COMMUNITY CONTROL OF SCHISTOSOMIASIS IN ZIMBABWE

Paper presented at the Third Pan-Arab Seminar on Zoonotic and Parasitic Diseases, Amman, Jordan, October 17-19, 1989.

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Key words: Human schistosomiasis, community-based control, Zimbabwe

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SUMMARY

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The community-based primary health care approach to control schistosomiasis morbidity is the strategy adopted in Zimbabwe. The paper outlines the results of such a control strategy in a rural community with over 30 000 people in the Madziwa area of Zimbabwe from 1985 to 1989. The community-based control strategy involved diagnosis of infection in school children (7-15 years of age) using reagent strips followed by treatment with praziquantel. The treatment was linked to programmes aimed at improved sanitation, better water supplies and health education. Following chemotherapy, there was a marked reduction in schistosomiasis prevalence (urinary and intestinal forms combined) (from 60 to 20%) in the affected groups. Of even greater importance was the significant reduction of 90% in heavy infections (>50 S. haematobium eggs per 10 ml of urine or >100 S. mansoni eggs per gram of faeces). Progress made through chemotherapy was consolidated by the implementation of intervention measures aimed at reducing human water contact with cercariae infested water. In the last 3 years of the community-based programme, 2 152 improved ventilated pit latrines were constructed and 104 hand pumps installed at new or existing water points. Drama competitions at schools showed great potential in communicating health education messages. However, technical and organizational difficulties limited the impact of the health education to the general population. A single application of the synthetic molluscicide Bayluscide was carried out in the main streams at the beginning of the programme in support of the initial chemotherapy. There were logistical problems in evaluating the precise impact of the control programmes due to variations among the villages; of their physical location in relation to snail habitats, differences in number of latrines and water points constructed and the extent of health education coverage. Nevertheless, the experience obtained in the Madziwa project demonstrates the feasibility of a community- based approach to control schistosomiasis. Of significance is the fact that the strategy allows for the development of a consistent community - level surveillance system to monitor progress of the different interventions.

INTRODUCTION

Schistosomiasis is a major parasitic disease in Zimbabwe ranking second after malaria in its public health importance. Recent nationwide surveys for schistosomiasis showed that over 30 per cent of the population living in high endemic zones were infected by the urinary form of the disease (*Schistosoma haematobium*).[1] On the other hand prevalence of the intestinal form (*S. mansoni*) is usually under 20 per cent.[1]

In the past, lack of a clear understanding of the major factors that influence the epidemiology of schistosomiasis prevented the development of control strategies that were appropriate to each endemic situation and could be implemented on a wide scale and on a sustainable basis. Recent comprehensive and longitudinal studies conducted by the Blair Research Laboratory have provided detailed information on focality and seasonality of schistosomiasis transmission, on human water contact patterns and on prevalence, intensity, morbidity and incidence of infection in the human population.[2-5]

Based on the results obtained from the above mentioned studies, a community-based primary health care (PHC) approach to control morbidity and transmission in a rural community of over 30 000 people is outlined and discussed. The community-based PHC approach to schistosomiasis control is the strategy adopted in Zimbabwe.[5]

The PHC approach allows for the active participation of the population. This is essential for long term and sustainable control programmes. The community can be actively involved in control activities such as assisting local health authorities in the distribution of antischistosomal drugs and health education posters, snail control through habitat modification and use of plant molluscicides and sharing costs of the sanitation and water supply programmes. Such community-based participatory and cost-sharing activities lower costs of the control programme to the health services and funds may be saved for tackling other health problems. Besides, local leaders can develop a community level surveillance system to monitor the progress of interventions and to determine an appropriate mechanism for sustaining the achievements.

Project Area and Control Design

Madziwa communal area comprising 53 villages (total area is about 21 000 hectares) with a total population of 30 913 was selected for the demonstration control project. The communal area lies in the north-east high veld of Zimbabwe, a region of high rainfall and temperature in summer, numerous perennial streams and high densities of human population, conditions which favour a high transmission of schistosomiasis. At the beginning of the control project combined prevalence of both forms of disease were in excess of 60% in the majority of villages. A significant proportion

of children and young adults (7 - 20 years) harboured heavy infections (i.e. >50 S. haematobium eggs per 10 ml of urine or >100 S. mansoni eggs per gram of faeces).

The human population is made up of the MaShona ethnic group of peasant farmers who intensively rear cattle as a form of wealth and for use in customary activities. Before the sanitation and water supply programmes were began the majority of the people used natural water (streams) for all water-related activities as piped/borehole water sources were few or unavailable. Most people used the cover of bushes and crops for excretion as toilet facilities were inadequate.

The Madziwa project, initially for three years (1985 - 1988) investigated the effectiveness of integrated control measures against schistosomiasis at the community level. The design involved control of schistosome infections through selective treatment targeted at school children being amongst the most heavily infected groups in the community. It was considered that progress made through selective chemotherapy would be consolidated by improved sanitation, provision of safe water supplies and health education.

Targets were set at one latrine per household, one protected water point for every 25 to 30 families and intensive health education through annual school-based drama competitions, talks, films, posters and local committees. A single blanket application of the commercial

molluscicide Bayluscide was applied into the main streams at the beginning of the programme in order to support the impact of the initial chemotherapy.

To evaluate the impact of the improved sanitation, protected water supplies and health education campaigns, 15 villages in Bushu rural community were subject to selective targeted treatment of the school children only. In these villages there were no active programmes to improve sanitation, water supplies, health education and to control snail hosts. Bushu is located about 20 kilometres from Madziwa area and presumably mixing of human populations of the two communities through inter-migration is not a problem. However, topographical, cultural and socioeconomic conditions and prevalence rates of schistosomiasis in the two areas are essentially the same.

CONTROL MEASURES

Chemotherapy

Treatment was targeted primarily at school children aged 7 to 15 years of age but older pupils and some teachers (up to the age of 21 years) were also included. Peak intensities of schistosome infections are known to occur in these age groups.[2] Targeted treatment was facilitated by the fact that in the project localities as in most rural areas of Zimbabwe, about 90% of the children attend school. Class teachers were available to assist with records and in controlling the pupils. In the Madziwa and Bushu project

areas school children comprised about 50 per cent of the total populations.

Children were examined for haematuria using reagent strips and those positive were given oral dosages of praziquantel at the recommended regimen of 40mg/kg body mass.[7] The sensitivity and specificity of reagent strips to haematuria were found acceptable following evaluation by parasitological examination of urine and stool specimens from 20% of children participating in the study. The technique saves a considerable amount of time when compared with conventional methods and is a convenient, rapid and effective tool for screening infected children. Treatments were done during January- February 1986, September - October 1986, and September - October 1987.

Results of our initial analysis of the impact of treatment on S. haematobium infections showed a marked reduction in the targeted age class, particularly heavy infections (Fig 1). However, treatment targeted at school children may not have a substantial impact on transmission and some reinfections observed could be attributed to infected members of other age groups who did not receive treatment (Fig. 1). Whether in the long term treatment targeted at school children has some benefit to other age groups remains to be seen in the ongoing monitoring programme. Similarly, comparison of incidence rates data from the Madziwa and Bushu project localities should elucidate the role if any of improved sanitation, safe water

supplies, health education and snail control in slowing the force-of-infection of endemic schistosomiasis.

Sanitation

The ventilated improved pit (VIP) latrine locally known as the Blair latrine (Fig. 2) is the sanitation technology of choice in Zimbabwe. It was developed in the early 1970s and its acceptability and effectiveness is probably measured by the fact that over 120000 VIP latrines have been constructed throughout the country in the last 10 years. The VIP is an improvement over the pit latrine and when it is properly constructed it is odourless and free of flies. The latrine works without water and is thus appropriate for most rural communities where water is a problem.

To encourage latrine construction in the Madziwa project area, the research team through the local health assistants and committees provided 5 bags of cement, a stainless steel mesh for the fly-screen and reinforcing wire to each family willing to construct a VIP latrine. These subsidies per family add up to about US$28 per latrine. The family provides labour for digging the pit, sand and gravel, bricks and labour for the construction of the latrine. Locally recruited persons were trained on how to build the VIP latrines thereby introducing building skills into the community. Approximately US$27 were required to contract a locally trained individual to build a single compartment latrine. There were additional costs for materials and

labour if a family required a two compartment latrine. This type of latrine is convenient and proved to be very popular in the project area.

Members of the research team with support from the provincial health authorities regularly visited the project area and gave advice to the locally trained builders as well as monitoring the quality of latrines built. The target of 3000 latrines for the Madziwa area was not met. However, this was compensated somewhat by the fact that of 2152 latrines that were completed by November 1988, nearly half were of the double compartment type. Furthermore, the monthly cumulative numbers of latrines and pits dug since the project was started (Fig. 3) suggest that satisfactory progress was made. Of significance is the fact that the majority of the latrines met the standard specifications indicating that the training programme for the builders was effective. What is left is to maintain the momentum if the goal of one latrine per family is to be achieved.

In a project of this complexity extending over an area of about 21 000 hectares there are variations in local conditions and in the requirements for promoting the sanitation programme. Besides, personal enthusiasm of local leaders, local customs and the degree of cooperation from the peasant families had a significant influence on the rate of construction and thus the total number of latrines that were built in each ward. The Blair latrines were accepted by the communities particularly the double compartment version

for males and females. Strict separation in usage of ablution facilities by gender accords well with the cultural norms of the MaShona.

Water Supply

The National Action Committee for the International Drinking Water Supply and Sanitation Decade in Zimbabwe has approved low cost technologies for the supply of water to scattered village communities. For the water supply component of the Madziwa schistosomiasis control project three approaches were adopted; 1) the use of a hand operated drilling rig to increase the number of wells, 2) installation of simple pumps (Blair and bucket pumps) on shallow wells and 3) construction of washing slabs at water points.

As with the sanitation programme, efforts were made to involve the community in all aspects of the water programme. Inputs of the local people included provision of their labour for drilling or digging wells, provision of bricks and river sand for the wells and washing slabs and in preparing rings for well lining. The villagers played a central role in the identification of sites for drilling new wells or upgrading existing wells. The research team with the help of other government agencies such as the District Development Fund (DDF) assisted in the formation and training of water committee members to install, maintain and repair water pumps.

Before the beginning of the water programme, there were 40 boreholes fitted with hand operated bush pumps in Madziwa. The Bush pump is more robust than the Blair pump and is suitable for heavy duty settings such as at schools and business centres. The target was to install 150 hand pumps which would approximate to three pumps per village. This target was by and large met if we take into account the Bush pumps, 104 shallow wells that were fitted with Blair hand pumps and several protected wells that were fitted with bucket pumps.

Some factors militated against optimum usage of the available water points. In some cases water points were not easily accessible due to distance (often necessitated by the fact that localities near the villages were rocky) or because some individuals claimed sole rights to wells that had been protected but were located on their land. In others, wells dried up during the dry season because they were not deep enough. However, the most important factor for the water programme concerned operations and maintenance of the water works. A clear national policy on who is responsible for maintenance and repair of installed pumps is required as observations in the project area showed that communities do not recognize installed pumps as belonging to the community and therefore their responsibility.

Health Education

In spite of the high prevalence of schistosomiasis in the project area, a survey of knowledge, attitude and practices

(KAP) conducted before the beginning of the control programme revealed that knowledge about the disease, its public health importance, transmission and control were not well understood. Few people associated schistosome infections with absence of latrines and unprotected water supplies. Although the people probably observed snail hosts in the natural streams they visited, in most cases they were unaware that snails played an essential role in the transmission process.

People usually acquired infection during a variety of water contact activities such as bathing, swimming, washing clothes and utensils and crossing of waterbodies. However, as the effects of schistosomiasis infection are not as dramatic as those of malaria, the people were generally not aware of the infection. Under such circumstances, it was necessary to launch a vigorous health education campaign to alert the people of the dangers of infection and also of the need to control the disease.

The implementation of the health education programme proved to be fairly complex. It was found convenient that health education be primarily undertaken by health officials in the district with some technical support from the research team. Three main approaches were selected to provide health education to the communities:

1) posters, films and talks

2) drama competitions

3) local committees

Posters and films on schistosomiasis, hygiene and safe water were available and were distributed throughout the project area with emphasis on schools and women groups. Posters and films on the construction of Blair latrines and upgrading of wells were popular because they were clear, portrayed indigenous actors and were relevant to the perceived health needs of the people. Besides, in rural communities, films, even educational ones, provide rare entertainment and therefore are well attended. After the films, health assistants and nurses talked to the people present on various aspects of hygiene and other health matters to support and strengthen community participation in the various control activities.

Drama is an important part of local culture and we incorporated it in the health education programme as an effective means of communication. For organizational reasons the annual drama programme was focused on schools. It was hoped that drama would be a more effective means of reaching the adult population which is less easily accessible. The themes of the plays sought to facilitate understanding of the disease and its control.

To encourage broad identification with the project, private sector companies were encouraged to give donations for the prizes (e.g. stationery, food, cash etc). District officials from the ministries of health, education and local government were invited to judge the plays and also present opening and closing speeches. Drama competitions were

popular with people of different ages who came to watch the performances. Members of the research team and health officials took the occasion to discuss with the people various aspects of the control project.

For a community-based control programme, the involvement of the target communities in disseminating health education is essential. Therefore efforts were made to maintain an information exchange system between local health officials and members of the village and ward development committees, local political and civic leaders. These groups and individuals played an important role in mobilizing the people to take part in various aspects of the control project particularly the sanitation and water supply components.

In spite of the above mentioned efforts, health education proved to be a difficult aspect of the control programme. Local health staff did not spend enough time in addressing the people due to other pressing duties. In addition, organizational and transport problems limited the number of school visits that could be made by the health education officers. Such a situation probably explains the results of the KAP surveys of 1985 and 1988 (pre- and post intervention respectively) which indicated that health education had a very limited impact on knowledge of schistosomiasis by female heads of household.

In addition, knowledge of specific aspects of the life cycle of the disease by children was poor. This could be

attributed to the fact that health education attempted to get children to grasp too technical details of the disease. Health education should aim at developing the ability of children to apply the information acquired to disease prevention. Interestingly, the majority of them were aware that natural streams were a source of infection. Such knowledge should be used to reinforce health education messages.

Snail Control

In support of the other control activities, Bayluscide, a synthetic molluscicide was applied to all permanent water bodies in July 1986. A total of 123.6 kg of 70% wettable powder of the molluscicide was used; packets of 50g being mixed in 8 litres of water and used as a cover spray. Spraying was carried out 10 metres upstream and 5 metres downstream from the contact site, spraying from one bank to the other[8].

Commercial molluscicides are too expensive for routine use and in the control project, Bayluscide was used once at the beginning of the control programme. Only human water contact sites were treated. In the long term sustained snail control would realistically be through the use of a low cost and locally obtainable molluscicide. Great promise has being shown by berries of the African soapbery, Phytolacca dodecandra which are highly toxic against snail hosts.[9]

Evaluation

The effectiveness of the community based schistosomiasis control project is being assessed by annual age-prevalence surveys in the human population and monitoring infection rates in snail hosts. Selective chemotherapy of school children based on reagent strip detection of haematuria proved to be an effective and cost effective means of detecting and treating S. haematobium infections. Nevertheless, the rate of reinfections appeared to be rather high although infection intensities were generally low. Infection rates may be misleading in evaluating the effectiveness of interventions since intensity and length of exposure to infection are the major determinants of the development of morbidity.

The impact of the sanitation, water supplies and health education programmes shall be evaluated by comparing reinfection incidence rates in people of villages in the Madziwa project area with those in the witness villages in Bushu area. In principle, improved hygiene and health education should limit the risk of reinfection. This would reduce the need for frequent chemotherapy with consequent savings in the costs of drug procurement and delivery. Nevertheless, the contribution of improved sanitation, safe water supplies and health education in controlling schistosomiasis is difficult to evaluate. Piped water may only influence a small proportion of human water contact activities that are normally carried out at natural

waterbodies[10]. The construction of washing facilities at water points is an attraction away from natural water. However, streams may continue to be used for swimming and bathing.

Overall, snail infection rates declined somewhat during the course of the project implementation. However, there was marked spatial heterogeneity in snail infection rates among different sites. Under such circumstances, it is difficult to attribute the decline in snail infection rates partly or wholly to the latrine building programme. In any case some water contact activities may result in the contamination of natural water with schistosome eggs.[10] On the other hand improved sanitation would have a psychological effect of reinforcing health education messages and thereby encourage behaviour patterns that result in less contamination.

There is concern that overall evaluation of the impact of the interventions will be difficult due to differences in location of villages in relation to natural waterbodies. Furthermore, account should be taken of variations in the number of latrines, water points and coverage of health education among the different villages. Besides, the results of the epidemiological monitoring may be confused by movements of people among the villages. This calls for intensified monitoring in the second phase of the project so that adequate comparison can be made of the impact of the interventions among the various villages.

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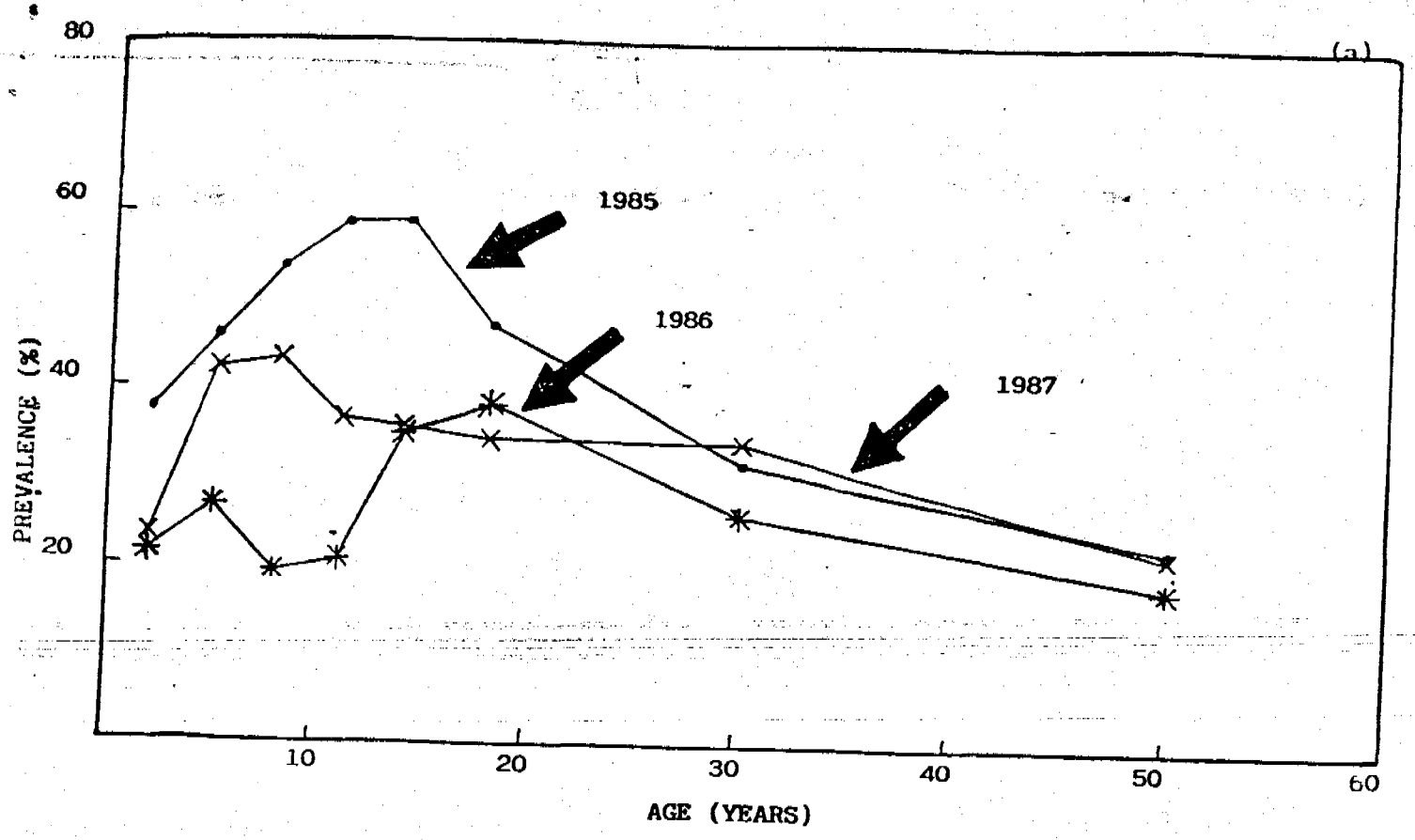
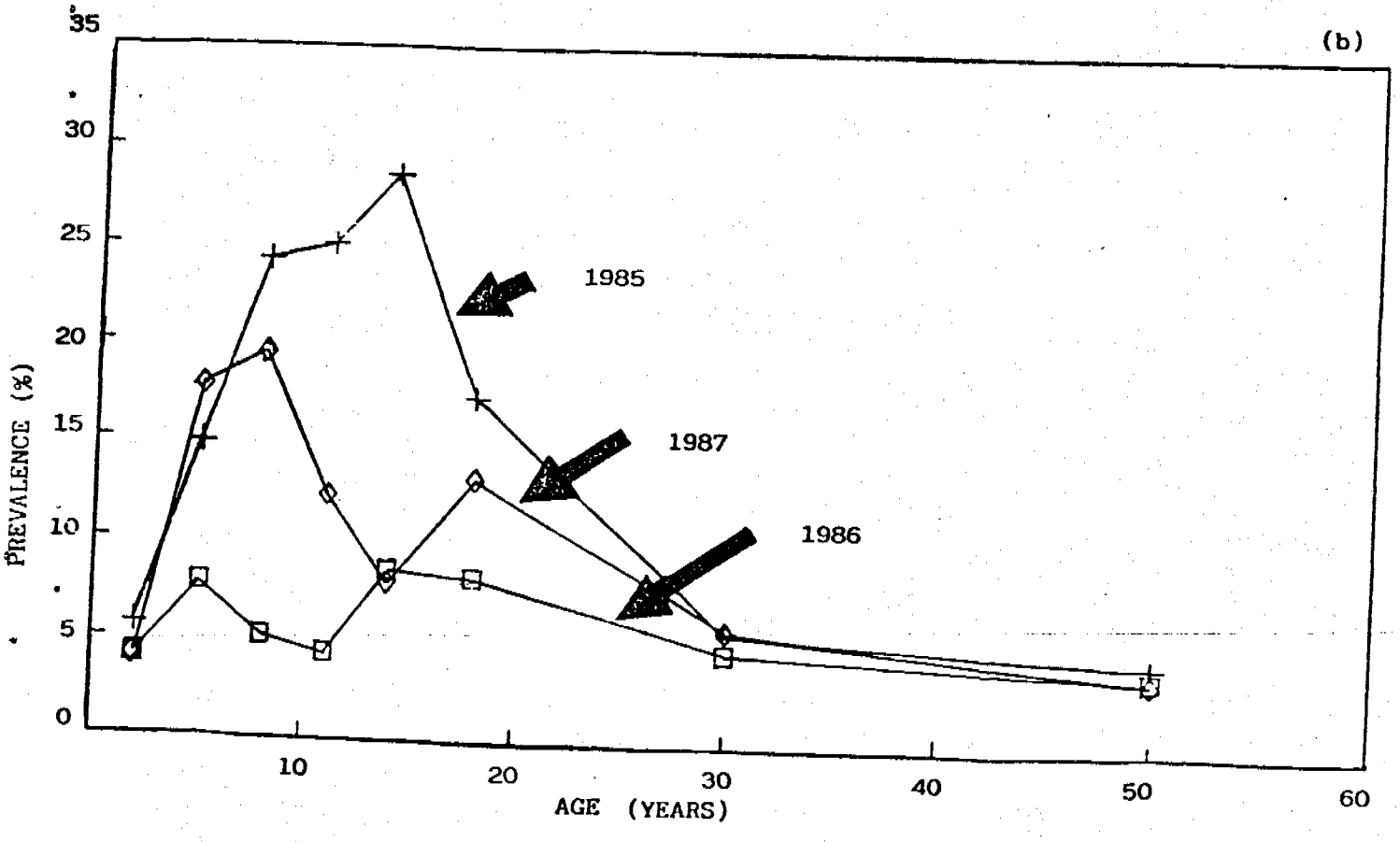
FIGURE LEGENDS

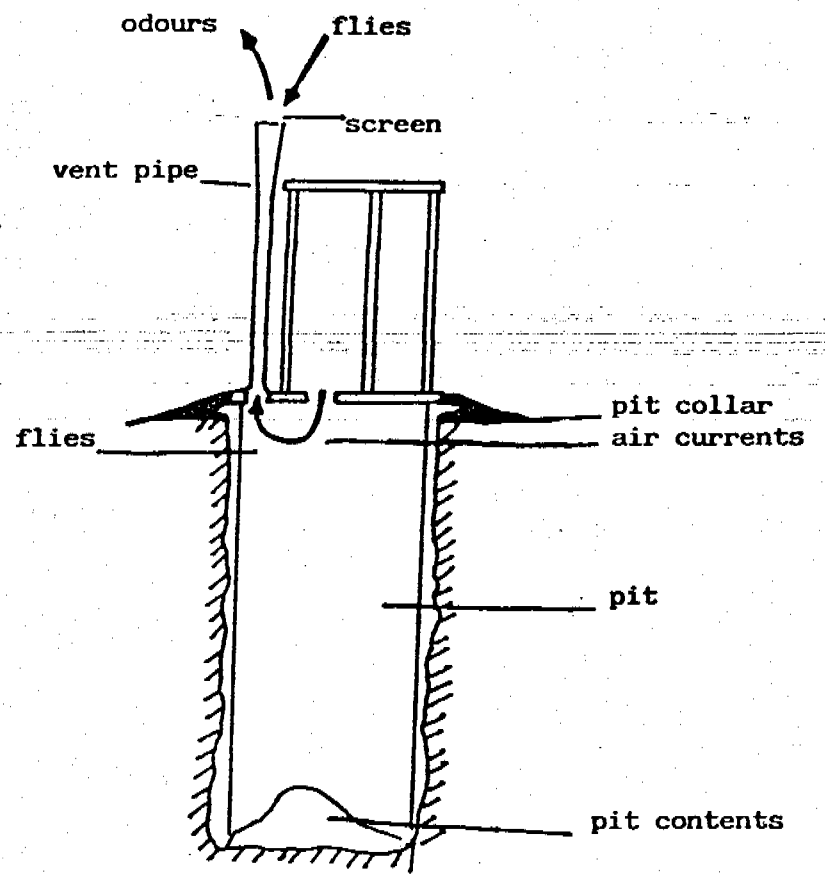
Fig. 1 Age group targeted treatment of *Schistosoma haematobium* in school children (7-15 years of age) living in Madziwa project area. Graphs in (a) show overall age prevalence profiles and in (b) prevalence of heavy infections (>50 eggs per 10 ml of urine) for 1985 (pretreatment) 1986 (3 months after treatment) and 1987 (8 months after treatment).

Fig. 2 Cross-section of the Blair ventilated improved pit latrine. The main feature of the latrine is the ventilation pipe which acts as a chimney and draws smell out through the pipe. A fly-screen made of stainless steel mesh keeps flies out of the pit as well as trapping those that attempt to fly out via the ventilation pipe.

Fig. 3 Cumulative numbers of Blair latrines and pits from July 1985 to January 1989 in the Madziwa project area.


(a)
80
60
40
20
PREVALENCE (%)
1985
1986
1987
10
20
30
40
50
60
AGE (YEARS)


(b)
35
30
25
20
15
10
5
0
PREVALENCE (%)
1985
1987
1986
10
20
30
40
50
60
AGE (YEARS)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SANITATION PROGRESS
MADZIWA