Schistosomiasis remains a major public health problem with almost 240 million people, and more than 90% of them living in sub-Saharan Africa, requiring preventive chemotherapy. Schistosomiasis in humans results from infection with parasitic blood flukes of the genus Schistosoma. Six species of schistosomes cause infection in humans. While the disease is now predominantly in Africa, it also occurs in the Americas, the Eastern Mediterranean region, the Southeast Asian region and the Western Pacific.

Infection is acquired when parasitic larvae penetrate the skin of people exposed to infested freshwater. Early infection may be characterized by dermatitis. Followed by a systemic acute phase caused by the migration of the juvenile worms through the circulatory system. In later phases, parasite eggs from adult worms cause penetrate the mucosa of the urogenital tract and the intestine. In such organs, acute inflammation progressively becomes chronic, and hyperaemia, abnormal growths such as polyps and internal haemorrhage are gradually replaced by fibrosis and thickening of the tissues. Bladder cancer is a late-stage consequence of S. haematobium infection, while embolization of eggs from the intestine to the liver through the portal system is typical of infection with the other Schistosoma spp., and is responsible for progressive liver fibrosis, portal hypertension and ascites.

Progress is being made in the control of schistosomiasis as in 2010; 34.8 million people were treated for schistosomiasis in 30 countries. Access to the drug of choice, praziquantel has been improved through a donation of up to 250 million tablets per year, until schistosomiasis is eliminated. It is thought that transmission has been interrupted in 19 countries, but this requires confirmation. In the World Health Assembly resolution WHA65.21, Member States called for intensified control interventions and initiation of elimination programmes where possible. The resolution also called for guidelines ttoward elimination as well as procedures for the verification of interruption of treatment.

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SCHISTOSOMIASIS

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Contents

Section 1

Introduction

1.1 Schistosomiasis

Schistosomiasis is the disease resulting from infection with parasitic trematode worms of the genus *Schistosoma*. The main species of schistosomes infecting humans are listed here according to the chronological order in which they were first described: *S. haematobium* (1852), *S. japonicum* (1904), *S. mansoni* (1907), *S. intercalatum* (1934) and *S. mekongi* (1978) (*1*). *S. malayensis* (1988) has also been described and found in Malaysia but its public-health significance is still undetermined. *S. guineensis* was separated from *S. intercalatum* in 2003 (*2*). While the adult worms of all species reside within the blood vessels of the mammalian hosts, *S. haematobium* is responsible for urogenital schistosomiasis; the other species mainly affect the intestine and the liver.

Schistosomiasis is acquired when free-swimming parasitic larvae (cercariae) penetrate the skin of people exposed to infested freshwater. The clinical picture of schistosomiasis includes an early phase characterized by a dermatitis in the area where the cercariae penetrate the skin; a systemic acute phase caused by the migration of the juvenile worms (schistosomula) through the circulatory system; and finally, and most notably, an organ-specific chronic phase produced by the eggs laid by adult female *Schistosoma spp*. in the mucosa of the urogenital tract and the intestine. In such organs, acute inflammation progressively becomes chronic, and hyperaemia, abnormal growths such as polyps and internal haemorrhage are gradually replaced by fibrosis and thickening of the tissues. Bladder cancer is a late-stage consequence of *S. haematobium* infection, while embolization of eggs from the intestine to the liver through the portal system is typical of infection with the other *Schistosoma spp*., and is responsible for progressive liver fibrosis, portal hypertension and ascites.

1.2 Evolution of the strategic approach to control schistosomiasis

The two pillars of schistosomiasis control have historically been represented by interventions targeting (i) the parasite within the human final host and (ii) the snail intermediate host, with the aim of decreasing morbidity and reducing transmission. The first attempts to control schistosomiasis employing such measures were made in the early 20th century in Egypt and Japan, respectively (*3*, *4*). In 1920, Egypt implemented the first mass treatment intervention in adults and children alike using intravenous tartar emetic, a derivative of antimony, which had been successfully tested in the Sudan two years before (*5*). Following these examples, a number of national programmes started controlling schistosomiasis using treatment and/or snail control, often combined with provision of health education messages (*6*). Since its establishment in 1948, the World Health Organization (WHO) has recognized the public-health relevance of schistosomiasis and has developed a number of documents providing guidance and support to countries willing to embark on disease control interventions (*Annex 1*; *Annex 2*). Schistosomiasis control strategies have evolved as a function of the availability of new tools, and thus shifted from snail control to chemotherapy with the availability of safer medicines such as niridazole, metrifonate, oxamniquine and praziquantel (*7*). In addition, with the development of single-dose oral administration (e.g. of oxamniquine or praziquantel), the cost effectiveness and feasibility of large-scale preventive chemotherapy could be considered and assessed.

In the 1970s, research in Saint Lucia showed that chemotherapy was more cost effective in controlling schistosomiasis than snail control or provision of water supplies (*8*). Other research conducted in the 1970s–1980s suggested that most morbidity from schistosomiasis was due to heavy-intensity infections and that those with heavy infections should be targeted for treatment (*9–11*). Heavy infections could be detected in the field using urine filtration and the Kato-Katz techniques (*12*). In appreciating the high disease burden caused by schistosomiasis in sub-Saharan Africa and the lack of resources for adequate provision of water and sanitation in the endemic countries, a WHO Expert Committee recommended in 1985 that control programmes adopt morbidity control through chemotherapy as the main strategy for schistosomiasis control (*13*) while recognizing that access to potable water and adequate sanitation remains a challenge in many developing countries (*14*). With praziquantel as the drug of choice in the treatment of schistosomiasis and with the new strategy for morbidity control, pilot control programmes were undertaken in sub-Saharan Africa. Unfortunately, these proved unsustainable without external funding (*15, 16*). Some success was achieved with larger programmes that were able to scale up preventive chemotherapy for schistosomiasis control, as in China (*17, 18*) and Egypt (*19, 20*). In recent years, the significant reduction in the price of praziquantel, together with increasing advocacy and provision of resources for control of neglected tropical diseases (NTDs), has resulted in renewed launching of schistosomiasis control programmes in sub-Saharan Africa (*21–24*).

1.3 Resolution WHA54.19 on schistosomiasis and soil-transmitted helminth infections

Even though WHO has recommended large-scale distribution of praziquantel to at-risk populations living in endemic areas since the 1970s and 1980s (*7*, *13*, *25*, *26*), it was only in 2001 that the 54th World Health Assembly officially endorsed chemotherapy as the key public-health strategy to combat schistosomiasis (*Annex 3*) (*27*). Resolution WHA54.19 on schistosomiasis and soil-transmitted helminth infections urged Member States (i) to sustain successful control activities in low-transmission areas in order to eliminate schistosomiasis (and soil-transmitted helminth infections) as a public-health problem; (ii) to give high priority to implementing or intensifying control of schistosomiasis (and soil-transmitted helminth infections) in areas of high transmission; (iii) to monitor drug quality and efficacy of these control activities; and (iv) to ensure access to essential medicines against schistosomiasis (and soil-transmitted helminth infections) in all health services in endemic areas for the treatment of clinical cases and of groups at high risk of morbidity such as women and children. The goal of these activities would be to achieve a minimum target of regular administration of chemotherapy to at least 75%, and up to 100%, of all school-age children at risk of morbidity by 2010 (*28*).

Resolution WHA54.19 also recognized the importance of complementary public-health interventions, thus urging Member States to promote access to safe water, sanitation and health education through intersectoral collaboration as means of reducing transmission.

School-age children (aged 5–14 years) in endemic areas were the primary target of preventive chemotherapy interventions. This was justified by the fact that children are at highest risk of infection. Because of their recent exposure to infection and consequently the early stage of their chronic lesions, children would also benefit most from treatment interventions. Treatment during childhood therefore prevents chronic morbidity in later years (*29*).

Resolution WHA54.19 considered both schistosomiasis and soil-transmitted helminth infections. As school-age children are the main target population for both diseases, large-scale interventions using a combination of anthelminthics have