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Policy Support and Resources Mobilization for the National Schistosomiasis Control Programme in The People's Republic of China

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Abstract

Schistosomiasis remains a public health problem in many developing countries around the world. After the founding of The People's Republic of China, from 1949 till date, all levels of government, from central to local, have been attaching great importance to schistosomiasis control in The People's Republic of China. With considerable policy support and resources mobilization, the national schistosomiasis control programmes have been implemented during the past 65 years. Here, we summarize the successful experience of schistosomiasis control during the process. Recommendations for the future management of the Chinese national schistosomiasis elimination programme are put forward after considering the remaining challenges, shortcomings and lessons learnt from 65 years of schistosomiasis control drives in The People's Republic of China. They will help to sustain past achievements, foster the attainment of the ultimate goal of schistosomiasis elimination for the country and provide reference for schistosomiasis control programme in other countries.



1. INTRODUCTION

Schistosomiasis remains a public health problem in many developing countries around the world (Mazigo et al., 2013), and is a major limiting factor in the development of local economies (Zhou et al., 2002). After the founding of The People's Republic of China, all levels of government, from central to local, have been attaching great importance to schistosomiasis control. Such efforts have also been integrated into sustainable social and economic development planning. After more than 60 years of constant efforts in the control of schistosomiasis, the Chinese government has made remarkable achievements, which can be a learning basis for many developing countries (Xu et al., 2016a,b). At present, schistosomiasis elimination has been identified as the new target in The People's Republic of China (Lei and Zhou, 2015).

This chapter reviews the process and successful experiences of schistosomiasis control in The People's Republic of China for the past 65 years, from 1949 to 2014. The control programme can be divided into four stages, namely in the early years after the founding of The People's Republic of China from 1949 to 1959, in the later 20th century from 1960s to 1980s, from the late 1980s to the end of the 20th century and the 21st century (Xu et al., 2016a,b). At each stage, the successful experiences have been summarized into three aspects, namely national policy support and measures, resource mobilization and effect of schistosomiasis control. Such a summary provides the basis for designing an elimination programme against schistosomiasis in The People's Republic of China and be potentially used as a reference for developing schistosomiasis control programmes in other developing countries.



2. IN THE EARLY YEARS AFTER THE FOUNDING OF THE PEOPLE'S REPUBLIC OF CHINA FROM 1949 TO 1959

2.1 Background

Before the founding of The People's Republic of China, schistosomiasis was a pandemic disease in southern China (Chen, 2014), causing great harm to people's life and health. After the founding of The People's Republic of China, the Central Committee of the Communist Party of China (CPC), headed by Chairman Mao Zedong, considered schistosomiasis a major public health problem and attached great importance to its control (Shi, 2011). Eliminating schistosomiasis was considered a serious political task at that time. Although the whole country was mobilized to make unremitting efforts to eliminate the disease, the work of schistosomiasis control was exceptionally arduous due to limited economic and technological conditions at that time.

2.2 Policy support and measures

2.2.1 To determine the organizational leadership of schistosomiasis control

Due to the urgency and difficulty in schistosomiasis control in the early days, the Central Committee of CPC set up the organizational leadership for the control programme promptly in November 1955. The leading group was also called the 'nine people group'. Subsequently, leading groups were found at different levels of party committee, including in the provincial party committee, municipal party committee, county party committee and town party committee, which lead the local work of schistosomiasis control (Fig. 1). In addition, specific responsibilities and actions at five levels of leadership were clearly stated. Firstly, a regular meeting system was established. Secondly, a regular reporting system, which reflected the true progress and problems of schistosomiasis control was set up (Zhang et al., 2016). Thirdly,

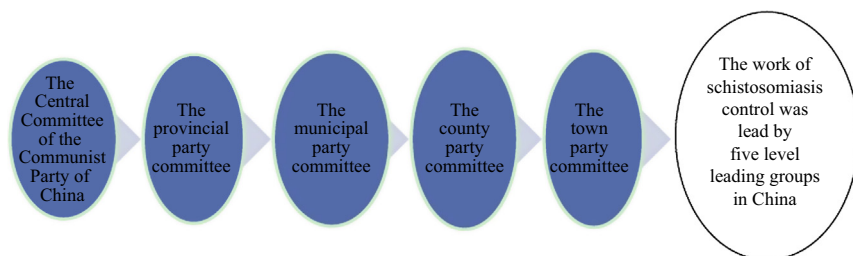


Figure 1 The leadership hierarchy for the work of schistosomiasis control in the 1950s in The People's Republic of China.

the local schistosomiasis control planning was sought to be assessed and reformulated each year. The leading group of the Central Committee of CPC performed its duties fully and consecutive national work conferences on schistosomiasis control were held thrice in Shanghai in a span of 2 years (Shi, 2011). Directives of the state council for schistosomiasis elimination were issued by Premier Zhou Enlai on 20 April 1957, and the council issued the highest level of government documents on schistosomiasis control (Wang, 2011). A notice on implementing the directives of schistosomiasis elimination was published by the Central Committee of CPC on 23 April 1957, which expressed the terms that all provincial party committees, municipal party committees of schistosomiasis endemic areas and the party groups of the relevant departments under the state council should ensure the execution of the state council's instructions. From then on, the relevant provincial communist party had to submit a report on schistosomiasis control every 6 months to the Central Committee of CPC.

2.2.2 To strengthening the legal system management

At this stage, setting up a legal system governing the control of infectious disease, including schistosomiasis, was required. The infectious disease management law of The People's Republic of China passed in 1955 was the first health law for the management of infectious diseases issued by the highest authority of the state after the founding of The People's Republic of China. With this law, the prevention and treatment of infectious diseases were brought into the ambit of legal system management for the first time (Zhou, 2004). Initially, only scientific management system of schistosomiasis control was set up at that time in The People's Republic of China, where schistosomiasis was listed as a 'c' class infectious disease in the law. By setting up a proper legal management system, a comprehensive set of regulations and principles as well as prevention and treatment measures for schistosomiasis were clarified. This included the responsibilities of the citizens, social organizations and relevant government departments (Cao et al., 2016). In addition, the law reflected science and humanity as more attention was directed at protecting the individual privacy of patients with infectious diseases (Li and Shen, 2006; Yao and Xu, 2005). Furthermore, the reporting and releasing system of epidemic became more effective as witnessed in the legal infectious disease reporting system carried out in the 1950s in The People's Republic of China. Therefore, the transparency of infectious disease control was strengthened and the citizens' right to know was respected according to the above approach.

2.2.3 To strengthen the top scientific planning

In order to strengthen the scientific aspect of the control programme, technology support measures were also put forward by the professional institutions in The People's Republic of China. For example, the national expert advisory committee of schistosomiasis control of CPC was established in December 1955, only one month after establishment of the leading group of the Central Committee of CPC. Subsequently, the comprehensive measures for schistosomiasis control were put forward by the national expert advisory committee of schistosomiasis control of CPC (Shi, 2011). The prevention and control of schistosomiasis and other infectious diseases were included in the national agricultural development outline (draft), which was passed by the Political Bureau of the Central Committee of CPC, in January 1956. From 1956 to 1967, infectious diseases research projects, including work on schistosomiasis, were considered important goals and formed the basis for the planning of science and technology development in The People's Republic of China. The drugs for the control of *Oncomelania hupensis*, oral therapy for infected patients and traditional Chinese medicine (TCM) therapy also received much attention during the planning (Li et al., 2016).

2.3 Resources mobilization

2.3.1 Integrating organizations at all levels from central to local for schistosomiasis control

The work of schistosomiasis control was lead uniformly by the office of the leading group of the Central Committee of CPC. Resources from different departments (including health, agriculture, water conservancy, education and civil affairs) and various organizations (including army, trade unions, communist youth league and women workers committee) were integrated for the control of all endemic areas. Besides, resources of organizations from different endemic provinces including Jiangsu, Zhejiang, Fujian, Anhui and Shanghai were integrated for the national control of schistosomiasis. In addition, the schistosomiasis control bureau, under the Ministry of Health, was established in Shanghai in July 1957 to strength the leadership of schistosomiasis control. All these activities had led to improved coordination and cooperation between the central schistosomiasis control institutions (Wang, 2011).

2.3.2 Integrating professional institutions for schistosomiasis control

Schistosomiasis control was regarded as the most important work under disease control during this time period. Therefore, different levels of leading

groups of CPC for schistosomiasis control were established after the central leadership group was established. They included the provincial, the municipality, the county and the township committees of CPC. Various levels of expert advisory committee for schistosomiasis control have also been successively set up during the same period. At a local level, there were people in charge of the schistosomiasis control work in villages. In 1953, stations of disease control and prevention had already been established in provinces, cities (municipalities) and counties (districts) across the whole country. These stations became the professional network for disease control unit of the CPC and the state to implement the strategy and measures of public health (Li, 2013). By August 1957, a total of 19 professional institutions, 236 stations and 1346 groups were established specifically for schistosomiasis control in The People's Republic of China.

2.3.3 Integrating scientific research institution

To strengthen the scientific research work on schistosomiasis, the human and financial resources from medical colleges and institutions working on schistosomiasis control in different areas, including Jiangsu province, Zhejiang province, Anhui province and Shanghai, were systematically integrated by the national expert advisory committee of schistosomiasis control of CPC. In addition, under the leadership of the national expert advisory committee of schistosomiasis control of CPC, different levels of scientific research institution were established in provinces, cities and counties (districts) (Wang, 2011). Besides the scientific research organization mentioned above, national and local institutions and laboratories of TCM, were also integrated. All of them played an important role of schistosomiasis control.

2.3.4 Integrating the strength of the people in endemic area

After the directives of schistosomiasis elimination were published by the state council and the basic policies of 'health work should be combined with the mass movement' were implemented in 1957, all masses and organizations were mobilized to carry out the work of schistosomiasis control with vigour and vitality. These organizations could be divided mainly into two kinds, namely mass organizations of treatment and mass organizations of prevention, which included the snail control team, investigation team of infection rate and emergency response team, who played important roles in snail control, faeces of human and livestock management, and daily sanitation and hygiene management. For example, in order to play its role properly, Jiangsu Province integrated their treatment and prevention units with their social medical organization by establishing a joint clinic. During this period, similar

mass organizations of prevention and treatment were also established in endemic provinces, so as to implement the principle of mass prevention and treatment into practice.

2.4 Effect of prevention and control

Through the implementation of measures mentioned in [Section 2.3](#), the following achievements have been achieved in the 1950s in The People's Republic of China.

Firstly, through a national large-scale epidemiological investigation on schistosomiasis, the distribution of schistosomiasis epidemic areas in 1959 were verified, and they were found to be located along the south of the Yangtze River of The People's Republic of China, including 12 provinces (autonomous regions and municipalities directly under the central government), namely Jiangsu, Zhejiang, Anhui, Hunan, Hubei, Jiangxi, Fujian, Guangdong, Guangxi, Sichuan, Yunnan and Shanghai. There were 449 epidemic counties (cities, areas), 3563 epidemic towns, resulting in more than 11.6 million patients, 1.20 million cattle infected by schistosome, and an area coverage of 14.3 billion m² of snail. The high epidemic areas of schistosomiasis were also located along the Yangtze River and its connected lakes, such as Dongting Lake, Poyang Lake and Tai Lake. The epidemic in other provinces, such as Yunnan, Fujian, Guangxi and Guangdong provinces, were relatively light ([Chen and Feng, 1999](#); [Tang, 2012](#)). According to the epidemiological characteristics and snail-ridden environments, the areas endemic with schistosomiasis were divided into three types in The People's Republic of China, namely marshland, hilly and water network areas ([Liu et al., 2016](#); [Shi et al., 2016](#); [Zhang et al., 2016](#)).

Secondly, successful experience of schistosomiasis control was documented in a systematic and comprehensive way including the scientific achievements and the invention of the masses during the work of schistosomiasis control. The national compilation of schistosomiasis research data has been published every year since 1955, and a guiding 'schistosomiasis control manual' was published for the first time in 1956. The ordinance of schistosomiasis control (draft) was also made available, and consisted of 7 chapters and 33 articles. Promulgation and implementation of the ordinance play an important role in promoting the work of schistosomiasis control.

Finally, Yujiang County in Jiangxi Province was the first county to achieve schistosomiasis elimination in June 1958. Chairman Mao wrote a brilliant poem entitled 'Send away the god of plague' when he heard the good news. This poem greatly inspired the passion of scientific researchers for schistosomiasis control and the people who resided in endemic areas. The will and

determination to send away the god of plague was formed since then (Wang et al., 2009a,b,c). By the end of 1958, the number of schistosomiasis-infected patients who have received treatment was more than 4.3 million, and many areas have completely eliminated the harm with schistosome infection (Zhang, 2014). The Health Minister, Li De Quan, said ‘schistosomiasis has basically been eliminated in 65% of the epidemic areas’ during a meeting, which summarized achievements for 10 years worth of health work since the founding of The People’s Republic of China in 1959 (Wang, 2011). Through masses mobilization in 1950s, great achievements had been obtained including achieving the goal of basic elimination of schistosomiasis and protecting people’s health, thus resulting in the promotion of national productivity and economy.



3. IN THE 20TH CENTURY FROM 1960S TO 1980S

3.1 Background

During 1960s to 1980s, the main task of schistosomiasis control was large-scale snail control, combined with irrigation and water conservancy construction by people who resided in endemic areas. It was inspired by the successful experiences of Yujiang County. It was also based on the global strategy of schistosomiasis control, which emphasized snail elimination and the condition of rural social economy at that time in The People’s Republic of China (Mao, 1990). Due to the occurrence of natural disasters and famines in 1960s, a huge negative impact was inflicted on health prevention between 1966 and 1976, causing the work of schistosomiasis control to be severely disrupted. The process of schistosomiasis control was halted, leading to a serious reemergence of schistosomiasis. The leading groups and professional organizations for schistosomiasis control were dissolved at different levels, namely the national, provincial, municipal (city) and county (district) levels (Wang et al., 1989). After 1970s, the process of schistosomiasis control began to develop steadily, with a national overhaul and recovery. Some epidemic prevention institutions were rebuilt. During this period, the effective policies and measures for schistosomiasis control were made once again under the leadership of the CPC and government, which played an important guidance for schistosomiasis control (Cai, 2013).

3.2 Policy support and measures

3.2.1 Continue to give policy guarantee and promoting

The management model of schistosomiasis control consisted of leadership of local party committees at different levels, which were led uniformly by the

leading group of the Central Committee of CPC. The coordination work of party committees, at different levels, and the relevant government departments were all completed by the leading group of the Central Committee of CPC. They were also responsible for the formulation and implementation of schistosomiasis control planning. In addition, a network of the specialized institutions of epidemic areas were formed at three levels, namely provincial, municipal (city) and county (district). By the end of 1960s, the epidemic reporting network has been set up throughout the urban and rural areas of the whole country (Zhou, 2004). The expert advisory committee of schistosomiasis control has set up at a later stage, and its responsibilities included: technical guidance and supervision for the implementation and application of the technical scheme and new technologies, setting standards, evaluation of control efforts and summarizing work experiences.

3.2.2 Following the principles of combining schistosomiasis control with agricultural production, combining mass movement with science and technology and combining temporary work with regular work

The movement of mass prevention and control involved mobilizing all party members and citizens. During this period, the financial costs of schistosomiasis control were shouldered by the state, collectives and individuals. The early and advanced stage of schistosomiasis were both given priority and treated. And according to the patient's socioeconomic status, different charging strategies, namely full, discounted and at no cost, were applied. Meanwhile, snail control was given priority than water conservancy.

3.2.3 Following the comprehensive strategy on emphasis of snail elimination

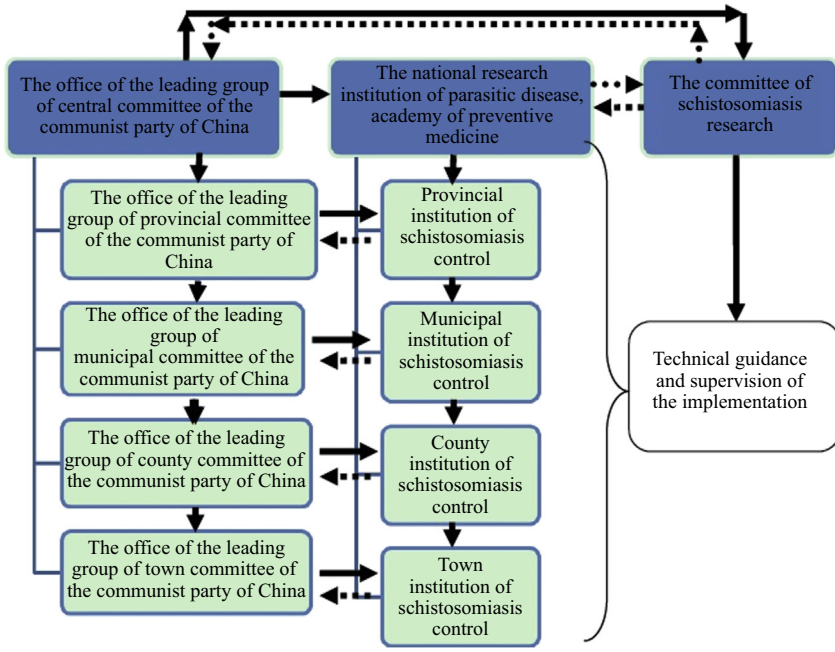
Schistosomiasis elimination was the main goal at that time. Schistosomiasis control workers strictly observed the following principles: active control, comprehensive measures of prevention and control, and performing work as circumstances permit. The comprehensive control strategy which emphasizes on snails elimination was implemented, and combined with the basic construction of irrigation and water conservancy depending on local economic conditions (Dai, 2001). In addition, other measures, including the treatment of patients and infected livestock, transforming the ecological habitat of snails, personal protection, waste management and safe water provision, were also implemented. A 5-year plan of schistosomiasis

scientific research from 1963 to 1967 was formulated in 1963 (Zhang and Cai, 2013), in which great importance was attached to the research on the snail as a vector, snail control methods and the treatment for advanced schistosomiasis.

3.3 Resources mobilization

3.3.1 Continue to integrate the professional schistosomiasis control institution

The national professional institutions and organizations of schistosomiasis control were improved and expanded (Fig. 2). By the mid-1980s, there was a total of more than 260 professional institutions in the province, municipal (city) and county (district), more than 1620 professional institutions in towns and subdistrict, more than 16,000 professionals, and about 10 part-time staff in each village (Zheng, 1988).



(→): The administrative management (••→): Information feedback

Figure 2 The work model of leadership and professional institution of schistosomiasis control at five levels in the early 1980s of The People’s Republic of China.

3.3.2 Integration and development of zone defence force

Due to its regional distribution, a document numbering as No. 12 was issued by the Central Committee of CPC in 1970 indicated that ‘adjacent area of the provincial, municipal (city), district (county) should carry forward the spirit of collaboration of communism through close cooperation, work together and strive to complete the task’, as well as the same hydrographic net of adjacent areas (eg, around Dongting Lake), in 1970. Accordingly, after the collaboration plan of schistosomiasis elimination between Hunan and Hubei provinces was made by the two provinces and their adjacent areas with 11 county and 2 farms, a huge range of activities for disease control were carried out. From then on, it has a growing influence on schistosomiasis control in the whole country. Because of the concern, support and good organization from the party and government in The People’s Republic of China, more collaborations between provinces and individuals were included in the work, resulting in the achievement of the goals for schistosomiasis control.

3.4 Effect of prevention and control

Through implementation of the strategy, which emphasized on snail control according to the target of schistosomiasis control, the progress of schistosomiasis control was hastened in The People’s Republic of China. The measures included survey of snail population and mass snail control, survey of infection rate and provision of chemotherapy to infected patients and livestock, and transforming the ecological environment of snail combined with the infrastructure of irrigation and water conservancy in endemic areas.

By the end of 1984, 11 million patients with schistosomiasis were treated and 11 billion m² of snail-ridden areas were eliminated. The number of counties that has eliminated schistosomiasis increased. Within 370 endemic counties nationwide, 76 counties reached the standard of schistosomiasis elimination and 193 counties reached the standard of basic schistosomiasis elimination (during 1956–95, the goals for schistosomiasis prevention and control were divided into two level, namely, elimination and basic elimination. ‘Elimination’ and ‘basic elimination’ were equal to the later technical term of ‘interruption’ and ‘transmission control’, respectively). For example, hilly areas or water network areas of Guangdong Province, Shanghai, Fujian Province and Guangxi Province reached the standard of schistosomiasis elimination (Zhou et al., 2010). Finally, the national standard for elimination of schistosomiasis and basic elimination of schistosomiasis were promulgated and implemented, guiding future work of schistosomiasis control (Chen, 2005).



4. FROM THE LATE 1980S TO THE END OF THE 20TH CENTURY

4.1 Background

Due to reforms in the national and the increasing needs of the development of health work, the leading group of the Central Committee of CPC and organizations and institutions were cancelled by the Central Committee of CPC in 1986. Subsequently, the work of schistosomiasis control was handed over to the Ministry of Health, where the Bureau for Disease Control was established. The Bureau for Disease Control was renamed to be the Department of Endemic Disease Control in 1989, and the latter was further renamed to be the National Endemic Disease Control office in 1994. After being restructured in 1998, the disease control department guided the work of schistosomiasis control countrywide. Under the leadership of the Ministry of Health, the Schistosomiasis Expert Advisory Committee was established and consisted of experts from the national institutions of schistosomiasis control, medical colleges and different provinces. These experts provided consultation and assisted in decision making. Since the 1980s, the collective ownership economy gradually transformed to the household contract responsibility system in rural The People's Republic of China. Due to changes in the economy system and opening up of markets in The People's Republic of China, the epidemic prevention system was also subjected to modification. It was difficult to organize the mass movement of large-scale snail control, and to assemble the resources of disease control. The idea of 'send away the god of plague' became history (Chen, 2005) and schistosomiasis infections began to rise again in areas where measures of schistosomiasis control failed to be carried out. Meanwhile, it was discovered that the target of schistosomiasis elimination in the marshland and some hilly areas was difficult to achieve with only emphasis on snail control as there were other natural environment and economic factors influencing the progress. The government paid high attention to the schistosomiasis resurgence in The People's Republic of China. Comrade Deng Xiaoping commented: 'It is beneficial for the people to control endemic diseases.' in 1984. Comrade Jiang Zemin said in the letter to the Five Province's Schistosomiasis Control Conference in 1989, 'It is the duty of the governments at all levels of schistosomiasis endemic areas to carry out schistosomiasis control and elimination', which contributed to a new wave of efforts in sending away the god of plague through mobilization of the available resources in the early 1990s.

At the same time, schistosomiasis control strategy and target have been adjusted by the WHO Expert Committee in 1984. They pointed out that health education should be an important part in the disease control strategy as transmission of schistosomiasis was closely related to people's work and living style. The emphasis on preventive chemotherapy was also gradually introduced in The People's Republic of China, and pilot work on control was carried out in heavy endemic areas.

4.2 Policy support and measures

In the mid-1980s, WHO put forward and carried out the strategy of 'disease control' through the administration of praziquantel, which was a high efficient, cheap and safe drug (Dabo et al., 2013; Ojurongbe et al., 2014). The People's Republic of China also started to adjust the strategy of schistosomiasis control by adopting integrated control involving both chemotherapy administration to humans and livestock and snail control in susceptible areas (Zhou et al., 2005; Utzinger et al., 2005; Guo and Zheng, 2000; Zheng and Guo, 2000).

4.2.1 Strengthening the leadership and adjusting strategy

In view of the severe epidemic situation at that time, the five provinces of marshland areas meeting was held in Nanchang City in December 1989, which called for 'sending away the god of plague by mobilization once more'. After 1989, the State Council strengthened the leadership of schistosomiasis control and various measures of schistosomiasis control were adopted. They included planning for prevention and control, increasing the investment, coordinating the power of different departments, adjusting the strategy, advocating the control strategy consisting of three steps (namely infection control, transmission control and interruption) and improving the management mechanism. The State Council issued the file on 'decision on strengthening schistosomiasis prevention and control' in 1990. Five provinces of marshland areas were defined as focus throughout the country in the file. Regular meeting were set up to solve the important problems during the progress of implementation. During the period of Chinese eighth five-year planning (1991–95), the Central Committee of CPC and the government of endemic areas at different levels invested funds of 1 billion yuan for schistosomiasis control (source: National Conference of Schistosomiasis Control in 1997).

4.2.2 Expert consultation, suggestions and decisions

The Expert Advisory Committee of Schistosomiasis of the Ministry of Health was founded in 1987. For decades, the expert consulting

organization has provided lots of scientific suggestion and advice of schistosomiasis control for the government, including guidelines, policies, planning, control strategy and technical guidance.

4.2.3 Making planning, scientific revention and control

Since the 1980s, the health policy focus on science and technology was put forward in The People's Republic of China. Attention was given to schistosomiasis control during the national planning. The national schistosomiasis control planning from 1987 to 1990 emphasized the importance of scientific research. The Schistosomiasis Expert Advisory Committee of Ministry of Health played an important role in schistosomiasis control, by working on inventing new drugs for snail control with high efficiency, low toxicity and low price through scientific research (Cai and Zhang, 2012). The State Council issued "the national eighth five-year plan of comprehensive control of schistosomiasis" in 1991, in which schistosomiasis control was accepted into the overall planning of economic and social development at different levels of government. The national eighth five-year plan of scientific research of schistosomiasis control has strengthened the scientific research of schistosomiasis control. The national health education implementation planning was made since 1992, where health education was accepted into the overall plan of schistosomiasis control. The purpose of health education was to mobilize the whole society to support schistosomiasis control, and to change the behaviour of target groups who are in close contact with infected water. The State Council issued 'The national ninth five-year plan of comprehensive control of schistosomiasis' in 1997, where the important position and role of science and technology in schistosomiasis control was provided with more attention by the government after 1980s. The government no longer relied on mass movement and participation for schistosomiasis control, but developed the science and technology for it instead.

4.3 Resources Mobilization

4.3.1 The resources of World Bank Loan Project

In face of the severe endemic situation due to a rebound of schistosomiasis, and insufficient investment for schistosomiasis control, Chinese government decided to actively strive for the World Bank Loan Project (WBLP). Foreign capital and advanced technology and management were introduced to make up for the inadequacy of government investment and the lack of technical and management skills. The project was implemented from 1992 to 2001 (Collins et al., 2012). The endemic disease control department of the

Ministry of Health and foreign loan office were responsible for the implementation of the project. Within the 10-year period, the total investment for the project amounted to 1.088 billion yuan, including the World Bank loan of RMB 491 million yuan and the Chinese government of different levels matching fund of RMB 597 million yuan (Tables 1–4). The projects covered 219 counties of 8 provinces (Hubei, Hunan, Jiangxi, Anhui, Jiangsu, Zhejiang, Yunnan and Sichuan). The total goals of the project were to control the epidemic of schistosomiasis and to interrupt transmission of schistosomiasis in some areas in The People's Republic of China. All project activities were planned till the end of 1998, while three provinces Hunan, Hubei and Yunnan continued till 2001 due to further demands. The project had support from the State Development Planning

Table 1 Planned and actual input of WBLP for schistosomiasis control in The People's Republic of China (in 10,000 RMB)

| | Loan | Matching fund | Loan/matching | Total input | Present value of input in 2001 |
|---|--------|---------------|---------------|-------------|--------------------------------|
| Planned input | 41,590 | 47,390 | 1.14 | 88,980 | 125,462 |
| Actual input | 49,092 | 59,702 | 1.22 | 108,794 | 108,794 |
| Difference between planned and actual input | -7502 | -12,312 | 1.64 | -19,814 | 16,668 |

The exchange rate of US\$ to RMB was 1:5.8 in 1992 and 1:8.2 in 2001.

Table 2 Use of the WBLP for schistosomiasis control according to different components in The People's Republic of China (in 10,000 RMB)

| Item | Loan | | Matching fund | | Total | |
|------------------------------|-----------|-------|---------------|-------|------------|-------|
| | Fund | % | Fund | % | Fund | % |
| Case screening | 4113.86 | 3.78 | 8750.09 | 8.04 | 12,863.94 | 11.82 |
| Chemotherapy | 10,589.02 | 9.73 | 10,267.01 | 9.44 | 20,852.03 | 19.17 |
| Snail survey and elimination | 27,925.19 | 25.67 | 20,004.53 | 18.39 | 47,929.63 | 44.06 |
| Health education | 539.18 | 0.5 | 2923.03 | 2.69 | 3462.21 | 3.18 |
| Training | 541.62 | 0.5 | 1857.66 | 1.71 | 2399.29 | 2.21 |
| Project management | 2055.19 | 1.89 | 11,507.08 | 10.58 | 13,562.27 | 12.47 |
| Disease surveillance | 217.33 | 0.2 | 1251.49 | 1.15 | 1468.82 | 1.35 |
| Operational research | 1252.46 | 1.15 | 868.01 | 0.8 | 2120.47 | 1.95 |
| Others | 1858.2 | 1.71 | 2273.49 | 2.09 | 4135.78 | 3.8 |
| Total | 49,092.06 | 45.12 | 59,702.37 | 54.88 | 108,794.43 | 100 |

Table 3 Input of chemotherapy drugs and molluscicide from the WBLP for schistosomiasis control in The People's Republic of China

| Year | Praziquantel for humans (tablet) | | Praziquantel for animals (kg) | | Niclosamide (kg) | |
|-------|----------------------------------|-------------------|-------------------------------|-------------------|------------------|-------------------|
| | No. purchased | No. actually used | No. purchased | No. actually used | No. purchased | No. actually used |
| 1992 | 46,641,517 | 40,867,249 | 4195.44 | 3145.07 | 174,027.00 | 162,855.98 |
| 1993 | 65,491,334 | 39,449,465 | 5968.59 | 3209.96 | 506,421.20 | 349,094.87 |
| 1994 | 37,928,859 | 31,854,397 | 1998.67 | 3245.96 | 283,698.10 | 326,904.80 |
| 1995 | 23,802,962 | 22,137,618 | 3728.73 | 2128.72 | 310,666.10 | 326,029.80 |
| 1996 | 34,675,780 | 21,265,729 | 3001.02 | 2226.93 | 659,520.30 | 394,261.14 |
| 1997 | 39,986,723 | 20,522,793 | 2916.81 | 2104.52 | 537,744.20 | 487,691.30 |
| 1998 | 25,535,193 | 21,626,767 | 1805.09 | 2425.10 | 254,404.60 | 309,463.33 |
| 1999 | 11,300,888 | 14,750,499 | 988.37 | 1557.69 | 141,743.80 | 222,526.81 |
| 2000 | 10,010,955 | 14,282,098 | 926.57 | 1522.83 | 164,973.30 | 209,650.70 |
| 2001 | 8,817,210 | 11,045,398 | 880.97 | 1201.88 | 165,028.40 | 117,526.60 |
| Total | 304,191,421 | 237,802,013 | 26,410.26 | 22,768.65 | 3,198,227.00 | 2,906,005.34 |

Note: Only included in the Table of the data from 1999 to 2000 all those from Hunan, Hubei, Yunnan and Jiangxi provinces; 2001 all those from Hubei, Yunnan and Jiangxi provinces

Table 4 The input and payment for schistosomiasis control between 1997 and 2001 in The People's Republic of China (in 10,000 RMB)

| Year | Government input | | | Payment for | | | | | | | |
|-------|------------------|-----------------------|------------|-------------|-------------------------------|------------------------------|-------------------------------|--------------------|--------------|-----------|---------|
| | Province | Prefecture and county | Total | Salary | Case finding and chemotherapy | Snail survey and elimination | Health education and training | Project management | Surveillance | Equipment | Others |
| 1997 | 6052.77 | 13,415.60 | 19,468.37 | 10,599.09 | 1772.17 | 2747.44 | 742.92 | 1093.24 | 355.57 | 717.62 | 1353.11 |
| 1998 | 6385.90 | 15,462.46 | 21,848.36 | 11,799.19 | 2009.88 | 3421.88 | 840.02 | 1284.32 | 349.57 | 1055.80 | 1357.78 |
| 1999 | 6629.74 | 16,007.47 | 22,637.21 | 12,835.99 | 1719.25 | 2988.96 | 627.49 | 834.35 | 726.30 | 1168.93 | 1778.95 |
| 2000 | 6712.05 | 15,788.76 | 22,500.81 | 14,105.25 | 2435.25 | 3165.98 | 869.91 | 888.94 | 724.88 | 1000.61 | 1444.53 |
| 2001 | 8385.40 | 18,748.44 | 27,133.84 | 15,671.53 | 2304.55 | 4072.54 | 984.39 | 953.43 | 3779.07 | 1073.33 | 1595.39 |
| Total | 34,165.86 | 79,422.73 | 113,588.59 | 65,011.05 | 10,241.10 | 16,396.80 | 4064.73 | 5054.28 | 5935.39 | 5016.29 | 7529.76 |

World Bank Loan Program completion report on infectious and endemic disease control project schistosomiasis control component of The People's Republic of China (1992–2001). Department of Disease Control, Ministry of Health, The People's Republic of China. Foreign Loan Office, Ministry of Health, The People's Republic of China.

Commission and the Ministry of Finance, with multisectoral participation including health, agriculture, water conservancy and the state drug administration departments. During the project, there were 63,375,009 person-time with case screening, 18,925,688 person-time with chemotherapy, 1,688,428 cattle with case screening and 2,234,634 cattle with treatment. In addition, 9.64 billion m² of area was surveyed for snails, snail elimination with molluscicide was performed on 2.85 billion m², and snail elimination via environmental modification was conducted on 1.05 billion m². An estimated 7.47 million people benefited from the project (Chen, 2005).

4.3.2 Continuing to integrate the resources of regional defence

The regional defence agreement of five provinces of schistosomiasis control was made in 1985 including Jiangsu, Anhui, Jiangxi, Hunan and Hubei. It was decided that classified guidance of schistosomiasis control should be carried out in the five provinces of marshland, paying special attention to the integrated control strategy. It was also demanded that acute schistosomiasis control should be a main component in the control work for the five provinces. Control included snail survey and elimination, case screening, chemotherapy of human and animal at the same time, and strengthening control of migrant population, so as to promote the progress of schistosomiasis control.

4.3.3 The integration of regional resources of comprehensive control

The State Council issued 'a decision on strengthening schistosomiasis control' in 1990, where the schistosomiasis leading group of five provinces, namely Hunan, Hubei, Jiangxi, Anhui and Jiangsu, comprised of the vice-governor or the local leader of schistosomiasis leadership team. This group unified commands and coordination and played an important role in schistosomiasis control.

4.3.4 Strengthening personnel training and scientific research

A series of technical training activities were carried out during the WBLP, and a national network of health education was also preliminarily established. The management and professional technical personnel having both ability and political integrity were selected to go abroad to study, and related experts were organized to go abroad to inspect and conduct academic exchanges at the same time. This resulted in a large number of elite people being trained and the quality of technical personnel improved together with the strengthening the international communication and cooperation ability.

A series of applied scientific research work was also carried out during the project, including a total number of 245 research projects approved and funded by joint research management committee (JRMC). Finally, a total number of 278 papers were published, 25 research projects won awards at or above the provincial level, and 7 research projects won the national patent through 6 years JRMC activity. These fruitful research results obtained have played a positive role in promoting the progress of schistosomiasis control in The People's Republic of China. To accommodate the need for applied research and training at that time in The People's Republic of China, the junior college classes and professional courses on schistosomiasis control were held in Nanjing Medical College, Hubei Medical College and Shanghai University of Medicine.

4.4 Effect of prevention and control

The WBLP, which lasted for 10 years was an important part of the national 'eighth five-year plan and ninth five-year plan' in The People's Republic of China, which funded for schistosomiasis control and accumulated valuable

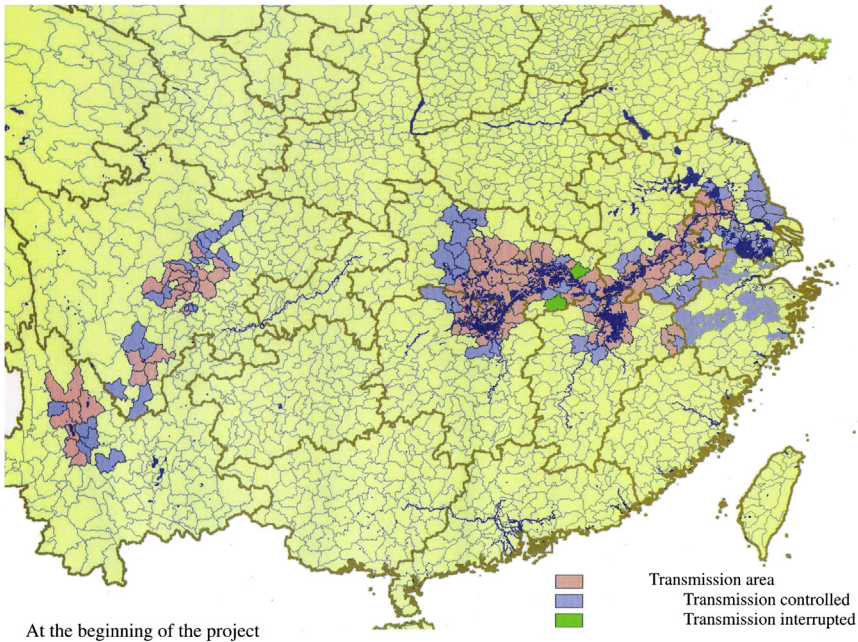


Figure 3 The distribution of the project counties and endemic situation of WBLP of schistosomiasis control in The People's Republic of China (at the beginning of the project).

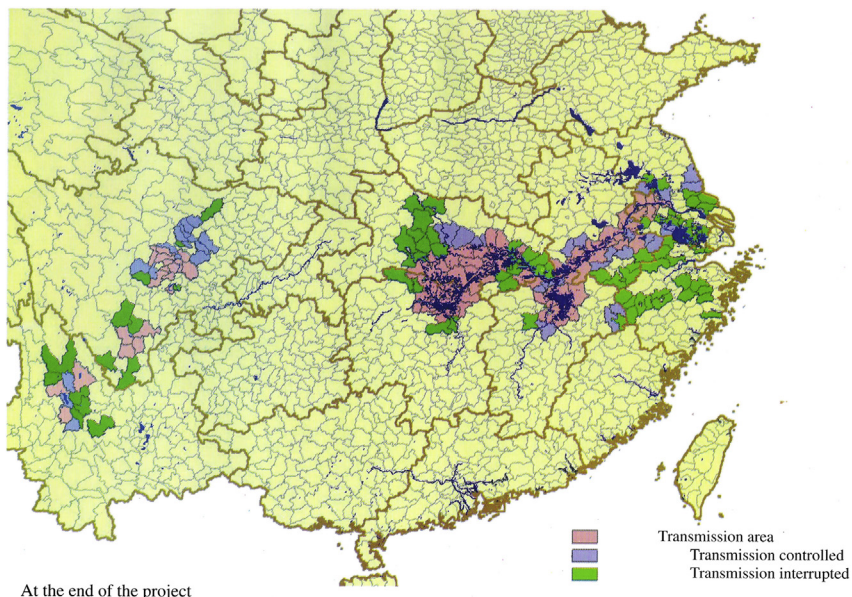


Figure 4 The distribution of the project counties and endemic situation of WBLP of schistosomiasis control in The People's Republic of China (at the end of the project). *WBLP completion report on infectious and endemic disease control project schistosomiasis control component of The People's Republic of China (1992–2001)*. Department of Disease Control, Ministry of Health, The People's Republic of China; Foreign Loan Office, Ministry of Health, The People's Republic of China.

experience. The number of endemic areas of schistosomiasis decreased yearly (Figs 3 and 4) through the implementation of the project. From 1992 to 2001, 47 counties achieved transmission control and 82 counties achieved transmission interruption. The number of highly endemic areas of administrative villages fell by 37.1% and the moderately endemic areas fell by 29.0%, but the low endemic areas increased by 15.0%. The epidemic of schistosomiasis was effectively controlled through the implementation of the project. By the end of 2002, the national infection rate of human and livestock fell 55.0% and 50.0%, respectively, from before the project was implemented in 1992. The national density of infected snails in endemic areas decreased by 75%. In Zhejiang province, schistosomiasis transmission was interrupted in 1995 (Chen et al., 2005) and thus, achieving one of the goals of the project.

Compared with the early years of The People's Republic of China, the infection rates in the province, county and town decreased by 59.0%, 74.2% and 72.0% respectively; total number of schistosomiasis patients

decreased by 93.0% and patients with advanced schistosomiasis decreased by 95.7% in 2002. There were 913 cases of acute schistosomiasis in 2002. In contrast, there were about 10,000 cases of acute infection, and 1000 people dying from acute infection each year in the early foundation of The People's Republic of China. In addition, national cattle infection rate decreased by 85.5%, areas containing snail reduced by 75.4% in 2002. During this period, the National Regulations of Schistosomiasis Control passed the administrative approval by Ministry of Health after repeated modifications. The 'Criteria for control and elimination of schistosomiasis (GB15976-1995) in The People's Republic of China' was issued for the first time. The 'Chinese Journal of Schistosomiasis Control' was established and the 'Handbook of Schistosomiasis Control' was modified. A lot of news on schistosomiasis control and the epidemic were reported by the central and local newspapers and radio stations, bringing them to the attention of the national and local leaders (Wang et al., 1989).



5. SINCE THE 21ST CENTURY

5.1 Background

In the early 21st century, there was a significant rebound of schistosoma epidemics in the Yangtze River basin and some hilly areas due to biological, natural and social economic factors (Zhou et al., 2004; Wang et al., 2004).

1. The ecological environment of endemic regions had changed because of the implementation of measures for flood diversion after the flood in 1998. Measures included building of embankments and returning farmland to lake. However, this change of environment has led to the proliferation of *oncomelania* snail—infested areas (Yang et al., 2005).
2. New epidemic characteristics and regularity of schistosomiasis thus emerged due to the changes of environment. For example, after the completion of the Three Gorges Dam, the extension of the flooding period caused the infectious season to be longer in areas with snails, such as Dongting Lake and Poyang Lake. Global climate change also increased schistosomiasis transmission intensity in some areas (Zhou et al., 2002, 2008; Wu et al., 2007).
3. The development of animal husbandry led to a more important role of the animal host in schistosomiasis transmission.
4. Chemical molluscicide (especially for aquatic animals) caused serious pollution in the environment, limiting the scope of application of molluscicide.

5. Compliance with long-term and repeated chemotherapy in humans and livestock dropped yearly. Infectious source increased since synchronous chemotherapy of human and livestock could not be carried out. Furthermore the only effective drug, praziquantel, had a potential risk of resistance (Wang and Liang, 2007) because of its wide-range use for a long time in the endemic areas.
6. The increase in social and economic developments brought along a rise in population mobility and livestock trading. Therefore, the frequency of contact with infected water, and reinfection of human and animal increased (Zuo et al., 2003).
7. Since 2000s, the society and the mass people have paid more attention to the market economy system; however, due to the change of people's ideology and behaviour, schistosomiasis control was ignored to some extent and some measures were hard to carried out at one time (Li et al., 2002; Cai et al., 2003; Yin et al., 2002).
8. After the WBLP on schistosomiasis control ended in 2001, there was a serious shortage of funding, causing schistosomiasis control in the country to be more passive.
9. The current technology and measures cannot satisfy the needs of the current schistosomiasis control programme, hence it was difficult to effectively control the disease.

Thus, at the beginning of the 21st century, there was a significant rebound of schistosomiasis epidemics in The People's Republic of China. As a result, the total number of patients countrywide remains at around 800,000 from 1998 to 2005, and 700,000 of them are from the five marshland provinces. Cattle infection rate was around 4–5%, with an increased spread of snails. The risk of infection with schistosome was rising, with new areas of infected snails estimated to be about 9 million m² each year in the marshland areas (Chen et al., 2011). The endemic status of schistosomiasis in The People's Republic of China showed that the task of schistosomiasis control was still urgent. The continuous rise in endemic status lasted for 3 years, increasing the risk of human and animal infected by schistosome (Chen et al., 2002, 2003; Xiao et al., 2004). In addition, it was difficult to reach the goal of transmission interruption through snail elimination in the marshland areas, such as Hunan, Hubei, Jiangxi, Anhui and Jiangsu Provinces, as well as the hilly areas, including Sichuan and Yunnan provinces, where the snails were widely distributed, and the ecological environment were complex. Therefore, during 2000s the emphasis on schistosomiasis control is in marshland and hilly endemic areas (Cao et al., 2003).

5.2 Policy support and measures

To curb the rebound trend of schistosomiasis endemic status, the Central Committee of the CPC paid important attention to effectively control schistosomiasis by quickly adopting a series of measures. The administrative institutions, including the State Council and the Ministry of Health, announced 141 files to guide the national schistosomiasis control from 2003 to 2007 (Fig. 5). The State Council leading group of schistosomiasis control was established in February 2004. And the notice of strengthening the control of schistosomiasis further was issued by the State Council in May 2004. The national conference of schistosomiasis control was held in Yueyang City one week after the notice was issued, in order to accelerate the process of schistosomiasis control. Since then, there were important adjustment and propulsion from the national planning and policies, legal management, financial investment and technical standards.

5.2.1 Establishing a new period national planning

The 'National Program of Schistosomiasis Control in Mid- and Long Term (2004–15)' was organized in July 2004. The goal and objectives of schistosomiasis control were clearly clarified in these national programs. The timeline for reaching goals and the national standards in the endemic areas in The

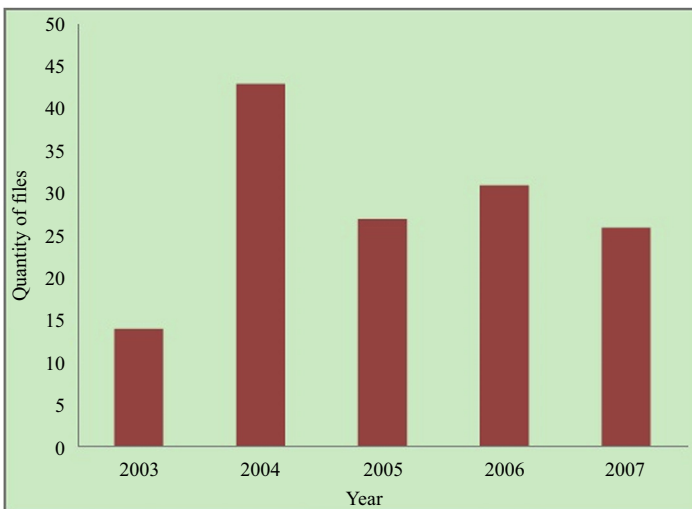


Figure 5 Documents issued by Chinese government (the State Council and the Ministry of Health) from 2003 to 2007. *The department of disease control of the Ministry of Health. 'Documents compilation of schistosomiasis and parasitic disease control (2003–07)'.*

People's Republic of China, including infection control, transmission control and interruption, was clearly stated. With the support of all departments, the central fiscal transfer payments programme was quickly implemented, thus achieving the expected results. At the same time, the management model of this project also became the best example for disease prevention and control in The People's Republic of China (Zhou et al., 2011) because of its specific goals, scientific strategies and specific measures, which took into account the vital interests of the people in endemic areas. The 'National Program of Schistosomiasis Comprehensive Control (2004–08)' was organized by multiministries and commissions in October 2004. The central government allocated special funds to carry out comprehensive control of schistosomiasis in heavy endemic areas, focussing on 163 key counties (city, district). The 'National Program of Schistosomiasis Comprehensive Control (2009–15)' was organized in 2010 and reaffirmed the overall goal of schistosomiasis control in The People's Republic of China. The 'National Program of Animal Disease Control for the Mid- and Long Term (2012–20)' was organized in 2012. In addition, suggestions for the twelfth five-year plan of the national economy and social development made by the Central Committee of the CPC were passed during the fifth plenary session of the 17th of the communist party. It was an important task to 'improve the system of public health and medical service' during the "twelfth five-year" period. According to the policy, a basic public health system, including schistosomiasis control, was to be provided in the future.

5.2.2 The application of comprehensive control strategy 'on the emphasis of infection source control'

With the rapid development of economy in the 21st century, the epidemic reduced gradually in endemic area. Based on results from epidemiological studies and a further understanding of the characteristics and regularity of schistosomiasis in The People's Republic of China, Chinese scholars paid more attention to the two transmission stages of schistosomiasis, namely the miracidium and snail. It was considered that the waste management of human and livestock was an effective way to control infection and reinfection of schistosome (Lin et al., 2009). The comprehensive control strategy 'on the emphasis of infection source control' was officially announced and implemented in 2006 (Chen et al., 2009; Wang, 2005; Wang et al., 2009a,b,c). The central government arranged special funds for water conservancy, agriculture, health and forestry for schistosomiasis control. The comprehensive control strategy 'on the emphasis of infection source control'

was implemented in endemic areas, through the project resources and the increased investment from the local government. The notice of 'further strengthening the infectious source control of schistosomiasis' was issued to the relevant provinces and the ministries by the State Council general office via an urgent telegram in October 2007. Prohibition of countermeasures to control grazing in the areas of snail habitats was extended since 2008. It was indicated that the Central Committee and the State Council were equally concerned with fighting the 'god of plague', flood prevention and disaster relief and people in the endemic areas were inspired to fight schistosomiasis. In addition, the research institute of parasitic disease of Chinese academy of preventive medicine was renamed to the National Institute of Parasitic Disease, Chinese Center for Disease Control and Prevention, in 2002. The national and provincial institutes of parasitic disease made up a scientific research base, which provided guidance for the scientific research of disease control. Three levels of institute (station) of schistosomiasis control, namely municipal (city), county (district) and countryside (town) were still playing a role to organize the implementation of measures. This led to an effective implementation of the measures of the comprehensive control strategy.

5.2.3 Further improving the legal management of schistosomiasis control

The law on the prevention and control of infectious diseases was formally implemented on 1 December 2004, in which schistosomiasis was promoted from 'c' to 'b' class of infectious diseases (Zhou, 2004). The regulations on schistosomiasis control were issued by the State Council in 2006. It was demanded that the comprehensive control measures must be implemented. From then on, the legalization of schistosomiasis control allowed the programme to have organization and management, forming a new work mechanism where the government-led ministries and departments cooperated, experts and technical personnel supported and the masses participated (Zhou et al., 2010).

5.2.4 Increasing National Finance investment

After the outbreak of severe acute respiratory syndrome (SARS) in 2003 (Wang, 2004), the Chinese government paid great importance to the public health and disease prevention and control. The National Finance increased finance investment on schistosomiasis control, making it part of the central financial transfer payment project. The total number of special funds

allocated for endemic areas was over 11.2 billion yuan from the central government since 2004 (data source: Deputy Prime Minister Liu Yandong, speech on the National Conference of Schistosomiasis Control in 2014).

5.2.5 Making standards and technical specification

The ‘Technical guidance for water conservancy combined with schistosomiasis prevention’ was issued by the Ministry of Water Conservancy in 2005. And the ‘Criteria for control and elimination of schistosomiasis (GB15976-2006) in The People’s Republic of China’ was issued in 2006, which replaced the ‘Criteria for control and elimination of schistosomiasis (GB15976-1995) in The People’s Republic of China’. In the same year, ‘National specifications on schistosomiasis prevention and control’ was issued, which made the implementation of schistosomiasis control more scientific and standardized.

5.3 Resources mobilization

5.3.1 Comprehensive control

With the present economic and social developments, the construction of new socialist rural areas has become an important work. The local governments invested lots of money for it, including agricultural mechanization, safe drinking water, the use of biogas and construction of nonhazardous sanitary latrines. These funds were made up of health project funds from the central transfer payments, construction funds such as agriculture, water conservancy, forestry and land (Yang et al., 2016), as well as matching funds from central project supporting funds from the local governments and routine funds of the schistosomiasis control project. This did not only guarantee a smooth development in all the endemic provinces, municipalities (cities), counties (districts), but also improved the efficiency of schistosomiasis control under the construction of a new socialist countryside. In endemic areas of schistosomiasis, the safe drinking water problem of 6 million people were solved, 1.62 million nonhazardous sanitary latrines were built, 490,000 biogas were built, 430,000 cattle were killed, 760 thousands sets of new agricultural machinery were introduced to replaced cattle, 1183 km of the river channel revetment were constructed, 0.17 billion m² of paddy fields were changed to dry land, 1272 km of river and lake beach were forbidden from grazing by fence, 20 billion m² of prevention forest were built since 2011. The government of Hubei Province invested 240 million yuan to implement cattle elimination, 200,000 head of cattle were killed for 4 consecutive years from 2011 to 2014. Thus, the infectious source

of livestock was controlled efficiently by lots of measures, such as promoting the whole county with comprehensive control, establishing agricultural co-operatives and carrying out the ‘no oxen county’ campaign (data source: Deputy Prime Minister Liu Yandong, speech on the National Conference of Schistosomiasis Control in 2014). Local governments at all levels worked according to the demands of ‘building a harmonious society, constructing new countryside’ and implemented comprehensive control measures, with emphasis on infectious source – timely suggested by the Ministry of Health. The process of schistosomiasis control were effectively promoted in The People’s Republic of China due to the priority of the resources and strategies, methods and technology, and efforts to ensure achievement of anticipated goal (Lin et al., 2007; Yi et al., 2009a,b; Wang et al., 2009a,b,c). For example, the State Council approved the implementation of the national rural drinking water safety project and solved the drinking water safety problem for 353 million rural residents and more than 24 million students and teachers from 2005 to 2012. In addition, The People’s Republic of China has also allocated 18.5 billion yuan to the construction of prevention and control system for animal disease and a comprehensive schistosomiasis control (Li, 2013). The pilot counties for schistosomiasis-integrated control were set up by the State Council leading group in different endemic areas for the first time, including Jinxian County in Jiangxi Province, AnXiang County in Hunan Province, Hanchuan County in Hubei Province, Guichi County in Anhui Province and Puge County in Sichuan Province. They were the representatives of schistosomiasis-integrated control through implementation of all proposed measures (Yu et al., 2006). Subsequently, provinces also carried out the pilot work in heavy endemic counties with effective results (Zhang et al., 2009; Zhu et al., 2009; Yang et al., 2009; Yi et al., 2009a,b).

5.3.2 Multisectoral cooperation

The planning has been implemented after 2005. The comprehensive and scientific prevention and control were strengthened under the unified leadership of the central government, and the close cooperation of ministries of agriculture, forestry, water conservancy, health and others, as well as the guarantee of organization, funding, laws and regulations, technology, institutions and personnel. According to different ecological environment and epidemic characteristics in endemic areas, distinct goals for prevention and control were made and thus a varied package of control measures was carried out to control schistosomiasis. Measures included eliminating and replacing cattle with machine, adjusting agricultural industry structure, eliminating

snails by aquaculture, forestry, improving irrigation system, river regulation, eliminating the source of infection by improvement of water supplier and construction of sanitary latrines, building the biogas, synchronous chemotherapy for human and livestock, case screening and treatment, health education (Liu et al., 2014; Cao et al., 2016; Yang et al., 2016) and others.

5.3.3 Provinces and ministries union

The work mechanism among the Ministry of Health, the Ministry of Agriculture, and provinces in heavy endemic areas was established in order to promote the process of schistosomiasis control in The People's Republic of China. The government of Hubei Province launched the new work mechanism of schistosomiasis control with the Ministry of Health and the Ministry of Agriculture in 2008. The strategy of prevention and control with emphasis on infectious source were strongly performed in 33 key counties. This strategy integrated the resources from the department of agriculture, water conservancy, land, health, forestry, transportation, including the leading group of government, departments union, action of the central and local, and thus allowed power and resources to be concentrated. Due to 'the implementation of comprehensive control in the whole county' in heavy endemic areas, the infection rate was reduced further and the achievements were consolidated in Hubei Province. The unified actions for schistosomiasis control between the government of Hunan Province and the Ministry of Health were carried out in 2010. According to the principle of 'overall planning, comprehensive control, showing emphasis', the control measures, focussing on management of infection sources, were carried out in 14 counties (districts) in heavy endemic areas of the Dongting Lake and along the Yangtze River. It was also combined with new rural construction in order to eliminate the cause of schistosomiasis.

5.3.4 Clearing responsibility

To strengthen the leadership of schistosomiasis control, lots of governments at different levels included the programme into their overall planning for local economy and social development and the management target of government, such as signing the 'target responsibility' and 'responsibility contract'. Various forms of responsibility system, including clearing responsibility, task and objectives and the regular evaluation system were set up. It was also important to evaluate the performance of the cadres. Related research work of schistosomiasis control has been carried out in-depth by the relevant ministries and commissions of the State Council and the governments at all levels in The People's Republic of China.

5.4 Effect of prevention and control

The above-mentioned strategy and measures further controlled the schistosoma epidemics in The People's Republic of China, and infection rate hit a record low in history (Figs 6–10). By the end of 2008, five provinces, namely, Jiangsu, Anhui, Jiangxi, Hubei and Hunan in marshland endemic areas and Yunnan Province in hilly endemic areas achieved the standard of infection control. Sichuan and Yunnan provinces achieved the standard of transmission control in 2008 and 2009, respectively. This meant the medium-term objectives of the national long-term planning of schistosomiasis

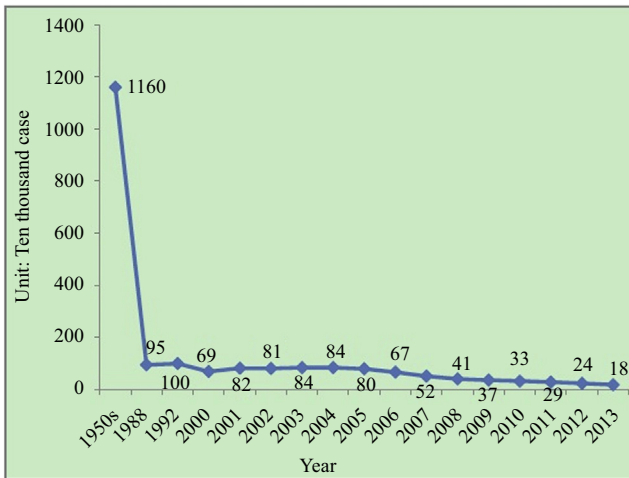


Figure 6 The number of schistosomiasis cases from 1950s to 2013 in The People's Republic of China.

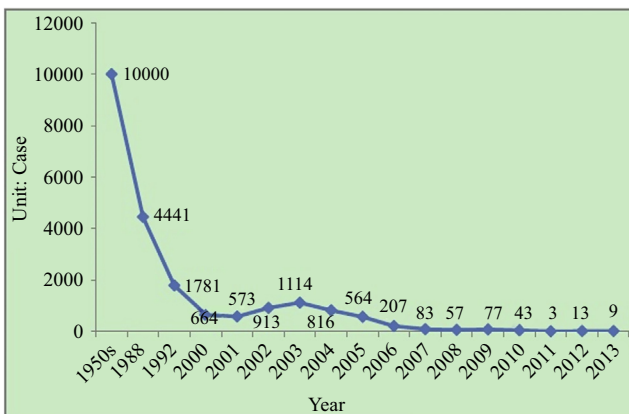


Figure 7 The number of acute schistosomiasis cases from 1950s to 2013 in The People's Republic of China.

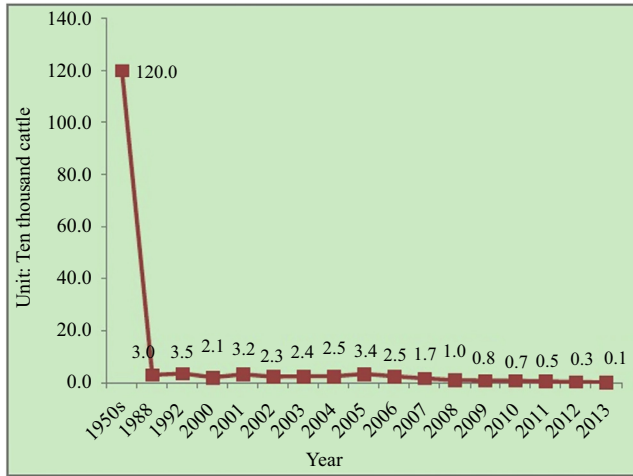


Figure 8 The number of infectious cattle with *Schistosoma japonicum* from 1950s to 2013 in The People's Republic of China.

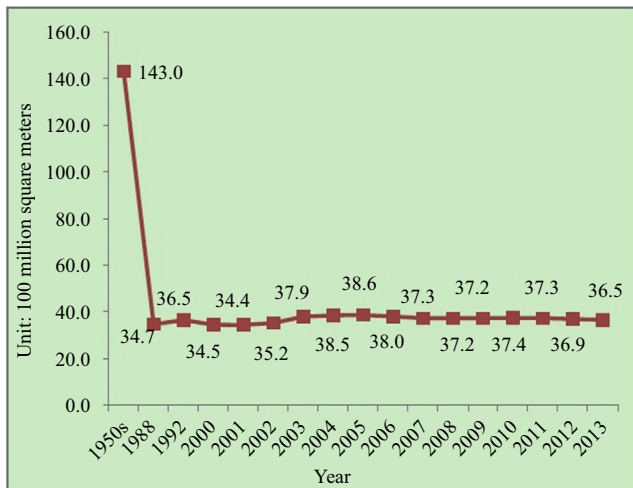


Figure 9 The snail areas from 1950s to 2013 in The People's Republic of China.

control were achieved (Hao et al., 2009; The Ministry of Health et al., 2008; Hao et al., 2010; Li et al., 2009). Jiangsu and Hubei provinces achieved the standard of transmission control in 2010 and 2013, respectively, causing the final objectives of national long-term planning of schistosomiasis control to be achieved. Besides, the infection rate in three provinces Anhui, Jiangxi and Hunan reduced yearly. All of them will achieve the final objectives of national long-term planning of schistosomiasis control as scheduled by the end of 2015.

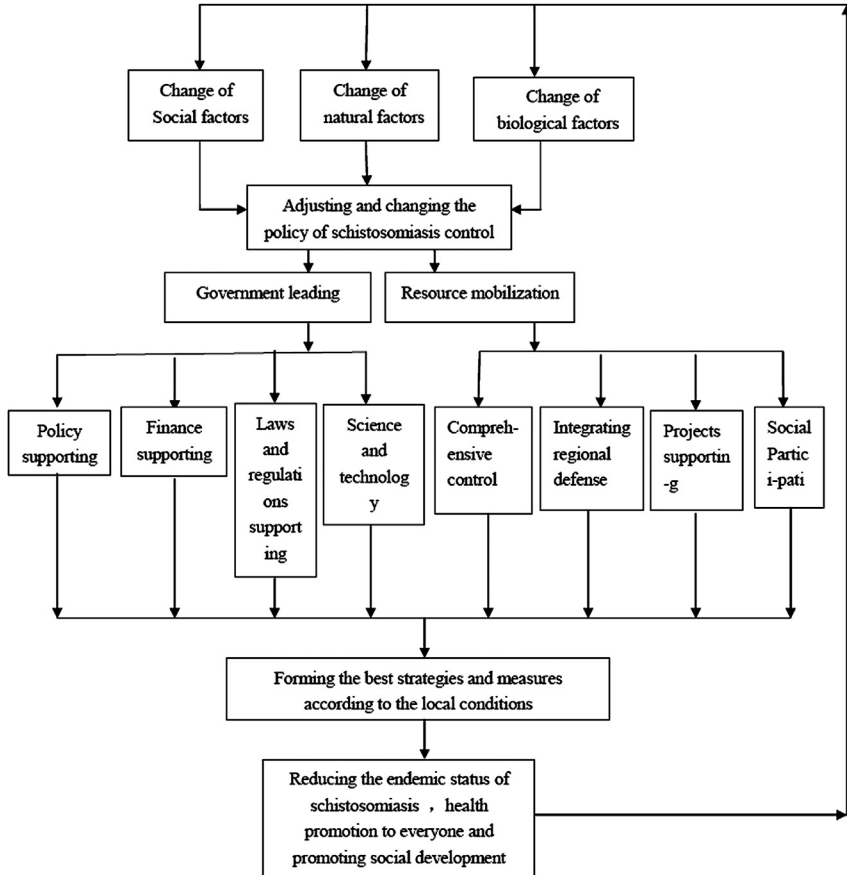


Figure 11 Model pattern of policy support and resources mobilization for the National Schistosomiasis Control Programme in The People's Republic of China.

the unified leadership and policy support from the government, whether it is in the early years where the country has a relatively backward social economy, or in 2010s with the rapid development of social economy (Table 5). There were three rebound epidemics of schistosomiasis in The People's Republic of China: the first one was influenced by the cultural revolution during the 1960s, the second was influenced by the reform of market economy system during the 1980s and the third was affected by the multiple factors of the natural environment and social economy around the 20th century. The CPC and the government paid great importance to schistosomiasis control. The policy system of schistosomiasis control was formed by strengthening the leadership according to the measures of issuing a series of policy

Table 5 The schedule of National Conference of Schistosomiasis Control organized by the Central Committee of the CPC and the government in The People's Republic of China, from 1950s to 2014

| Time | Name of conference | Place (Provinces/ Municipalities) | Organizer |
|---------------|--|--|----------------------------------|
| November 1955 | The First National Conference on Schistosomiasis Control | Shanghai | The Central Committee of the CPC |
| March 1956 | The Second National Conference on Schistosomiasis Control | Shanghai | The Central Committee of the CPC |
| December 1956 | The Third National Conference on Schistosomiasis Control | Shanghai | The Central Committee of the CPC |
| December 1989 | The Conference on Schistosomiasis Control from Five Provinces in Marshland Areas | Jiangxi Province | The State Council |
| November 1990 | The National Conference on Schistosomiasis Control | Hubei Province | The State Council |
| 1991 | The National Conference on Schistosomiasis Control | Hunan Province | The State Council |
| December 1992 | The National Conference on Schistosomiasis Control | Anhui Province | The State Council |
| November 1993 | The National Conference on Schistosomiasis Control | Jiangsu Province | The State Council |
| November 1994 | The National Conference on Schistosomiasis Control | Beijing | The State Council |
| December 1995 | The Conference on Schistosomiasis Control from the Ministry of Agriculture | Yunnan Province | The Ministry of Agriculture |
| November 1997 | The National Conference on Schistosomiasis Control | Beijing | The State Council |
| March 1999 | The National Conference on Schistosomiasis Control | Beijing | The State Council |

| | | | |
|----------------|--|------------------|-----------------------------|
| June 2000 | The Conference on Schistosomiasis Control from the Ministry of Agriculture | Guangxi Province | The Ministry of Agriculture |
| May 2002 | The Conference on Schistosomiasis Control from the Ministry of Agriculture | Jiangxi Province | The Ministry of Agriculture |
| August 2003 | The Conference on Zone Defence of Schistosomiasis Control from Five Provinces in Marshland Areas | Jiangsu Province | The Ministry of Health |
| May 2004 | The National Conference on Schistosomiasis Control | Hunan Province | The State Council |
| May 2006 | The National Conference on Schistosomiasis Control | Jiangxi Province | The State Council |
| December 2009 | The Conference on Schistosomiasis Control from the Ministry of Agriculture | Anhui Province | The Ministry of Agriculture |
| September 2010 | The National Conference on Schistosomiasis Control | Hubei Province | The State Council |
| November 2011 | The Conference on Schistosomiasis Control from the Ministry of Agriculture | Yunnan Province | The Ministry of Agriculture |
| December 2012 | The Conference on Schistosomiasis Control from the Ministry of Agriculture | Hunan Province | The Ministry of Agriculture |
| May 2013 | The Conference on Schistosomiasis Control from the State Forestry Bureau | Anhui Province | The State Forestry Bureau |
| November 2014 | The National Conference on Schistosomiasis Control | Hunan Province | The State Council |

document on schistosomiasis control from central to local government, and making central planning and local specific measures. Therefore, the mode of schistosomiasis control depended on the leadership of the government, who indicated the direction of the development and laid the foundation in future. In addition, disease control and prevention was upgraded to the national polity level, where promoting disease control and prevention by political authority formed the solid foundation of schistosomiasis elimination.

6.2 National planning

A series of planning has been made from the central government to the local governments in The People's Republic of China, effectively promoted by the implementation process of schistosomiasis control, by setting phased objectives and the final target in the long term. Measures were adjusted according to local conditions and epidemic situation, and from strategies to specific measures all were integrated to allow a comprehensive control programme to be rolled out. Experiences from The People's Republic of China showed that the prevalence of schistosomiasis could be controlled effectively with well-planned and executed national control programmes and a certain amount of investment (Zhou et al., 2009).

6.3 Comprehensive control

Schistosomiasis is a public health concern and its control involves the departments of agriculture, forestry, water conservancy, forestry and environment. Thus the control programme depends on the cooperation of different departments, and is difficult to be implemented by the department of health alone. Remarkable achievements of schistosomiasis control were achieved in The People's Republic of China, because it has always paid important attention to combine coordination with development between different departments, integrate resources from the whole society, conform to the trend of social development, closely combine with the economic construction and implement comprehensive control measures according to the local condition.

6.4 Science and technology leading

Strategies for schistosomiasis control has been continually improved in The People's Republic of China with the development of society and economy, the progress of science and technology, and the adjustment of strategies from WHO. All the corrections were made using scientific research as the guide. Practice shows that the promotion of science and technology was the key in speeding up the progress of schistosomiasis control. Difficulties and

bottlenecks from schistosomiasis control were defeated relying on the progress of science and technology (Chen et al., 2016). The level of disease prevention and control are improved relying on the guidance of science and technology. Concurrently, it is important to assemble a professional high-quality team who can carry out the scientific prevention and control measures.

6.5 Social participation

In the early years of The People's Republic of China, the whole society was mobilized to join in the infectious diseases control, including the fundamental interests of the masses, social politics and economic development. The basis of schistosomiasis control relied closely on the masses during the 1950s. Remarkable results were achieved by organizing the masses movement at that time even though the science and technology were underdeveloped. Hence, people were the main force of the elimination of schistosomiasis then. Nowadays, schistosomiasis control still need the organizations and institutions of disease prevention and control with the leadership of the party committees at all levels. We still need the understanding and support of the whole society to carry out extensive social mobilization and participation (Salam et al., 2014). And we hope to create a healthy environment by sending 'the god of plague' away together.



7. CHALLENGES

Across the 65 years of history in schistosomiasis control in The People's Republic of China, precious and rich experiences in terms of policy support and resource mobilization were accumulated, providing a powerful guarantee to promote the process of national prevention and control. But two main problems need to be emphasized on the macrocontrol of policy in future, as follows: Firstly, it was not given enough attention to the schistosomiasis control, which is complex in nature, its economic benefits were always ignored. Therefore, there was a lack in assessment on strategy, especially on comparative assessment on economic benefit analysis of strategy and the rational allocation of resources. Secondly, the investment of schistosomiasis control was under a budgeting system responsible by the state. When the proposed measures did not work, nobody but the state had to bear the economic losses. It also means that there is no competition for investment of schistosomiasis control, so there is no push for an effective use of national resources (Zhou et al., 2010).



8. THE WAY FORWARD

The national conference on schistosomiasis control was held by the State Council in November 2014. Premier Li Keqiang, the Standing Committee of the Political Bureau of the CPC Central Committee made important instructions for the meeting: ‘... sweeping “the god of plague” into history, and bringing the clean, peace and health to all people.’ Vice Premier Liu Yandong, the Committee of the Political Bureau of the CPC Central Committee stressed that the control planning of the next 10 years must be made as soon as possible at the meeting. We must strive to improve the professional technology in order to win the battle of schistosomiasis control in the next 10 years, and strive to realize schistosomiasis elimination. With the social and economic developments, the level of people’s life and culture has gradually improved. The government invests more financial and material resources to schistosomiasis control, therefore people will be able to choose a healthy life, far away from schistosomiasis (Jiang et al., 2010). We believe that we will achieve the goal of schistosomiasis elimination as early as possible, and the long-cherished wish of sending ‘the god of plague’ will be finally realized through the leadership of the party and government, and the joint efforts from the whole society in the near future (Zheng et al., 2013).

The time of cooperation for the development of improved global public health is approaching (Xu et al., 2016a,b). The global elimination of schistosomiasis in 2025 was passed on the World Health Assembly in 2012. The United Nations summit put forward ‘sustainable development goals after 2015’ on ‘Rio + 20’ in 2014, including the global elimination of schistosomiasis. Currently, one-third of global population is threatened by schistosomiasis in The People’s Republic of China. In order to achieve global sustainable development, it is important to control schistosomiasis well in The People’s Republic of China. As a responsible and big country, we should response positively to the international initiative, by speeding up the pace of schistosomiasis elimination (Tambo et al., 2014). This will in turn benefit both the people of The People’s Republic of China and the international community.

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