

— Review Article —

## Health Education Approaches to Control Urinary Schistosomiasis in Developing Countries

Kazuhiko MOJI<sup>1)\*</sup>, Tai-ichiro TAKEMOTO<sup>1)</sup>, Masaaki SHIMADA<sup>2)</sup>, Yoshiki AOKI<sup>2)</sup>, Mohamed KARAMA<sup>3)</sup>, Wilfred Kisingu<sup>3)</sup>, C.G.N. Mascie-Taylor<sup>4)</sup>

1) Department of Public Health, Nagasaki University School of Medicine, Nagasaki, Japan

2) Institute of Tropical Medicine, Nagasaki University, Nagasaki, Japan

3) Centre for Public Health Research, Kenya Medical Research Institute, Kenya

4) Department of Biological Anthropology, University of Cambridge, UK

\* Current Position: Visiting Professor, Department of Biological Anthropology, University of Cambridge and Overseas Fellow, Churchill College, Cambridge, UK

**This article reviews the main health education approaches for the control of urinary schistosomiasis which is endemic in many developing countries. The control of schistosomiasis by mass-chemotherapy and safe water supply needs people's behavioural changes through simultaneous effective health education. The characteristics of the following five health education approaches were demonstrated; (1) the 'provision of knowledge' approach, (2) the KAP (knowledge, attitude, and practice) or KAPB (knowledge, attitude, perception, and behaviour) study-based approach, (3) the health belief model, (4) the PRECEDE/PROCEED model, and (5) the community participation approach through empowerment and health learning. Education should be orientated by KAPB studies. Then, information on people's perception and attitudes toward the targeted disease should be collected through communication and discussion with people based on the Health Belief model. In the next step, proper knowledge and message for behavioural changes and disease control should be provided in a culturally acceptable and effective manner. These core parts of health education should be backed up using findings of the PRECEDE/PROCEED model. At the same time, health education should stimulate community participation, which in turn enhances the health learning process of community members. All these processes with available public health and basic human services should work together for effective behavioural change and for better health outcomes such as increasing mass-chemotherapy participation**

**and reducing infection and re-infection rates through avoidance of contaminated water.**

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### Introduction

Schistosomiasis, previously called bilharziasis, is a parasitic disease caused by trematodes (blood flukes) called schistosomes. Although the life cycle of the parasite and the route of infection are well understood, and an effective drug therapy exists, many control efforts have failed to produce a sustained reduction in the prevalence of the disease in developing countries. The disease is still very common mainly in tropical rural areas of Africa, South America, and Southeast Asia. In 1985 there were approximately 200 million infected individuals (WHO, 1985) and a similar number were thought to be infected in 1993 (WHO, 1993) although Gentilini (1993) estimated 300 million people were infected worldwide. The disease may be increasing in some areas with 'development' following the construction of dams and the introduction of irrigation schemes (Hunter et al., 1982) and environmental changes such as deforestation (Walsh et al., 1993). Epidemic schistosomiasis has followed the construction of large dams, such as those built at Lakes Volta, Kainji, Kossou, Kariba and Aswan in Africa (Ross et al., 1997). Schistosomiasis is the second most prevalent tropical disease after malaria and a leading cause of severe morbidity in large areas of the world (TDR, 1997). The disease was estimated to be responsible for the loss of 1.5 million disability adjusted life years (DALYs) and mortality was estimated to exceed 100,000 per year.

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#### Address Correspondence :

Tai-ichiro Takemoto, M.D.

Department of Public Health, Nagasaki University School of Medicine,

Sakamoto 1-12-4 , Nagasaki 852-8523, JAPAN

Phone: +81(95)849-7065 Fax: +81(95)849-7069

Three major types of the disease exist in humans caused by three species of schistosome; *S. haematobium*, *S. mansoni*, and *S. japonica*. *S. haematobium*, known as urinary schistosomiasis because eggs are excreted through the urinary channels, is prevalent mainly in Egypt and Sub-Saharan Africa. The life cycle of urinary schistosomiasis is summarised in Table 1. Once eggs excreted with urine reach water, they hatch within one hour to free-swimming miracidia. They chemotactically find the intermediate snail hosts of *Bulinus sp.* and penetrate into the snails. This process represents a dangerous period for the survival of schistosomes; they must be excreted into water where the host snails live, and the miracidium must find a proper snail within 24 to 32 hours. In the snail, a process of asexual multiplication produces thousands of cercariae from a mother sporocyst via daughter sporocysts within 4 to 8 weeks. A snail sheds 200 to 2,000 free-swimming cercariae per day for 6 weeks or more (until the death of the snail). A snail may shed as much as 600,000 cercariae. Finally, the free-swimming cercaria must find a human being within 24 to 48 hours and penetrate the skin. The life cycle of schistosome can be blocked by one of three ways, (1) by avoiding urination in the river/pond, (2) by eradicating the host snails with molluscicides and/or environmental modification and/or (3) by avoiding going into river/pond.

Within the human body, schistosome move from the

skin to lungs, then to hepatic portal vessels where they mate, and reach the veins of the bladder within 6 to 12 weeks. A pair of mature worms, a male worm, about 7 mm long, and a female worm, a bit longer than the male, produce in the bladder about 20 to 200 eggs/day (Loker, 1983) for 3.5 to 12 years (Jordan and Webbe, 1982) or sometimes even up to 30 years. Some eggs manage to drop into urine in the bladder to be excreted. In the case of *S. mansoni*, only less than a half of eggs penetrate the tissue into lumen. The control measure during this part of the life cycle is to kill the worm by drug treatment. Mass chemotherapy with praziquantel is the most effective way because it produces a marked reduction in the worm population in the human, and secondarily reduces the transmission rate. People need to take praziquantel only once for a treatment. The conversion rate, the percentage of egg-positive people who become egg-negative after chemotherapy treatment, was reported at around 85% (Shimada et al., 1989; Kiliku et al., 1993).

Infection with urinary schistosomiasis could be divided into four clinical stages. These are (1) the invasive stage characterised by itchiness and skin rashes, (2) acute toxæmic stage; travellers having swum in water in endemic areas often suffer from the disease at this stage, (3) egg-laying stage, associated with haematuria and anaemia, and (4) chronic stage with dysuria, hydronephrosis, renal failure, and cancer of the

**Table 1.** The life cycle of urinary schistosomiasis.

Site	Organ	Form and activity	Duration and multiplication
Human	Bladder	Egg	Less than 50% of eggs penetrates tissue into lumen. (data of <i>S. mansoni</i> )
		[ excretion with urine to water ]	Over 1,000 mean eggs /hour of urine in 10 -14 years old children (Shimada, 1987)
Water		[ hatch ]	Eggs hatch within 1 hour after reaching water.
		Miracidium (free-swimming)	24-32 hr
		[ find snail chemotactically and penetrate ]	Infectivity remains only 6 hours or less.
Snail		Mother sporocyst	It appears 15-20 days after infection. (depends on temperature)
		Daughter sporocyst	It appears 4-8 weeks after infection. (depends on temperature)
		Cercariae within snail	A snail sheds 200 or more cercariae/day for 6 weeks or longer.
Water		Cercariae (free-swimming)	24-48 hr (depends on temperature)
		[ penetrating to human skin ]	
Human	Skin	Shistosomula	3 days (hamster)
	Lungs		5-12 days (peak on day 8) (hamster)
	Liver, hepatic portal vesseles	growing to adults / mating	pair on day 31 and produce eggs from day 65 ( <i>S. mansoni</i> , hamster)
	Veins of bladder	Adult pairs [ laying eggs ]	A female produces 22 - 203 eggs/day (Loker, 1983) for 3.5 - 12 years or longer.
			Eggs can live in the tissue for 5-21 days. (data of <i>S. mansoni</i> )

After Jordan and Webbe, 1982; Mohamed, 1992; Shimada et al., 1987

bladder. Haematuria is the most common sign of infection in the egg-laying stage for *S. haematobium*. Urinary schistosomiasis can also lead to iron deficiency, anaemia and protein-energy malnutrition (Stephenson, 1989), and reduced physiological and mental performance (Tanner, 1989; Kimura et al., 1992). Continuous heavy infection is a risk factor for squamous cell carcinoma of the bladder, particularly in Egypt, Iraq, Kuwait, Malawi, Zambia, and Zimbabwe (WHO, 1985).

*S. mansoni* is found in Africa and Central and South America. *S. japonica* which is mainly found in the Philippines and other areas of South-East Asia and some parts of China gives rise to the most serious damage to human health among the three species. Eggs of these two species are excreted with human faeces. *S. mansoni* causes symptoms of colicky abdominal pain, diarrhoea, and blood in the stools during the egg-laying stage, though these symptoms are often not very clear. *S. mansoni* may cause a serious disease of pipe-stem fibrosis of the liver, with hepatosplenomegaly in the chronic stage. The acute toxæmic stage of *S. japonica* is known as the Katayama disease. *S. japonica* frequently causes liver cirrhosis and cancer in the chronic stage. There is a sharp contrast between those individuals with mild schistosomiasis, which is of little consequence to the well-being and economic productivity of infected people, and the tragedy of advanced cases, who require hospitalisation (Mascie-Taylor and Mohamed, 1995).

People become infected through contact with fresh-water such as rivers and canals, and the disease is common among rural poor who do not have access to safe water and sanitation facilities (Eckholm, 1973). The highest prevalence is found among children and young adults (age range 5-19 years) in many communities, because they are more likely to frequently use river sources for recreational purposes (Shimada et al., 1987).

Changing the behaviour of people through health education and communication efforts, in addition to mass-chemotherapy and provision of safe water and sanitation is acknowledged by WHO (1985) as the most feasible way to control the disease. This article reviews various health education approaches to changing human behaviour with special emphasis on the control of urinary schistosomiasis in tropical rural communities in developing countries.

## Health Education Models

Many models, theories, and approaches to health education and behavioural change communication are available. For example, Graeff, et al. (1993) listed the

following models: (I) the health belief model, (II) the communication/persuasion model, (III) the theory of reasoned action, (IV) the transtheoretical (or stage of change) model, (V) the PRECEDE/PROCEED model, (VI) the diffusion of innovations model, (VII) the social learning theory, and (VIII) the applied behaviour analysis. This article deals with (1) the 'provision of knowledge' approach, (2) the KAP (knowledge, attitude, and practice) or KAPB (knowledge, attitude, perception, and behaviour) study-based approach, (3) the health belief model, (4) the PRECEDE/PROCEED model, and (5) the community participation approach through empowerment and health learning. These approaches are mutually related and overlap, and clear distinctions do not exist. The major characteristics of each model or approach are listed in Table 2.

### I. The 'Provision of Knowledge' Approach

To provide people with sufficient information and knowledge is essential for health education. Such reasoning also applies to disease control. Nowadays, the notion that people (or patients) do not need to know about diseases and their outcomes, and that only specialists need to know about diseases and people should obey specialists without knowledge, is outdated. It is because co-operation of people is indispensable for the effective control of diseases, and such co-operation can be obtained and sustained only by having appropriate knowledge and avoiding misconceptions. Nowadays, health-related information is available through mass media although some people misunderstand the real messages. Myths and misconceptions based on rumours and information from unconfirmed sources are affluent. They are often worse than simple ignorance. Under this situation, proper education of knowledge is more important than before. Knowledge regarding schistosomiasis transmission is still very limited in many endemic communities (Ofozie et al., 1998).

There is a general consensus that health education is not given a sufficiently high priority in control programmes. Sadly, some medical specialists and parasitologists tend to think that health education is not part of their job description, or if it is it involves extra work for them. But given that the goal is to control disease by all means, educating people about a disease or diseases is among the most important components of their work. Medical specialists have an excellent opportunity to impart knowledge in urinary schistosomiasis control at the time people come for a urine examination and chemotherapy. At that stage, people are ready to listen and simple health education message can be imparted. On the other hand, some health education specialists see

**Table 2.** Characteristics of health education models and approaches.

Health education models and approaches	Characteristics
<b>The provision of knowledge approach</b>	<p>Provision of knowledge is the core of health education. People's awareness, attitude and behaviour will not change without knowing something new. Without proper knowledge, autonomy and sustainability of healthy behaviour can not be guaranteed. Knowledge and education is a basic human right.</p> <p>Limitation: There may be an assumption or prejudice in this approach that ignorance causes disease. But, there are many factors of epidemics other than ignorance. Outsiders often tend to force their value, their education, and their knowledge to people without hearing from them. Provision of knowledge alone often do not induce behavioural change effectively. Some people already know about diseases and risky behaviour. Yet, they are taking risky behaviour. Some of them are fed up with being given such information</p>
<b>The KAP/KAPB study-based approach</b>	<p>By understanding people's knowledge, attitude, perception and behaviour, and by analysing relation among them, this approach can make a better planning for effectivea health education. One can identify the target population, the target subjects, and the appropriate approach through the KAPB study.</p> <p>Limitation: People may not answer to KAPB interview properly. Individual based KAPB study may not take into account the socio-cultural background. The results of KAPB studies tend to be interpreted according to the outsiders' value system.</p>
<b>The Health Belief model</b>	<p>By seeing the relative strength of people's perceived risks, benefits from health behaviour, costs of not taking health behaviour, and costs of health behaviour, health educators can understand why people do and do not take a behaviour psychologically. Perception of risks, benefits, and costs may change with the socio-cultural background. With these information, health educators can take better approaches to change people's behaviour.</p> <p>Limitation: To understand the reasons why people behave differently from what specialists expect may not have direct impacts on improvement of a disease control programme.</p>
<b>The PRECEDE/PROCEED model</b>	<p>The PRECEDE/PROCEED model provides a total process of a disease control and improvement of the quality of life. It integrates health education into disease control/health promotion programmes, and provides an idea of effective health education centred disease control programmes.</p> <p>Limitation: In developing countries, it is difficult to improve enabling and reinforcing factors. Administrative and policy diagnosis may find out the difficulties to change such situations (especially without any donor sponsored projects). We have not yet had enough empirical cases.</p>
<b>The community participation approach</b>	<p>Positive participation of the community is the base of rural development and autonomy. It is indispensable to improve and sustain health and living conditions (especially in developing countries). It will also increase the effectiveness of the disease control as well as of the health education programmes.</p> <p>Limitation: Community participation is difficult to organise naturally in the present situations in developing countries. 'Forced' community participation may finish with the end of support from the outside. People may ask/demand more (and different) services as a result of health education and community participation instead of doing something what they can do by themselves. Fostering the sound leadership is very difficult where life itself is economically harsh. There may be antagonism in a community (between rich and poor, male and female, etc.). The community itself may be weakened in the process of modernisation</p>

KAP: knowledge, attitude, and practice; KAPB: knowledge, attitude, perception, and behaviour

themselves as the only ones able to impart knowledge. This also reduces the chances of people receiving health education. According to the authors' own experience in a urinary schistosomiasis control in Kenya, good collaboration between parasitologists (including technologists and field workers on parasitology), health education specialists (including village health educators), staff on curative medicine (doctors, clinical officers, and nurses in clinics and hospitals), and staff on public health activities (public health nurses and community health workers) was indispensable for providing an effective and adequate health education in the schistosomiasis control project.

The main health education components for schistosomiasis control imparts knowledge on (1) awareness of the problem, (2) early signs and symptoms, (3) consequences and complications, (4) causes and risk factors, (5) preventive measures (control), (6) treatment (curative measures), (7) control measures through community efforts, and (8) mechanisms of infection and morbidity. How this information is imparted depends upon the situation, but people should understand the value of controlling and preventing the disease through health education, and be convinced that they can avoid the disease and its transmission by changing their behaviour. They should also learn concretely what they must do and how they must change their behaviour for preventing and treating the disease. Health education for urinary schistosomiasis control should stress avoiding contact with cercarial infested water sources, avoiding to urinate in and near river/canal, and for the need to attend urine examination and mass-chemotherapy where and when available.

It is not always easy to stimulate interest in health education of schistosomiasis control, especially in rural communities in developing countries where the disease is chronic, not life-threatening in the short period, and public health impacts of the disease are difficult to see (Tanner, 1989; Mascie-Taylor et al., 1995). In endemic areas where the majority of children suffer from haematuria, people tend to think that haematuria cannot be avoided. Moreover, there are usually many life-threatening diseases in these environments. Good health education programmes and skills are needed if an effective schistosomiasis control is to be introduced in these situations. The education process may fail if the educators concentrate too much on transferring detailed knowledge and fail to let people understand the value and their ability to control the disease. The life cycle of schistosoma is very interesting and amazing for parasitologists but may not be so for villagers. Unless people understand the importance of the contents of

education for them, they will not listen seriously to an educator. Education may also be boring if the educators just repeat what people already know. Some community health workers and their superintendents tend to think that the goal of health education is giving knowledge to the people. Rather, teaching knowledge should be recognised as one necessary measure for controlling the disease through behavioural change.

Although imparting knowledge is a common basis of the educational approach, it alone has not been found to be effective for controlling disease. For example, el Katsha and Watts (1997) found in Nile delta villages that most people who used the canals for domestic, recreational or agricultural activities, thought that they had little alternative but to do so, even though they knew of the risk of becoming infected with schistosomes. Sama and Ratard (1994) reported from Cameroon that a high level of knowledge about schistosomiasis was positively associated with the infection. The positive association between knowledge and risky behaviour has also been reported recently for HIV/AIDS (Maswanya et al., *in press*). These authors showed that providing the knowledge of what constitutes risky behaviour for infection, signs, symptoms, and outcome of the disease is not enough to change peoples' behaviour. Most people already have some knowledge of the disease, and they are somehow aware of the risks of infection. In these situations, it is not effective to repeat perfunctory health education messages. Instead, it is necessary to learn about the relationship between people's behaviour and their knowledge, attitude and perception.

## II. The KAP/KAPB Study-Based Approach

In order to make a better and effective health education programme, people's knowledge, attitudes, perception, and practice/behaviour, and relations among them, have been explored in KAP and KAPB studies. The notion is that if insufficient knowledge of some aspect of a disease is related with less preferable attitude and behaviour, health education should concentrate on that aspect. If a less preferable attitude is associated with risky behaviour, such an attitude must be a target of the health education and communication programme. Therefore, health education based on KAP/KAPB studies should be more effective than health education that does not take into account this knowledge.

For example in Zimbabwe, a studied community was aware of schistosomiasis but their knowledge on transmission and control of the disease was limited (Chimbari, 1992). About 80% of people in another endemic area in Zimbabwe thought that schistosomiasis was a dangerous disease with blood in the urine, but only 12%

knew that snails were involved in transmission (Ndamba et al., 1989). In this case, education about the life cycle and mechanism of infection may be effective in enhancing behavioural changes not to contact water sources. In Nile villages, where *S. mansoni* has almost completely replaced *S. haematobium*, education about differences between the two forms of the disease for health unit staff and local people was needed (El Katsha et al., 1995). A study on perception of risk of schistosomiasis in Malawi (Ager, 1992) found that those who were perceiving risks tended to keep preventive guidelines. In this case, health education should be focused on increasing risk perception of the villagers.

Water contact is a key behaviour for schistosomiasis control, and many studies reported the diversity of water contact within and among populations. Both water contact rates and prevalence of schistosomiasis are high among children (Shimada et al., 1987; Chandiwana, 1987; Akogun, 1996). It is therefore useful to discuss the subject with school children and teach how to avoid contact with freshwater. Fulford et al. (1996) found that patterns of water contact varied dramatically among different gender and age groups in communities of Kenyan Akanba, and Chandiwana and Woolhouse (1991) reported that 90% of water contacts were made by 37% of the population. Provision of piped water in a Kenyan community had a beneficial effect on some villagers but very little effect on others (Noda et al., 1997). These findings suggest that the contents of health education and communication messages should vary according to gender, age, and water contact patterns. Yet, further studies are necessary to understand the relation between level of knowledge, attitudes toward the disease and water contact behaviour.

Studies of knowledge, attitude, and perception in relation to participation in mass chemotherapy campaigns are also necessary. In coastal Kenya, an increase in knowledge was not associated immediately with an increase in participation neither in urine examinations nor in mass chemotherapy (Moji et al., 1996). Huang (1992) pointed out that a more comprehensive exploration of the social and cultural context of infection has yet to be undertaken. Although the number of KAPB studies conducted on schistosomiasis control is not small, these studies have failed, at least in part, to clarify the relationship between knowledge, perception, attitude, behaviour and transmission in the communities' socio-cultural settings. This is because KAPB studies were mainly designed to enquire about individuals' knowledge, attitudes, and behaviour without taking into account the socio-cultural background. To consider cultural and social factors, other approaches are required.

### III. The Health Belief Model

In the 1970's, Becker and colleagues (1974) proposed the health belief model for explaining why people behave in a way other than expected by health specialists. They tried to explain sick-role behaviour in low-income populations based on social psychology. The model explains why the KAPB study-based approach often fails to predict people's behaviour. People's behaviour is decided, according to the health belief model, by the relative strength of three factors; (1) perceived risk of the disease, (2) perceived benefit of health-related behaviour and/or perceived damage of not taking health-related behaviour, and (3) perceived cost of taking the health-related behaviour.

This model can be used to explain why some people go to dentists, hospitals or vaccination, while others do not. The strength of these three factors may vary according to socio-cultural and economic characteristics of a household or a person. It also varies with accessibility to health facilities and by availability of information. Therefore, without knowledge of social, cultural, and economic conditions in addition to the epidemiological picture, it is virtually impossible to design a good intervention programme (Robert et al., 1989).

Health specialists think (or perceive) that the risk of disease and benefit of health behaviour are much higher than the cost, while some people perceive the cost of health behaviour is higher than the risk and the benefit. Adherence to preventative guidelines for schistosomiasis is influenced by personal perceptions of risk and its controllability (Ager, 1992). Villagers may perceive that washing clothes at a remote standpipe, oily water from a borehole, or salty water from well instead of just going to a nearby river costs more than schistosomiasis infection. Villagers may perceive that the benefit of participating in a urine examination and mass-chemotherapy is less than going to their farm to work. This problem can be solved by changing the conditions (e.g. closer standpipes or quicker urine examination) and/or by communication to change their perceptions. If facilities cannot be improved immediately, health education needs to focus on changing perceptions of the risk, benefit and cost through discussion and through giving appropriate knowledge. If one expects a greater change in people's behaviour, an integrated, health education centred disease control approach like the PRECEDE/PROCEED model becomes necessary.

### IV. The PRECEDE/PROCEED Model

Kloos (1995) examined the role of human behaviour in the transmission and control of schistosomiasis in

relation to health education, and evaluated the PRECEDE/PROCEED model of Green and Kreuter (1991). The PRECEDE model (Green et al. 1980) is a predecessor of the PRECEDE/PROCEED model (Predisposing, Reinforcing, and Enabling Constructs in Educational/ environmental Diagnosis and Evaluation). Health education planning precedes implementation of health education, and health education diagnosis and assessment with evaluation of former implementations precede planning. The two new points in this model are (1) combining educational diagnosis and environmental diagnosis, and (2) classifying behavioural factors into predisposing, reinforcing, and enabling constructs. Different from the former models which contain themselves into health education, the PRECEDE model deals with non-behavioural environmental factors (reinforcing, and enabling constructs) as important targets of health promotion activities. Desirable behavioural changes could result when knowledge is supported by enabling and reinforcing factors (Ekeh, 1988). In other words, the PRECEDE model is not a health education model but an integrated health education centred diagnosis model for disease control and health promotion.

The PROCEED process (Policy, Regulatory, and Organisational Constructs in Educational and Environmental Development) focuses on implementation of disease control and health promotion programmes. The PROCEED process considers policy, regulatory, and organisational constructs, which have not been included in former health education approaches (Yoshida, 1993). The PRECEDE/PROCEED model includes almost every factor related to disease control. The nine steps in the model shown in Table 3 can be followed in a straightforward manner. Therefore, it is a strong tool when planning a disease control programme, particularly in the primary health care systems.

The problem with the use of the PRECEDE/PROCEED model to control schistosomiasis in the developing countries is that one finds too many factors to improve. Furthermore, these factors remain unchanged, because they are almost impossible to improve in the short term. These factors include poor community health services, lack of manpower, poor water supply, weak transportation, poor environmental sanitation and hygiene, low school enrolment, high unemployment rates and frequent migration, financial shortage, inefficient bureaucracy, lack of national schistosomiasis control policies and programmes, too many politics in the political arena, poverty, and social discrimination. There are more disabling factors than enabling factors, and more discouraging factors than reinforcing factors in rural communities, and it is not easy to change these factors altogether at once. By applying the PRECEDE

/PROCEED model, prioritisation of the factors can be decided.

## V. The Community Participation Approach

The community participation approach through empowerment and health learning is a key to whether a disease control programme succeeds and is sustained or not. Although most researchers and local specialists are realising the importance of community mobilisation, involvement, and participation, however, mobilisation of a community and sustainability are very difficult especially in developing countries, even though a number of successful trials have been reported (Cline et al., 1996). Schistosomiasis control programmes combining local involvement and major government projects have been successful in many parts of China, but not in remote areas where the infrastructure is not sufficient (Zhou, 1994). Brieger (1996) reported on the success of merging a community development approach and a 'communications to behavioural change' approach in a Guinea worm control programme in Nigeria through training of community health workers.

One beneficial effect of emphasising community involvement is the increased participation of women in many disease control efforts. It is essential as gender differences in the impact of tropical diseases on women have been reported (Vlassoff et al., 1994). Failure to involve women in the design, implementation, and evaluation of most control programs remains a serious shortcoming in view of their important educational roles as mothers and main users of water supply and laundering facilities (Kloos, 1996), though some studies reported good effects of women's participation in disease programme(s) (Rahman et al., 1996; Jordan, 1988).

Katsivo et al., (1993a) examined the impact of mobilisation, involvement, and participation of the community in schistosomiasis control efforts between 1983-1988 in Mwea District, Kenya. Most villagers appreciated the social, economic and health benefits of the control project, expect it to survive over a long period of time (suggesting that it was self-sustainable), and were willing to start a facilities maintenance fund (Katsivo et al., 1993b). However, after completion of the project, the investigators found that community mobilisation was difficult to sustain and contact with contaminated water and poor faecal disposal returned, leading to re-infection of more than 50% in the 5-19 year age group twelve months later (Muthami et al., 1995). This example probably represents the situation in most schistosomiasis control programmes in developing countries; the problem of how to maintain continuous community participation in disease control. The strategies to empower

**Table 3.** The nine steps of the PRECEDE/PROCEED model.

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<b>1. Social diagnosis</b>
a) Define the final goal of action/programmes. ( The goal should increase quality of life (QOL) of people.) ( The goal meets the needs and thinking of the people.)
<b>2. Epidemiological diagnosis</b>
a) Define health issues/diseases to be targeted. b) Collect epidemiological information of the targeted disease.
<b>3. Behavioural and environmental diagnosis</b>
a) List the behavioural factors associated with the disease. b) List the environmental (non-behavioural) factors.
<b>4. Educational and organisational diagnosis</b>
1) <b>predisposing factors:</b> motivation, knowledge, attitude, belief, value, and perception
2) <b>reinforcing factors:</b> factors which reinforce preferable behavioural changes
3) <b>enabling factors:</b> technologies and resources enabling preferable behavioural changes
a) Collect information on predisposing, reinforcing, and enabling factors. b) Seek the possibilities of changes in these factors.
<b>5. Administrative and policy diagnosis</b>
a) Collect information on administrative factors related to the disease. b) Collect information on existing related policies. c) Seek the possibility of change in administration and policies.
<b>6. Implementation</b>
a) Make a total plan for the disease control with information above. (The plan should be health education with other interventions and structural changes.) b) Implement the plan.
<b>7. Process evaluation</b>
a) Monitor the process of implementation of the disease control. b) Feedback the results and change it. c) Evaluate the input and the output (behavioural changes etc.).
<b>8. Impact evaluation</b>
a) Evaluate the impact on disease morbidity and mortality.
<b>9. Outcome evaluation</b>
a) Evaluate the changes on QOL of the people. b) Evaluate social outcome of the action/programme.

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The nine steps were cited from Green and Kreuter (1991).  
Actions taken in each step were made by the authors.

people and enhance autonomous health learning in terms of sustainable community participation must be explored further. Disease control programmes and projects need to collaborate with sociologists, social anthropologists, and other specialists in education and rural development.

It is unlikely to expect good community participation without any cost. In our experience in rural Kenya, provision of safe water and a primary health facility (a village dispensary) activates community participation. Co-leadership of health workers, government officers, and villagers seemed essential to obtain and



sustain community participation in the schistosomiasis control project. Persistent health education was an important component of community participation.

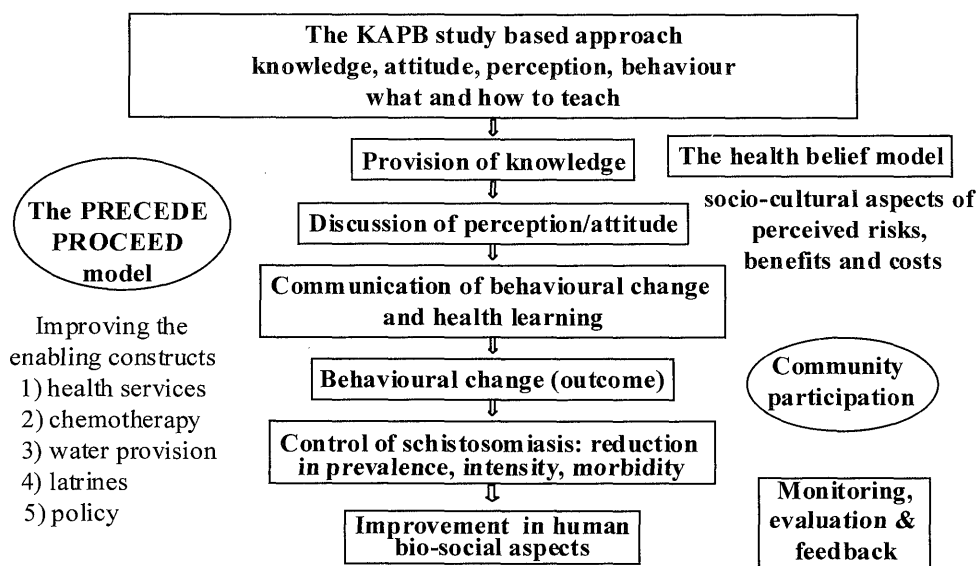
Needless to say, health education is one of the WHO's eight essential activities of the primary health care. Schistosomiasis control activity, which integrates health education as an essential component, also has to be integrated into each country's primary health care services.

**Discussion**

The control of urinary schistosomiasis in developing countries by presently available and affordable strategies can be approached most effectively by a combination of (1) human behavioural change through health education, communication, and community participation, (2) mass-chemotherapy, and (3) clean water supply and sanitation facilities in the health primary care systems (WHO, 1985; Moji et al., 1996). This paper examined five approaches to health education and shows that although all have certain limitations, each of them promotes some desirable behavioural changes that enhance disease control. The relationships between the five approaches are summarised in Figure 1. Education should be orientated by KAPB studies. Then, information of people's perception and attitudes toward the targeted disease should be collected through communication and discussion with people based on the Health Belief model. In the next step, proper knowledge and message for behavioural changes and disease control

should be provided in a culturally acceptable and effective manner. These core parts of health education should be backed up using findings of the PRECEDE /PROCEED model. At the same time, health education should stimulate community participation, which in turn enhances the health learning process of community members. All these processes with available public health and basic human need services should work together for effective behavioural changes and for better health outcomes such as an increase in mass-chemotherapy participation and reduction in infection and re-infection rates though avoidance of contaminated water.

To establish a stronger and direct link between health education and control of schistosomiasis, and to increase the efficacy of health education approaches as a tool for control of schistosomiasis, there is a need to combine research on health education with epidemiology and human biological studies. Assessment of the pathological morbidity and socio-economic impact of the disease is an essential pre-requisite to any schistosomiasis programme, because as a chronic disease, it lacks the obvious impact of those with high mortality and high morbidity (Farley, 1991). Indeed, the societal stress of schistosomiasis on nutrition, growth, work capacity, physical and mental fitness, and productivity are still open to doubt especially in situations where the prevalence is high but intensity of infection is low or moderate (Mascie-Taylor and Mohamed, 1995). The direct and indirect effects of health education approaches on the epidemiology of schistosomiasis and its societal stress require further study.



**Figure 1** Relationship between health education approaches and the control of schistosomiasis

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