REVIEW
HUMAN BEHA VIOUR AND SCHMTOSOMIASIS

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ABSTRACT: This paper critically examines the relationship between human behavior and schistosomiasis transmission and control. It argues that human behavior must be studied not only at the individual but also at the family, community and national levels, and that socioeconomic, cultural, political and environmental factors must be considered in health education programs. The qualitative model developed by Dunn is modified and examples from Ethiopia and other African countries are used to indicate the great variety of human behaviours relevant to schistosomiasis transmission, spread and control. [Ethiop. i. Health Dev. 1993;7(2):55-61]

INTRODUCTION

There is an increased need to carefully design and execute studies on the relationship between human behavior, health education and schistosomiasis control because of the following reasons: 1) the limited success, if not outright failure, of most schistosomiasis control programs using molluscicides, chemotherapy,
environmental sanitation and biological control, 2) the trend to integrate schistosomiasis control programs into primary health care (PHC) and 3) the ineffectiveness of present health education strategies. These studies, must in particular address the crucial role of human behaviour in the transmission and control of this disease.

The broad range of human behavioral factors in schistosomiasis transmission and control was first emphasized at a WHO workshop in St. Lucia in 1979 (1). Subsequently, the objective of the Schistosomiasis Working Group of WHO's TDR programme became "to increase the effectiveness of disease control measures and programmes through integration of human behavioral factors in programme design and management. " Human behaviour was defined by that working group as consisting of social, cultural, psychological and economic factors (2). This definition resulted in the broadening of the scope of behavioral studies in schistosomiasis. Previous investigations only studied local factors such as exposure (water contact behaviour), contamination of aquatic snail habitats (mainly urination and defection) and attitudes and knowledge bearing on transmission and illness behaviour. The recent conceptual change permitted investigators to address broader issues, including socioeconomic conditions, health services utilization and bureaucratic bottlenecks (3). The purpose of this paper is to examine the behavioral factors affecting schistosomiasis transmission and control and to argue that effective control programs must examine these factors. The qualitative model of disease transmission developed by dunn (4) and examples from Ethiopia and other African countries are used to indicate the wide range of different types of human behaviour bearing on schistosomiasis transmission, spread and control are also addressed. The problems and achievements of health education in schistosomiasis control are examined in a separate paper (5).

The need to consider poverty, social interaction networks and policy decisions in developing community-based schistosomiasis control programs are increasingly being recognized (3). This requires more participation of social scientists and of communities themselves in research for the development and implementation of health programs. The development in recent years of

academic programs in medical anthropology, medical geography, medical sociology and health economics at universities in developing countries may help to overcome what Dunn (6) descried as intellectual discontinuity between the social
and biomedical sciences, and to strengthen human behavioral research. But for the time being, well qualified _____

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social scientists life rare in this field, and about half of all studies on human behaviour and health education carried out to date were headed by epidemiologists and other biomedical scientists, with little or no input from social and behavioral scientists. In many countries where specialized social scientists' do exits, socioeconomic differences between urban- based scientists (as well as decision makers and health planners) and rural communities constitute a serious impediment to establishing strong working relationships with populations affected by schistosomiasis.

It must be emphasized here that human behavioral studies in schistosomiasis are crucial to the success of control programs, contrary to the persisting view that they are of secondary importance or an adjunct to chemotherapy and snail control. Another misconception is that PHC-based disease control programs require less intensive field activities than conventional programs because of the emphasis on community participation and self-reliance. On the contrary, these programs are characterized by heavy labour and material inputs (7), so much so that several schistosomiasis programs using the PHC approach have experienced problems of labour shortage at the community level (8). In fact, a major reason for the failure of PHC programs in Africa is lack of time or contribution from rural people to control programs (9).

A MODEL OF SCMHOSOMIASIS-RELATED BEIIA VIOUR

The model of schistosomiasis-related behaviour developed to provide an overview relevant to control (tables I and 2) is based on the filariasis model developed by Dunn (4). This model addresses the Ethiopian and global / scenes of schistosomiasis and may be modified " , for specific programs and endemic areas. Many
forms of behaviour cannot be changed through health education, but require socioeconomic or government policy changes, that are dealt with only briefly in this paper. This model also does not categorize activities as exposure and contaminative behaviour, or as specific water contact behaviour, such as swimming and bathing. This is because these areas have been covered by others (1, 10-12).

Schistosomiasis-related behaviour may be distinguished along three axes. First, behaviour may be examined in terms of the community at risk (fable 1) and outsiders who are involved in control, prevention, health promotion and treatment and who are not themselves members of the community at risk (fable 2). This broadly based division will permit the inclusion of regional, agricultural, demographic and environmental factors in

Table 1: SHISTOMIASIS-RELATED HUMAN BEHAVIOUR IN THE COMMUNITY

Deliberate behaviour	Non deliberate behaviour
(A) Health-enhancina behaviour' 1. Behaviour that results in reduced exposure to and contamination of known transmission sites (avoidance of sites, choice of residence, occupation and work place) 2. Voluntary and intentional migration to and settlement in non-endemic areas 3. Efficient water management levels and high sanitation levels that minimize or preclude the creation and contamination of snail habitats 4. High priority given to the control of schistosomiasis and active participation in control programs 5. Health-seeking behaviour resulting in early diagnosis and treatment 6. Development and maintenance of community water supplies using a maximum of local resources	(A) 1. Human cyclical activities circadian, weekly, monthly, seasonal and annual that minimizing contact with infested water 2. Migration to and settlement in non-endemic areas 3. High rates of out-migration (emigration) resulting in dispersal of infected persons to other communities, lower or stabilized population density and reduced contamination of snail habitats 4. Urbanization resulting in inadvertent destruction of snail habitats and development to domestic water supplies. 5. Cultivation of irrigated crops with lower water demand, seasonal irrigation closure and use of sprinkler or drip irrigation instead canal irrigation 6. Equitable distribution and accessibility of health and other social services 7. Strong adherence to "tradition". especially low socio-cultural change, which increases the potential for successful health education and community-based schistosomiasis control
(B) Health-lowering behaviours 1. Voluntary migration to areas known to have endemic schistosomiasis (acceptance of the known hazard, for example, because of the need to cultivate new tracts of land) 2. Contact with known transmission sites because of social, cultural logistic reasons (water fetching, children playing in water, wadu) or economic reasons (fishing, boating; or failure to repair pumps because of lack of technical know-how or poverty) 3. Use of ineffective traditional medicine 4. Low priority given to schistosomiasis control due to competing health needs and lack of resources 5. Patient refusal of parasitological examination and chemotherapy (there may be many reasons) 6. Refusal of local people to permit the use of molluscicides because (a) they may have already had bad experience with other chemicals, such as pesticides, (b) local water bodies may have significance for religious rituals, or (c) local snail habitats are in private ownership. The same problem may also pertain to chemotherapy (e.g side effects of drugs) 7. Negative attitude toward people with schistosomiasis which discourages them from participating in screening programs 8. Use of nearby schistosomiasis-contaminated streams rather than more distant safe water supplies, and failure to visit health facilities for diagnosis or chemotherapy because of lack of time or money, or illness perception	(B) 1. Human cyclical activities that maximize contact with infested water 2. keeping of domestic animals (in S. bovis and S. haematoium-endemic areas) 3. Contact with unrecognized transmission sites because of socio-cultural or economic reasons 4. Factors contributing to high population density in rural areas 5. Water and sewage management practices creating habitats and resulting in their contamination 6. Rapid sociocultural change: weakening of traditional community social structure and decreased responsiveness to traditional community leadership; thus lower success of control programs 7. The presence of various socially culturally or politically antagonistic groups in the community may impair the implementation of schistosomiasis control programs 8. Lack of popular support and initiative for the maintenance and proper implementation of control programs Source: See Table 2 behaviour affecting the individual, the group and the entire community

Table 2. SCHISTOMIASIS-RELATED BEHAVIOUR ORGANIZATIONAL OUTSIDE THE COMMUNITY

Deliberate behaviour	Non deliberate behaviour
(A) HEALTH-ENHANCING BEHAVIOUR 1. Chemotherapy, health education, snail control, water supply and latrine construction programs 2. Regulated or restricted river/canal use of to reduce contact with and contamination of transmission sites 3. Mandatory and deliberate resettlement of the population in a non-endemic area 4. Development of a health policy that places emphasis on schistosomiasis control, rural water supply development and primary health care	(A) 1. Changes introduced or encouraged for reasons having nothing to do with schistosomiasis control but nevertheless resulting in reduced transmission (introduction of washing Machines, Radios, TV, or motor pumps for irrigation) 2. Siting of settlements or individual homesteads away from water courses for reasons other than schistosomiasis control 3. Development of a government policy that ~asizes decentralization, rural development and subsistence agriculture (by supporting rural development projects) 4. Mandatory resettlement of whole countries in non-endemic areas
(B) HEALTH-LOWERING BEHAVlOUR' 1. Regional increase in irrigation schemes and dams. The possible side effects, including increasing nulber of schistos001iasis transmission sites and human infection, were considered to be less significant than the benefits, such as increased agricultural and hydroelectric production 2. Mandatory resettlement of whole populations in endemic areas. Increased schistosomiasis is thought to be outweighed by the advantages 3. Low budget (or reductions or delays in allocation of budget) for schistosomiasis control or rural health services in general 4. Pilferage,wastage and costly procurement and distribution of drugs and molluscicides 5. Deficiencies in planning, implementation and support of schistosomisis control programs due to lack of timely and appropriate information (e.g. case detection and surveillance data) 6. War and insurgency which disrupt disease control programs, destruct safe water supplies and medical facilities and result in increased exposure to schistosome infested water	(B) 1. Deficiencies in schistosomiasis control programs that lead to low level of participation or outright rejection of programs by the population at risk. Failures in health education and communication may be critical in this but the root problem may be poor team morale and lack of motivation (due to poor working conditions, inadequate salaries, support and supervision of health worker, personality conflicts and transportation problems) or a top-down approach characterized by paternalistic and stifling attitudes of project staff 2. Mandatory resettlement of the population in an area with unrecognized schistosomiasis endemicity 3. Negative changes in health policy or disruption of schistosomiasis control programs, supplies and training due to political instability or change in government 4. Deficiencies in the quality and quantity of health services 5. Emphasis on high-technology/expensive water supply systems and sanitary facilities rather than on affordable systems that can be maintained and expanded with reduced cost and local resources

schistosomiasis control programs. The relevance of these influences was revealed by national schistosomiasis control programs in Mali, Madagascar, Malawi, Congo Republic and China (13,14). In Egypt, the ecological changes associated with the construction of Aswan Dam and the concomitant extension of endemic schistosomiasis are well known examples of extra-community activities or behaviour . Hydrological changes due to irrigation development and water impoundment have also been associated in the Awash Valley of Ethiopia with changes in schistosomiasis transmission (15,16).

It is also necessary for health educators to distinguish between deliberate and non-deliberate behaviour (tables 1 and 2). The former includes activities that are known or assumed to have some effect on schistosomiasis transmission and control. Both forms of behaviour are common not only in community settings but also among organizations influencing communities. An example of deliberate behaviour is voluntary migration to areas known to be endemic for schistosomiasis. Deliberate behaviour conferring schistosomiasis risk involves trade-offs as when economic gain, social benefits, or savings in energy expenditure are considered to outweigh the risk of

schistosomiasis infection, although lack of alternatives are also often involved. For example, many migrant farm labourers work in irrigation schemes they know to be endemic for schistosomiasis. Or children may consider the social pressure to swim with friends stronger than the fear of schistosomiasis (or punishment from parents). Similarly, women fetching water at nearby canal or stream transmission sites may choose to use those sites because of lack of time to obtain safe water at the more distant piped source or to socialize with other village women. Non-deliberate forms of behaviour include faecal contamination of snail habitats by villagers and the location of houses or new settlements near
infested canals without recognition of their health consequences. Health education and broader measures at the community and more centralized levels are potentially most effective in this area.

Third, deliberate and non-deliberate behaviour of both community members and outsiders may be examined in relation to their impact on health. Health-enhancing (or health- promoting) behaviour includes both preventive and curative behaviour, as determined by positive health outcome (tables 1 and 2). Similarly, health-lowering behaviour ranges far beyond individual human exposure and contamination, to cover many activities and socioeconomic conditions at the community, district and national levels, as well as deficiencies in schistosomiasis control, water resources development, resettlement programs and even political instability and disasters (tables 1 and 2). The terms health-lowering and health- enhancing behaviour are used here refer only to schistosomiasis, without consideration of other health effects (which is beyond the scope of this paper but which should always be considered in control programs with the aim of obtaining optimum result from any intervention). Some health-enhancing behaviours may result in lowering the overall health status of the
population. An example of multiple, opposing effects of health-enhancing behaviour is the well intended construction of dikes and embankments along the Awash River for the purpose of elimination river-fed swamps and their schistosomiasis intermediate host snails and to protect irrigation schemes from flooding, a
measure which also resulted in the deterioration of the grazing areas of local pastoralists and corresponding livestock losses (15,16). Another example of a schistosomiasis health enhancing behaviour is the release of industrial pollutants into the Akaki River, which has been linked with the decline of Biomphalaria pfeifferi snail populations (17) and acute poisoning in humans and livestock drinking that water (18).

Thus, whereas a considerable amount of information has been gathered about health- enhancing behaviour and health-lowering behaviour of individuals (particularly water contact activities) little is known about the more intractable effects, many of them indirectly produced by economic development, health policies, socioeconomic change and education. For example, although the development of irrigation schemes most often results in higher incidence and intensity of schistosomiasis infection, this effect has been reduced by the
effective health services on farms, including those in the Rift Valley of Ethiopia. Similarly, primary school education has not always brought about desirable behavioral changes, as for example in several Ethiopian communities students were more highly infected than illiterate children, because they washed more frequently in the local streams in their quest for school- taught personal hygiene (19, 20). problems with the accessibility and maintenance of piped water supply systems and the effectiveness of health education in Ethiopia (19, 21, 22) are summerized in tables I and 2. More difficult to evaluate is the effect of rural primary health services which are incapable

of dealing with schistosomiasis patients due to lack of diagnostic facilities and effective referral mechanisms is more difficult to evaluate. In Ethiopia and other African countries many of these health stations are in fact under-utilized and thus not cost- effective (9).

SOME RESEARCH NEEDS

Inter-sectoral communication with engineers, agriculturalists, sanitarians and government administrators together with new research methods and approaches may provide new insights into the broad spectrum of human behaviours bearing on schistosomiasis. In particular, cost-benefit analysis and studies of people's coping behaviour, attitudes and perceptions in different environmental and socioeconomic settings may elucidate constraints such as poverty, economic/health trade-offs and relevant social factors. It is clear that safe domestic water supplies, laundering facilities and swimming pools constitute alternatives for the use of schistosome-infested water bodies (23,24). But improved facilities must also meet the economic, social and cultural needs of local populations, such as women's for low-cost, accessible taps without long waiting lines that provide an adequate and reliable water supply (25,26). Similarly from what has been noted in various Ethiopian irrigation schemes (27) and subsistence communities (12, 28-30); taste, appearance and hardness of water must meet the expectation of local people and hygienic standards (28). Social and behavioral scientists can be instrumental in identifying people's preferences, with the objective of assuring community acceptance and use, of different types of water supplies and facilities, with the objective of assuring community acceptance and use(31-39).

There is also a need to study any new forms of health-enhancing behaviour generated by successful disease control programs for their feedback and multiplier effects in multi-disease environments. The development and successful maintenance of safe and acceptable water supplies and sanitation facilities using community inputs, for example, may not only reduce the incidence of schistosomiasis and other water-related diseases but also encourage community development efforts (31,32). Thus it is desirable to develop educational messages aimed at changing behaviour affecting the transmission and control of a wide range of communicable diseases whose transmission and spread are affected by water and environmental sanitation.

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