

Morphometric and Micrometrical Studies of the esophageal tonsil in *Siruvidai* Chicken of Tamil Nadu

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ABSTRACT

The study aimed to investigate the morphometric and micrometric age-related changes in the esophageal tonsil of *Siruvidai*, a native chicken breed from Tamil Nadu. The tissue samples from six birds of each age group were collected from 4th week, 8th week, 12th week, 18th week, 24th week and 52nd weeks, respectively. Both male and female *Siruvidai* chicken were included in the study. The topography of the esophageal tonsil across all age groups was found to be similar. The esophageal tonsil had become more clearly visible from 8th week onwards and became distinct and more defined with the advancement of age. Statistical analysis of morphometrical data showed that esophageal tonsil reached to its maximum size by 18th weeks of age and remained constant in 24th and 52nd week of age. The micrometric measurements revealed that the lymphoid nodule of the esophageal tonsil also reached to its maximum diameter by 18th weeks, of age and gradually decreased during 24th and 52nd week of age.

Key words: Gross Anatomy, Esophageal tonsil, Morphometry, Micrometry, *Siruvidai* chicken.

The esophageal tonsil is recognized as a component of the peripheral immune system in birds. Its functional basis is formed by lymphoid tissue and under the influence of antigens, lymphocytes differentiate into effector cells, causing specific immunity (Korver, 2006). It is well known that most antigens penetrate an animal's body through the digestive system. The esophageal tonsil is consistently concentrated in regions where antigens may potentially penetrate an animal's body (Nochi, *et al.*, 2018).

The esophageal tonsil is situated in the mucous membrane and submucosal portion of the caudal part of the esophagus before its termination into the glandular portion of the proventriculus (Al-Juboury *et al.*, 2016).

In *Siruvidai* chicken, there is no information on the morphometrical and micrometrical studies of the esophageal tonsil, especially age-related changes. The goal of the current study is to reveal the morphological changes of esophageal tonsil in different age groups of *Siruvidai* chicken.

The experimental birds for this study were collected from *Siruvidai* flock raised in a healthy environment at the Poultry Research Station (PRS), Madhavaram milk colony, TANUVAS, Chennai-51 as per the standard managerial practices after

obtaining Ethical Committee approval No. 11/SA/IAEC/2023. The abdominal cavity of the birds was cut opened through a ventral coelomic incision and the gross anatomical features of the entire digestive tube was examined on fresh and unfixed specimens immediately after exsanguination.

Six birds each belonging to different age groups; 4th week, 8th week, 12th week, 18th week, 24th and 52nd week were utilized for the study. The thoracic part of the esophagus and the cranial part of the proventriculus were collected and dissected to visualize the gross morphology of the esophageal tonsil. Tissue specimens were washed in normal saline and gross morphometric measurements such as length and width (mm) of the esophageal tonsil were recorded using Vernier calliper.

After the macro anatomical studies, samples were thoroughly rinsed in normal saline, and then fixed using 10 per cent neutral buffered formalin (NBF) solution for further processing. The fixed tissue samples were processed by paraffin embedding and thin sections of 4 to 5 µm were subjected to the standard haematoxylin and eosin staining protocol to facilitate histological examination. To record the micrometry, the length and width of the lymphoid nodules in the esophageal tonsil was measured using Leica application suite (LAS V4.4) in Leica microscope (CH9345 Heerbrugg).

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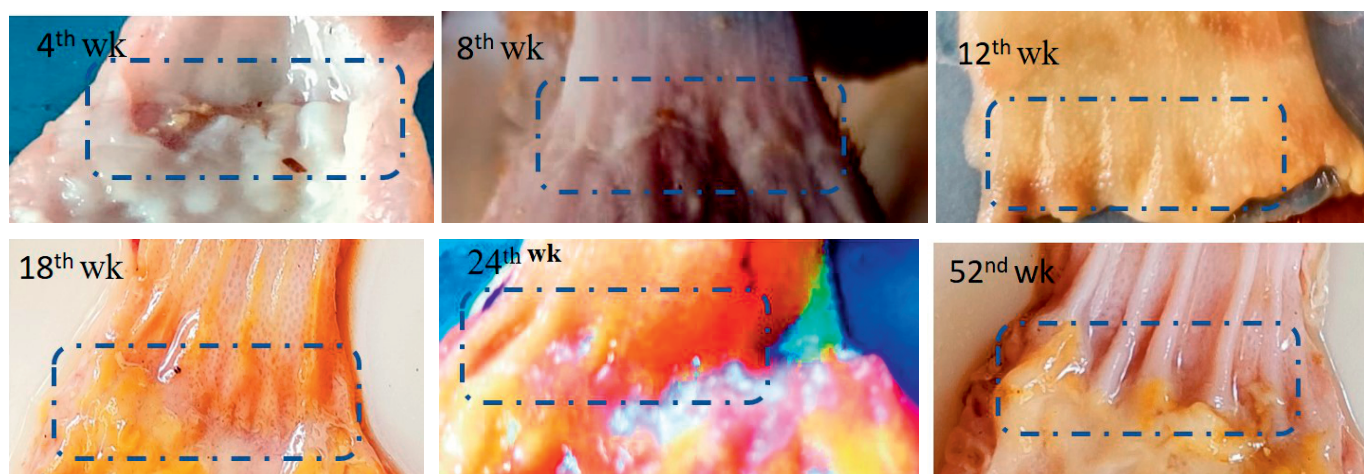


Fig 1. Gross photograph of the esophageal tonsil in different age groups of *Siruvidai* chicken

One-way ANOVA test was performed to analyze the morphometric and micrometric data of esophageal tonsil collected in this study. Post hoc Duncan's multiple range test was performed to indicate significant means across the age groups. The morphometrical and micrometric parameters under study were represented as mean $\pm$ standard error.

Under this study, in all age groups of *Siruvidai* chicken, esophageal tonsil was situated at the transition zone between the thoracic or caudal part of esophagus and the proventriculus as reported earlier (King and McLelland, 1975 and Olah *et al.*, 2003; Nagy *et al.*, 2005; Casteleyn *et al.*, 2010) and in ducks (McLelland, 1990; Donmez *et al.*, 2012).

The esophageal tonsil appeared as a whitish pink strip upto 8 weeks of age. As the mucosal folding of this area deepened, the colour of the esophageal tonsil changed to pale yellow with dark spots from 8th week onwards. However, Dyshliuk (2018) reported that esophageal tonsil appeared as a thin whitish pink strip at 120 days in chicken.

In 52nd week of age, the esophageal mucosa thickened and tonsillar surface became tuberous in *Siruvidai* chicken (Fig 1). However, the esophageal tonsil thickening was more pronounced in adult duck (Grau-Karlsbad, 1943) and pigeons (Hamoda and Farag, 2018) when compared to that of chicken (Grau-Karlsbad, 1943).

The length of the esophageal tonsil in *Siruvidai* chicken was 20.3 ± 0.27 mm at 4th week and it reached to a maximum of 27.38 ± 0.07 mm by 18th week of age with mean length remaining almost unchanged at 24th week (27.53 ± 0.08 mm) and 52nd

week (27.67 ± 0.06 mm). The width of the oesophageal tonsil reached the maximum at 18th week of age from 3.52 ± 0.04 mm to 6.23 ± 0.05 mm and then gradually declined in later stages to 5.48 ± 0.06 mm by 52nd week of age. Dyshliuk (2018) also observed the length and width of the esophageal tonsil in 120-day-old birds measuring about 27.83 ± 0.87 mm and 6.63 ± 0.51 mm, respectively.

In this study, the mean diameter of the lymphatic nodules in the oesophageal tonsil of *Siruvidai* chicken was 88.35 ± 1.17 μ m in 4th week and it reached a maximum diameter of 187.07 ± 2.06 μ m on 18th week and then decline to 117.31 ± 1.84 μ m by 24th week and 78.94 ± 4.34 μ m by 52nd week. Statistical results showed that the diameter of lymph nodules significantly varied between age groups $P \leq 0.01$

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