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Understanding Schistosomiasis: A Neglected Tropical Disease in Nigeria

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Abstract:

Schistosomiasis, a disease caused by parasitic worms, is a significant health concern in many parts of the world, particularly in areas with poor sanitation. The disease is prevalent in sub-Saharan Africa, South America, and parts of the Middle East, affecting millions of people, especially school-age children. In Nigeria, schistosomiasis is a leading neglected tropical disease, with approximately 29 million cases and 101 million people at risk of infection. The disease is caused by three main species of Schistosoma: S. haematobium, S. mansoni, and S. japonicum. The life cycle of Schistosoma involves an intermediate host, a freshwater snail, and a definitive host, humans. Infection occurs through contact with contaminated water, and the parasite can cause significant morbidity, including anemia, malnutrition, and organ damage. The symptoms of schistosomiasis can vary depending on the species and the stage of infection. Acute schistosomiasis can cause fever, rash, and abdominal pain, while chronic infection can lead to liver and spleen enlargement, bladder damage, and increased risk of cancer. Diagnosis is typically made through microscopic examination of stool or urine samples, and treatment involves antiparasitic medication. Prevention strategies include improving sanitation, providing clean water, and promoting hygiene practices.

Keywords: *Schistosomiasis, S. haematobium, S. mansoni, and S. japonicum, promoting hygiene practices*

Introduction

Schistosomiasis a disease otherwise dubbed as bilharzia has been related to be due to the infection of parasite worms. The worms causing the disease include *Schistosoma mansoni, S. haematobium,* as well as *S. japonicum* are affecting the human race. In some rare situations, *S. mekongi* and *S. intercalatum* are other causes of the disease (Dawaki et al., 2015; Oyeyemi et al., 2020). Along the disease transmission cause, the Infection of the disease take place through contact of skin and polluted water containing the snail that carries the parasite (Dawaki et al., 2016). In freshwater, contamination easily occurs when Schistosoma eggs are divulged by an

infected person through urination or open defecation in water. Thus, the eggs are hatched and when they reach specific snails they ultimately certain types develop and multiply within the snails' body. Therein, the parasite gets out of the snail into the fresh water. In the water, the parasite can live for about leave two days or 48 hours (Singh et al., 2016). The Schistosoma parasite is adapted to enter the human skin during bathing, swimming, wading, washing or relations provide the is contaminated. It takes the parasite some weeks to mature and become the adult worms, and stay inside the blood vessels where the females produce eggs.

Therewith, portions of the eggs are shuttle into the bladder or intestine and released in and stool or urine (CDC, 2018; Rinaldo et al., 2021). Signs and symptoms of schistosomiasis during the few days after infection include itchy skin. Later in the next 1-2 months chills, fever, cough, and muscle aches can be seen. Many people harbor the infection without showing any symptoms during the early phase (Anthony et al., 2019; In & Lee, 2017). Presence of adult eggs or worm leads to shuttling to the liver, bladder, intestine, and thereafter causing inflammation or scarring. In children who are serially affected by the infection suffers from malnutrition, anemia and learning difficulties. A long-term infection that lasts for years can damage the vital organs of the body such as the lungs, intestine, liver, intestine, and bladder. In some uncommon scenarios, the eggs travel to the brain or spinal cord to spur inflammation, paralysis, and seizures (Anyolitho et al., 2022).

Geographically, *Schistosoma mansoni* mostly occurs in sub-Saharan Africa and some South American countries like Venezuela, and Brazil. It has also been found in Caribbean, and with Arab countries. *S. haematobium* has been related from Africa and some few places in the Middle East. *S. japonicum* is reported from in Philippines, China and Sulawesi (Hamburg et al., 2021). The other species that are rare in humans are comparatively restricted geographically with *S. mekongi* occurring in some places in Laos and Cambodia. While, the *S. intercalatum* is being specifically reported from the Democratic Republic of the Congo; and the *S. guineensis* is determined in West Africa (Johnbull et al., 2021).

1.2 Statement of the Problem

Nevertheless, Schistosomiasis is an important cause of disease in many parts of the world, most commonly in places with poor sanitation. School-age children who live in these areas are often most at risk because they tend to spend time swimming or bathing in water containing infectious cercariae (Aula et al., 2021). If you live in, or travel to, areas where schistosomiasis is found and are exposed to contaminate freshwater, you are at risk (Nelwan, 2019). Schistosomiasis is still a leading Neglected Tropical Disease prevalent in tropics and subtropics with most elevated prevalence and highest morbidity in school-aged children, and youngsters. Its negative impacts are lowered school performance, debilitation, and low overall growth and development in endemic areas (Gamde et al., 2022). Albeit, the urogenital schistosomiasis is due to *S. haematobium*, it is known with dysuria, hematuria, bladder wall pathology, hydronephrosis. In some instances, it can spur squamous cell carcinoma. Sadly, efforts to address the disease are affected by the lack of baseline data on the distribution of the disease. A Nigeria master plan for NTDs 2013-2017, shows that, from the 37 states of Nigeria, mapping and baseline surveys about the disease were only done in the total of 19 states of the in southern and western parts of Nigeria. Thus, the schistosomiasis has been completely mapped in only 9 of those states. Indeed, there is a scarcity of data that needs to be relieved (Dawaki et al., 2016; Akinneye et al., 2018; Umoh et al., 2020).

In Nigeria and the likes, the Schistosomiasis is still a daunting challenge and a disease of public health importance that inflicts on the approximately 779 million individuals at risk (Rinaldo et al., 2021). Globally, Nigeria is the country that records the most elevated prevalence of the

disease schistosomiasis. In the same vein, bout 29 million cases and about 101 million risk of infection in 2010 (Rivadeneira & Luo, 2019). Nevertheless, the high prevalence of urinary schistosomiasis in the country can be as a result of vast availability of the host snail of *Bulinus spp*. (the host of *S. haematobium*) and the lack of sanitation and hygiene resulting from indiscriminate urination and open defecation that culminates to the release of haematobium eggs by infected individuals into the water. There are other many factors, like poverty, poor sanitation, poor healthcare, ignorance, poor social amenities availability that spur the elevated prevalence of urinary schistosomiasis in developing countries. Children are usually prone to urinary schistosomiasis, because of a strong they tend to play near water bodies (Jibia & Sani, 2019).

1.3 Objective of the Study

The objective of this study is to give an overview of schistosomiasis.

2. 1 Schistosomiasis

The word schistosome is otherwise called as schistosoma, and it is referring to 'split body' because it males are identified with a ventral groove act is popularly known as gyhocophoric canal. The canal is responsible to serve as a house to the female. These parasites are typical examples of platyhelminthes, flat in shape and are flashy flat looking worms. These worms are different from trematodes in the sense art, they male and female has a distrinct male or female reproductive organs (they are regarded as disecious). However, they are capable of living within the bloodstream of the host (the warm blooded animals). In most of the cases, the infections regarding schistosoma is due to the prevelent species like the *S. haematobium, S. japomicum, and S.mansoni.* other insufficient infections are due to the *S. intercalatum* and *S. meleongi* species (Singh et al., 2016; Nelwan, 2019).

2.1.1 Life cycle

A cercarial penetrates human skin during bathing, washing, fishing, farm work e.t.c or any means of contact with water that was already polluted by the feces (containing the parasites). The intermediate hosts of the parasites include the *B. pfeifferi* and *B. Sudanica* are spatially distributed a norm that limited the distribution of the infection. Feces or urine of the infected person convey the parasites, where the eggs are released (under suitable conditions). Thereof, meracidia is divulged. Miracidia is expected to swim and find its way in to the snail (intermediate host). In the snail's environment, the 2 sporocysts generations are to take place and the synthesis of cercarieae. The snails release the infection cercariae that swimming and invade the human skin (Nelwan, 2019).

2.1.2 An association between human and the parasite

Within the ecosystem, organisms interact with each other for various purposes such as food and shelter. These associations between human and the parasites can be like predation, symbiosis, competition, saprophytism, and parasitism among others. In parasitism an association between two or more organisms occurs whereby one organism known as the parasite line on or in the host and derives benefits while harming the host. Parasites living in our side an organism are ecto-parasites, while parasites living within hosts body are known as Endo-parasites. In this kind of relationship, called parasitism, the parasites obtain food, shelter and protection against being eaten by other organisms. Whereas the host organism being affected by the parasite suffers harms. Serious diseases, damage to tissues and organs deposition of toxic substances, malnutrition, deficiency, poor health, and even death are some of the harms suffered by the host organisms during the parasitism (Sady et al., 2015).

2.1.3 Mode of association

Parasites have developed and adequate mechanisms to be able to live profitably during the host-parasite interactions, for example, they have ability to cling the hosts body without being they able to release enzymes that dissolve tissues of the host, they have organs to absorb nutrients from the host and organs to enter the host body. Likewise, parasites are well adopted to survive harsh conditions for example, many of them are hermaphrodites have well developed reproductive system producing large chunk of eggs to survive in the life cycle; they also have resistant body linings to invade being cleared by host enzymatic system they are able to live in the environment characterized with low oxygen concentration (Kassal et al., 2005; Olveda et al., 2013).

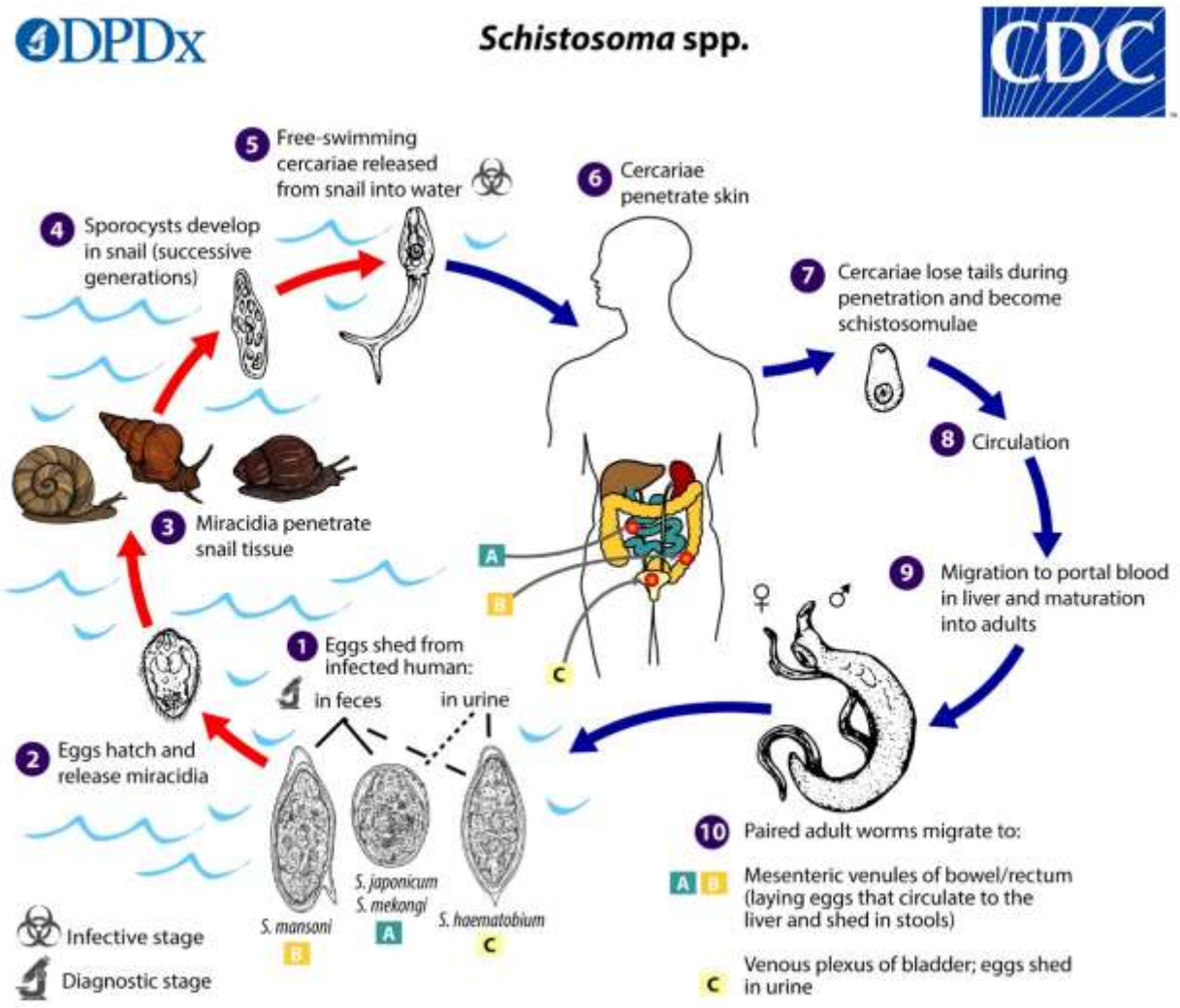


Figure 1: Life cycle of Schistosoma spp.

2.2.1 Schistomia mansoni

S. mansoni is responsible for eliciting infection in the intestine, popularly known as intestinal schistosomiasis. It is vast in the Africa states, India, Arab countries (middle east), South America, Brazil e. t. c It occur in farming areas especially due to the facilitation of water bodies such as streams, pounds, lakes, irrigation, dams e.t.c(Singh et al., 2016; Nelwan, 2019).

2.2.2 Life cycle

In the human host, forked tail is cut up to make schistosomulae, an entity that travels in the tissues to the vein. Adult types stay in the mesenteric venules. Female parasites dispose eggs in the little venules of the portal and perivesical system. Eggs are transported towards the intestine lumen. *S. mansoni* or *S. japonicum* (peculiar to the bladder) and *S. Hematobium* (specific to the bladder and ureter) are disgorged outside the body via urine and feces (Singh et al., 2016; Nelwan, 2019).

2.2.3 Pathogenesis

The disease is severe according to the time, infection load, other infections present, and location of the infection. Infection popularly led to Katayama fever (acute schistosomiasis), skin rash, excretion of eggs, liver damage, GIT problems, chronic inflammation, bowel wall hardening, balder fibrosis, rectal polyps, etc. these are some of the pathogenic effects of the parasites (WHO, 2022).

2.2.3. Clinical features

"Swimmers itch" is the immediate observed thing as the parasite invades, and this is noticed 2-3 days, itchy rash is also seen. During invasion, fever, cough, malaise, and general allergy are noticed. These observation lead to the clearance of the cercariae and schistosomula and later released (Singh et al., 2016; Nelwan, 2019). Acute schistosomiasis is known with fever, chill, dermatitis, headache, eosinophilia, general lyphaenopathy, and hepatosplenomegally as a result of immune system response to the invasion of the parasite. When the parasite is established, large chunk of eggs is disbursed through excretion. *S. mansoni* and *S. japonicum* eggs enter the walls of the intestine and elicit bloody diarrhea. Eggs of s. *hematobium* elicit dysuria, frequent urination, and blood released in urine as a result of damaged bladder. At chronic stage, *S. mansoni* and *S. japonicum*, a condition of portal hypertension, esophageal varices, and ascites are noticed. *S. hematobium* obstructs smooth flowing of urine, elicits polyps, and bladder ulcer take place. Chronic intestinal schistosomiasis causes portal hypertension. The infection can stay for several years causing colicky abdominal pain, blood in diarrhea, poor growth, and fatigue in children (WHO, 2022).

2.2.4 Diagnosis

The infection due to Schistosoma is diagnosed based on the signs and symptoms, endemic area visitation, tests, that reveal egg of the parasites.

2.3.1 *S. haematobium* causes urinary schistosomiasis

The disease urinary schistosomiasis is due the activity of the *S. haematoboium* parasite, a species that is endemically found in about 54 countries across the world. Most of the endemic areas are found in Africa, and parts of Mediterranean due to irrigation, dams, flooding etc (WHO, 2022).

The lifecycle if the *S. hematobium* resembles the *S. mansoni* species. In *S. hematobium* the *Bulinus Africanus* is the host in many parts of Africa. The parasites are paired within the liver blood vessels for transfer to the veins in the bladder. The female confine eggs in the venules in the bladder. Large amount of the eggs enters the mucosa inside the bladder lumen to be egested via urine. Eggs can stay in the bladder, rectal mucosa tissue, liver, reproductive organs, and ureters as well (WHO, 2022).

2.3.2 Pathogenesis of *S. hematobium*

S. hematpbium pathogenesis occurs in a similar fashion to that of the *S. mansoni* during the inactive and acute stages. Suring the established stage, the eggs enter the bladder and spur bleeding during urination. Egg concealed in the bladder causes inflammation, and what is known as “Sandy patches” within the bladder. Long term infection can cause obstruction of the ureter, reduction in function of the bladder, and obstructed renal disease or kidney failure.

2.3.3 Clinical features

Most of the inflammatory responses made by the host ae due to the eggs of S. *hematobium* in the tissues; in turn, this can cause bladder or ureter damage (or all). Most of the affected children are presented with frequent urination, blood in urine, and dysuria. Granuloma, can occur as well (WHO, 2022).

2.4. Other species of schistosoma

Other species of schistosoma are as described as follows:

S. japonicum is prevalent in China, Philippines, and Indonesia. It exerts clinical pathologies like the *S. mansoni* infection. It causes liver and spleen enlargement in humans and it has the capacity of infecting animals like pigs, sheep, cattle, rodents, cats, dogs, etc. In the laboratory, the parasite is diagnozed by finding the eggs in feces or rectal biopsy. The eggs features are ovoid and lateral spine. *Schistosoma intercalatum* is rare and poorly pathogenic. It has an schistosoma matures in human body and elicits intestinal schistosomiasis in West Africa region causing dysentery, and lower pain of the abdomen. Eggs are cornered within the tissues; thus, less immune response is triggered. Its eggs are diagnosed with terminal spine (Singh et al., 2016; Nelwan, 2019).

5. Conclusion

In conclusion, schistosomiasis remains a significant public health concern in Nigeria, particularly in areas with poor sanitation and hygiene. The disease is caused by parasitic worms, including *Schistosoma mansoni, S. haematobium, and S. japonicum*, which can lead to severe morbidity and mortality if left untreated. The prevalence of schistosomiasis is highest among school-age children, who are often exposed to contaminated water while swimming, bathing, or engaging in other activities. Efforts to control the disease are hindered by a lack of baseline data on its distribution, as well as inadequate sanitation and hygiene infrastructure.

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