

A Review on Critical Care of Some Helminthic Infections Developing Life Threatening Diseases and Malignancies in Human

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Abstract

Perhaps, this is one of the attitudes of human psychology that we procrastinate everything until and unless any one of them proved either problematic, life-threatening or lethal to us. Similar is the case with helminthes infection in human. Sometimes, these infections are lethal to us if they are not treated well within time. The present paper deals with the study of some of the common helminthic infections developing life-threatening diseases in human in the light of recent researches done so far in the field of human parasitic helminthology.

Keywords: Human Helminthic Infections; Life-Threatening Diseases; Disease Complications; Cancer; Death

Abbreviation

TDS: Trichuris Dysentery Syndrome; IARC: International Agency for Research on Cancer

Introduction

Helminths are widely distributed all over the world. They are often called as worms. These worms are classified as nematodes, trematodes and cestodes. They are usually transmitted in humans either by contaminated foods and water or by close contact with the infected hosts. Similarly, humans are either definitive, intermediate or accidental hosts of the worms. Further, this is quite unfortunate for us that sometimes these helminthes infestation are taken very lightly and their chronic infections developed several life-threatening diseases, lethal complications, malignancies and even cancer in human. The present paper discusses riskiness and enormity of some of the helminthes lethality in human if not treated well within time (Chai *et al.* 2005, Schauntz 2006, Keiser and Utzinger 2009, Harhay *et al.* 2010, Ziegabauer *et al.* 2012, Wei *et al.* 2017, Wendt *et al.* 2019) [1-7].

Discussion

Nematodes

Let us begin with nematodes, a little bit structurally different, the roundworms are either as pinworms, hookworms or whipworms. Human intestines are the good reservoir of these gastrointestinal roundworms. However, they are also found in other body parts such as urinary bladder, liver, lymph, blood and brain developing life-threatening diseases as bowel obstruction and malignancies in human (Chai *et al.* 2005, Harhay *et al.* 2010, Ziegabauer *et al.* 2012, Wei 2017, Wendt *et al.* 2019) [1,4-7].

***Ascaris lumbricoides* (Ascariasis)**

One of the most problematic nematodes developing life threatening diseases in human, if not treated in time is *Ascaris lumbricoides*. This is worldwide in occurrence and mostly found in children. These worms can easily be visualized in stool samples. They can live in a human intestine for a couple of years. It causes life threatening bowel obstruction, pancreatitis and biliary and gall bladder ascariasis if misdiagnosed or left untreated for a longer period of time. However, primary symptoms of the disease are loss of appetite, nausea, vomiting, wheezing, abdominal pain, difficult breathing due to shortness of breath, coughing with blood, diarrhoea and fever (Dold and Holland 2011) [8].

***Wucheraria bancrofti* (Filaria)**

The next roundworm developing filarial deformity and even inferiority complex in human is *Wucheraria bancrofti*. It causes mainly foot elephantiasis, a kind of lymphadenopathy. However, it may also affect arms, scrotum, vulva and mammary glands. A person suffering from filariasis may also experience chronic asthma with tropical eosinophilia (Mathison *et al.* 2019) [9].

***Strongyloides stercularis* (Strongyloidiasis)**

Strongyloides stercularis develops a zoonotic nematode disease named as strongyloidiasis. This is easily transmitted in humans from cats and dogs. A life threatening hyperinfection syndrome is developed in humans due to the same infection causing respiratory and multiple organs failure with systemic sepsis. Further, in an immunocompromised individual the same infection is lethal close to death rate more than 90%. *Strongyloides* infection also developed gastric and colorectal cancer in human (Bounfrate *et al.* 2020, Sampath *et al.* 2020) [10,11].

***Trichuris trichiura* (Trichuriasis)**

Similarly, *Trichuris trichiura*, a roundworm infection also causes the life threatening trichuris dysentery syndrome (TDS) developing bloody and mucoid diarrhoea with rectal prolapse (Zanwar *et al.* 2015) [12].

Trematodes

Trematodes are also worldwide in their distribution transmitting in humans by contaminated soil, water or close contact with their respective hosts. They are the group of helminthes containing flatworms and flukes. While some of these trematodes developed lethal cancers in humans, others have usually been involved in causing life-threatening diseases in humans. *Schistosoma haematobium*, *Opisthorchis viverrini* and *Clonorchis sinensis* developed urinary bladder cancer, cholangiocarcinoma and clonorchiasis cholangiocarcinoma and liver cancer in humans respectively. Similarly, other trematodes like *Fasciola hepatica*, *Paragonimus wastermani* and *Fasciolopsis buski* also causes life-threatening diseases such as fascioliasis, paragonimiasis and fasciolopsiasis in humans (Chai *et al.* 2005, Keiser and Utzinger 2009, Sripa *et al.* 2012, Machicado *et al.* 2016, Qian *et al.* 2016, Berry *et al.* 2017, Wu *et al.* 2020) [1,3,13-17].

***Schistosoma haematobium* (Schistosomiasis)**

Schistosoma haematobium is a blood fluke developing schistosomiasis, a disease popularly known as the bilharzia in human causing lethal urinary bladder cancer in human. The disease is characterized by the hematuria, dysuria, obstructive uropathy with kidney failure due to bacterial infections. *S. haematobium* is classified as Group 1 biological carcinogen, an agent definitely carcinogenic to humans by the IARC, 2011. The disease is most commonly found in Egypt. However, this is also prevalent in other countries also as Iraq, Sudan, China,

Zimbabwe Malawi and Kuwait. (Elbaz and Esmat 2013, Berry *et al.* 2017) [16-18].

***Opisthorchis viverrini* (Opisthorchiasis)**

Opisthorchis viverrini is a next zoonotic fish trematode causing opisthorchiasis and cholangio carcinoma in human. This is generally called as Asian liver fluke mainly found in Thailand, Laos, Vietnam and Cambodia. *O. viverrini* has also been categorized in the Group 1 carcinogenic bioorganism by the IARC in 2009. Humans and other piscivorous vertebrate animals are the good reservoir and the definitive hosts of this pathogenic organism. In Thailand, it has been reported that approximately 10% of the Thai populations are affected. As the average life span of the liver fluke in human is about 20 years, initially it does not appear as a life-threatening one but as the disease progresses it develops hepatomegaly, gall bladder dysfunction, cholangitis, cholecystitis and fatal cholangiocarcinoma. However, their initial symptoms during the course of 20 to 30 years are chronic constipation, diarrhoea, abdominal pain, ascites, dyspepsia, anorexia, edema in legs and eosinophilia. Since, there is no any specific prescribed medicine available to cure the disease completely, only proper cooking of fishes can prevent the disease naturally. (Andrews *et al.* 2008, Kaewpitoon *et al.* 2008, Sripa *et al.* 2012) [13,19,20].

***Clonorchis sinensis* (Clonorchiasis)**

The third trematode found in some piscivorous animals including humans is *Clonorchis sinensis* developing clonorchiasis in humans. This is worldwide in occurrence mainly found in Russia, Japan, Korea, Vietnam, China and Taiwan. Though, this is also not a life-threatening fluke and can live in bile ducts and gall bladder for up to 30 years depending on the bile as feed their primary symptoms appearing intermittently are indigestion, nausea, vomiting, abdominal discomfort, diarrhoea, anorexia, weight loss, Jaundice, bile ducts obstruction, cholangitis, and the formation of gall stones. Finally, after a long period of time chronic clonorchiasis develops inflammations and fibrosis of the biliary tree, cholangiocarcinoma and the cancer of liver. *C. sinensis* has also been found potent biological carcinogenic organism definitely causing cancer in human by the IARC, 2009 and kept in Group 1 carcinogen (Huang *et al.* 2013, Tang, *et al.* 2016, Qian *et al.* 2016) [15,21,22].

***Fasciola hepatica* (Fascioliasis)**

Fasciola hepatica a giant liver fluke easily visualized by the naked eyes is mostly found in India. There are two species of *Fasciola* viz. *F. hepatica* and *F. gigantica* causing the same disease in humans. *F. hepatica* is mostly found in the liver of sheep, goat, cow, buffalo and the human. The life threatening conditions occur when these adult worms living in the bile ducts caused the rupture of liver capsule developing peritonitis. The extreme abdominal pain in the epigastrium or right hypochondrium with nausea and vomiting with intermittant fever is the primary clinical symptoms of the disease. In addition, "Halzoun" may occur where these worms are attached to the buccopharyngeal mucosa where they develop edema of the soft palate, pharynx and larynx. Some common symptoms are skin rashes, urticaria and feeling of airways obstruction as foreign bodies in throat. Further, Machicado *et al.* has reported it to be also linked with liver fibrosis, cirrhosis and cancer. However, a clear picture is still required to prove the disease as cancer (Almendras *et al.* 1997, Tolan 2011, Marcos and Terashima 2013, Machicado *et al.* 2016) [14,23-25].

***Paragonimus wastermani* (Paragonimiasis)**

Paragonimus wastermani is a Japanese lung fluke causing paragonimiasis in many far east Asian countries of the world like Japan, Korea, Philippines, South America, Magnolia, China, Taiwan and India. This is transmitted mainly by the consumption of undercooked, raw crabs or crayfishes. Humans and cats are the good reservoir of the worms. It infects the human lungs where they mature into an adult developing pneumonia. The incubation period of the disease is about 3 months but the worms can live in human for up to 20 years showing the symptoms of the disease intermittently as fever with reddish-brown mucus expectoration on coughing, hemoptysis, urticaria, abdomi-

nal pain and difficult breathing on exertion. The actual life-threatening conditions occur when a patient develops hemoptysis mimicking as tuberculosis. Here in lungs, the worms are encapsulated, ulcerated, bleed and heal over a period of time. It appears that the cases of *Paragonimus* hemoptysis is occurring next to tuberculosis globally. And, the condition is more worse where the disease is misdiagnosed either as tuberculosis or aspergillosis. The other life-threatening pleural, breast, hemorrhagic and cerebral paragonimiasis have also been reported (Romeo and Pollock 1986, Heath and Marshall 1997, Nawa 2000, Jun *et al.* 2003, Xia *et al.* 2014) [26-30].

***Fasciolopsis buski* (Fasciolopsiasis)**

Fasciolopsis buski is a largest known intestinal fluke found in the intestines of pigs and humans. Both the hosts are mainly affected by ingesting certain aquatic vegetations like water cress, water spinach, water chestnut, water caltrop, lotus and bamboo. *F. buski* is isolated from duodenum of a sailor in 1943 by George Busk in London. In India, this is mostly found in Bihar and Uttar Pradesh. However, this is endemic in Japan, Malaysia, China and Taiwan. Though, the symptoms of the disease are abdominal pain, diarrhoea, intestinal obstruction and perforations, ascites and appendicitis, the life-threatening allergic reactions also occur if not treated in time. (Gupta *et al.* 1999, Wang *et al.* 2005, Bhattacharjee *et al.* 2009, Mohanty *et al.* 2012, Cao *et al.* 2015, Khurana 2016, Wu *et al.* 2020) [17,31-36].

Cestodes

Last but not the least, cestodes, the tapeworms are worldwide in their distribution usually found in pork, dogs, sheep, beef, fishes and humans as their definitive hosts. As most of the larvae of cestodes look like a bladder, they are also called as the bladder worms. These worms when ingested humans developed life-threatening diseases as cysticercosis, neurocysticercosis and the hydatid disease in human (Schauntz 2005, Carpio *et al.* 2018, Melki *et al.* 2018) [2,37,38].

***Taenia solium* (Taeniasis)**

Taenia solium, a very common cestode distributed globally is an intestinal tapeworm developing life-threatening cysticercosis and neurocysticercosis diseases in human. These diseases are characterized by the muscle pain, convulsions, blindness, dizziness, dementia and eosinophilia. Neurocysticercosis are specifically represented by the lesions in brain, hydrocephallus, hypertension, seizures and epilepsy, paraplegia, meningitis and finally the death occurs. In India, the disease is mostly disseminated by the infected feces and the consumption of infected cabbage and pork. Therefore, the food materials must properly be cooked before taken as meal (Garcia *et al.* 2018, Melki *et al.* 2018) [38,39].

***Diphyllobothrium latum* (Diohyllbothriasis)**

***Echinococcus granulosus* (Echinococcosis)**

Further, the tapeworm *Diphyllobothrium latum* causes life-threatening intestinal obstruction due to its unusual length, also develops the pain of appendicitis. Similarly, *Echinococcus granulosus* develops life-threatening cystic echinococcosis in different human body parts as well. Further if these cysts are either macerated traumatically or during the process of surgical excision, the patient may suffer lethal anaphylactic shock. (Bitton *et al.* 1992, Eckert and Deplazes 2004, Moro and Schauntz 2009, Ramana *et al.* 2011, Sharma *et al.* 2018, Singh *et al.* 2020, Durrani *et al.* 2021) [40-46].

Conclusions

The present paper is a shadow of those picturizations dealing with the study of life-threatening and lethal consequences of some of the helminthes infection in human. The nematodes like *Ascaris lumbricoides*, *Wucheraria bancrofti*, *Strongyloides stercularis* and *Trichuris trichiura* developed the life-threatening diseases such as ascariasis, filariasis, hyperinfection syndrome and trichuris dysentery syndrome

with rectal prolaps in humans respectively. Similarly, the trematodes like *Schistosoma haematobium*, *Opisthorchis viverrini* and *Clonorchis sinensis* cause bilharzia, a urinary bladder cancer, cholangiocarcinoma, a bile duct cancer and cholangiocarcinoma with liver cancer in human. In addition, there are some other trematodes developing life-threatening diseases in humans are fascioliasis, paragonimiasis, fasciolopsiasis caused by *Fasciola hepatica*, *Paragonimus wastermani* and *Fasciolopsis buski* respectively. Lastly, the cestodes also developed some other life-threatening diseases in humans as taeniasis, diphyllbothriasis and echinococcosis caused by the *Taenia solium*, *Diphyllobothrium latum* and *Echinococcus granulosus*. Finally, in a nutshell all the above mentioned life-threatening diseases are cured if detected early and treated well within time.

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Ethical Clearance

Since the article is purely a review work hence it does not require an ethical clearance.

Conflict of Interest

The authors have declared that no competing interests exist amongst us. They have approved the final version of the manuscript contributing equally.

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