CHAPTER 6

DISCUSSION AND CONCLUSION

Cost-effectiveness analysis (CEA) is an analytical method that can provide us a framework for clarifying different approaches' values. From this study, three approaches of schistosomiasis control were evaluated by CEA method.

6.1 Chemotherapy Role in the Schistosomiasis Control

Praziquantel is a effective drug in all forms of schistosomiasis. The results of this chemotherapy showed that by one year selective mass chemotherapy, the prevalence of schistosomiasis could be reduced from 19.23% to 7.98% (Table 4.22). For four years chemotherapy, the prevalence could be reduced to 4.92%. After four years implementation, the selective mass chemotherapy stopped, the prevalence of schistosomiasis rose quickly. The impact of chemotherapy stopped for two years, the prevalence rose again from 4.92% to 13.58%. The effects on schistosomiasis chemotherapy was evident in just one or two years in this areas. In this type of epidemic area, schistosomiasis would reemerge yearly. Although during the selective mass treatment, the population got the treatment, the intermediate host-snail was still in a higher density (Table 4.27). Because the main infection sources are from the infected livestock in this area, the chemotherapy can decrease the prevalence in the population, but the intensity of transmission was still at a high level. The yearly selective mass treatment was still recommended in this area.

Chemotherapy established as a basic component of schistosomiasis control. The study demonstrated that appropriate drug treatment lowers worm burden and decreased the intensity of infection with schistosome similarly to the prevalence of infection (Figure 5.1).

In the implementative stage, the cost-effective ratio (CER) of the selective mass chemotherapy was 30.56 and chemotherapy was the most cost-effective of the three approaches in this stage.

In the whole study period (eight years), the cost-effective ratio (CER) of the selective mass chemotherapy was 41.56 and chemotherapy was the second cost-effective approach following the approach of environmental change.

In the regression model, the coefficient of the selective mass chemotherapy is 40.18 (Table 5.7). That means if we want to increase one case avoiding the infection, we need to pay 40.18 yuan. The result showed the same with cost-effectiveness analysis of the chemotherapy that was the second most effective approach following the approach of environmental change in the whole study period.

In order to increase the cost-efficiency, treatment strategies can be adapted to prevalence level aiming at accessible indicator groups within a community; 10-19 years and 19-29 years age groups (Table 5.8). The children are usually easily located at school for stool examination and also usually the most heavily infected group in the community. Treatment based on this method is empirical and aims to cover most people at risk. If we have detailed data to show that the prevalence of schistosomiasis in a special age group or occupational group is high, we can use selective group chemotherapy.

The principal goal of treatment schedule must be to protect 10-19 year old children as they grow older and continue to be infected. Re-treatment may be required at intervals ranging from two to three years according to the surveillance data. Adults and particularly those at risk of infection through their occupation, should be treated if and when the intensity of infection increases.

The chemotherapy is very difficult to decrease the schistosome transmission, because zoonotic schistosomiasis infection has a great impact on the epidemiology and control of the disease. In China, about 40 mammalian species have been found naturally infected with *S. japonicum*. Cattle, buffalo and pigs are of great importance in contamination of the marshes. It will be more difficult to use chemotherapy for schistosomiasis in those animals in those areas.

6.2 Molluscicide Role in Schistosomiasis Control

When snail control was added, the drop was sharp in molluscicide and chemotherapy community. the impact of control during the study period is shown in Table 5.2. It shows that schistosomiasis transmission was significantly reduced during the study period. The study shows that the application of a combination of strategies will permit the to control Schistosomiasis effectively as Yuan (1992) has stressed.

In this study, one year molluscicide and chemotherapy could reduce the prevalence from 26.23 to 7.08%. Two years implementation could reduce the prevalence to 3.40%, and then keep it at this level if the molluscicide did not stop. If the impacts stopped, the prevalence would increase again, but the speed would be slower than with chemotherapy alone. When the molluscicide stopped for three years, the prevalence rose again from 3.73% to 10.34%. The effects on schistosomiasis of molluscicide was evident in just three or four years in this area.

Snail control using synthetic molluscicides is one of the most effective methods for the control of snail-borne diseases. In the implementative stage, the cost-effective ratio (CER) of the molluscicide and chemotherapy was 68.31 and molluscicide was the least cost-effective approach in three approaches in this stage (Table 5.4).

In the whole study period (eight years), the cost-effective ratio (CER) of the molluscicide and chemotherapy was 61.74 and this approach also was the least cost-effective approach (Table 5.5).

In the regression model, the coefficient of the selective mass chemotherapy was 56.71 yuan (Table 5.7). That means if we want to prevent one infection case, we need pay 56.71 yuan. the result showed the same with cost-effectiveness analysis of the molluscicide and chemotherapy which was the least effectiveness approach in the whole study period.

The cost of molluscicide is high. Both in the stages of implementation (four years) and in the whole study period (eight year), the cost-effective ratio was highest of the three approaches. The cost would limit molluscicide use on a large scale, particularly in

endemic areas, where limited economic resources often do not guarantee constant supply of the chemicals.

With molluscicide, we can decrease the prevalence to a lower level more than chemotherapy could do. If the molluscicide is stopped for three of four years, the prevalence of schistosomiasis would rise again, but the speed of rise was slower than with chemotherapy alone.

No new molluscicide of any great significance has been developed in the past decade. Although the molluscicide, niclosamide, is predominantly used in the control programmes in the world, the niclosamide is expensive in the market of China. The price of pentachlorophenate is lower than niclosamide, and it has been widely used in control of schistosomiasis in China for thirty years. Molluscicide-pentachlorophenate was used in this study.

Before using molluscicides the water bodies should be surveyed for the presence of snail hosts of schistosomiasis. The molluscicide application technique depends on the type of water bodies. In marshes and stagnant water the recommended technique is hand or power spraying.

Chemical control remains the best method for the destruction of snail hosts. But it is the most expensive approach. If the sitting of human settlements in and near irrigation areas can be strictly controlled, molluscicide is the best approach we can implement. If the human settlement is very close to the snail ridden marsh and the people have a high frequency to contact the infected water, molluscicide is approach of choice.

6.3 Environmental Change Effect on Schistosomiasis

Resource projects are essential components of the development process in many endemic provinces in China. Measures to reduce snail populations and hence the risk of transmission of schistosomiasis and to prevent its spread are usually considered during the planning of projects. The costs of altering designs may be high overhead sprinkler systems instead of canals and provision for adequate periodic drainage of small reservoirs or irrigation systems, but there may be a long-term economic benefit.

Natural water bodies, marshes, ponds and swamps, where snails breed and from where they may infest irrigation schemes and other water projects, can be modified or completely eliminated. Land can be reclaimed for agricultural purposes.

In this study, we successfully controlled schistosomiasis to a very low level. A dike was built in the first year, the molluscicide was used during building the dike in the first year. Although after the dike finished, some snails were found in the marsh the density was very low. The infected snails disappeared from the third year to the end of the study. After the fourth year, the prevalence dropped from 17.31 to 1.32 and then kept this level for the whole study period. Although few cases were found every year, this is a schistosomiasis risk area; it was difficult to say that the people with schistosomiasis getting infection was from the local marsh.

In the implementative stage, the cost effective ratio of environmental change was 58.31 yuan (Table 5.4), that was higher than CER of the chemotherapy. But it is the only way we can decrease the prevalence to a very level. If we consider the long-term effect of control approaches, environmental change is the most cost effective approach. In whole study period, the CER of environmental change was 36.48 yuan, which was the most cost-effective control method among the three approaches.

The environmental change approach should be considered with local agriculture development programmes together. If possible, any agriculture programme development in schistosomiasis epidemic areas should be evaluated in relation to the effects of schistosomiasis transmission.

Building the ecological conditions that do not allow the snails to live is the best way of controlling schistosomiasis. In marshes and lake areas of China, we have not had the experience of using chemotherapy and molluscicide to eliminate schistosomiasis. If we want to control schistosomiasis to a low level, environmental change would be the best way we can use.

6.4 The Factors of People Getting Infection

In the implementive stage, the implementation of three control approaches were carried out by the research team. Those approaches were given to separate communities. The results of this stage were clearly attributed to different approaches. a logit model was developed here to show those effects.

Eight factors entered the model, as shown in Table 5.8. Two independent variable of Age3 (age group 3-10 year) and sex did not show significant effect (Pr > 0.05). The positive independent variables were Age10 (age group 10-19 year), Age20 (age group 20-29) and IDS (density of infected snail). That means if age groups 10-19 and 20-29 had a higher probability getting infection, higher density of infected snail would give the people more chance to get infection. Negative factors were Moll (mollusicicde), Envm (environmental change) and DS (density of snail). Envm and Moll can decrease the probability of getting infection. The regression coefficient of Envm was bigger than that of Moll; that means the effect of decreasing the probability of infection of Envm stronger then that of Moll. The variable of DS (density of snail) was negative with the people getting infection, but attribution of DS to the model is very small (b_i=-0.126).

6.5 Limitation of the Study

Cost-effectiveness analysis has the potential to provide information of immediate practice of benefit to control schistosomiasis. However, even cost-effectiveness studies are of limited value unless we take into account local cost structures and practical issues which can influence effectiveness. These include the community acceptability of and compliance with different options. In the maintenance period, in some years we use focal molluscicide, but the effect of this approach was difficult to address. In the molluscicide and environmental change communities, we also were able to decrease the prevalence of schistosomiasis domestic animals, but this additional benefit was not dated.

The study has discussed the cost from the provider view point, The cost for the schistosomiasis control programme is still high in relation to the ability of the local governments or community to pay. We did not discuss the cost of the resources here. It is clear that

the family with disease may be willing to pay for the treatment, but it difficult to expect that they are willing to pay for the molluscicide or environmental change.

6.6 Conclusion

1. Selective mass chemotherapy can largely decrease the prevalence of schistosomiasis in marshland areas south of China. Chemotherapy is a most important and cheap method to reduce prevalence of schistosomiasis. Selective mass chemotherapy can drop the prevalence of schistosomiasis from about 20% to 5-7%. In the implementation period, chemotherapy is the most cost effective approach.

2. Reinfection is high in the chemotherapy community. If the selective mass chemotherapy is stopped, the prevalence of schistosomiasis would increase quickly.

3. Chemotherapy is recognized to be the most important rapid and cheap method to reduce the prevalence of schistosomiasis. Because of the high of reinfection rate, annual treatment should be recommended to be a essential approach of schistosomiasis control in those areas.

4. Molluscicide and chemotherapy can largely decrease the prevalence of schistosomiasis in marshland areas.

5. Molluscicide and selective mass chemotherapy can drop the prevalence of schistosomiasis from about 26% to 3-4%.

6. If molluscicide is stopped, the prevalence of schistosomiasis increases more slowly than with selective mass chemotherapy.

7. In the long-term, the approach of molluscicide and chemotherapy is an expensive control method.

8. Environmental change approach can control prevalence at a very low level for long time. In the implementation period, the investmentmant of environmental change is not a cheap. But the environmental change approach can decrease the prevalence to low level in the long time, so, per unit time, this approach is the most cost-effective in the three approaches for schistosomiasis control.

9. The cost of environmental change is higher in the beginning of the implementation. The cost of this approach is most exceeded the capacity of the local health resource. This approach should be considered with local

agriculture programme development together. Otherwise, it will be very difficulty to managed. Most importantly in those areas, during the agriculture programme developing, the effects on schistosomiasis should be involved.