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Review On Epidemiology And Public Health Importance Of Schistosomosis In Ethiopia

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Abstract: Schistosomosis is a chronic debilitating infection of humans and animals, and hence the disease is of public health importance. Different species of schistosomes can be found in animal populations, such as *Schistosoma rodhaini* in wild rodents and antelope, and *S.bovis* in domestic cattle which is one of the major veterinary problems. Animal populations can also serve as reservoirs for schistosomes that more commonly infect humans, including *S. japonicum* and *S. mansoni*. The presence of schistosomosis is directly related with the geographical distribution of snail intermediate host. *Schistosoma* resides in mesenteric and portal veins causing various pathologies, mainly acute intestinal and chronic hepatic syndromes with various forms of visceral lesions. The pathogenesis and pathologies of *Schistosoma* infections correlate with the life cycle of the parasite and most lesions depends on the species of schistosomes, the duration of infection, the number and location of eggs trapped in the tissues. Epidemiological factors like ecology (Lake Stream and Irrigation) in Ethiopia favors for endemicity of schistosomosis. The prevalence of schistosomosis in different regions of Ethiopia is also discussed. Routine diagnostic metodes, serology and more recently advanced molecular techniques are available for diagnosis of schistosomosis. The treatment is by using Praziquantel and other similar schistosomicidal drugs. Environmental sanitation, educating the society, snail control, fencing of infested waters and marshy areas and others are indicated for control of schistosomosis.
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1. Introduction

Parasitic diseases are common in many parts of the world mainly in tropical and sub-tropical Countries. Among parasitic diseases of zoonotic importance, Schistosomosis which is infection with trematods of genus *schistosoma* is the major one. The Bilharziosis, blood fluke disease and Snail fever are the synonymies of the Schistosomosis. Schistosomosis is the most common disease In Eastern Asia, Africa and India (Bont, 1995; Jocelyn, 2004). The disease cause significant losses due to chronic or long term effects on animal growth and productivity and increase susceptibility to other parasitic or bacterial disease (Dargie, 1980; Mc-Cauley *et al*., 1983, 1984).

Schistosomosis is a major growing health problem in Ethiopia (Jemaneh, 2000). Developing countries face the biggest challenges because, the clean water is not always accessible and many times untreated bodies of fresh water is used for different purposes. This disease is one of the most serious parasitic diseases next to malaria and also listed as one of the neglected tropical disease (Barry and Hughes, 2008). The common Schistosome spp affect human are S. *japonicum, S. manasoni, S.haematobium, S. ekongi, S.intercalatum*, *S.guineensis, S.matheei and S. alayensis* (Standley *et al*., 2012). Among them two clinical forms of human Schistosomosis occur in Ethiopia are *S. mansoni* which is transmitted by *Biomphalaria* and *S. haematobium* which is transmitted by *Bulinus* species (IAMAT, 2012).

German physician Theodor Maximilln Bilharz is the first who describes the cause of urinary Schistosomosis in 1851. Since then, schistosomosis is a disease of animal and man caused by many species of schistosomes (Barry and Hughes, 2008). In Ethiopia studies on animal schistosomosis are very scanty, despite the fact that the country has many wetlands that can support the multiplication of snails and the development of infective cercaria.

Therefore, the objective of this seminar paper is:-

- To review and compile current information on epidemiology and public health importance of Schistosomosis in Ethiopia.

2. Biology Of Schistosomes And Their Snail Intermediate Hosts

2.1. Taxonomy and Morphology of schistosomes

The parasite that causes schistosomosis belongs to Kingdom Animalia, phylum platyhelments, Class Trematoda, Order Digenea, Family Schistomatidae, Genus Schistosoma and several species. The species include *S.bovies, S. matheel, S. haematobium, S. ansoni, S. japonicium, S. intercalatum, S. leiperi, S. curasoni, S. margrebowel, S.spindale, S.guineensis, S. ndicum, S.rodhaini, S. incognitum, S.edwardense, S. mekongi, Orientobilharziaturkestanium* and *sinensium* (Standly *et al.,* 2012).

Adult schistosomes share all the fundamental features of the digenia. They have a basic bilateral symmetry, oral and ventral suckers, a body covering of a syncytial teguments, a blind- ending digestive system consisting of mouth, esophagus and bifurcated caeca; the area between tegument and alimentary canal filled with a loose network of mesoderm cells, and an excretory or osmoregulatory system based on frame cells. Adult worms tend to be 10-20mm (0.4-0.8inch) long and use globin from their host's hemoglobin for their own circulatory system. Unlike other trematods, the schistosomes are dioecious, i.e., the sexes are separate. The two sexes display strong degree of sexual dimorphism, and the male is considerably shorter and larger whereas the female is thinner and longer. The male surrounds the female and encloses her in gynacophoric canal for the entire adult lives of the worms, where they reproduce sexually (Brant *et al*., 2006).

Figure 1: The mature male and female Schistosome worm (Brant *et al.,* 2006)

The different Schistosome species can be differentiated through morphology, chromosomes, host specificity or enzyme and DNA studies. Some schistosomes are specific to certain organs and produce eggs with terminal or lateral spine. The schistosoma species are also differ from each other by their egg size (Jones *et al.,* 1997).

S.mansoni *S. japonicium* *S. haematobium*

Figure 2: Eggs of different types of Schistosoma species. **Source**: (Brant *et al.,* 2006).

2.2. Taxonomy and morphology of snail intermediate Host

The taxonomy and morphology of fresh water snails which act as the intermediate host of Schistosome are in the kingdom Animalia, phylum Mollusca and class Gastropoda. Classification is based primarily on morphological characteristics, such as shell and radula, as well as differences in their anatomy, especially the reproductive systems. The intermediate snail hosts for schistosomosis are mainly weak-shelled, aquatic animals. All species of snail susceptible to infection with *S.mansoni* and *S.haematobium* belongs to family Planorbidea in the sub class Pulmontana. *S. mansoni* infects snails in the genus Biomphalaria. *S. haematobium* infects pulmonate snails of genus *Bulinus* (Ponder and Bouchet, 2008).

Intermediate snail hosts belong to family Pomatiopsidae, in the sub class Prosobranchiata, harbor *S. japonicium, S. mekongi*, and *S. malagenesis*.

This snail group has conical or sub conical shells with 4-8 dextral whorls, and rarely exceeds 10mm in height. The shell surface may be smooth, have fine axial growth lines, or strong axial ribs. It may also contain a poucispiral ridge or concentric rings on the corneous or calacareous gill. They are dioecius, and must copulate to produce viable eggs. Snails in the genus Neotrichula are susceptible to produce viable eggs. Snails in genus Neotrichula are susceptible to infection with *S. mekongi*, while those in the genus Robertsiella are infected by S.malayensis. S. japonicium is found primarily in amphibious snails of the genus Onncomelania (Adema *et al*., 2012).

Table 1: Major Schistosoma species, adult female length, uterine egg counts, egg size (length x width) and hosts affected.

Schistosoma spp.	Adult female (mm)	Number of uterine eggs (mean)	Egg size	Hosts affected
S. haematobium	13.5-22.5	4-56(29)	*144x58*	Man, monkey
S. intercalatum	13-28	12-54(30)	*175x62*	Man, rodent
S. matheei	17-25	5-42(26)	172x53	Cattle, heep, goat, man
S. bovis	13-14	5-62(29)	202x58	Cattle, sheep, goat, antelope
S. curasoni	18.3-25.5	47-65(50)	149x63	Cattle, sheep, goat, antelope
S. margrebowiei	20-33.8	30-205(130)	87x62	Antelope
S. leiperi	7-14.8	6-17(12)	270x53	Antelope, cattle
S. mansoni	7.2-14	1	142x60	Man, monkey
S. indicum	4.9-26.4	86	122x57	Cattle, sheep, goat, horse, camels
S. spindale	7.2-16.2	4-5	382x57	Cattle, sheep, goat, horse, antelope
S. nasale	6.9-11.7	0-2(1)	382x70	Cattle, goat, horse
S. incognitum	2.6-7.6	1	456x66	Pig, dog
S. japonicium	15-30	161	81x62	Man, dog, cat, rat, cattle, sheep, goat, water buffalo, horse, pig

Source: (Jones *et al*., 1997).

3. Life Cycle Of *Schistosoma*

Inside the final host, the female parasite produces 200-3000 eggs per day, depending on the species. The eggs exit from the host by penetrating the gut or bladder wall and being passed with host feces or urine. When deposited in water, the embryonated eggs hatch releasing free swimming miracida which only live several hours. In that time they actively seek suitable intermediate hosts (amphibious snails) using chemo taxis despite absence of eye spots. All *schistosoma* spp demonstrate quite narrow host specificity for particular snails: for instance *S.mansoni* infects *Biomphalaria* spp, *S.japonicium* infects *Oncomelaria* spp and *S. heamatobium* and *S.bovis* infects *Bulinus* spp. The miracidia invade the soft tissue of snails and form sporocysts by asexual reproduction after 4-6 weeks of infection. Then the sporocysts migrate to different organs in the snail. The Schistosomes do not produce redia stage; instead the sporocysts produce cercariae which are released in to water (Urquhart *et al*., 1996; Karin and Peter, 2011).

The free- living cercariae with bifurcated tail, when animals and humans (final host) contacts with fresh water containing this infectious larvae, which penetrate the intact skin and, in the process, they shade their forked tail to become schistosomulae. Schistosomulae migrate the skin in to the blood and lymph vessels and are carried to the heart and lung. They then migrate through the pulmonary capillaries in to the left side of the heart and, from there, into the arterial circulation. They are carried to mesenteric arteries, spleenic arteries and portal veins, subsequently reaching the liver where they mature in to adults over a period of 1-4 weeks (Urquart *et al.,* 1996). Different spp of schistosoma have a propensity to affect different organs. The adult worms migrate against portal blood flow to varying destinations. For instance, *S.japonicium* and *S.mekongi* migrate to the mesenteric venules of the colon and *S. heamatobium* to the vesical venous plexus. The adults remain in these blood vessels for life, residing in permanent copulation and adhering to the wall of blood vessels with suckers. These worms usually survive for 5-7 years but can persist for 30 years (Karin and Peter, 2011).

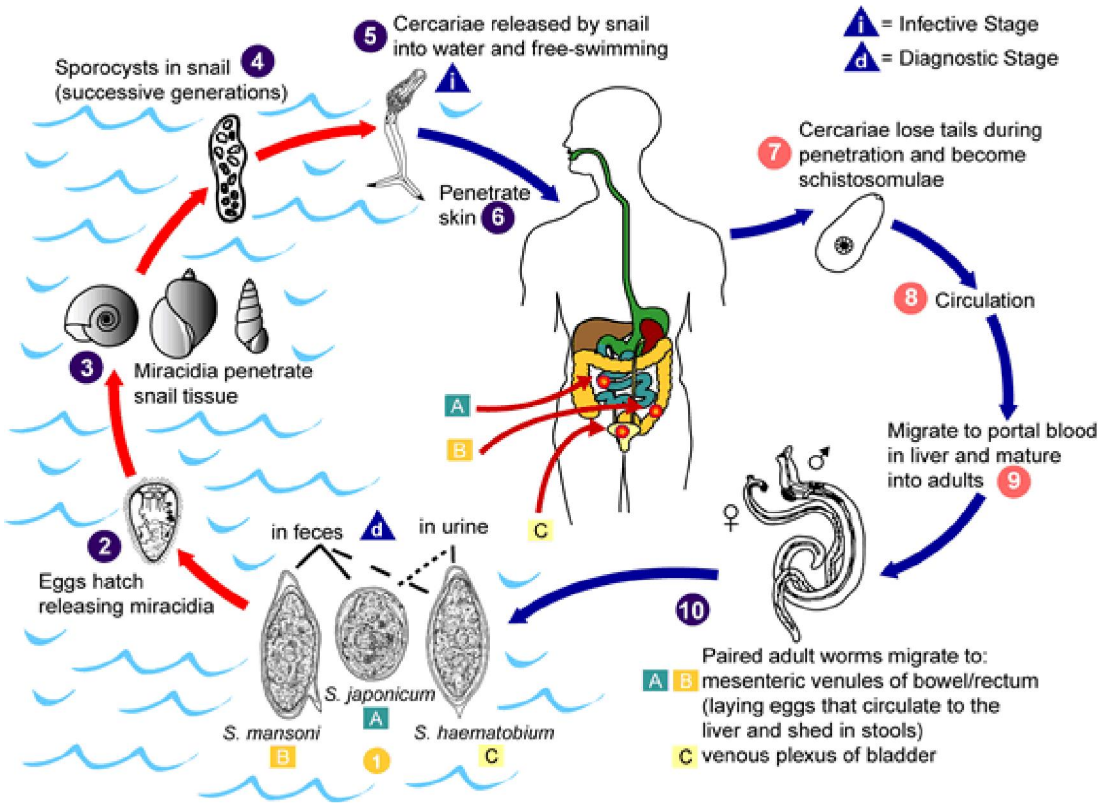

Figure 3: The life cycle of schistosoma. **Source**: (CDC, 2002).

4. Pathogenesis And Clinical Features

Pathogenesis can be due to egg and larvae or adult stage of the parasite. Eggs penetrate the blood vessels in which the adult worms are residing or during travel via the portal venous systems by spine. In the bowel, granulomatos inflammation around the invading eggs can result in intestinal ulceration and scaring. In the liver, eggs lodge in portal veins, where they elicit a granulomatous fibrosing reaction that can eventually lead to blockage of venous blood flow (Andrade, 1987). A host mediated TH2 cells induced fibrogranulomatos inflammatory response occur in reaction to the parasitic eggs, which may result in activation of hepatic stellate cells (Jubb *et al*., 1993).

Schistosomes are obligatory hematophagus parasite and cause anemia. Up on death in the veins, disintegration products of the adult parasites may cause toxemia and associated pathologies (Sastry, 1983). Generally, the interaction between the parasite and host immune response is complex. Adult worms absorb host proteins and coat themselves with antigen. So they can reside in the blood stream for years without being attacked by the immune response to adult worm is minor cause of clinical disease, when compared with invading ova (Fekade *et al.,* 1989).

Clinical signs can be divided in to acute and chronic stages of infection. Pruritic rash at the site of larval entry which is called "*Swimmer's itch"* and sudden onset of fever due to hypersensitivity reaction against the migrating parasites are some of acute Clinical signs of schistosomosis (Jones *et al*., 1997). Granuloma on nasal mucosa (Fischer and Say, 1998) coughing and wheezing (Marilyn and Gary, 1994), chronic and intermittent abdominal pain, poor appetite and diarrhea (Stephenson. 1993), Splenomegally, portal hypertention, cirrhosis and atrophy of liver leads to ascites, which is the leading cause of morbidity and mortality (Andrade *et al.,* 2001), heamaturea, dysuria and ulcerative lesions in genital organs are among the most common Chronic clinical signs of schistosomosis both in animals and human (Karin and Peter, 2011).

5. Epidemiology

5.1. Occurrence

The disease has acute, sub-acute and chronic course depending on the amount of primary infection. Acute and sub-acute infections are restricted to young cattle and adults undergoing primary infections (Dargie, 1980). The disease is severe in sheep than other domestic ruminants. However, frequent and infection usually occurs in cattle, sheep and goats are reluctant to enter water, and the efficiency of oral infections is less important than the percutaneous route of infection (Solomon, 1985; Chchristensen *et al*., 1982). Bilharziosis is tropical and sub-tropical infection in the world (Siah, 1989).

5.2. Transmission

For schistosomosis transmission to take place, the ecologies of the schistosomes, the aquatic snail intermediate host and the definitive host must converge in space and time in suitable water bodies. By affecting the transmission cycle of schistosome parasite directly or indirectly, numerous factors act to determine the transmission of Schistosomosis. Infection occurs when skin comes in contact with contaminated fresh water in which certain types of snails that carry Schistosomes are living. Although schistosomosis is not transmitted by swallowing contaminated water, when the mouth or lip comes in contact with water containing the cercariae, the host could become infected (CDC, 2012).

5.3. Prevalence

The occurrence of Schistosomes depends on the presence of intermediate snail hosts, their level of infection and the frequency of water contacts. In the areas where conditions are favorable, prevalence rates of Schistosome infections may occur at a level of 40-70% and commonly higher in cattle. However, abattoir studies have shown that most natural infections in cattle represents a subclinical form characterized by high prevalence of low to moderate worm burdens in the host. The behavior of definitive host at the water contact affects the prevalence of disease in different species of animal (Bont, 1995).

Schistosoma bovis has a localized distribution, which is found commonly in northern, eastern, southwestern and central parts of Ethiopia. (Almaz and Solomon, 2011).

Table 2: Prevalence of bovine schistosomosis in Ethiopia

Study area	Sample s.	Prevalence	Reference
Andassa (NW)	384	9.89	Assresa *et al.,*2012
Fogera (N)	167	10.7	Mengistu S. *et al*., 2012
Gewane (N)	143	1.5	Aemro, 1993
Hawassa (S)	185	5.5	Aemro, 1993
Kemisse (N)	267	28	Ameni *et al.,* 2001
Bahir Dar (NW)	229	28.14	Almaz H. & Solomon W. 2011
Jimma (SW)	583	13.6	Abebe *et al*., 2011
Gorgora (N)	579	20.6	Tarko *et al.,*2013)

Table 3: Prevalence of human schistosomosis in Ethiopia

Study area	Sample size	Prevalence (%)	Reference
Mekelle (N)	457	23.9	Alembrhan *et al.,* 2013
TIkur wuha (N)	375	12	Habtamu *et al.,* 2010
Waja (N)	224	27.1	Tadesse *et al.,* 2009
Adwa (N)	386	63.85	Lemlem *et al.,* 2010
Sanja (N)	384	77.25	Getachew *et al.,* 2014
Ziway (	2,692	8.3	Tesfa, 1987
Dulshatalo (W)	234	57.8	Assaye *et al*., 2013

Results of epidemiological studies in different parts of Ethiopia showed the characteristically wide dispersion of schistosomosis cases and high egg counts among school children.

5.4. Geographical distribution

The schistosomosis is a tropical and sub-tropical disease common in different animals of Africa, Asia, Middle East and Southern Europe (Urquhart *et al*., 1996). In Ethiopia, Schistosoma bovis has a localized distribution, which is found commonly in northern, eastern, southwestern and central parts of Ethiopia. (Almaz and Solomon, 2011).

5.4.1. Factors affecting distribution of schistosomosis

There are biotic and abiotic factors affecting the distribution of schistosomosis. Some of them are:

Altitude and temperature: Altitude exerts an influence through temperature, which is an important factor in limiting the distribution of snails. The most favorable temperature for survival of snails range from 22^0c to 28^0c. Low temperature retard the growth rate, the production, respiration and oxygen consumption causing snails to hibernate. High temperature decrease egg lying by atrophying the albumin gland and ovotestis and regressing the female gonadal tissue (Urquhart *et al.,* 1996).

Light: Some snail species prefer a place in which both sunshine and shed are available (example *Biomphalaria* and *Bulinus* species). They usually tend to congregate in place with marginal vegetation but could appear in completely sunlight as well. For instance, *B. abyssinicus* comes out of shade and is remarkably active in direct sunlight during the brightest part of the day. In field conditions the light rarely exerts direct limiting influence on water snails, rather than light exerting influence on snails indirectly regulating the photosynthetic activity of macro vegetation and phytoplankton (Adema *et al*., 2012).

Rainfall, flow rate and silt: The population density of snail is highly associated with the amount of rain fall and the topography of the area. Stream flow from high lands to the arid and relatively flat lowlands (high gradient of water) encourages rapid run off and low retention of water in soil, resulting in flood occurrence as seen in Awash lowlands. Particularly high volume of runoff occurs in the southwestern highlands and part of central and southern highlands, where rain fall and water surplus are high. High water current has a detrimental effect on the physiology of snails, primarily by washing away the snails and also clean off emergent and floating vegetation and sand or silt particles that serves as sources of food habitat. In big water bodies wave action has more effect than the inflow water current. As the direction of movement continuously changes situations becomes unfavorable for snail survival. Due to this fact snail in big lakes are confined to wind protected shorelines or inflowing streams. In small and temporary water bodies the effect of wave action is less. There, it is lack of water that imposes changes of behavior, i.e., aestivation or hibernation or in the nearby vegetation (Aemero, 1993).

Vegetation and food: The distribution and abundance of water snail is associated with the capacity of water bodies to support aquatic and sub aquatic vegetation growth, which in turn is dependent on the type of water bodies. For instance, a firm mud substratum with sand and detritus provides a favorable condition for microphytic plant growth and also provides favorable sites for egg- laying and serves as food source (Urqhart *et al.,* 1996).

Water chemistry: Snail hosts of scistosomiosis have a wide range of tolerance to most chemical factors and only a few of the elements have a detrimental role. Calcium is one of the essential elements for the natural distribution and abundance of snail. It plays a role in the construction of shells; in metabolism and regulation tissue permeability also and thus affects the growth, survival, fecundity, fertility of egg and reproduction rate of snails. Magnesium is required in small amounts for snails and the chlorophyll bearing micro flora which forms their food supply. When the concentration of sodium and potassium are higher than calcium the situation is becomes unfavorable to snails (Fekade *et al.,* 1989).

6. Public Health Importance Of Schistosomosis

As the results of irrigation schemes, population increment and movement, low socio-economic status, schistosomosis continues to be a major public health and socio-economic problem for several millions of people living in the rural areas of the tropics. At least 200 million people are infected and about 600 million people are at risk of infection with Schistosome parasites in more than 76 endemic countries (Mengistu *et al.,* 2009).

Schistosomosis is a disease of the less developed society characterized by poverty, lacking basic Services, and lack of information and instruction. Particularly, the scarcity of latrines enhances transmission probabilities through indiscriminate defecation habits. Under poor hygienic condition, faeces and urine often enter water body occurring near human habitations and this enhances transmission. Indiscriminate defecation either increase the chance of the Schistosome parasite to reach in to the water body, which is the critical point in the life cycle of the parasite or improve the water habitat as habitat moderately polluted with organic matter create suitable conditions for the snail intermediate host. Prepubescent children and particularly boys are the age group most at risk from clinical symptoms and are frequently targeted treatment interventions. Less widely recognized is that some species of *Schistosoma,* which commonly affect man, can also be infective in other mammalian species and particularly in non-human primates (Frenwick *et al.,* 2009). Overall, Schistosomosis transmission depends, unlike the transmission of malaria and other insect-transmitted diseases, on the active role of the human host in the transmission process, through excretory contamination of snail habitats and direct contact with infective water. Out of the 22 currently recognized species of *Schistosoma,* only 8 have been reported from human and of this, only 3 (S.*mansoni, S. haematobium* and *S. japonicium)* are heavily implicated as a disease (Standly *et al*., 2012).

In Ethiopia, intestinal scistosomiosis caused by *S.mansoni* and urinary Schistosomiosis caused by *S.haematobium* have been known to be endemic. The former is widely distributed in the country while the latter has so far been reported only from three lowland areas, including the Awash and Wabi Shebele valleys and an intermittently flowing stream in Kurmuk at the Ethio Sudan border. The main determinants for the distribution, transmission and spreading of the Schistosomosis in Ethiopia include water temperature, local absence or presence of snail intermediate host, human population movement and water impoundment for irrigation and power. A number of schistosomosis and snail surveys have been carried out in different water bodies in Ethiopia (Ali *et al.,* 1986).

The disease causes different manifestations in human. A form of cutaneous larva migrans, often called "swimmer's itch" (cercarial dermatitis) occurs in man and is thought to be caused by cercariae of avian and mammalian Schistosomes. The local hypersensitivity reactions, general ill health with low grade fever and eosinophilia and urticarial rush are a problem of individuals exposed to infested water, e.g. agricultural workers and swimmers (Barry and Hughes, 2008). The chronic clinical features, such as neurological, pulmonary, hepatic, intestinal, urinary and genital schistosomosis result in myelitis, seizure, paralysis, dyspnea, coughing, wheezing, splenomegally, ascites, abdominal pain, poor appetite, diarrhea, anemia, heamaturia, dysuria, ulceration on vulva, vagina and cervix, infertility, morbidity and mortality are common in human infected with Schistosomes (Karin and Peter, 2011).

7. Current Status Of Schistosomosis In Ethiopia

7.1. In Animals

Though Ethiopia is recognized for its vast wealth of livestock, the economic benefit derived from the livestock center does not commensurate with the potential. Development of large animal is constrained among other important factors, by wide spectrum of the diseases like Schistosomosis. In our country, Schistosomosis appears to be spreading. The major transmitting sites are small streams all over the highlands of Ethiopia, lakes like Tana, Zeway as well as irrigation systems, such as sugar state Wonji do also play a similar role (Belayneh and Tadesse, 2014).

7.2. In human

A recent survey in sub-Sahara Africa indicates that 70 million individuals out of 682 million have experienced heamaturia with 32 million cases of dysuria associated with *S. haematobium* infection. Furthermore, it was estimated that 18 million people suffer from *S. haematobium*-related bladder wall pathology and 10 million from hydronephrosis (WHO, 2009).

In Ethiopia, the capital city Addis Ababa and the surrounding high land area is risk free. *S.mansoni* infection is wide spread throughout Ethiopia including Awash, Blue Nile, Omo valleys, but is not present in the Ogaden region. *S. haematobium* is present in lower awash valley, in some localized area in western Ethiopia, and along the Seble River in southern Ethiopia (Ogaden). Species of snails that are found in Ethiopia includes; *Biomplaria pfeifferi, Biomplaria sudanica and Bullinus abyssinicus* (IAMAT, 2012).

8. Diagnosis And Treatment

The diagnosis is based primarily on the clinico-pathological picture of diarrhea, wasting and anemia, seasonal occurrence and previous history of schistosomosis in the area or the identification of snail habitats with a history of access to natural water bodies. Postmortem examination, hematological tests and examination of faeces for *Schistosoma* eggs are useful. The relatively persistent diarrhea, often blood stained and containing mucus may help to differentiate this syndrome from fasciolosis (Urquhart *et al.,* 1997). The demonstration of the characteristic egg in feces or in squash preparation of blood and mucus from the feces is useful. The identification of *S. haematobium* egg from urine is mainly recommended (Dwight and Bowman, 2009). The eggs are characteristic in shape and size for each species. These *Schistosoma* eggs are oval (as in *S. mansoni*, *S. haematobium*, *S. japonicium*) to spindle shaped (*S. bovis* and *S. matheei*) containing a single spine protruding from the shell. The position of the spine on the egg shell in a distinguishing feature: a lateral spine in ova of *S. mansoni*, a rudimentary lateral spine in *S. japonicium* and terminal spine in others (Sween and Whaley, 1993).

In general, when schistosomosis is suspected, diagnosis is best confirmed by detailed post mortem examination which reveal the lesions and, if the mesentery is stretched, the presence of numerous *Schistosomes* in the veins. In Epidemiological survey, serological tests like ELISA and CFT may be of value. An observation of nasal granulomas in areas where *S. nasale* is endemic is highly suggestive for nasal schistosomosis (Fraser *et al.,* 1991).

When treating the clinical cases of schistosomosis the care has to be taken since the dislodgment of damaged flukes may result in massive thrombus formation in liver. The drugs such as Entrol (6mg/kg, 1 dose IM) and Tartaric emetic (2mg/kg/day IV for 6 days) are highly effective and also Nilodin (30mg/kg for 3 days) and Noguron (10-12mg/kg IM for 3-5 days) are moderately effective in animals. Now days, Praziquantel and Mirazid are highly effective against schistosomes both in animals and humans (CDC, 2012).

9. Control And Prevention

Obviously, the most effective way to control animal schistosomosis in endemic areas is fencing of dangerous waters and supply of clean water to prevent contact between animals and parasite. Unfortunately, this is not possible in most parts of fresh water before drinking even though, the swallowing of contaminated water not transmit the disease (Barry and Hughes, 2008) and wearing of water proof cloths when working at irrigations as well as educating society about the disease and chemoprophylaxis are the ways to prevent the infections (Charles and Hendix, 1998). The immunological control methods, such as the injection of irradiated *Schistosome* larvae and protective antigens, e.g. *Schistosome* derived glutathione *s-transferase* are used (Bont, 1995).

The other methods of control are targeted against the snail intermediate host population:

Chemical measures: These include the use of molluscicide, such as copper sulphate, nicotininalide, orgatonin, sodium pentachlorophenate, acetamide and niclosamide to destroy snail from environment but they have some side effects on other aquatic organisms (Jolcelyn, 2004). A native Ethiopian plant, *Phytolacca dodecandra,* locally known as" endod" is also an effective molluscicide (Shibiru *et al.,* 1989).

Biological control measures: A number of predators (e.g. cray fish) and competitor snails (e.g. *Marisa cornuaritis)* are resiving more and more attention as potential control agents (Jolcelyn, 2004).

Ecological measures: Rendering the habitat unsutable for snail survival, such as drainage. Removal of weed and increased water flow (Bont, 1995)

Conclusion and Recommendations

Schistosomes live in blood vessels of the host where they feed on blood and produce eggs there. The eggs penetrate the wall of the veins and reach different organs. The most important pathological consequences of schistosomosis are caused by the eggs which are trapped in tissues. The snail intermediate host play important role in transmission of the disease. The disease prevalence is high in tropical countries since the climate is favorable for the snail intermediate hosts. The pathological significance of Schistosomes is unlimited in susceptible populations following intense transmission. In Ethiopia, the disease cause significant loss of different animals and its public health importance is very high. The confirmatory diagnosis is identification of the *Schistosoma* eggs from feces and urine, and the effective drugs are available to treat the disease. There are many ways to control and prevent the schistosomosis.

Based on the above conclusive remarks, the following points are recommended:

- Further detailed epidemiological and pathological studies should be done to clearly set the extent of animal scistosomiosis and its public health impact in Ethiopia.
- The application of molluscicide and other control measures of snail control should be conducted by educating farmers and other civil servants.
- Educating the society about the disease and its mode of transmission is required and expected from veterinarians and other health professionals.
- The annual chemoprophylaxis should be experienced at the disease endemic areas.
- The governmental and private associations should supply pure water to the community and should also support those who involve in control of the disease.

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