PART III Chapter 8

PRIMARY HEALTH CARE AND SCHISTOSOMIASIS CONTROL

8.1 An approach to quantify the role of existing health facilities in controlling vesical schistosomiasis in rural northern Cameroon.

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Attention in schistosomiasis control has in the last decade mostly been aimed at morbidity control through mass-treatment based on systematic active case-detection. Transmission is probably little interrupted by such a control strategy, but the intensity of infections can be dramatically reduced and morbidity is assumed to have improved parallel. Disadvantages of mass chemotherapy campaigns are the elevated cost per treated individual and the low compatibility with the existing health care facilities (extensively discussed by Gryseels, 1990). The high operational costs of a campaign in areas with high prevalence rates already surpasses many a countries' national health budget. For Mali, Brinkman et al. (1980) calculated that a reduction in prevalence to less than 20% would cost about DM 5,- per person annually. This amounts to 1.8 times the total government expenditure on health per capita for this region with high rates of prevalence. For regions with moderate to low prevalence rates, the cost per treated individual will be much higher since less infected individuals will be found in systematic campaigns of case detection, implying that schistosomiasis can generally not be controlled cost-effectively.

While active case detection is mostly beyond the limits of most health budgets, passive case detection and treatment by (rural) health centres may contribute significantly to the reduction in morbidity, especially in areas with moderate to low prevalence rates. In this study we have tried to quantify the role of existing health care facilities in the control of vesical schistosomiasis around the artificial reservoir of Lagdo in the Benue valley, Cameroon. The Benue valley is endemic for vesical and intestinal schistosomiasis with moderate regional prevalence rates; the geographical distribution of both types of schistosomiasis is highly focal (Ratard et al., 1990). The artificial lake of Lagdo was created in 1982 after the construction of the Lagdo dam. A large community of fishermen and peasants has settled around the lake in order to profit from the enormous fish production and availability of arable land. The fish production (12.000 metric tons per year) is traded through Lagdo, the only village with a tarmac road to the outside world, in this case the provincial capitals of Garoua and Ngaoundéré. Almost the entire lake region depends on Lagdo for imported supplies and for health facilities. Two other villages in the vicinity of the lake also posses a small health centre, but since all trade occurs through Lagdo, people also come to Lagdo for medical help. In 1991, the number of people living along the shores was estimated to exceed 50,000 (Ganzeman & Postma, pers. com.).

The severity of infection of people reporting at the Lagdo health centre is quantitatively analyzed and compared to objective data obtained from schistosomiasis surveys that have been performed in recent years. In this paper we will only consider cases of vesical schistosomiasis since intestinal schistosomiasis is rare in this area. This study tries to give an answer to three questions;

1) Assuming that morbidity from S. haematobium is reflected by the egg-count in urine samples, the first question is whether people reporting at the health centre actually have higher egg-counts than the mean egg-count in the total infected population. This is a prerequisite for effective morbidity control.

2) If the health centre indeed treats cases with heavy infections, do the records then give reliable information about the distribution of schistosomiasis in the area? Most health centres keep records of visitors, but in practise this wealth of information is hardly ever used. If these records could be used for the identification of problem areas, it is not necessary to perform large campaigns with active case detection. For this purpose the records of the Lagdo health centre have been analyzed and compared to data obtained from an area-wide schisto-survey. So independently obtained data from active case detection in a survey are compared to passive case detection at the health centre.

3) Among the persons that are ill due to schistosomiasis, do persons from different age-classes and of different sex have access to a health centre. It is often noted that women and children have limited access to health care facilities. In order to evaluate the access to health facilities, the number of people reporting at the dispensary per class of age and sex was compared with the expected number of people as derived from the survey data.

Collection of data

The organization of primary health care. The health care system consists of several layers: a provincial hospital in the provincial capital Garoua, three district hospitals in Bibemi, Pitoa and Rey Bouba. In each district several health centres are located that each serve between 10,000 and 20,000 persons. A health centre is staffed with one or more qualified health workers. The larger health centres possess a laboratory and a small ward. Visits to a health worker are free of charge; reference to a physician costs CFA 600; materials needed for laboratory analysis or medication have to be paid for, adding up from CFA 300 (approximately US$ 1,-) for stool analysis to CFA 1,500 for blood transfusion; drugs, syringes, etc. have to be bought at the pharmacy at cost price. The pharmacies in this area are regularly supplied with drugs.

Active detection. Data on schistosomiasis prevalence and intensities around lake Lagdo are taken from Robert4,5, whose 1986 survey data from Lagdo, Ouro Kessoum, Mai Djamba, Liferi, Damé and Ouro Tchaido are used. Additional surveys were carried out in Gounougou in 1989 (Robert, pers. com.), Riao in 19906, and Djiporde in 1992 (Vroeg, pers. com.). The standard method in all surveys was urine filtration (10 ml) using Nytrell® filters. Filters were analyzed the same day.

Passive detection. The records of the Lagdo health centre were used for basic information on numbers of visitors per village and numbers of presumed cases of schistosomiasis, as recognized by the health worker. From February 1988 until October 1990, sex, age and village of origin of all recognized cases of schistosomiasis were taken from the records. Per month also the total numbers of visitors were counted; a sample of four months (3,174 visitors) was analyzed to describe the geographic origin of the visitors to the health centre. If the number of visitors from one particular village constitutes less than 1% of the total number of visitors, the village in question is omitted from the analysis.

Intensity of infection in reported cases. The Lagdo health centre is staffed by two qualified health workers and two laboratory assistants. Near the health centre a permanently staffed pharmacy disposes of a regular supply of drugs; praziquantel (sold as Biltricide®) was in constant supply and sold at CFA 400 per tablet. Officially all people suspected to be infected with *Schistosoma haematobium*, usually indicated by recent haematuria, have to present a urine sample to be verified by the laboratory. In the laboratory an electric centrifuge is available for sediment analysis. In practice however, cases of haematuria were treated without laboratory verification, especially on market days when the number of visitors is high. In order to assess the severity of infection among people that actively seek medical help, all suspected cases of schistosomiasis were asked to deliver a urine sample which was stored in the refrigerator. Regularly, the samples were filtered through Nytrell® filters and counted. These quantitative results were filled in on a special data sheet; name, sex, age, village of origin, and quantity of urine filtered were also registered.

Access to health centre. The numbers of actual cases of schistosomiasis reporting at the health centre were compared to the expected numbers of visitors per age class, based on the survey data. The expected number of cases was calculated using the data on intensity of infection from the survey and from the health centre analyses. The ratio between the relative number of lightly infected cases (1-100 eggs / 10ml of urine) reporting at the health centre and this number in the survey was calculated (r_l); the same was done for heavy infections (r_h). From the survey data the fractions of light and heavy infections (f_l and f_h) were determined per age class for men and women. The expected number (N_{exp}) of persons per sex and age class to report at the health centre was calculated as follows:

$$N_{exp} = (r_l \times f_l \times N_{tot}) + (r_h \times f_h \times N_{tot})$$

where N_{tot} is the total number of infected persons in the concerning age/sex-class as measured in the survey. To permit comparison, the resulting numbers of expected cases were scaled to the recorded number of cases reporting at the health centre between February '88 and October '90. (If larger

numbers of data are available, this calculation can be more detailed by distinguishing more classes of infection. The resulting formula to calculate the expected number of visitors per age-class than is:

$$N_{exp} = \sum_{1 \rightarrow X}^{a} (r_a \times f_a \times N_{tot})$$

where "X" is the number of classes of infection that are distinguished.)

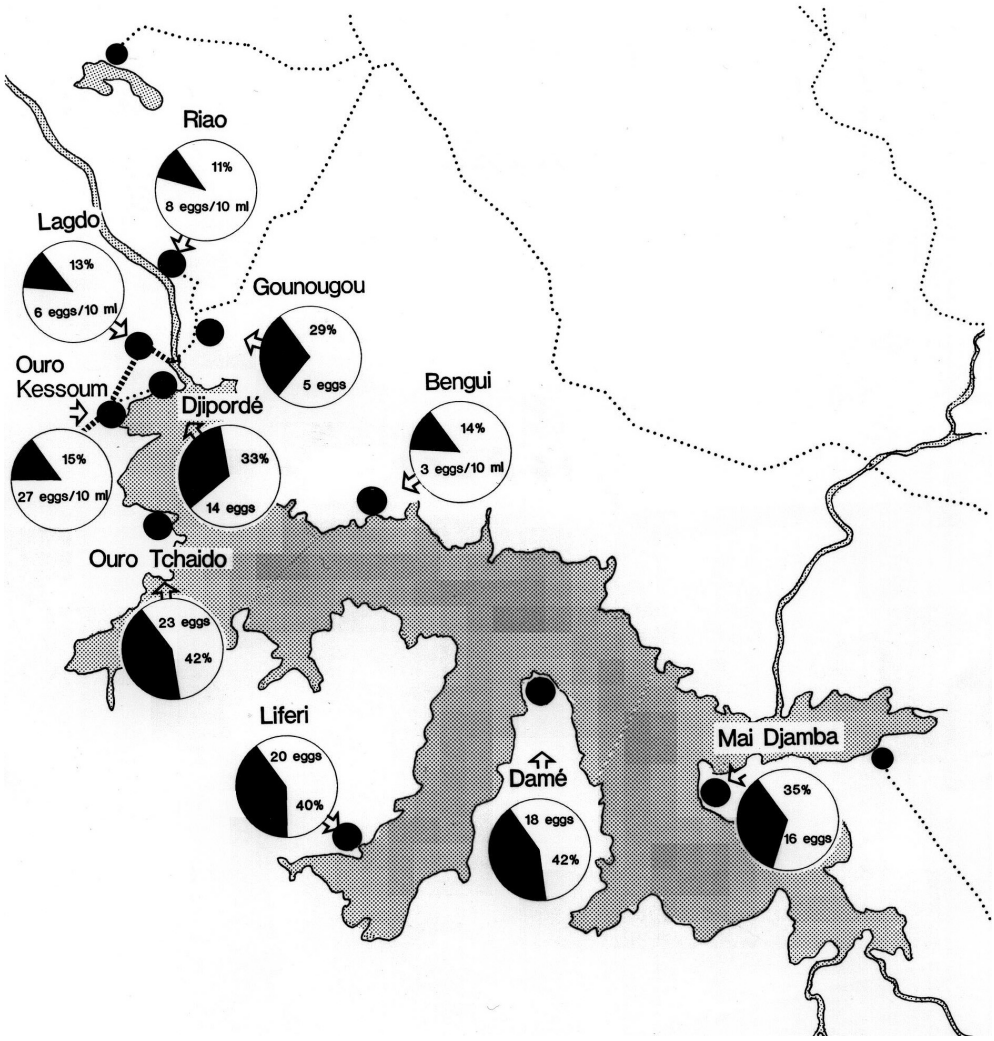

Figure 36: Results of surveys on vesical schistosomiasis around Lagdo lake; in pie charts the prevalence (percentage of total population) and intensity of infection (number of eggs per 10 ml urine).

Results

Active detection. Complete sets of data were available for 10 villages, of which 7 were situated on the shores of lake Lagdo, i.e. Djipordé, Ouro Kessoum, connected by road with the health centre, and Ouro Tchaido, Dame, Liferi, Mai Djamba and Bengui, only having access by boat. Three additional villages were situated immediately downstream of the Lagdo dam, i.e. Lagdo s.s., Gounougou and Riao. The results from several *S. haematobium* surveys in the area and the geographical location of the villages are presented in figure 36. According to Robert (1986), Slootweg (1989) and Vroeg (pers. com.) the surveys significantly reflect the sex and age structure of the population. Prevalence ranged

from 11% in Riao to 42% in Damé and Ouro Tchaido. Intensity was lowest in Bengui with a geometric mean egg output of positives of 3 eggs per 10 ml urine and highest in Ouro Kessoum with 27 eggs/10 ml.

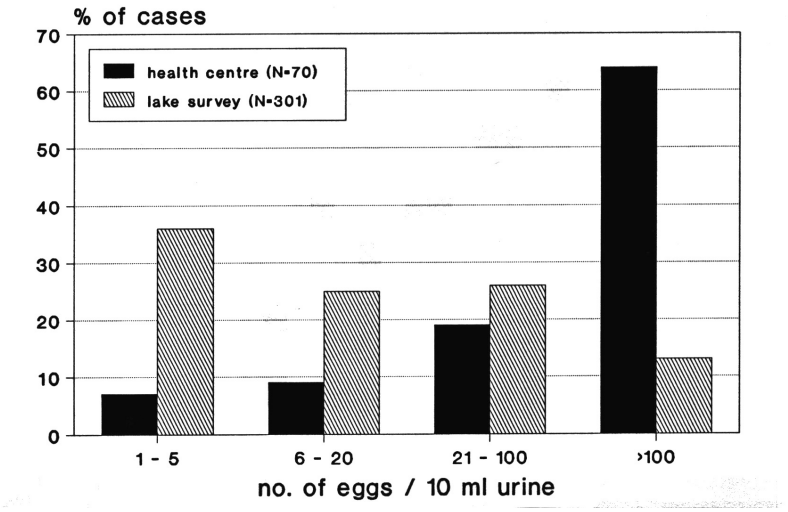

Figure 37: Comparison of egg-output between active (survey) and passive (health centre) case detection, by classes of intensity.

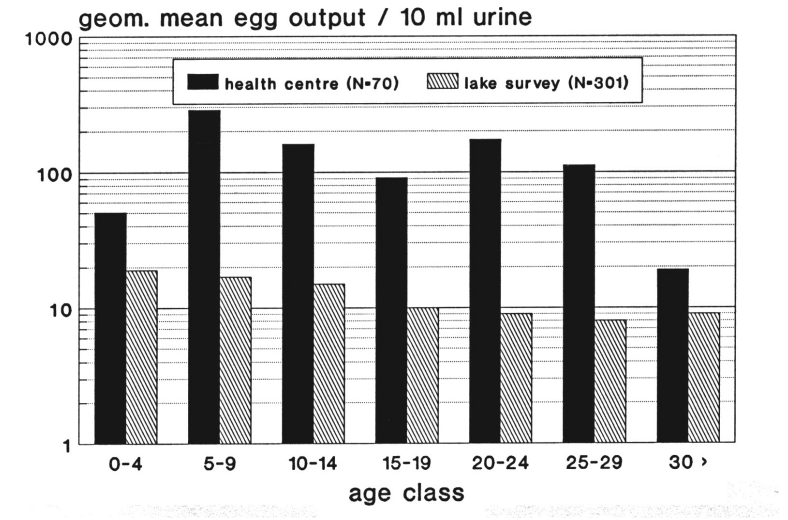

Figure 38: Comparison of geometric mean egg-output between active (survey) and passive (health centre) case detection per age-class.

Intensity of infection of cases reported at the health centre. Sofar 70 cases of vesical schistosomiasis have been quantitatively analyzed in the laboratory at the health centre. The age distribution of the tested group does not differ significantly from the overall age distribution of the schistosomiasis patients reporting at the health over the entire period (Komogorov Smirnov one sample analysis: p=0.22). The intensity of infection of people reporting at the health centre, the passive detection, is plotted together with the intensity of infection as measured in the survey, the active detection (figure 37). In the survey the largest numbers of infected people fall within the group of least infected people, excreting 1-5 eggs per 10 ml urine (36% of all infected persons). In the health centre, however, this group only constitutes 7% of the reported cases. The people with heavy infections (over 100 eggs per 10 ml urine) by far make up the majority of patients at the health centre (64%), whereas heavily infected people only represent 13% of the total number of infected people in

the survey. In the reported cases that were quantitatively analyzed, more heavy infections were found than in the entire lake survey, i.e. 43 out of 70 persons examined vs. 40 out of 1154 respectively. This implies that passive case detection by the existing health facilities is highly selective for heavily infected individuals.

When analyzing the data per age-class (figure 38), a similar conclusion as above can be drawn; i.e. that people who actively seek medical help are on average more heavily infected than the average infected person detected in the general survey, with an extreme 20 fold difference in the 20-24 years age-class.

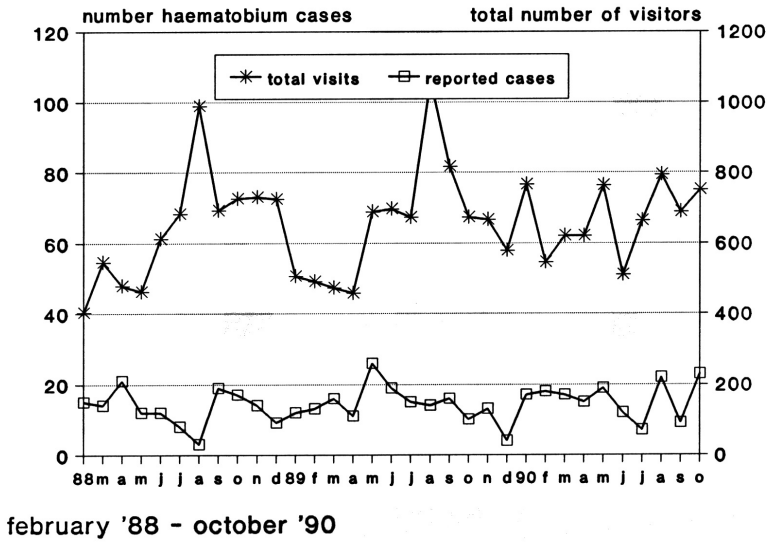

Figure 39: Total number of visitors and number of reported cases of vesical schistosomiasis in the Lagdo health centre between February 1988 and October 1990.

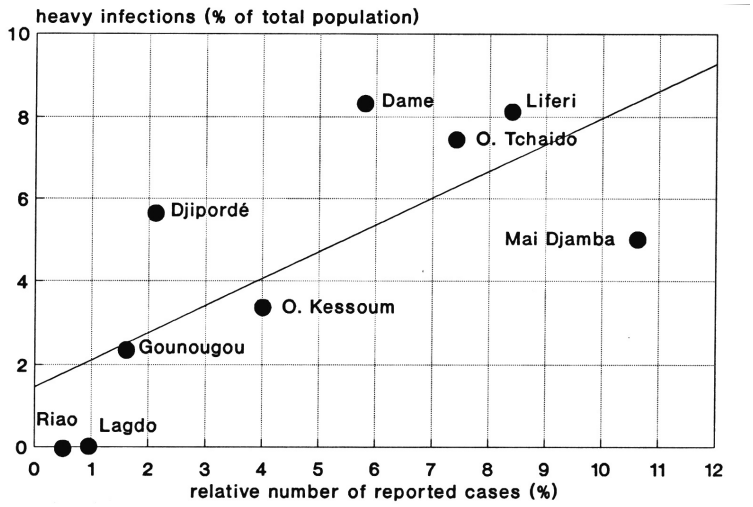

Figure 40: Relation between the relative number of reported cases per village and the prevalence of heavy infection per village.

Analyses of the health centres' records. The total number of visitors and the number of reported cases of vesical schistosomiasis at the Lagdo health centre between February 1988 and October 1990 is graphically represented in figure 39. It is not possible to recognize any seasonality in the numbers of visitors and the number of schistosomiasis cases. Over the entire 30 months period 2.2% of the total

number of visitors was reported to have vesical schistosomiasis, with a monthly range between 0.3% (August '88) and 4.4% (April '88). In the rainy season the numbers of visitors is strongly influenced by weather conditions on the lake; also the availability of cash money is said to be of influence. According to the health centre's staff, people only seek medical help if they have money to buy medicines.

The number of people from a particular village reporting at the Lagdo health centre with vesical schistosomiasis, expressed as the percentage of the total number of visitors from that village, i.e. the relative number of reported cases per village, shows a significant correlation with the measured prevalence of heavy infections per village (figure 40). This implies that proportionally more people report with schistosomiasis at the health centre from villages with higher rates of heavy infections. These results corroborate with the finding that passive case detection at the health centre is selective for heavy infections, and suggest that the dispensaries' records give important information about the actual morbidity due to the parasite in the region.

Table 1: Necessary data to determine the access of patients with vesical schistosomiasis to the Lagdo health centre. The data for males and females are separated. The total number of visitors per class and the recognized number of cases are based on the health centres' records. The fractions fl and fh and the number of infected persons per class Ntot are taken from the lake-wide survey. Between brackets the calculated Nexp before scaling.

MALES age-class	total no. of males at PHC	fraction of light infections in survey (f_l)	fraction of heavy infections in survey (f_h)	number of infected males in survey (N_{tot})	no. of infected males expected at PHC (N_{exp})	no. of infected males recognized at PHC
0 - 4	262	0.77	0.23	13	30 (18.7)	36
5 - 9	106	0.89	0.11	72	104 (64.4)	97
10-14	126	0.88	0.12	25	38 (23.5)	52
15-19	88	0.86	0.14	22	37 (22.7)	32
20-24	78	1	0	4	3 (1.6)	32
25-29	67	1	0	12	8 (4.8)	20
30-34	97	1	0	8	5 (3.2)	12
35-39	69	1	0	5	3 (2)	10
40-44	58	0.8	0.2	5	11 (6.6)	7
45-49	30	1	0	2	1 (0.8)	5
50-54	25	0	0	0	0 (0)	2
55 >	32	1	0	4	3 (1.6)	4

Access to the health centre. The age-class and sex distribution of the recognized cases of vesical schistosomiasis at the health centre (table 1) is significantly different from the total numbers of visitors per class of age and sex (Komogorov Smirnov: p=0.009 for males and females), indicating that the cases of schistosomiasis are not randomly encountered among the visitors. The expected number of cases is calculated with the formula $N_{exp} = r_l \times f_l \times n_{tot} + r_h \times f_h \times N_{tot}$ as explained above. The ratio's r_l and r_h, derived from figure 37, are 0.4 (35% : 87%) and 4.9 (64% : 13%) for light and heavy infections respectively. These values indicate that the proportion of heavy infections at the health centre is 4.9 times that in the lake survey; the proportion of light infections is 0.4 times that in the lake survey. The fractions f_l and f_h are calculated from the survey data from the villages indicated in figure 36. To allow comparison, the resulting N_{exp} is scaled to the total number of recognized cases at the health centre.

The number of recognized cases does not differ significantly from the distribution of expected cases as calculated from the survey data (p=0.52 for males and females). The graphical representation in Fig. 41 shows that, although both men, women and children do visit the health

centre, women are underrepresented, especially girls in the 5-9 years age-class and women between 25 and 29 years of age.

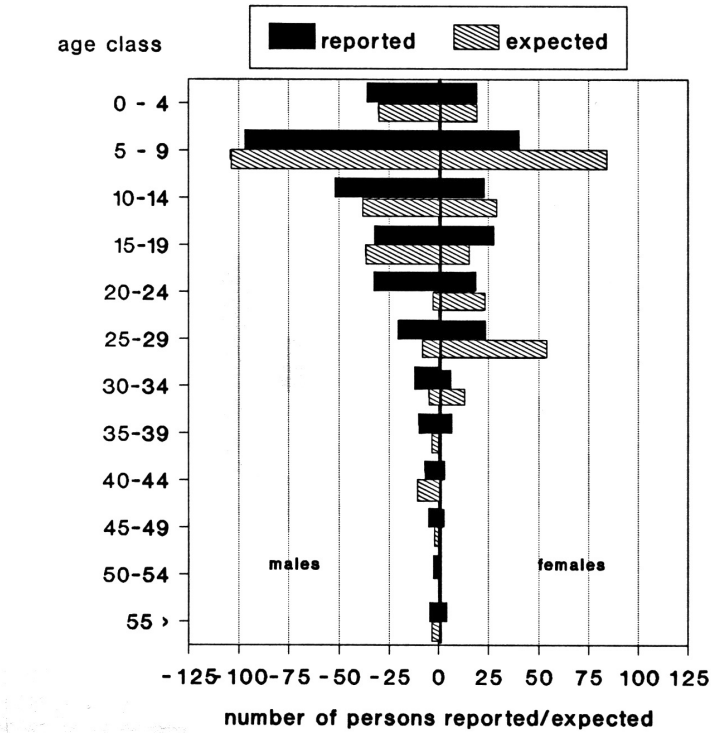

Figure 41: Numbers of recorded cases of vesical schistosomiasis at the Lagdo health centre per class of age and sexe, and the expected number of cases as derived from the survey around Lagdo lake.

Discussion and conclusions

The results of this study can be summarized in four statements:

1) Villages around the artificial reservoir of Lagdo have low to moderate infections with *S. haematobium*.
2) Passive case detection at the health centre is highly selective for heavy infections in all age-classes.
3) Severity of infection per village, represented as the prevalence of heavy infections, significantly relates to the proportion of visitors from this particular village reporting with medical complaints caused by schistosomiasis. A high number of heavy infections leads to a higher percentage of reported cases per village. Consequently, the records of a health centre can give detailed regional information on morbidity due to vesical schistosomiasis.
4) Men, women and children have access to the health centre, although men are overrepresented. Especially girls between 5 and 10 years of age have restricted access.

Several problems were encountered that interfere with the interpretation of data:
- Comparison of data retrieved from the records with demographic data was impossible because reliable demographic data were virtually absent in this area characterized by a high migration rate. Without the total number of inhabitants it is impossible to quantify the total number of heavily infected persons living in the area. It is thus difficult to see what percentage of the heavily infected population is reached by the system of passive case detection.
- Problems arose with the collection of quantitative data on intensity of infection at the health centre. Many supposed cases of schistosomiasis were treated with biltricide without laboratory verification,

and the laboratory worker failed to record negative examinations. As a result there will be false positive and unnoticed negative cases and consequently the reliability of the research data decreases.
- We assumed that schistosomiasis prevalence rates did not change dramatically in time. The surveys were performed over a six year period, while the record analyses only covers two years. In the period of study no intensive medication campaigns have been carried out.

In this paper we only try to show a possible way to assess the role of primary health care in morbidity control of schistosomiasis. In many endemic areas with low to moderate prevalence rates, morbidity control through primary health care may well be the only feasible and realistic approach. The data presented in this study showed that with relatively little effort more cases of heavy infections were found and treated at the health centre, than in the labour intensive lake-wide survey. These results give some reason for optimism concerning the effectiveness of the health centres in dealing with vesical schistosomiasis in this lightly infested region.

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