4-8 weeks age. The volume was found to be 0.73+0.02 cc and 0.87+0.02cc in Kadaknath and Narmada Nidhi breeds of poultry respectively, at 16-32 weeks age. The difference in each age group in average volume between the two breeds of poultry under study was found to be significant ($p < 0.05$). (Table No.2)

Table 2: Age wise mean volume (in cc) of Bursa of Fabricius of Kadaknath and Narmada Nidhi breeds of poultry

Group	Kadaknath	Narmada Nidhi
0-2 weeks	0.1667a±0.0211	0.2667a±0.0211
2-4 weeks	1.7667c±0.0333	1.8000c±0.0365
4-8 weeks	2.9500d±0.0428	2.9667d±0.0558
8-16 weeks	3.000d±0.0365	3.2167e±0.0477
16- 32 weeks	0.7333b±0.0211	0.8667b±0.0211
> 32 weeks	-	-
Total	1.723A±0.016	1.823B±0.016

The average diameter of Bursa of fabricius in Kadaknath birds of 0-2 weeks of age was found to be 1.21+0.01 cm whereas in Narmada Nidhi, it was 1.34+0.01 cm. The average diameter of the organ increased to 1.57+0.01 cm and 1.6 cm in Kadaknath and Narmada Nidhi birds, respectively, of 4-8 weeks age. The diameter was measured to be 2.12+0.01 cm and 2.31+0.01 cm in Kadaknath and Narmada Nidhi breeds of poultry respectively, of 16-32 weeks age. The values for average diameter of Bursa of fabricius in each age group between the two breeds of poultry under study differ significantly ($p < 0.05$). (Table No.3)

Table 3: Age wise mean Diameter (in cm) of Bursa of Fabricius of Kadaknath and Narmada Nidhi breeds of poultry

Group	Kadaknath	Narmada Nidhi
0-2 weeks	1.2067a±0.0076	1.3400a±0.0063
2-4 weeks	1.4283b±0.0091	1.4717b±0.0070
4-8 weeks	1.5717c±0.0065	1.6033c±0.0042
8-16 weeks	2.5267e±0.0062	2.6567e±0.0138
16-32 weeks	2.1150d±0.0067	2.3050d±0.0062
> 32 weeks	-	-
Total	1.770A±0.003	1.875B±0.003

Table 4: Age wise mean thickness of wall (in cm) of Bursa of Fabricius of Kadaknath and Narmada Nidhi breeds of poultry

Group	Kadaknath	Narmada Nidhi
0-2 weeks	0.1950a±0.0050	0.2267a±0.0056
2-4 weeks	0.3300b±0.0068	0.2850b±0.0043
4-8 weeks	0.5233c±0.0042	0.3050b±0.0043
8-16 weeks	0.5600d±0.0037	0.5883d±0.0031
16-32 weeks	0.5883e±0.0048	0.56567c±0.0067
> 32 weeks	-	-
Total	0.439A±0.002	0.392B±0.002

The average thickness of the wall of Bursa of fabricius in Kadaknath birds of 0-2 weeks of age was found to be 0.2+0.01 cm whereas in Narmada Nidhi, it was 0.23+0.01 cm. The average thickness of the wall of the organ increased to 0.52 cm and 0.31cm in Kadaknath and Narmada Nidhi birds, respectively, of 4-8 weeks age. Gradually, with the advancement of age the plicae regressed and the wall thickened. The thickness was measured to be 0.59 cm and 0.57+0.01 cm in Kadaknath and Narmada Nidhi breeds of poultry respectively, of 16-32 weeks age. The difference in average thickness of the wall of Bursa of fabricius in each age group between the two breeds of poultry under study was found to be significant ($p<0.05$). (Table No.4).

4. Conclusions

The biometrical values indicated variation amongst the two breeds which might be due to breed difference. Bursa of fabricius of Kadaknath was observed to be greyish black in colour whereas it was found to be creamish white in colour in Narmada Nidhi birds. Number of plicae was about 17-18 in Kadaknath birds in contrast to their number being 15-16 in Narmada Nidhi birds at the age of 16 weeks. On an average, the gross biometrical values for weight, volume, diameter and thickness of wall of Bursa of fabricius in Narmada Nidhi birds were found to be higher in each age group under study. Regression of the organ was seen to start early in Narmada Nidhi birds at the age of 16-18 weeks onwards whereas in Kadaknath birds it started at about 24-28 week onwards.

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