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Fresh-water fish diseases in west Bengal, India

Koustav Sen and Rimpa Mandal

Abstract

Present day diseases issues are of great concern in fish production. Similar to other animals, fish can also suffer from different diseases. Every fish carry pathogens and parasites. The present study highlight the different fish diseases in west Bengal, India. Generally freshwater fish is the principal source of protein for people in many parts of the world. Disease is a main agent affecting fish mortality in young age. This problem affect our fish biodiversity. The most common freshwater fish diseases-Dropsy, Tail and Fin rot, Koi Herpes virus, Vitamin-C Deficiency, Cloudy Eye, Lymphocystis, Furunculosis etc. Due to the water pollution, a huge amount of bacteria affect fish body, so our present study highlight the actual causes of different fish disease and their damaging power and their symptom.

Keywords: Fish, diseases, micro-organisms and parasites, treatment and control

1. Introduction

West Bengal is one of the leading producers of fresh water fish and the largest producer of fish seed production in the country. Similar to other animal's fish can also suffer from various diseases. Every fish carry pathogens and parasites. Now a days diseases is a main factor in West Bengal fish production. West Bengal fully cover with a freshwater system. Ganga, coastal area, Damodar River, Tista River, Hooghly River and also village pond, private hatchery present in West Bengal which help to freshwater fish production. But every year diseases damage the production Rate. Generally fish diseases spread one to other. For this causes, if one fish carry a viral infection that spread in fresh water system. Fish can also be infected by different pathogens, parasites. The most common fresh water fish diseases-Dropsy, swim Bladder disease, worm infection etc. The study is based on primary and secondary data source. Such as different Research Paper and filled study. For picture capturing canon-EOS 1300D and single lens, sjcam 4000 Wi-Fi (water proof 30 meter) action camera use. Microscopic Picture Collect By Esaw Trinocular Microscope with Semi-Plan Objectives (Magnification 40x-1500x) and Camera 5mp (White).

2. Methods and Materials

2. Study Area- The present study totally based on freshwater fish disease in west Bengal so this study covered a major area in west Bengal. This study choose a major freshwater system such as Ganga River, Hooghly River, Damodar River, Tista River and also present study covered different village pond (Village area under kalna subdivision, katwa subdivision and Nadia sub division), cannel which located in west Bengal. The study area of Ganga River also known as Bhagirathi River (katwa-kalna). A huge amount of freshwater fishes found in Ganga River.

2.2 Common diseases occurring in fish- Generally two types of disease present in fish body.one is infectious disease and other is non-infectious diseases. Infectious diseases caused by different Protozoa, Fungus, Bacteria, Virus and Non-infectious diseases caused by different acid and vitamin deficiency. This study highlight the actual cause of this diseases and also identify their symptom. Infectious diseases divided into six ways. They are- (1) bacterial disease, (2) Viral Disease, (3) fungal Disease, (4) protozoan disease (5) crustacean disease, (6) Helminth Disease. These type of diseases have been discussed in this study.

3. Results and Discussion

3.1 Bacterial diseases-There have been noticed nine types of bacterial diseases shows on fresh

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water fish's body. They are discussed in below.

a) Columnaris- It is a bacterial disease caused by **Flexibacter Columnaris**. The clinical symptom is raised white plaques often with reddish peripheral zone leading to hemorrhagic ulcers.

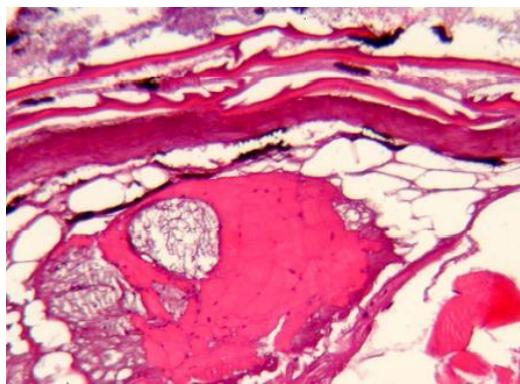


Fig 1: Histological Picture of Columnaris

b) General Septicemia- It is caused by **Aeromonas Hydrophila**. This type of bacteria found in fish blood. This disease affected on Catla, Rohu, Mrigala, Cat Fish. This disease shows ulceration of skin, distended abdomen and inflamed fins and fins bases.

c) Ragged Fins and Tail- These diseases affected both adults and young fishes. It is caused by **Pseudomonas Bacteria**. This infection during its early stage appears as a white line on the margin of the fin. Fin rays become brittle and start breaking.

d) Furunculosis- This is a highly contagious disease that effects fish of all ages. It is caused by **Aeromonas Salmonicida**. Generally common carp, tilapia are effected. Sudden death, fish may also show swimming just below the surface, loss of appetite can be observed. Pathological and microscopic pathological signs are body discharge from vent, stomach filled with mucus, blood and sloughed epithelial cells, fusion of gill lamellae, bacterial colonies in many tissue.



Fig 2: Histological Picture of Furunculosis

e) Enlarged eye (Exophthalmos) - This is an epidemic eye disease which effects medium-sized and large sized catla fish. It is caused by **Aeromonas Punctata**. Cornea of eye becomes vascularized and later becomes opaque, eyeballs gets decayed.

f) Dropsy-It is not an actual disease, but a physical manifestation of kidney failure in fish, where the fish body balloons outward from excess water and its scales stick out like a pine cone. But dropsy disease can possible through the

bacterial infection. A fresh water fishes exists in a hypotonic environment. That is freshwater is made up of a higher concentration of water and lower concentration of solutes, like salt. This result in water similar enough to the water in the fish body so that the water moves freely into the fish's skin and other tissues. The water also needs to leave its body, otherwise the fish absorbs fatal amount of water. The kidneys are responsible for removing the excess water, pushing it out of the body and back into the environment through the gills and urinary tract. However if the kidney are not working correctly, the excess water can be build up internally, leading to the bloated appearance referred to as dropsy. Sign of excess water retention may be from a slight rounding of the belly to a very swollen belly.

g) Bacterial Kidney Disease (BKD) - It is a bacterial disease caused by **Renibacterium salmoninarum**. It is a gram positive bacteria. This disease can be transmitted through the eggs and also fish can be infected by oral route and also via skin erosions. The source of infection can be contaminated feed and water. Clinical signs of BKD is darkness of the skin, gills are pale in colour, swelling of the kidney.

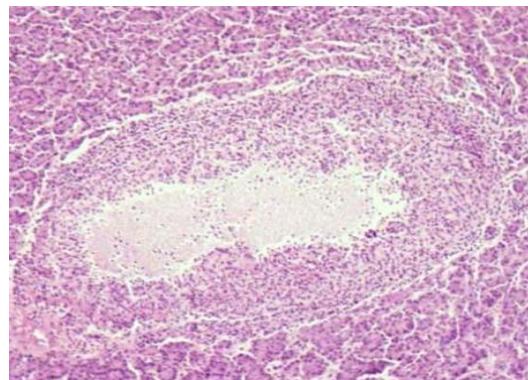


Fig 3: Histological Picture of BKD Disease

h) Cold water Disease (CWD) - Cold water disease caused by **Flavobacterium psychrophilia**. This disease is rare in west Bengal but some area fishes observe this disease generally in north Bengal. In infected fish, the caudal peduncle darkness and as the disease progresses, the caudal fin becomes frayed and eroded. According to wood (1979), the transmission of the disease is associated with the presence of carrier fish, vertical transmission of the disease to the offspring may also be a possibility

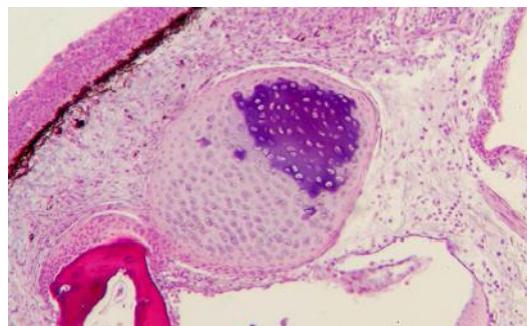
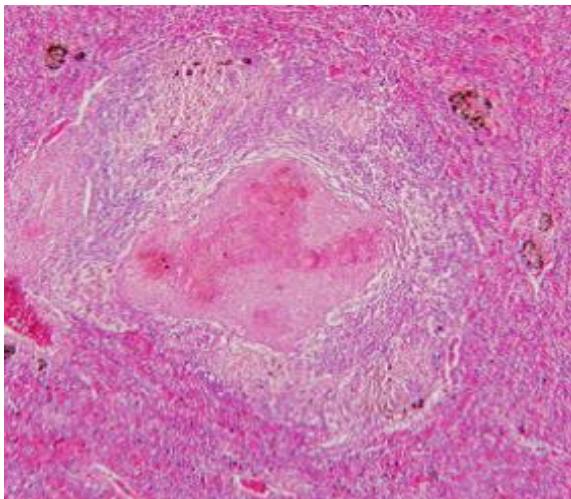


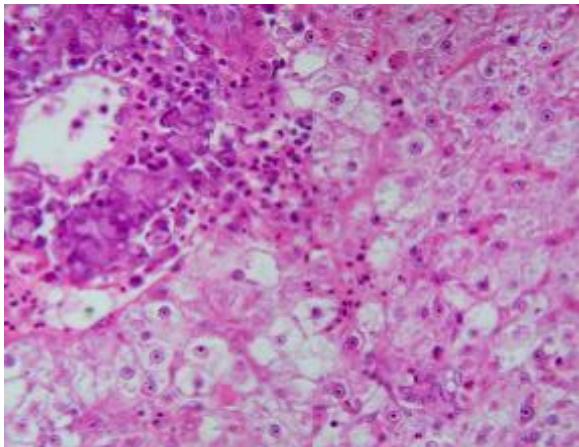
Fig 4: Histological Picture of Cold Water Disease

i) Mycobacteriosis- Mycobacteriosis is a bacterial disease of fresh water fish. It is also called fish tuberculosis. It is caused by **Mycobacteria chelonian**. These disease symptoms are mainly shows in summer session. The most common symptoms are poor body condition, skin ulcers, scales loss.

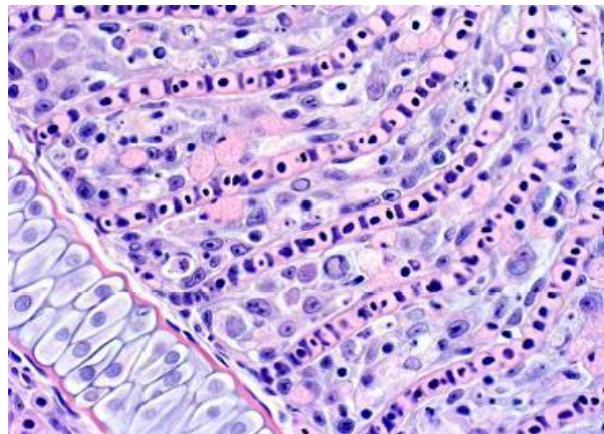
**Fig 5:** Histological picture of Mycobacteriosis Disease

3.2. Viral Diseases-There are six types of viral diseases present in fish body. They are-

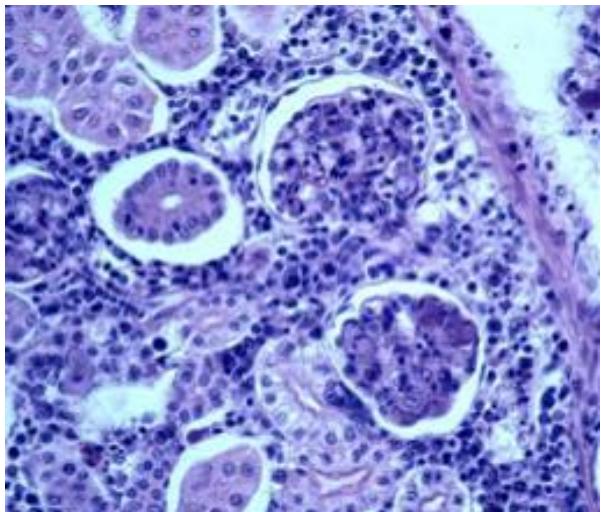
a) Spring viremia- It is a viral disease, the causal agent of this disease are *Rhabdovirus Carpio*. Generally host species of this disease are common carp. Other infected species are silver carp, grass carp, koi carp, and crucian carp. The clinical signs of this disease are nonspecific, but some symptoms shows in generally. Abdominal distension, exophthalmia and petechial hemorrhages of the skin, gills and eyes, swim and breathe more slowly than normal. This virus is shed in the feces and urine, as well as the gill and skin mucus of infected fish.it is also found in the exudate of skin blisters and edematous scale pockets. The virus enter most often through the gills and direct contact, through the water.

**Fig 6:** Histological picture of spring viremia Disease

b) Carp Pox- Carp pox is a viral disease which is caused by the *Herpes virus Infection*. This disease usually affects carp and koi.it is also called koi herpes virus disease. The gills of the infected fish show serious tissue damage. Due to the death of gill tissue, the fish are unable to breathe. Mucus secretion can be seen on gills and skin of the infected fish, initially stage carp pox shows up as milky skin lesions.

**Fig 7:** Histological picture of Koi Herpes virus

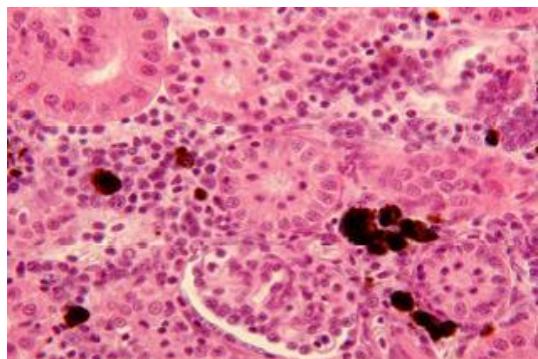
c) Lymphocystis- Lymphocystis disease is a common viral infection of fish, it is caused by *Lymphocystis Virus (Irido Virus)*.It affects the skin and fins growth of fresh water fish's. Generally this viral infection does not pose any health problem to the fish.

**Fig 8:** Histological Picture of Irido Virus

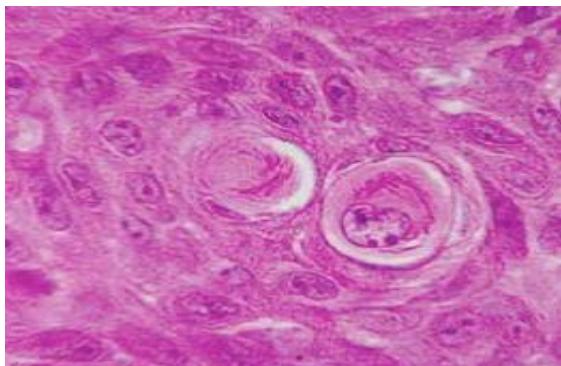
d) Viral Nervous Necrosis (VNN) - It is caused by Betanodavirus. Betanodavirus can infect tropical, sub-tropical or cold temperature fishes. Betanodavirus more commonly cause disease and morality in larval stages. Abnormal swimming behavior, muscle tremors, hyperinflation of the swim bladder symptoms shows generally because Betanodavirus attack on nervous system.

e) Infectious Hematopoietic Necrosis (IHN) – It is a viral disease caused by **IHN**. It is a bullet shaped novirhabdovirus.

The clinical signs of these disease are abdominal swelling, anemia, darkened body coloration, exophthalmia, stomach and intestine filled with milky fluid, pale liver and petechial hemorrhaging of mesenteries or visceral tissues. This disease transmission through the water via sex product. Virus occurs commonly in ovarian fluids and on the surface of eggs

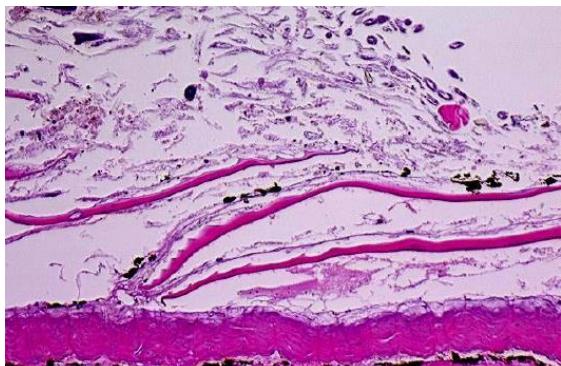
**Fig 9:** Histological Picture of IHN Disease

f) Viral Hemorrhagic septicemia (VHS) – It is caused by viral Hemorrhagic septicemia virus. This virus found in generally European country but this virus found in north Bengal areas river water. Most of fingerlings effect on this disease. The clinical symptoms are small hemorrhages are common in the musculature, gills, visceral organ. Middle stages internal organs become very pale.in late stages kidney become swollen and discolored

**Fig 10:** Histological Picture of VHS Disease

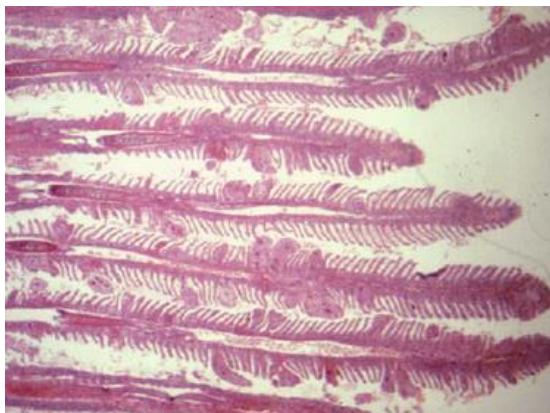
3.3 Fungal Diseases- There are three types of fungal disease observed in freshwater fishes.

a) Saprolegniasis- Saprolegniasis is a fungal disease caused by *Saprolegnia Parasitica*. *Saprolegnia* is the main genus of water molds responsible for significant fungal infections of freshwater fish and fish eggs. The disease is transmitted by direct contact between diseased fish or fish eggs and healthy one. Clinical signs of this disease are- the appearance of cotton-like white to grey growth on the skin, gills, fins and eyes or eggs of fish. Scales are lifted away from body surface.

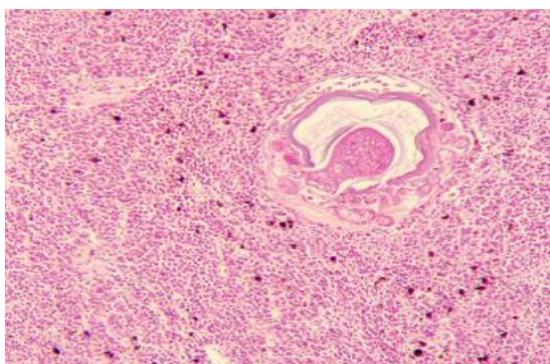
**Fig 11:** Histological Picture of Saprolegniasis

b) Branchiomycosis- It is a fungal disease involving gill tissues, affecting the most species of freshwater fish.it is

caused by *Branchiomyces Sanguinis* and *Branchiomyces Demigrans*. *Branchiomyces sanguinis* grows mainly in the blood vessels of gill arches, filaments and in the gill lamellae and *Branchiomyces demigrans* is found in the parenchymal tissue of the gills. Both species produce branched and non septate hyphae. Fungal spores are transmitted by water to gills. Clinical signs are- fish become weak in movement. Fungus develops on gill tissue or penetrates the blood vessels causing obstruction, congestion and necrosis of gill tissues. Gills may appear red from impaired circulation. There are respiratory distress in infected fish and do not swallow the air.

**Fig 12:** Histological Picture of Branchiomyces

c) Ichthyophonous Disease- It is caused by *Ichthyophonus Hoferi*. It is spherical or oval in shape, yellowish brown and has granulated cytoplasm. This disease transmitted through skin abrasions of damaged gills help in transmission of the infection. Carriers' help in spreading of the infection through faecal discharges and also disease can be transmitted by contact between diseased fish and healthy one. There are no external signs can be observed. Fish with advanced infection have rough or granulomatous skin. The term sand paper effect is used to describe the granulomatous appearance it's caused by development numerous infective units under the skin and underlying muscle. These nodules found in heart, liver, kidney, and brain and filled with cellular debris and fungus. Infection of swim bladder, which led to damage of it, fish lies on the bottom of the pond and died.

**Fig 13:** Histological Picture of Ichthyophonous Disease

3.4 Protozoan Disease- Generally six types of protozoan disease are found in freshwater fish body.

a) Costiasis - It is a protozoan disease. It is caused by *Costia Necatrix*. Disease is characterized by blueish of the skin and respiratory manifestation. The parasites are transmitted from

fish to other fish through the water. Infection occurs when free swimming forms attach to a fish. The clinical symptoms are the gills are usually swollen and sometimes covered with mucous lead to respiratory distresses. Thickening of the mucous at the different parts of the body and fins lead to form dull spots on infested part. Damage of fins is main cause of costiasis.

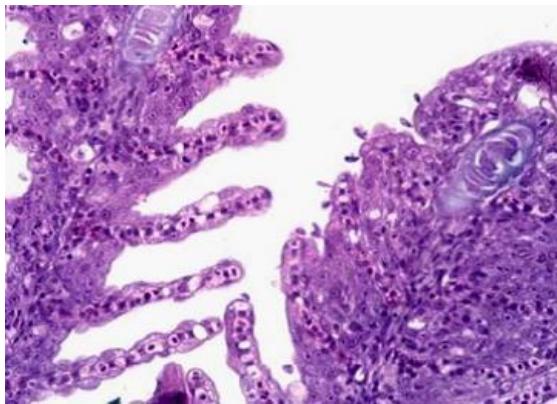


Fig 14: Histological Picture of Costiasis Disease

b) Epistylis- It is caused by *Heteropolaria Colisarum*. Host species of this disease is cat fish. *Heteropolaria colisarum* is horizontally transmitted from fish to fish. The clinical symptoms are grey patches are show on the anterior portion of the fish, fish swims in shorts bursts, then stop. Gills shows very obvious white spots on and around them, bloody hemorrhages are apparent over several parts of the skin, the head of the fish has one or more bleeding areas and also gills shows fungal growths.

c) Ichthyophthiriasis (ICH) - It is caused by *Ichthyophthirius Multifilis*. The host species is tilapia carp. It is round to oval in shape. The body surface covered with cilia. The full grown parasitic from grows to 0.5-1.5mm, which is quite large for unicellular organisms. The disease is transmitted through direct and indirect contact with infected fish. Water act as vehicle for spreading the infection. The disease is characterized by appearance of white spots on the skin, gills, fins and cornea of the eye. More severe attacks result in skin detachments when the gills become infected. They appeared pale in colour and swollen, respiration become difficult and the fish aggregate at the water inlet and die.

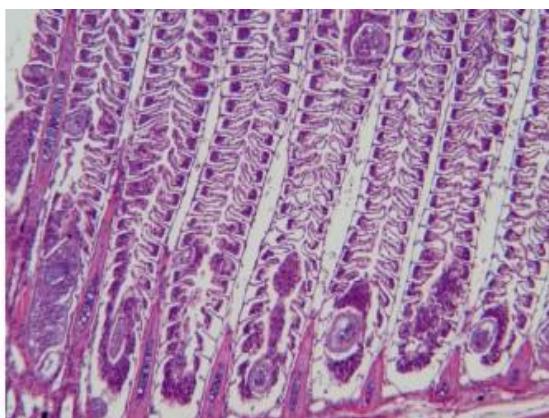


Fig 15: Histological Picture of ICH Disease

d) Myxosporidians infestation- It is caused by

Myxosporidians genera. Clinical symptoms are weakness, falling of scales, raising of the scales along their posterior margins.

e) Pox Disease- It is caused by sprozoans. Clinical symptoms is small milky white spots raised 1-2 mm above the surface of skin.

f) Trichodiniasis- It is caused by *Trichodina Truttae* protozoans. These protozoans are saucer shaped, 50 microns diameter. These disease are observed on most freshwater fish. Clinical symptoms is increase in mucus production causing a white to bluish haze on the skin. The skin may develops ulcers and the fins may fray. If the gills are involved, the fish may have severe respiratory distress. Histologically observation is masses of organisms are attached by adhesive discs and denticles of exoskeleton to the epidermis.

3.5 Crustacean Disease- Two types of crustacean disease shows in freshwater fish's. They are anchor worm infection and arugulas infestation.

Anchor worm infection is caused by *Lernaea Cyprinacea*. The body of the crustacean is elongated, worm like. This parasite is a type of skin parasite. It can infect any fish. Pond fishes are more susceptible. The clinical symptoms are anchor worm infected fish have red and inflamed skin irritations. Initially fish starts swimming's rapidly. Generally catla fish is mainly affected by this disease.

Argulus infestation is mainly effected on *Labeo Rohita*. The effected fish have patches of hemorrhagic and oedematous skin, gills or fins.

3.6 Helminth Disease- The common parasitic worms are *Dactylogyurus*, *Gyrodactylus* and *neobenedenia*. *Dactylogyurus* is a gill parasite which most commonly infect koi fish. The clinical symptoms are swollen and pale gills that make breathing difficult for the infected fish.

Neobenedenia is a large parasite which infects salt water fishes and destroys their gills, leading to breathing problems.

3.7 Non-infectious disease- Five Types of Non-Infectious Disease Observe in Fresh Water Fish Body. They Are-

a) Vitamin C deficiency- Vitamin c deficiency is a normal fresh water fish diseases. The host species is punctatus, tilapia, *Cirrhina mrigala*, *L. calacifer*. The clinical symptoms are-

Punctatus---Reduced growth, scoliosis, lordosis, increased disease susceptibility, broken back syndrome, internal and external hemorrhage, fin erosion, dark skin colour, anorexia, erratic swimming behavior.

C. punctate---Scoliosis, lordosis, anemia, distorted gill filaments.

Tilapia---Scoliosis, lordosis, reduced growth/wound repair, internal/external hemorrhage, caudal fin erosion, exophthalmia, anemia, reduced egg hatchability.

Cirrhina mrigala---Reduced growth, increased mortality, scoliosis, lordosis, hypochromic macrocytic anemia.

L. calacifer---Reduced growth, dark colorations, loss of equilibrium, caudal fin erosion, haemorrhagic gills, short operculum, short snout, exophthalmia, short body, fragile gill filaments, and club shaped gill lamellae, fatty degeneration of liver, muscle degeneration, skin hemorrhage.

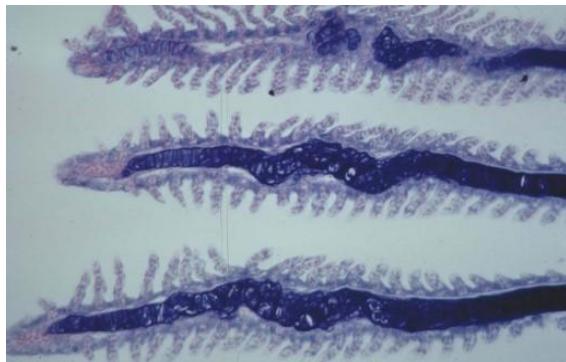


Fig 16: Histological Picture of Vitamin C Deficiency Disease

b) Vitamin E Deficiency- Clinical symptoms of vitamin E deficiency in *C. Carpio* and *punctatus* is *C. carpio*--Muscular dystrophy, mortality, exophthalmia.

Punctatus--Reduced growth and feed efficiency, exudative diathesis, muscular dystrophy, Depigmentation, fatty liver, anemia, atrophy of pancreatic tissue, mortality, ceroid deposition in liver/blood vessels, splenic haemosiderosis.

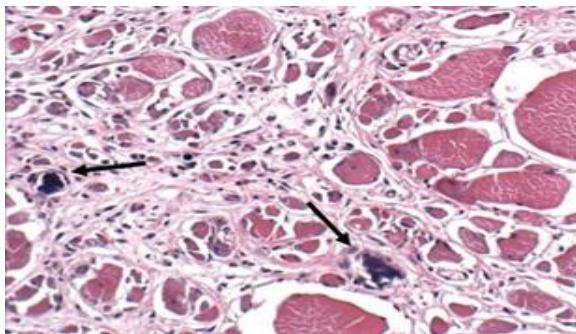


Fig 17: Histological picture of Vitamin E Deficiency Disease

c) Folic Acid Deficiency- The clinical symptoms of folic acid deficiency is

Punctatus--Anorexia, increased mortality, lethargy, reduced growth, low haematocrit.

Labeo rohita--Reduced growth and haematocrit.

C. batrachus--Anorexia, reduced growth, fading of body colour, pale gills and liver.

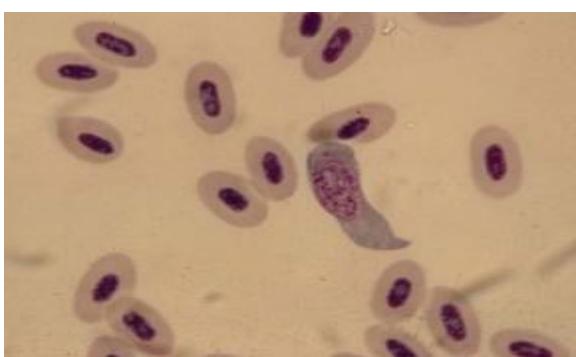


Fig 18: Histological Picture of Folic Acid Deficiency Disease

Phosphorus Deficiency- The clinical symptoms of this disease is *C. carpio*--Reduced growth, poor feed efficiency, bone demineralization, skeletal deformity, and abnormal calcification of ribs and the soft rays of the pectoral fin cranial deformity increased visceral fat.

I. punctatus--Reduced growth, poor feed efficiency, bone demineralization.

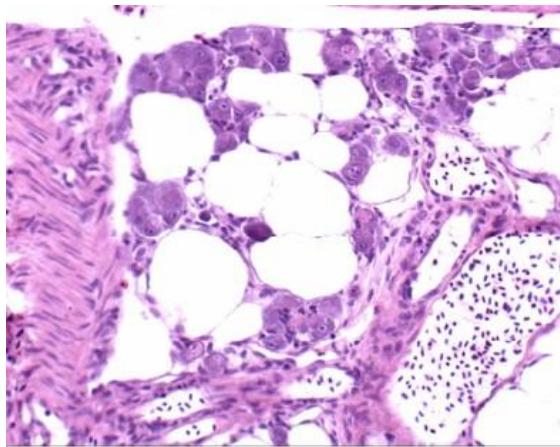


Fig 19: Histological Picture of Phosphorus Deficiency Disease

Pantothenic Acid Deficiency- The host species is *C. Carpio*, *I. Punctatus*, *L. Calcarifer*. the clinical symptom is- *C. Carpio*--Anorexia, reduced growth, sluggishness, anemia, skin haemorrhage, and exophthalmia.

I. punctatus--Anorexia, clubbed gills, eroded skin, lower jaws and head, anemia.

L. calcarifer--Anorexia, reduced feed efficiency, weight gain and survival, dark colouration, abnormal Swimming, haemorrhagic operculum, eroded pelvic fin, clubbed gills.

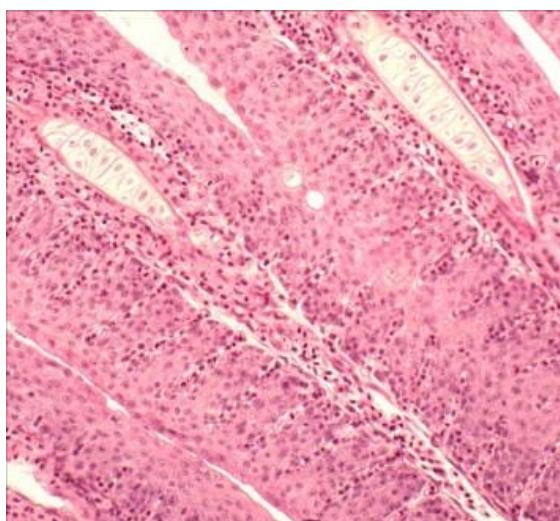


Fig 20: Histological Picture of Pantothenic Acid Deficiency Disease

4. Diagnosis and Treatments of Fish Diseases- Fish have a variety of defense to prevent the diseases and parasites. The present study highlight that different types of freshwater fish disease such as protozoan diseases, bacterial disease, viral disease, fungal disease and crustacean diseases.as a different type of disease present so different type of treatment will be needed.

a) Treatment and control of Bacterial Diseases- There are nine bacterial diseases show on freshwater fishes.in generally for columnaris disease, addition of nifurpirinol to pond.in eye disease, chlormycetin (8-10mg/l) bath for one hour for 2-3 days. For furunculosis, dip treatment for one minute in 1:2000 copper sulphate solution for 3-4 days.in fin and tail rot, one minute dip treatment in 500 ppm copper sulphate solution. For dropsy disease, dip treatment in 5ppm potassium permanganate solution for 2 minutes. BKD disease can treated with clindamycin, crythromycin, penicillin G, spiramycin and lincomycin. CWD disease can treated by the

use of quaternary ammonium compounds added to the water.
b) Treatment and control of viral diseases- There are six types of viral diseases show on freshwater fishes. In carp pox disease there are no treatment for carp pox infection. But only way to prevent the viral infection from spreading is to destroy the infected fish and its environment. For lymphocystis only disease has been diagnosed, the veterinarian may recommend to not treat the fish. Because the infection is not terminal.

c) Treatment and control of crustacean diseases- Generally two types of crustacean disease found on freshwater fishes. For Argulus infestation, gammexane at a concentration of 0.2 ppm should be repeated at weekly intervals. Treatment of anchor worm disease is bath in weak by permanganate solution for 2 to 3 minutes.

d) Treatment and control of helminth diseases- Three types of helminth diseases observed in freshwater fishes. For dactylogyridae and neobenedenia the water of the pond treated with formalin and praziquantel. These medicine kill all parasites, their eggs, and their larvae. For gyrodactylosis, infected fish Bath in 1:2000 acetic acid and sodium chloride solutions have been effective for major carps.

e) Treatment and control of protozoan diseases- Treatment of ICH disease is 1:5000 formalin solution mixed into water for 7-10 days. For costiasis disease 3% common salt solution mixed into the water for 10 min. In trichodiniasis chelated copper compounds which are extremely effective against protozoan parasites.

5. Conclusion

Similar to others animals, fish can also suffer from different diseases. The present study totally based on freshwater fish disease so the study covered different freshwater system. Generally, now a day's freshwater system more polluted than previous year. For this causes fish parasite and pathogens are increased rapidly. Pathogens which can cause fish disease include Bacteria, viral infections, protozoan and fungal infection. River area fish's disease cannot control or treatment but pond, hatchery area fish's disease can control or treatment by a proper process. Most of rural farmers are with little or no knowledge of aquaculture, health management and with inadequate opportunities to improve management skills and respond effectively to diseases problems. Most of them to not understand the signs of disease. Government have to more active to solve this problem.

6. Author's Contributions

This work was carried out in collaboration between the Authors. Authors KS designed the study area and collect the data and author RM collect the picture and analysis the Histological Picture. Author KS and RM wrote the paper. Both authors read and approved the final manuscript. All laboratory work done under on Department Laboratory (Zoology Colour Lab).

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