


Comparative Anatomical and Histological study of gall bladder in Mallard (*Anas platyrhynchos*) and Broiler fowl (*Gallus gallus*)

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Abstract

The current study was investigated anatomical and histological description of gall bladder of two species which differ in nutrition and life habitat Mallard (*Anas platyrhynchos*) aquatic life bird, and broiler fowl (*Gallus gallus*) wild life bird, used ten birds of each species, anatomical results founded the gall bladder is located at the visceral surface right lobe of liver at right side of abdominal cavity, and composed of three parts head, neck and body, gall bladder in both species appeared with dark green color. Gall bladder of mallard has balloon shape more elongated organ while in *Gallus gallus* is pear shape, the mean weight of gall bladder in mallard (1.91 ± 0.56 g), length (3.07 ± 0.505 cm) and width (3.07 ± 0.5 cm) while broiler fowl weight of gall bladder (8.24 ± 2.88 g), length (3.31 ± 0.8 cm) and width (3.56 ± 1.32 cm). Histologically; Gall bladder in mallard has three main layers: tunica mucosa, tunica muscularis and tunica adventitia, tunica mucosa which lined by simple columnar epithelium non-ciliated with goblet cells and the lamina propria-submucosa composed of loose connective tissue, tunica muscularis was a thick layer of muscles (smooth muscles) and adventitia made of loose connective tissue, while gall bladder of *Gallus gallus domesticus* has three layers; tunica mucosa, lamina propria submucosa, tunica muscularis and adventitia, tunica mucosa which lined by simple columnar epithelia non-ciliated without goblet cells, with present lamina propria-submucosa fused with lamina propria, and thin layer of tunica muscularis and adventitia made of loose connective tissue.

Key word: *Anas platyrhynchos*, *Gallus gallus*, gallbladder, anatomy, histology



I. INTRODUCTION

Birds are group of endothermic (warm blooded) vertebrate with more than 18,000 different species, Birds are hugely different species, which that more than 10,000 extended species which distributed across the world (Rohan ,2020) .All birds are evolved with their environments such as deference food source, ponds, small rivers ,birds have different habits due to their life styles (Zainab and Fawzi, 2022)

The digestive system in birds consist of with the beak and ending at vent or cloaca (Devendra and *et al.*, 2019) the digestive system comprises of organs provide reception mechanical digestion, chemical digestion and absorption of food (dyce2010) (korbel and liebich ,2016), the dietary habitant and nature of their lifestyle all influence the morphology of organ system (Thaer *etal.*,2022)

The gall bladder is a cyst to store bile, which is a thin muscular wall green sac founded at visceral surface of the liver(Nada,2020), the bile helps in fat digestion, it is not found in most birds such as pigeons, most parrots and ostriches but it is found in chickens, ducks and goose (Al-bakri and Alhamawandy,2020)

The histological appearance of gall bladder in common moorhen show that it is composed of three tunica: tunica mucosa, muscularis exterina and tunica serosa, the tunica mucosa lined by non-ciliated simple columnar epithelium the lamina propria-submucosa under tunica mucosa which founded as a loose connective(Dyair,2017), tunica muscularis consisted of circular layer of smooth muscle fiber and loose connective tissue in serosa or adventitia which made up of adipose tissue and blood vessels.(Mobini,2014) surface of whole gall bladder of common quail is simple isometric folds are distributed regularly it is villus-like projection when contracted, while with only small folds when the bladder is distended. (Maya *et al.*, 2012) in Kuttanad Duck, aim of this study, anatomical and histological investigation of gall bladder between various species that different in nutrition and environments.

II. MATERIALS AND METHODS

The study was investigated to gall bladder of two species by used ten healthy bird of both species and regardless of their age and sex then compared between two species anatomical feature, after that they anesthetized by using a combination of diazepam and ketamine at dose rate 5mg/kg and 25mg/kg by injection birds dissected (schindala,1999)

Remove the gall bladder and fixated it on buffered formalin 10% for 48 hours and then the samples were washed with a tap water for 30 minutes and left in 70% ethyl alcohol the samples passed through ascending concentration of ethyl alcohol (70%-80%-90%-100%) to dehydration samples and remove the



water from tissue (Luna ,1968) ,clearing step process done by passing the specimens in two steps of pure xylene ,5 to 10 min for each step to remove alcohol from tissue, then embedded samples with a paraffin wax at (57-60 C°) (suvarna and Bancroft ,2018) and sectioning with micrometer in transverse sections .after that the sections staining with hematoxylin and eosin stain depending on (Bancroft and stevens 1982) and (Luna ,1968).

III. RESULTS

Anatomical result of gall bladder in both species are very developed sac hollow organ with caudally directed at it is position (figure 1, A, B). It is attached to the visceral surface of right lobe of liver In both specious gall bladder composed of three parts head, neck and body of organ the head or fundus of gall bladder at distal position which extends beyond the anterior liver, gall bladder has thin musculo- membrane walls which give elasticity to helps it to distance to store bile material. The color of gall bladder is dark green organ in both birds with smooth surface (figure 2, A) in mallard it is appear balloon like shape and more elongated organ while in Gallus domesticus is pear shape (figure 2,B). The mean length, weight and width with bile material gall bladder of mallard is (3.07±0.505) cm, (1.91±0.56) g and (1.93±0.437) cm (table 1) While the mean length, weight and width with bile substance in local broiler fowl (3.31±0.8) cm, (8.24±2.88) g and (3.56±1.32) cm respectively (table 1) Histologically, the wall of gall bladder of (*Anas platyrhynchos*) is made up of three layer; tunica mucosa, Lamina propria was fused with submucosa, tunica muscularis and adventitia, (figure3) The tunica mucosa lined by simple columnar epithelium non-ciliated with goblet cell many resemble villi and variable in size and shape (figure 4) Each villus has core of lamina propria and some smooth muscle and fiber extending from muscularis layer also there are invagination or crypts between the folds of mucosa in the lamina propria (LP) they are similar to tubular gland (figure3,4) The lamina propria (LP) –submucosa (SM) are a fine denes connective tissue, the tunica muscularis mucosa is thick and consist of two layer of smooth muscle circular and longitudinal, and adventitia is composed of loose connective tissue. (figure4) While gall bladder of Gallus gallus, It was composed of three layer; tunica mucosa, tunica muscularis and adventitia The tunica mucosa mainly lined by non-ciliated simple columnar epithelium to with oval nucleus and basal position without goblet cell in some region it was converted to pseudostratified columnar epithelium (figure,5) The mucosa is irregular simple folds to be arranged over the luminal surface also it had invagination of the surface were showed into underlying lamina propria The lamina propria was fused with sub-mucosa contain a loss connective tissue the tunica muscularis consist of a layer of smooth muscles, the outer region was adventitia composed of loos connective tissue (figure 6)



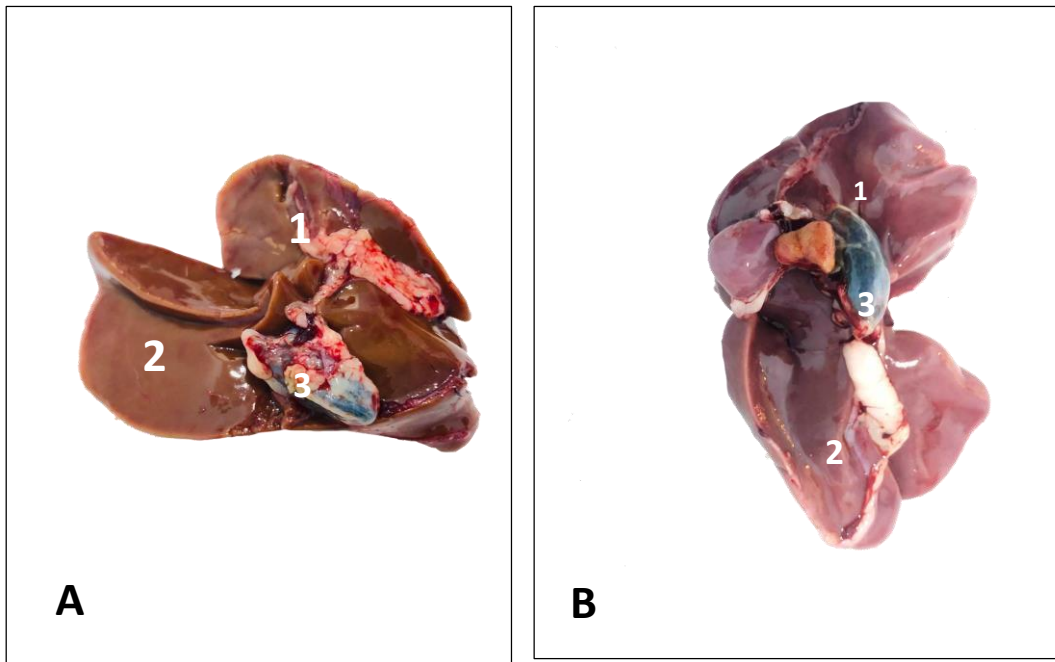


Figure (1) show a gross section to ventral surface of liver and location of gall bladder A- Mallard ,B- local broiler ,1-Left lobe ,2-Right Lobe ,3-gall bladder

Specious	Weight (g)	Length (cm)	Width (cm)
Mallard	(1.91±0.56) g	(3.07±0.505) cm	(1.93±0.437) cm
Broiler fowl	(8.24±2.88)g	(3.31±0.8) cm	3.56±1.32) cm

Table (1) : explain the significant difference of gall bladder in two specious at level $P \leq 0.05$

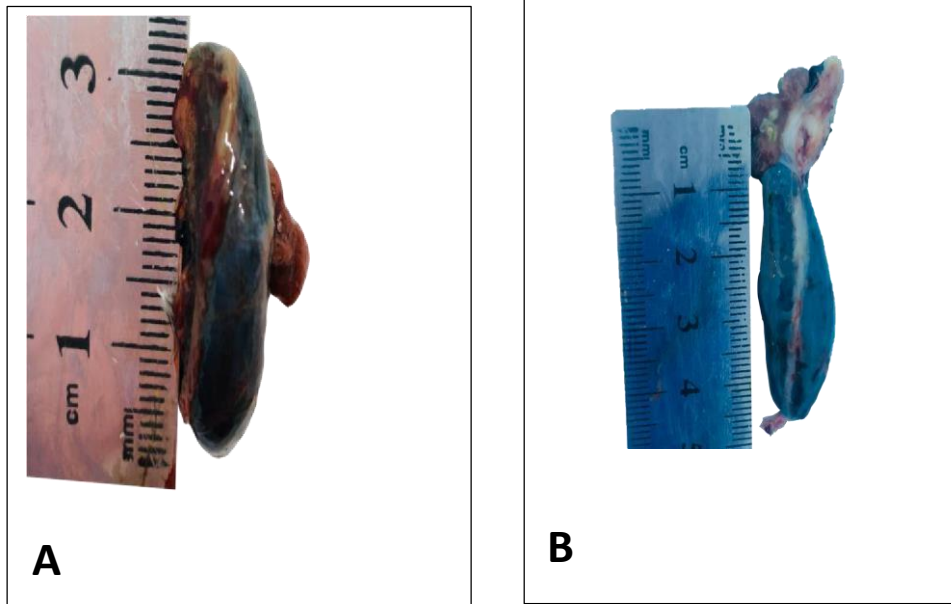


Figure (2) show a gross dissected gallbladder between A- Mallard, B- local broiler fowl

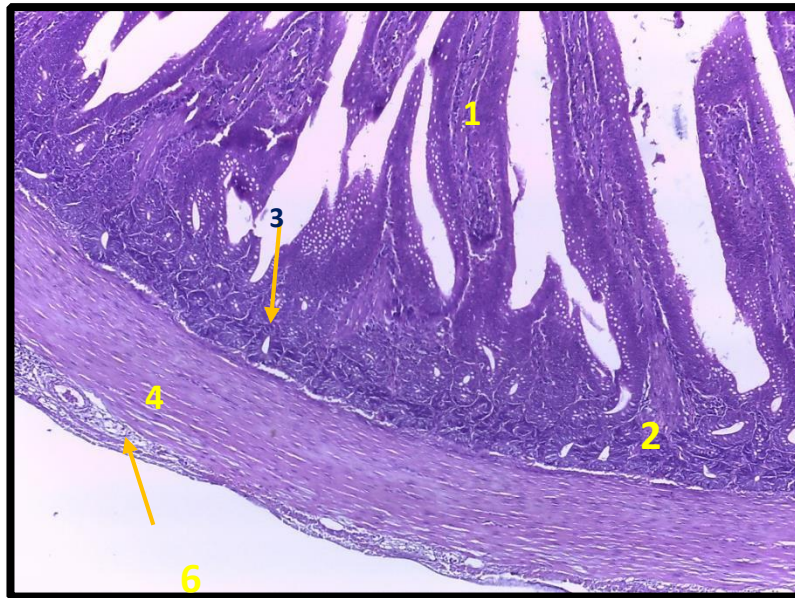


Figure (3): cross-section of gall bladder in Mallard cross-histological section of Gall bladder in Mallard showing layers ,mucosa(1), Lamina propria –submucosa(2), tunica muscularis (4) , adventitia(5) ,gland (3) (H&E,x10)

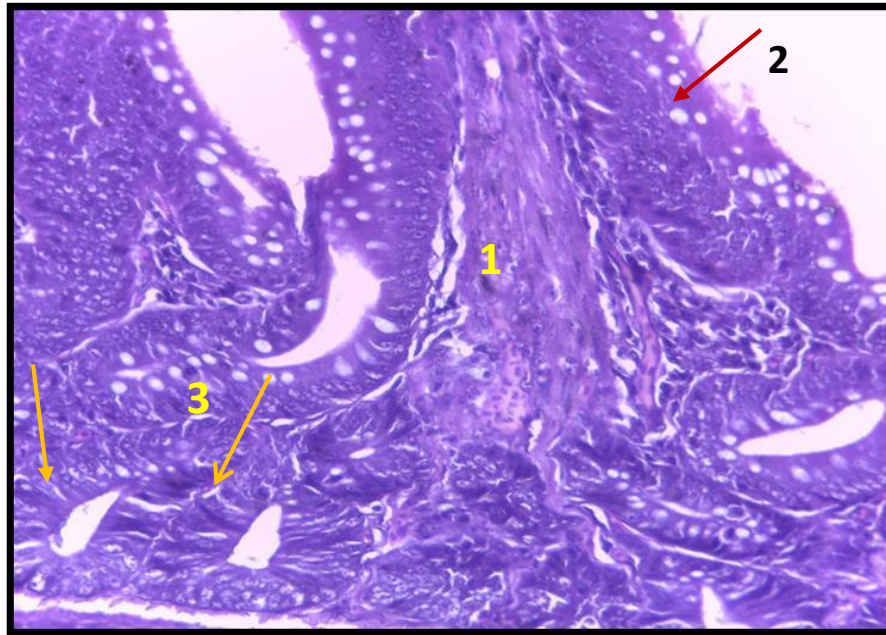


Figure (4): magnification power of gall bladder in Mallard is showing connective tissue (1) extending toward mucosa , goblet cell (2) , glands (3) yellow arrow (H&E,x40)

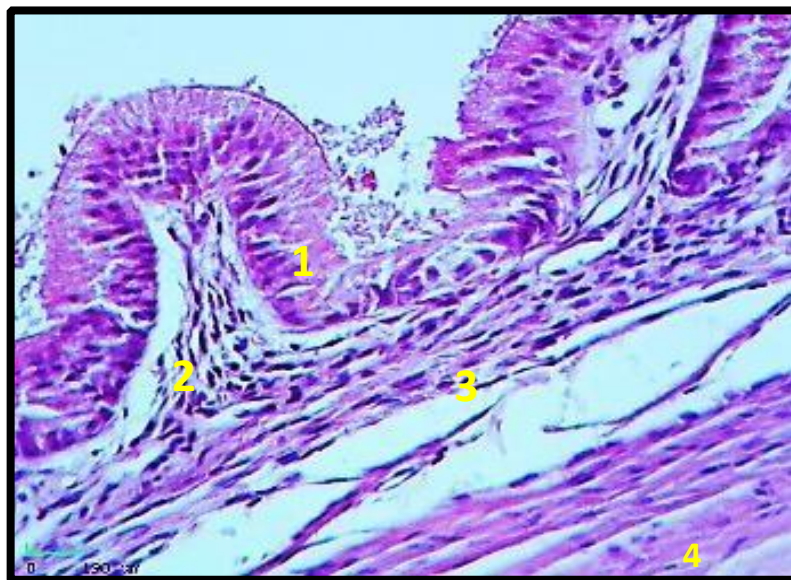


Figure (5): cross- histological section of gall bladder in Gallus gallus showing mucosa(1) ,lamina propria –submucosa (2) , tunica muscularis(3) , adventitia(4) (H&E,x40)

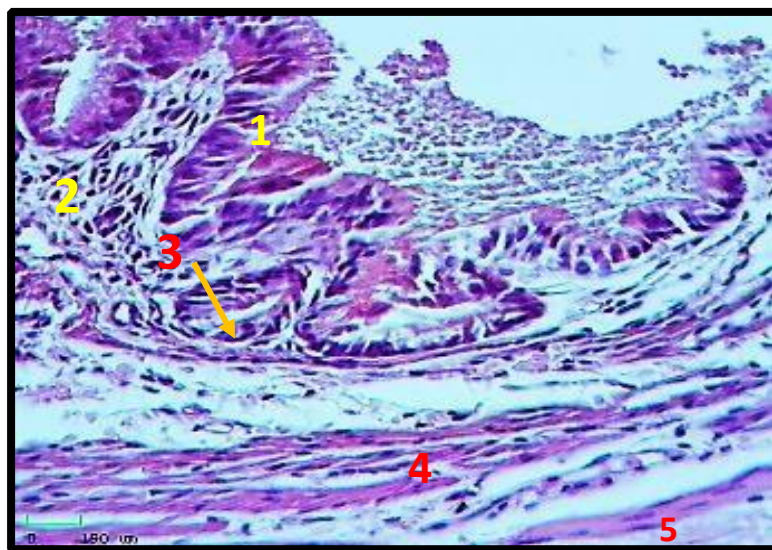


Figure (6) : Magnification power of gall bladder in Gallus gallus showing mucosa(1),lamina propria –submucosa(2) , glands (3) ,tunica muscularis (4) ,adventitia(5) (H&E,x40)

IV. DISCUSSION

The present result of this study to gall bladder reveals that is in both birds is a developed sac , hollow green color organ attachment to the visceral surface of right lobe of liver at right side of abdominal cavity this concur with (Al-shaheen and Hussein,2020), and similar to (Clark,2005)who explained that gall bladder of avian was sac like a structure which located on the visceral surface of right lobe ,and consistent with (Subhan,2009) when showed that gall bladder in geese (*Anser anser*) appeared as a hollow musculo-membranes sac for bile store The result of investigation of gall bladder of mallard (*Anas platyrhynchos*) which appear as a lobulated organ that's agreement with (Abed and AlBeakry, 2011) who mention the gall bladder was elongated and pear in shape in the *Passer domesticus*. Agree (Bacha *et al.*,2000) who noticed that different birds gall bladder which consist of head, neck, body while (subhan,2009) indicated in study of gall bladder of local geese consist of only two part (head and body) without neck region that disagree with result of this study. Gall bladder founded in most birds exception some birds like parrot such as, *Melopsittacus undulatus* and *Agapornis fischeri* and ostrich (*Steruthio camelus*) and pigeon (Mohsin and hammed,2016)(Al- Hamodi *et al.*,2013) The animals who don't have a gallbladder that are possess oddi – sphincter which control on the section of bile material (Storelli *et al.*,2006) In the present study the histological examination revealed the wall of gall bladder was composed of; tunica mucosa, lamina propria-

sub mucosa and tunica muscularis, and adventitia these founded agree with (Iqbal et al.,2014) avian gall bladder , (sivagnanam and Geetha .2008) in Guinea(mobini,2012) in gall bladder of chukar partridge genus (Alectoris chukar) Mucosa appear finger like projection composed of non-ciliated columnar epithelium with goblet cell transfer to pseudostratified columnar ,the mucin secretion on the surface of epithelium might be attributed to poses a protection layer against the detergents and pollutants(Gilloteaux and Oldham,2013) ,also may contributed a surface – gel of the concentration of ingredients of bile components (Hayward,1968) epithelium and contain on glands spread in lamina propria-sub mucosa consisted of loos connective tissue agreement (mobini,2014) in chuker partridge

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