

Histopathological Effects of Some Helminthic Parasites on the Liver of Serranid Fish

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Research Article

Received date: 03/06/2016

Accepted date: 21/03/2017

Published date: 22/03/2017

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Keywords: Histopathology; Liver; *Epinephelus* spp; Helminthes parasites

ABSTRACT

In this study, histopathological effect of different helminthes on the liver of different Serranid fish has been investigated. The fishes examined for liver helminth infections are *Epinephelus tauvina*, *Epinephelus polyphemadion*, *Epinephelus summana*, and *Epinephelus chlorostigma*. Herein, helminthes were identified as *Anisakis simplex* larvae; *Thynnascaris* larvae; *Procamallanus chetumalensis* sp., and *Camallanus hypophthalmichthys*. The parasites were found in blood sinusoids in between the blood cells and among the hepatocytes. Microscopically examination of liver tissue revealed different histopathological and cellular lesions in liver of infected fishes. The pathological alterations included extensive vacuolization and destruction of most hepatocytes and blood vessels, accumulation of lipid droplets, congestion of blood sinusoids and focal haemorrhage. The heavily infected fish species was *E. polyphemadion* and the intense infestation was recorded for the parasites *Anisakis simplex* larvae and *Thynnascaris* larvae.

INTRODUCTION

Serranid fishes (*Epinephelus* spp.) are one of the most important commercial fishes living in the Red Sea. They are widely used in Jeddah restaurant and fish markets. Such marine fish could be infected with a variety of helminthes^[1]. At least 30,000 species of helminthes that had already been described from fish were estimated by^[2]. Helminth parasites *Anisakis simplex*, *Thynnascaris*, *Procamallanus chetumalensis* and *Camallanus hypo phthalmichthys* have been previously described in Serranid fishes (*Epinephelus* spp) on Jeddah coast by Maghrabi^[3].

The effect of parasite on the fishes is of considerable importance because of its wide spread occurrence and an intermediate link in the food chain^[4]. Some parasitic forms cause serious damage to the tissue and also alter the normal physiology, histology and haematology of the host^[5]. Liver is one of the most important glands concerned with several vital functions of the body. It is the chief organ for the process of detoxification and plays an important role in the metabolism of carbohydrates, proteins, lipids, storage of glycogen, denaturation of fatty acids and amino acid synthesis^[4]. Therefore, the histological study of liver is a direct evidence of robust effect on the fish health and is helpful in knowing the possible effect of parasitism on the functions of different body systems^[5].

Histopathological changes caused by the *Paracryptogonimu shirastrictus* (Digenea: *Cryptogonimidae*) and *Raphidascar islutiani* Raillietet (Nematoda: *Heterocheilidae*) include severe destruction and necrosis liver tissue were reported by^[6]. Destruction of epithelial cells, inflammation and an increase in thickness of sub-mucosa, atrophy and aggregation of inflammatory cells between hepatocytes.

The present study describes the histopathological findings of the natural infection in the liver of some Serranid fishes caused by helminthic parasites on the coast of Jeddah.

MATERIALS AND METHODS

200 specimens of the Serranid fish species namely *Epinephelus tauvina*, *Epinephelus polyphemadion*, *Epinephelus summana*, and *Epinephelus chlorostigma* were collected from Al-Bangalla fish market-Jeddah coast, Red Sea at Saudi Arabia and were transported alive to the laboratory for parasitological examination.

During dissection of fish the number of parasites and their distribution within the infected liver were carefully recorded. Samples of infected liver were immediately fixed in Bouin, washed in distilled water, dehydrated in alcohol, cleared in xylene and embedded in paraffin wax. Sections were cut at 5-6 μm , stained with haematoxyline eosin and mounted with DPX. Finally, through the microscopic examination, photographs had been picked from infested tissues with different helminthes.

RESULTS

Helminthes were identified as *Anisakis simplex* larvae; *Thynnascaris* larvae; *Procamallanus chetumalensis* sp. and *Camallanus hypophthalmicthys*. The heavily infected fish species was *E. polyphkadion* and the intense infestation was recorded for the parasites *Anisakis simplex* larvae and *Thynnascaris* larvae.

Liver histology of control fish *Epinephelus spp.* exhibited the normal structural features. The hepatocytes are arranged in branching and anastomosing cords interrupted by hepatic sinusoids (**Figure 1**).

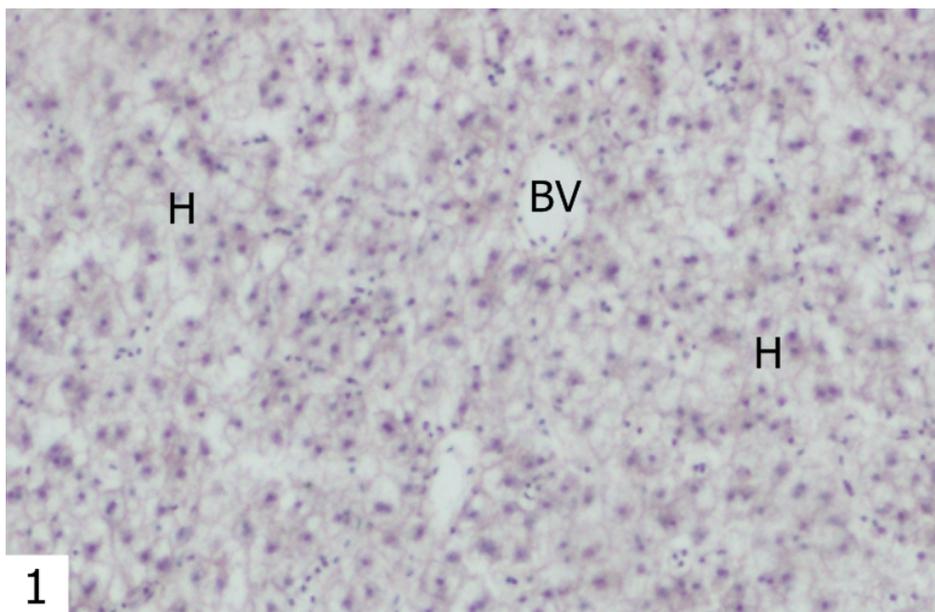


Figure 1. Light micrograph of liver section from control fish showing the normal arrangement of the hepatocytes (H), BV, blood vessel. H&E $\times 100$.

The microscopic study of most examined liver specimens of different *Epinephelus* species infected with helminthes parasites revealed different histopathological and cellular lesions. Sections of *Anisakis simplex* and *Thynnascaris* nematode larvae, were clearly detected in blood sinusoids in between the red blood cells (**Figure 2**) as well as among the hepatocytes (**Figure 3**). While, other infected parts of liver were appeared with attached flukes to the serosal coat and damaged the liver tissue itself (**Figures 4-6**).

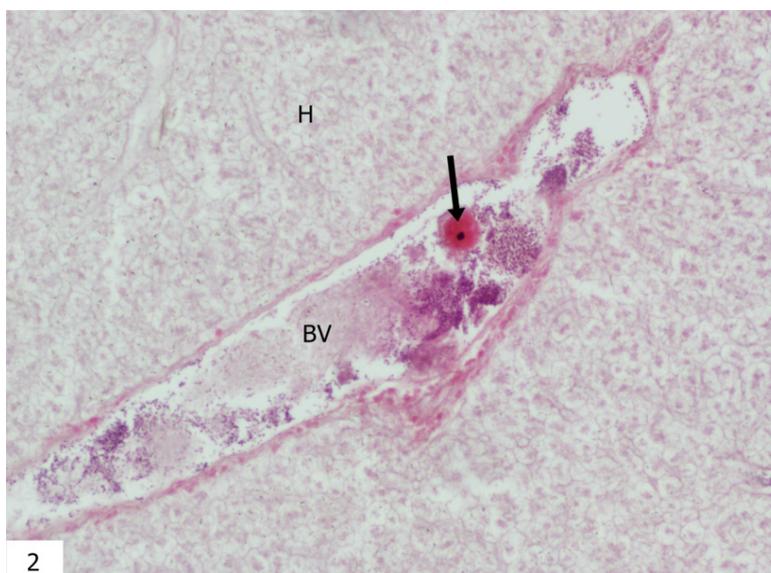


Figure 2. Light micrograph of infected liver section from *Epinephelus tauvina*, showing nematode larvae *Anisakis simplex* (arrow) inside the blood vessel (BV), H, hepatocytes. H&E $\times 40$.

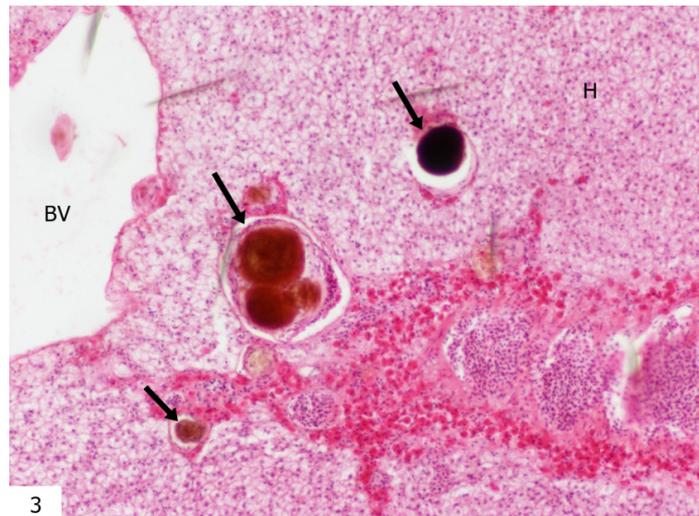


Figure 3. Light micrograph of infected liver section from *Epinephelus chlorostigma*. Note the presence of nematode larvae *Anisakis simplex* and *Thynnascaris* among the hepatocytes (arrows). BV, blood vessel H&E×100.



Figure 4. Light micrograph of infected liver section from *Epinephelus polyphekadion* showing the attached flukes *Anisakis simplex* to the serosal coat (arrow) H&E×40.

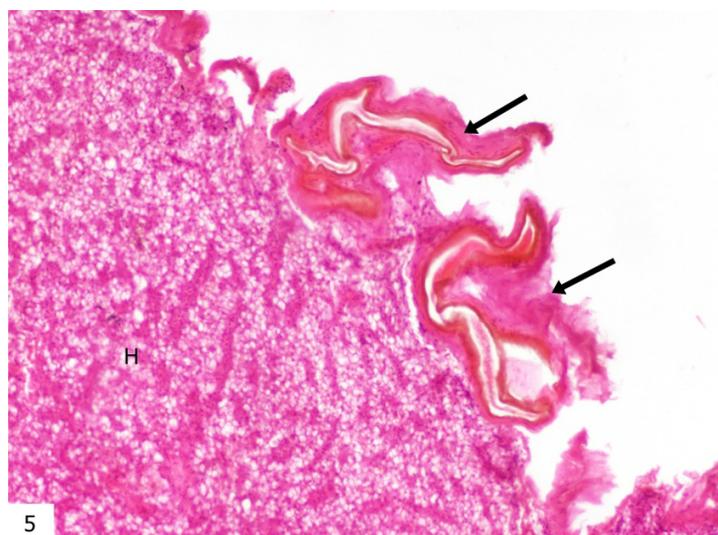


Figure 5. Light micrograph of infected liver section from *Epinephelus polyphekadion*. Note the presence of *Anisakis simplex*(arrows) at the serosal coat. H&E×40.

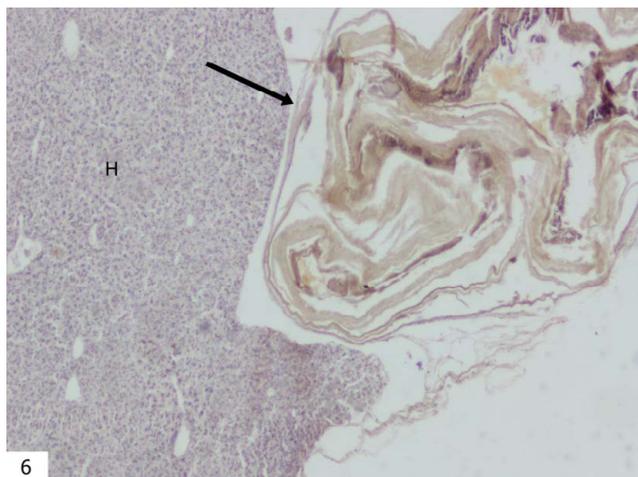


Figure 6. Light micrograph of liver section from *Epinephelus polyphkadion* infected with *Anisakis simplex* nematode larva (arrow). H&E×40.

Moreover, different alterations were recorded in the liver structure of the infected fishes. Extensive vacuolization and dilatation of most hepatocytes was clearly observed in *E. polyphkadion* (**Figure 7**) infected with *Thynnascaris* larvae. The boundary of many cells was invisible and lipid droplets were accumulated in the hepatic cells.

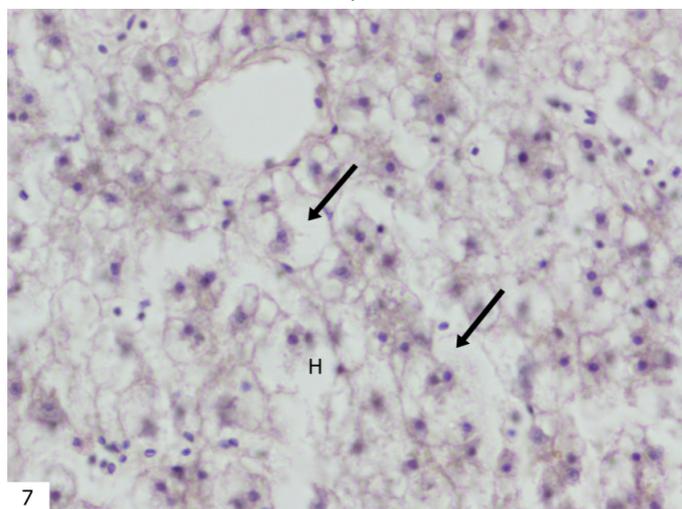


Figure 7. Light micrograph of liver section from *E. polyphkadion* infected with *Thynnascaris* larvae showing vacuolization and dilatation of most hepatocytes (arrows). H&E×400.

The liver hepatocytes of *E. chlorostigma* infected with *Anisakis simplex* larvae lost their specific shape and appeared necrotic, pale and without nuclei. Other hepatic cells appeared cloudy swollen with pyknotic nuclei (**Figure 8**). In addition, there was a distinct congestion of the central vein and hepatic sinusoids with focal haemorrhage in *E. summana* and *E. tauvina* infected with *Anisakis simplex* and *Thynnascaris* larvae (**Figures 9 and 10**).

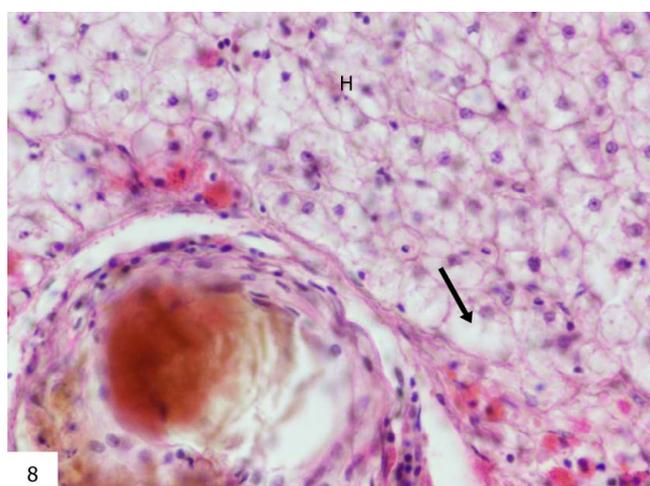


Figure 8. Light micrograph of liver section from *E. chlorostigma* infected with *Anisakis simplex* larvae showing necrotic hepatocytes and pyknotic nuclei (arrows). H&E×400.

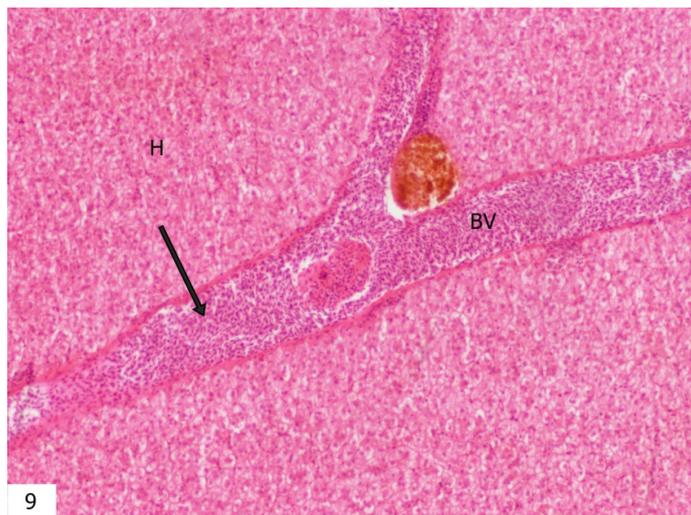


Figure 9. Light micrograph of infected liver section from *E. summana* showing congestion of the central vein and hepatic sinusoids (arrow). H&E×40.

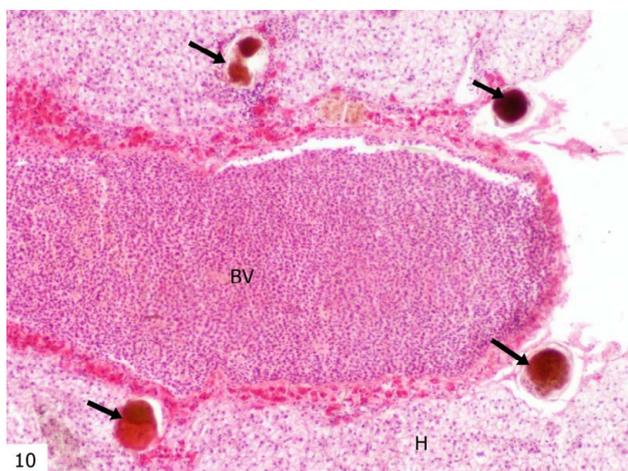


Figure 10. Light micrograph of liver section from *E. tauvina* infected with *Anisakis simplex* and *Thynnascaris* larvae. Note congestion of the blood sinusoids with focal hemorrhage (arrow). H&E×40.

Melanomacrophage centre cells proliferation and Kupffer cells activation were characteristic in *E. twvina* and *E. polyphkadion* hepatocytes infected with *Anisakis simplex* and *Thynnascaris* larvae (**Figures 11 and 12**). Destruction of the hepato pancreatic cells around the parasite could be clearly observed in *E. chlorostigma* infected with *Anisakis simplex* (**Figure 13**). Leucocytes infiltration was apparent along the parenchymal hepatocytes, around the parasite and in the blood vessels in *E. polyphkadion* infected with *Anisakis simplex* and *Thynnascaris* larvae (**Figure 14**).

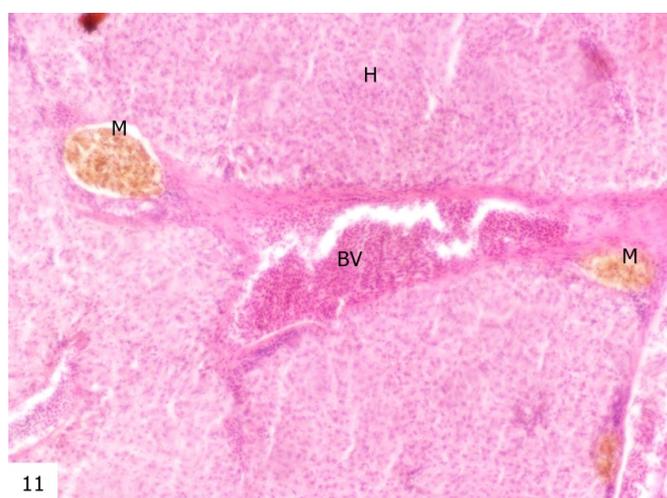


Figure 11. Light micrograph of infected liver section from *E. twvina* showing proliferation of melanomacrophage centers (M). H&E×40.

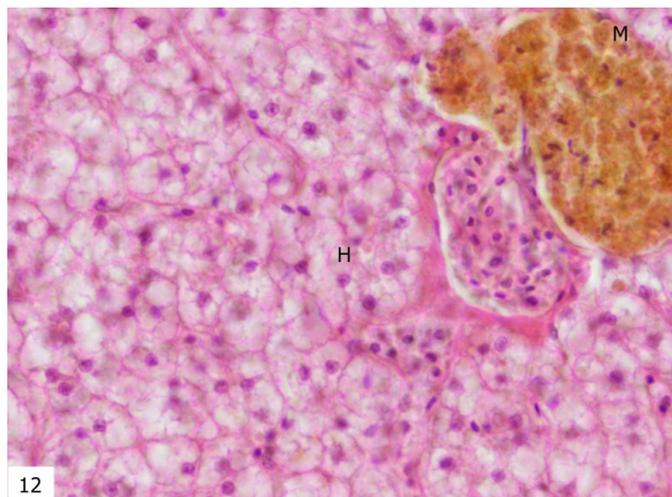


Figure 12. Light micrograph of infected liver section from *E. polyphkadion*. Note melano macrophage proliferation (M). H&E×400.

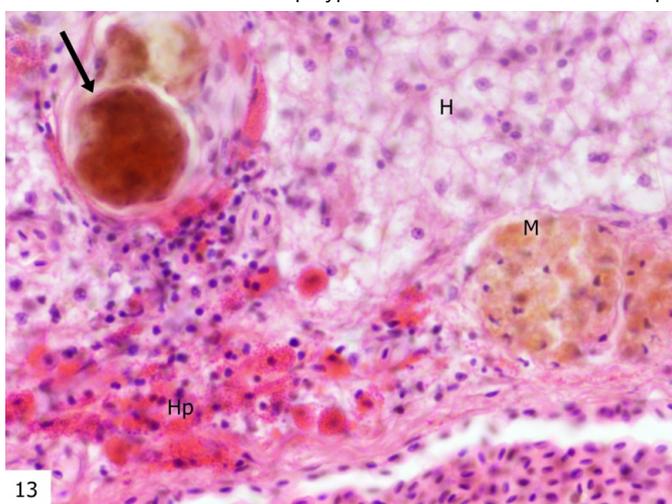


Figure 13. Light micrograph of liver section from *E. chlorostigma* infected with *Anisakis simplex*. Note the destruction of the hepatopancreatic cells around the parasite (arrow). H&E×400.

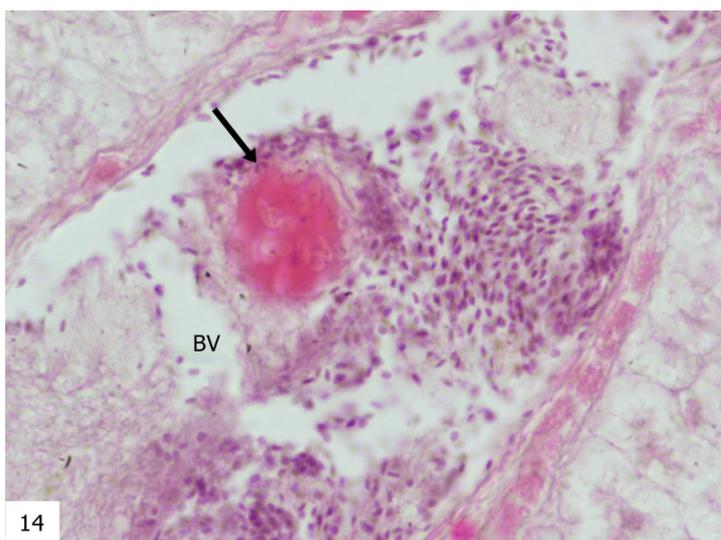


Figure 14. Light micrograph of liver section from *E. polyphkadion* infected with *Anisakis simplex* (arrow) showing leucocytes infiltration along the hepatocytes, around the parasite and in the blood vessels. H&E×400.

DISCUSSION

The present study describes the histopathological alterations induced by different helminthic parasites in Serranid fish. Many parasitologists studied histopathology caused by helminth parasites which cause damage to its habitat with the strong armed holdfast organs. The distribution of parasites within the fish liver is variable and they may damage the liver at the point

of their attachment ^[7]. In addition to Hanchla Devi and Pinky Kau studied the effect of helminth parasites in *mastacembalus armatus* with special reference to hepato-somatic index. As morphologically, infected liver appeared pale yellow and very thin in size. External surface showed few encysted parasites. Histologically, infected liver showed loosening in hepatic parenchyma, irregular lobular arrangement and necrosis. Most of the hepatocytes are indistinguishable with eccentric and enucleated ^[8].

The results of this study revealed that there was damage in liver of infected fishes. Vacuolization and dilatation of most hepatocytes were noticed in *E. polyphkadion* infected with *Anisakis simplex* larvae and *Thynnascaris* larvae. While, necrotic hepatocytes with pyknotic nuclei were observed in *E. chlorostigma* infected with *Anisakis simplex* larvae. Similar alterations were recorded by Lakshma in liver of fresh water fish *Channapunctatus* infected with *Euclinostomum heterostomum* and by Pardeshi in liver of *Mastacembelus armatus* infected with *Allocrea diumkhami*. Loosening of hepatic tissue and necrosis of hepatocytes were found in *Nandusnandus* (Ham.) parasitized by metacercariae of *Clinostomum complanatum* ^[9,10]. Atrophy of the liver tissue of *C. punctatus* due to *E. heterostomum* infection, which may be a result of inflow of nutrients from the host tissue to the metacercariae, was observed by ^[11]. They also observed compressed and distorted hepatocytes due to the metacercarial growth in the liver.

Moreover, the results of the present study showed congestion of blood vessels with focal haemorrhage and destruction of hepatic cells in *E. summana* and *E. taurina* infected with *Anisakis simplex* larvae. Severe necrotic hepatitis and haemorrhages in *Thalassomak lunzengri* fish infested with helminth parasites were recorded by ^[12]. He reported that these alterations in the infected tissue could be a direct result of the attachment of the parasites to the wall of the organ which causes damage, degeneration and inflammatory reactions in the infected tissues. Also, El-Mansy mentioned that the nematode parasite *Procamallanus laevichonchus* lead to haemorrhage at attachment site in the infected fish tissue. According to Bamidele, fish in intensive culture are continuously affected by environmental fluctuations which can cause considerable stress on the homeostatic mechanism of fish, rendering them susceptible to a wide variety of pathogens ^[1,13].

CONCLUSION

From the present study, it was concluded that Serranid fish is highly infected with different types of helminthic parasites and the parasitic infection induces severe damage to liver tissue. Also, it is obvious that *Anisakis simplex* larvae and *Thynnascaris* larvae might be considered as more negative on fish health.

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