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Novel antipathy for schistosomiasis-the most lethal ailment of the tropical region

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To the Editor,

Schistosomiasis also named as snail fever is a combined name of parasitic diseases caused by several species of tropical trematodes belonging to the genus *Schistosoma*. Snails serve as the intermediary agent between mammalian hosts carrying this demonic disease. Individuals in developing countries who lack proper cleanliness and sanitation facilities and proper drinking water often fall as victims to contaminated water containing parasites[1].

Skin is the initial organ of contact where the parasite makes its first hideout and then transforms into another stage (schistosomula). Lungs and liver are the next area of migration, where it matures into the adult form. The adult worm then moves to specific body part depending on its species and sub-species. These areas include the bladder, rectum, intestines, liver, portal venous system (the veins that carry blood from the intestines to liver), spleen, and lungs. Schistosomiasis is not usually seen in countries like United States. It is often found in many tropical and subtropical areas worldwide[2]. Figure 1 illustrates the developed adult parasite and its body parts.

Figure 1. *Schistosoma* parasite.

1. Why is it named lethal?

Schistosomiasis is the second most socioeconomically devastating parasitic disease after malaria. The disease affects many people in developing countries, particularly children who may acquire the disease by swimming or playing in infected water[3]. When children come into contact with a contaminated water source, the parasitic larvae easily enter through their skin and mature further within organ tissues. As of 2009, about 74 developing countries statistically identified epidemics of schistosomiasis within their respective populations[4].

The newly transformed schistosomulum may stay in the skin for two days before locating a post-capillary venule which would be the primary target; from here the schistosomulum travels to the lungs where it undergoes further developmental changes necessary for subsequent migration to the liver. Eight to ten days after penetration of the skin, the parasite migrates to the liver sinusoids. *Schistosoma japonicum* (*S. japonicum*) moves more quickly than *Schistosoma mansoni (S. mansoni)*, and usually reaches the liver within eight days of penetration. Juvenile *S. mansoni* and *S. japonicum* parasites develop an oral sucker after arriving at the liver, and it is during this period that the parasite begins to feed on red blood cells thereby showing off the major symptoms in the human body. The nearly-mature worms pair, with the longer female worm residing in the gynaecophoric channel of the shorter male. An average adult worm measures about 10 mm. Worm pairs of *S. mansoni* and *S. japonicum* relocate to the mesenteric or rectal veins. *Schistosoma haematobium (S. haematobium)* schistosomula ultimately migrate from the liver to the perivesical venous plexus of the bladder,

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ureters, and kidneys through the hemorrhoidal plexus.

Figure 2 elucidates the life cycle of the deadly tropical parasite. The initial step would be from water to snails where the parasites penetrate into the snails. The sporocysts in snail undergo possible changes and then are released into the water. After the initial part of the life cycle, the cercariae are released and absorbed into the skin of humans where the most crucial step of the life cycle occurs. The parasite does all the devastating effects on human body[5]. The eggs thus released in the body are released through stools leading to transmission of the disease.

Maturity is attained by the parasites in about six to eight weeks, at which they begin to produce eggs. Adult *S. mansoni* pairs residing in the mesenteric vessels may produce up to 300 eggs per day during their reproductive lives. *S. japonicum* may produce up to 3 000 eggs per day. Many of the eggs pass through the walls of the blood vessels, and through the intestinal wall, to be passed out of the body in feces. *S. haematobium* eggs pass through the urethral or bladder wall and into the urine. In the digestive tract, only mature eggs cross the digestive tract, possibly through the release of proteolytic enzymes, but also as a function of host immune response, which fosters local tissue ulceration. Nearly half of the eggs released by the worm pairs become trapped in the mesenteric veins, or will be washed back into the liver. An average of four and half years is the time period of the worms to reside, but may even persist up to twenty years[6].

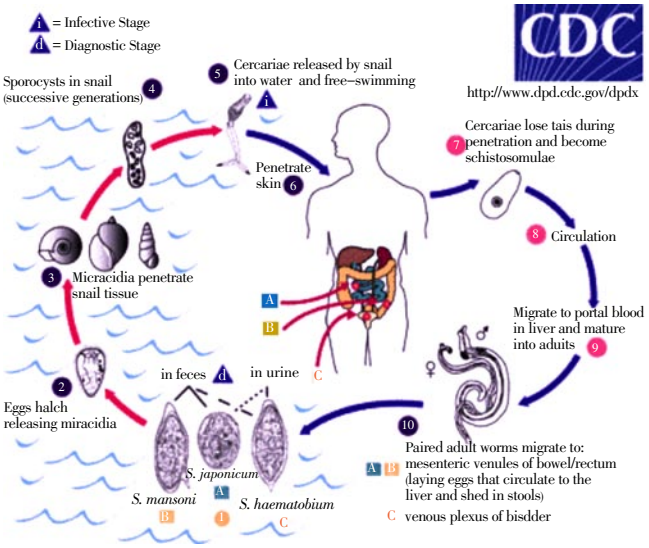

Figure 2. Life cycle of the schistosomulum.

Trapped eggs mature normally, secreting antigens that elicit a vigorous immune response. The eggs themselves do not damage the body. Rather it is the cellular infiltration resultant from the immune response that causes the pathology classically associated with schistosomiasis[7].

2. Intricacy of the parasite

Fever, chills, lymph node enlargement, and liver and spleen enlargement are the general symptoms or complications observed by heavy infestation. Secondary complications also do develop from these symptoms. Initial invasion of the parasites into the skin may cause itching and a rash (swimmer's itch). The schistosome is destroyed within the skin in such conditions. Intestinal symptoms include abdominal pain and diarrhea (which may be bloody). Symptoms related to the urinary system may include frequent urination, painful urination (dysuria), and blood in the urine (hematuria).

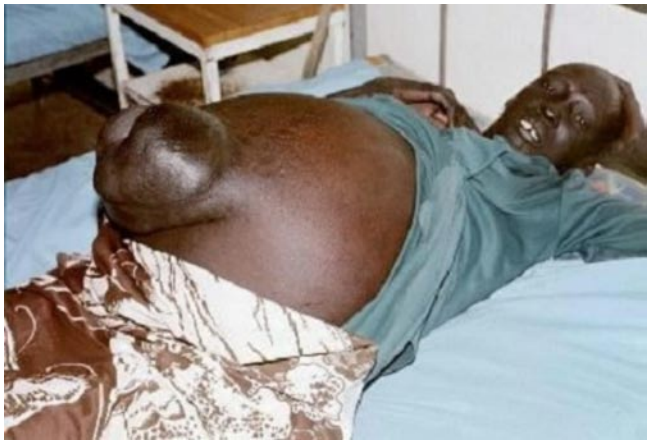

Figure 3. Patient with schistosomiasis having enlargement of the liver.

If left untreated, the adult parasite may progress to attack liver and spleen, causing more complications. It can also infect urinary tract, increasing the risk of getting squamous cell carcinoma. It would trigger renal stones by causing secondary infection. In extreme cases, schistosomes may cause renal failure. If it attacks gastrointestinal tract, you may have complications like bleeding in the gastro-intestine and malabsorption. There may be symptoms of iron deficiency and lesions begin to develop in the colon and also on the rectum. It can attack liver, causing fibrosis.

On rare occasions, it can invade lungs, causing pulmonary hypertension or chronic pulmonary infection.

Schistosomiasis affects the uterine environment during pregnancy. These pregnant women develop severe anemia, have low birth-weight infants, and are at increased risk for infant and maternal mortality. Schistosomiasis has been found in placenta, and newborns have been diagnosed with this condition, thus confirming congenital infection. Infected pregnant women have a higher rate of spontaneous abortions and a higher risk for ectopic pregnancies. In addition, increased pelvic blood flow during pregnancy is thought to increase the infection load[8].

3. Novel approach

Patients should receive antischistosomal drugs and corticosteroids, especially if acutely ill. Steroids reduce inflammation and help suppress changes that result from killing of the parasites. As maturing schistosomes are less susceptible to therapy than adult worms, a second course of treatment is necessary. This is given several weeks after the first course of therapy.

4. Praziquantel as the apt boulevard

The drug of choice for treating all species of schistosomes is praziquantel. Cure rates of 65%-90% have been described after a single treatment with praziquatel. In individuals not cured, the drug causes egg excretion to be reduced by 90%[9]. Praziquatel affects the membrane permeability of the parasite, which causes vacuolation of the tegument. It paralyses the worm and exposes it to attack by the host immune system. However, as praziquantel is ineffective on

developing schistosomula, it may not abort early infection. Praziquantel can be used in pregnant and lactating women[10].

Treatment of schistosomiasis affecting the central nervous system consists of praziquantel with glucocorticoids. In central nervous system disease, corticosteroids are used to reduce inflammation and edema around eggs. In patients with neurological complications like seizures, anticonvulsant therapy may also be needed. Patients are to be observed with suspected or known cysticercosis as they may deveop seizures or neurologic effects from dying cysticerci.

World Health Organization recommends giving praziquantel to pregnant and lactating women to decrease the disease burden and improve the pregnancy and fetal outcomes[11].

It was proven positive in many aspects. A retrospective study of 88 women with schistosomiasis who received praziquantel during pregnancy, in a mass treatment campaign, did not show an increase in the rate of abortion, preterm deliveries, or congenital abnormalities compared with untreated women[12].

5. Other antipathys

There are no vaccines for the disease; however clinical studies show that artemether may be used as a prophylactic agent if given once every 2-4 weeks[13]. In general, travelers are said to be attacked most by such parasites. Topical lipid formulations of N, N-diethyl-m-toluamide (DEET), such as lipo DEET, are effective in killing schistosome cercariae. Minimal absorption, low cost, and a range of activity against insects and schistosomes make this compound an excellent prophylactic agent against human and animal schistosomiasis, especially for travelers[14]. Also artemether, which is used as antimalarial treatment, is also active against all 3 major schistosome parasites (mainly schistosomula)[13]. In addition, the combination of artemether and praziquantel can kill schistosomula during the first 3 weeks of infection and is synergistic with praziquantel in killing adult worms[15]. The high efficacy of mefloquine-artesunate against *S. haematobium* warrants further investigation. Individuals co-infected with *Plasmodium* and *Schistosoma* who are treated with a mefloquine-artesunate combination against malaria may experience a dual benefit: clearance of malaria parasitemia and reduction of schistosomiasis-related morbidity[16].

6. Conclusion

Many such tropical parasites are existing in the world especially in underdeveloped and developing countries in the Asia-Pacific region. The weather conditions, environment, poverty and lack of proper sanitation are the major causes of rampant spread of such life taking diseases. Many of the parasites are life taking while some leave the individuals with some serious complications. Awareness, granting the researchers and supporting them will definitely help in eradicating such demons from the world. This article definitely acts as an active endorsement for researchers in fighting against schistosomiasis and saving the tropical region.

Conflict of interest statement

I declare that I have no conflict of interest.

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