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The contribution of existing health facilities to the control of urinary schistosomiasis in northern Cameroon

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This paper attempts to analyse the impact of the regular functioning of existing health services on the control of urinary schistosomiasis in two villages in northern Cameroon. The health centres' diagnostic systems selectively recognise heavy infections. The efficacy of reaching and subsequently treating heavily infected subjects, however, is low. No more than around 5% of the heavily infected subjects in the health centres' catchments areas is reached on an annual basis. Further analysis shows that the percentage of infected and heavily infected subjects is not higher among the visitors of the health centre than in the inhabitants of the villages involved. Heavy infection is not a reason to visit the health centre, in these villages.

To increase the role of the existing health structure in coping with *Schistosoma haematobium* infections, the diagnostic system, used in the health centres, could be improved by a standardized inclusion of laboratory examination of clinically suspected individuals. Simultaneously, the awareness of the infected population to respond to infection by visiting the health centre needs further development.

Key words: *Schistosoma haematobium*; Control; Health services; Case detection; Cameroon

1. Introduction

Control of schistosomiasis is indicated in areas where the infection is a recognisable cause of morbidity and where – at the same time – socio-economic conditions allow for sustainable measures.

Many regions in rural Africa are endemic for either intestinal or urinary schistosomiasis but more often than not the intensity of infection is low and the morbidity remains unconspicious and difficult to prove. Moreover, in many of those areas, resources are minimal and priorities in health care plentiful. In those conditions disease-specific control of schistosomiasis may not be justified and alternative approaches in dealing with the infection need to be worked out.

Much of the research into control of schistosomiasis has been directed towards

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either the possibilities to implement (selective) population chemotherapy, or to reduce transmission through preventive measures such as snail control and the modification of snail habitat (Chandiwana et al. 1991, Engels et al. 1993). The structure and facilities of existing health centres are sometimes used as a tool to implement such measures (Wolff et al. 1989, Gundersen et al. 1990, Engels et al. 1993). Little attention, however, has been paid to assess the impact of the day to day functioning of the existing health services in controlling schistosome morbidity at the population level (Gryseels et al. 1989, Engels et al. 1993).

In the present – preliminary – attempt we report on an analysis of the system of diagnosis and treatment of urinary schistosomiasis in two health centres in northern Cameroon, in relation to quantitative epidemiological data collected in the catchment areas of the health centres. The data are interpreted in terms of selective power and efficacy to reach the population at risk. It is discussed which components of the functioning of the existing system of health centres need improvement to more adequately cope with the problem of urinary schistosomiasis in the region.

2. Population and methods

The research was carried out in northern Cameroon, in the area of Djippordé, just outside Lagdo, and in Padermé. In this region prevalences of *S. haematobium* vary from 20 to 50% per village (Robert et al. 1989, Ratard et al. 1990). **Lagdo** was a small fishermen's village until the creation of the Benué barrage in 1982, and **Djippordé** used to be, and still is a fishermen's village close to and largely depending on Lagdo. The population of Lagdo is some 11 500 while Djippordé has a population of 6300. Lagdo is a centre for commerce and agricultural activities and both Lagdo and Djippordé are populated by a rich mixture of immigrants and original inhabitants. The Lagdo health centre has beds for 20 inpatients. It is manned by one health officer, a number of assistents and a small laboratory with one lab technician. The catchment area consists of Lagdo township, Djippordé and the surroundings with a total of some 35 000 inhabitants; the health centre is visited by around 9500 outpatients per year. **Padermé** is a traditional village in the vast and sparsely populated area north of the barrage. It counts about 2000 inhabitants of local tribes. Padermé possesses similar health facilities as Lagdo, again with one health officer and a lab technician but with a smaller number of assistants. The population covered is some 20 000; the yearly number of outpatients approximately 1800.

Both intestinal and urinary schistosomiasis have been known to occur in the area, even before the Benué barrage was filled (Project de Recherche, 1988). An explosive increase of transmission and morbidity as a result of the construction of the dam and the subsequent irrigation activities was anticipated. Until 1993, however, *S. mansoni* nor *S. haematobium* prevalences have greatly increased (Slootweg 1994). *S. haematobium* used to be transmitted in temporary pools (probably by *B. senegalensis*) and the additional role of *B. truncatus* and *B. globosus* in irrigation scheme and lake has still to be properly assessed (Slootweg et al. in press). *S. haematobium* is the predominant species both in Lagdo and Padermé, and the present study is directed towards this parasite; no specific attention is paid to *S. mansoni* infections. Also, we only considered cases, originating either from Djippordé, or from the village of

Padermé. Only in these two villages appropriate population-based parasitological surveys have been carried out.

A random 10.2% sample of the **Djippordé** population (100 house holds, $n=641$) was taken from a census, carried out in 1991. In **Padermé** a census had to be executed since no population data were available. The population size came up to 1923 persons from which 223 persons (34 households, 11.6%) were randomly selected for parasitological examination. Prior to the parasitological surveillance informed consent was obtained from all participants. Sex and age were registered.

2.1. Case-identification

Cases of urinary schistosomiasis are examined at three different levels:

(1) *Routine examinations* in the health centres by the local staff, using clinical and parasitological methods. At the **Lagdo** health centre the diagnosis *S. haematobium* is mainly based on the presence of macrohematuria; microscopic examinations are rarely done. At the **Padermé** health centre, direct smears of the urine sediments are examined microscopically when the health officer considers such examination appropriate.

(2) *Passive case detection* by the research project: cases identified by the health centre during the period from June 1992 to May 1993 are subjected to a standard quantitative urine filtration procedure.

(3) *Active case detection*, also by the project, using the same quantitative urine filtration procedures, but examining the (randomly selected) samples of the inhabitants of the villages of Djippordé and Padermé. These surveys took place in July 1992.

To assess the sensitivity of diagnosing light and heavy infections, a standardized urine filtration was not limited to cases recognized by the health centres only. In **Lagdo**, during two weeks all outpatients were subjected to the project's quantitative examination. At the **Padermé** health centre urines of all patients subjected to any microscopical routine examination in the period of passive case detection, were also quantitatively analysed by the project.

Although it is realized that analysis of single urine samples is not a very satisfactory tool for a reproducable and sensitive estimation of prevalence and intensity of infection, it was not possible to collect multiple samples for each patient. Prevalence and intensity of infection were therefore based on urine filtration of two 10 ml aliquots of one specimen of urine (WHO 1983). For further analysis, the cases identified are classified as "light infections" when less than 100 eggs/10 ml were found, or as "heavy" when more than 100 eggs/10 ml.

In the attempts to correlate the observations of the health centres, and of the research project's passive and active case detection, the **"selectivity"** of the passive case detection is defined as the capacity of the health centre to identify heavy infections. A health centre's operational diagnostic system has a high selectivity when a comparatively high proportion of heavily infected subjects is recognised from a population with a known percentage of heavy infections. The **"efficacy"** of the health centre's system of identifying heavy infections is defined as the percentage of the heavy infections present in the area of study, that is recognised in a one year period. The efficacy is thus the result of the people's ability to recognise the need to visit the health centre, their inclination to actually go there, the health centre's clinical capacity to get the right type of examinations done and the laboratory's diagnostic qualities.

The **"sensitivity"** of diagnosing light and heavy infections at the health centres is defined as the capacity of the health centre's laboratory to recognise the infection, compared to the project's diagnostic power based on urine filtration of two 10 milliliter aliquots of urine as desribed above.

3. Results

3.1. Passive case detection at the health centres

In one year 60 cases from **Djippordé** were diagnosed through routine examinations at the Lagdo health centre, out of which 42, 23 men and 19 women, were confirmed by our urine examination (Table 1). The calculation of the selectivity of the health centre to recognize heavy infections among the population of patients coming from Djippordé is based on these 42 infected cases only. Eighteen out of them were shown to be heavily infected. In **Padermé** 31 out of the 34 cases recognized at the health centre were parasitologically confirmed by urine filtration. Eight of them were heavily infected (Table 1).

3.2. Active case detection in Djippordé and Padermé

The age-specific prevalences and intensities of infection measured among the populations examined in Djippordé and Padermé are summarized in Table 2. The response was 87.6% in Djippordé (9.0% of the village population), and 97.3% in the Padermé survey (11.3% of all inhabitants). In **Djippordé** 31 heavy infections were found among 563 persons examined (5.5%, 95% confidence intervals (95% CI) $\pm$ 1.9%), i.e. 16.8% of the 184 positive cases (95% CI $\pm$ 5.4%). In **Padermé** the percentage of heavy infections was 9.8% of the 217 subjects examined (95% CI $\pm$ 4.0%); i.e. 17.4% (95% CI $\pm$ 6.8%) of the 121 infected subjects.

TABLE 1

Passive case detection at the Lagdo and Padermé health centre: number of routine examinations, confirmed and heavily infected cases by sex and age

	Lagdo (Djippordé)	Padermé
Routine examinations	60	34
Men	34	19
Women	26	15
Confirmed cases	42	31
Men	23	17
Women	19	14
0–4	2	2
5–19	27	16
20+	13	13
Heavily infected cases	18	8
Men	10	5
Women	8	3
0–4	0	0
5–19	14	7
20+	4	1

TABLE 2

Active case detection surveys in Djippordé and Padermé: prevalence of (heavy) infection by sex and age

	Djippordé ($n=563$)			Padermé ($n=217$)		
	n	%	95% CI	*n*	%	95% CI
Prevalence	184	32.7	±3.9	121	55.8	±6.6
Men	98	35.3	±5.6	56	56.0	±9.7
Women	86	30.2	±5.3	65	55.6	±9.0
0–4	23	17.8	±6.6	13	29.5	±13.5
5–19	103	53.4	±7.0	65	78.3	±8.9
20+	58	24.1	±5.4	43	47.8	±10.3
Prevalence of heavy infection	31	5.5	±1.9	21	9.8	±4.0
Men	19	6.8	±3.0	14	14.0	±6.8
Women	12	4.2	±2.3	7	6.0	±4.3
0–4	0	0.0	±1.5	2	4.5	±6.1
5–19	23	11.9	±4.6	17	20.5	±8.7
20+	8	3.3	±2.3	2	2.2	±3.0

3.3. The health centre's selectivity to recognize heavy infections

The percentage of heavy infections recognized in the health centres is 2.6 and 1.6 times higher than among the villages' populations (95% CI 1.9–3.8 and 1.1–2.4 respectively; see Table 3). These rates are of the same order of magnitude in different age classes and slightly, but not significantly higher in females than in males.

3.4. The efficacy of recognising heavy infections

The total number of heavily infected subjects in **Djippordé** can be calculated to amount 344 ($100{:}9.0 \times 31$) with a 95% CI of ±119 (Table 4). During one year 18 heavily infected cases (5.2%) were recognised at the Lagdo health centre (95% CI 3.9–8.0). Among women, the efficacy came up to 6.0% (95% CI 3.9–13.3%) whereas 4.7% (3.3–8.5%) of the heavily infected males have been identified. For **Padermé**, the total number of heavily infected persons is estimated to be $100{:}11.3 \times 21 = 186$ (95% CI±77). The efficacy of the Padermé health centre in recovering heavy

TABLE 3

Selectivity[a] of the Lagdo and Padermé health centre by sex and age

	Lagdo (Djippordé)					Padermé				
	HC %	Survey %	95% CI %	Selectivity	95% CI %	HC %	Survey %	95% CI %	Selectivity	95% CI %
Total	42.9	16.8	±5.4	2.6	1.9–3.8	25.8	17.4	±6.8	1.6	1.1–2.4
Men	43.5	19.4	±7.8	2.3	1.6–3.8	29.4	25.0	±11.3	1.2	0.8–2.1
Women	42.1	14.0	±7.3	3.0	2.0–6.3	21.4	10.8	±7.5	2.0	1.2–6.5
0–4	0.0	0.0	±8.3	–	–	0.0	15.4	±35.0	0.0	–
5–19	51.9	22.3	±8.0	2.4	1.7–3.6	43.8	26.2	±10.7	1.7	1.2–2.8
20+	30.8	13.8	±8.9	2.2	1.4–6.3	7.6	4.7	±5.3	1.8	0.7–∞

[a] The selectivity is calculated as the percentage of heavily infected subjects (number of positive cases = 100%), detected at the health centre (HC), divided by the same percentage in the population survey.

TABLE 4

Efficacy[a] of the Lagdo and Padermé health centre by sex and age

	Lagdo (Djippordé)					Padermé				
	HC	Survey	95% CI	Efficacy %	95% CI %	HC	Survey	95% CI	Efficacy %	95% CI %
Total	18	344	±119	5.2	3.9–8.0	8	186	±77	4.3	3.0–7.3
Men	10	211	±93	4.7	3.3–8.5	5	124	±60	4.0	2.7–7.8
Women	8	133	±73	6.0	3.9–13.3	3	62	±45	4.8	2.8–17.6
0–4	0	0	±22	–	–	0	18	±41	0.0	–
5–19	14	256	±99	5.5	3.9–8.9	7	151	±64	4.6	3.3–8.0
⩾20	4	89	±62	4.5	2.6–23.5	1	18	±23	5.6	2.4–∞

[a] The efficacy is calculated as the number of heavy infected subjects detected at the health centre (HC), divided by the same number in the population, as estimated by the population survey.

infections is 8:186=4,3% (95% CI 3.0–7.3%); 4.0% (2.7–7.8%) among men and 4.8% (2.8–17.6%) among women.

3.5. The sensitivity of diagnosing light and heavy infections

At the **Lagdo** health centre, the research project examined 300 outpatients, 48 of whom were residents of Djippordé. Comparison of the health centre's findings and those of the research project shows that among them no more than 5 out of the 20 cases of *S. haematobium* were recognised by the health officer (20%), while only 2 out of the 6 heavy infections were correctly diagnosed (33%). In **Padermé** urine samples of 294 out of 1800 visitors were examined by the health centre's laboratory. These samples were also analysed by the research project. It appears that 31 out of the 48 infected subjects (65%) from Padermé itself were recognized by the standard urine sediment examination of the health centre's laboratory, and eight out of the nine heavily infected cases were detected (89%).

4. Discussion

Morbidity control in schistosomiasis aims at the prevention of the development of serious clinical schistosomiasis with irreversible pathology. Therefore vertically organized disease-specific programmes to control morbidity base their strategy on the detection and treatment of (heavily) infected subjects in whom such pathology might develop. Experience with praziquantel treatments, even of advanced cases, indicates that the pathologic changes are less irreversible than previously believed (e.g. Hatz et al., 1990; Kardorff et al., 1994). In areas with low prevalences and intensities of infection it would therefore seem justifiable to base control on treatment of clinically apparent cases rather than on a system of active detection of the (heavily) infected subjects. In this context the present study was based on a mixture of elements from primary health care and strategies developed in disease-specific control programmes. The decision on who should be treated was based on the recognition of the disease by the infected subjects, their search for medical help and the health centres' diangosis. At the same time it was estimated to what extent the classical goals of

reducing the numbers of heavily infected subjects in a population could be achieved by the system of health centre-based diagnosis and treatment of patients.

The data presented show that the proportions of heavy infections among those recognized by the health centres as *S. haematobium* infected subjects, is higher in the health centres than in the villages. This selectivity confirms previous findings (Slootweg et al. 1995). The efficacy of recovering the heavily infected fraction of the villages' populations was shown to be in the order of 5%. Clearly, very many heavily infected subjects remain undiagnosed and untreated when control is left to the daily routine of the health centres.

Why do so many heavy infections in the villages remain unrecognised? Do the health centres fail to adequately recognize the infection? And then, what is the need and which are the possibilities to increase their efficacy? Or don't the people realize that they are infected, and therefore don't they go and visit the health centre?

In Lagdo diagnosis was based almost exclusively on the presence of macro-haematuria; the sensitivity of diagnosis was very low. The efficacy identifying heavy infections could be greatly increased if the diagnostic system would be improved. In Padermé, on the other hand, the diagnostic system is already functioning satisfactorily. Thus, the comparatively high selectivity of the Lagdo health centre in recognizing heavy infections is largely the result of its poor diagnostic sensitivity.

Next, the recognition of infection by the people themselves needs to be addressed. In the Lagdo health centre 1200 of the outpatients came from Djippordé. Since the total Djippordé population is about 6300, 20% of the population came to the health centre for some kind of consultation. On the basis of the active case detection survey in Djippordé, 392 ± 47 ($32.7\% \pm 3.9\%$) infected and 66 ± 23 ($5.5\% \pm 1.9\%$) heavily infected subjects should be expected (Table 2). In reality, no more than 42 infected and 18 heavily infected subjects were seen: i.e. only 10.7% (95% CI 9.6–12.2%) of the expected number of infections and 27.3% (95% CI 20.2–54.5%) of the expected number of heavy infections.

The Padermé health centre is not frequently visited: no more than approximately 1800 outpatients were seen in the study period, 720 of whom appeared to be inhabitants of Padermé itself. This equals about 37% of the village population. Among them the health officer requested microscopical urine examination in 130 cases. The population survey in Padermé shows that 73 ± 9 subjects (55.8%, 95% CI $\pm 6.6\%$) should be expected to be infected with *S. haematobium*, whereas it foresees 13 ± 5 ($9.8\% \pm 4.0\%$) heavily infected subjects. By routine microscopic examination 31 (42.5%, 95% CI 37.8–48.4%) of the infected cases and 8 heavy infections have been detected (61.5%, 95% CI 44.4–100.0%).

It is rather unexpected that not only among Lagdo's patients from Djippordé, but even in Padermé, where the quality of microscopical diagnosis was shown to be satisfactory, less cases of *S. haematobium* were found among the health centre's outpatients than expected on the basis of the active case detection in the village as a whole. The most obvious explanation for the finding is that the most heavily infected age group may be underrepresented among the outpatients. This, however, is not the case: specific analysis shows that in each of the three different age classes (0–4, 5–19, 20+) less (heavy) infections were found in outpatients than in inhabitants of the village. Apparently, infected villagers do not visit the health centres more frequently than non-infected villagers. Changes of the role of the health centres in controlling (heavy) infections in the region will depend on changes in the attitude of the villagers towards disease and their utilization of the health centres.

Finally, it should be concluded that the present type of disease oriented health system's research merits much more attention than it actually receives. The study was a preliminary one and aimed at an exploration of methodologies to analyse the impact of health services on the burden of urinary schistosomiasis at the district level. The conclusions drawn from the present study lack statistical significance. The numbers of subjects examined were small, the classification of "heavy" infection was weak, and the number of villages involved should be increased. It would therefore seem appropriate to extend the approach to studies at a larger scale and to include observations on the patients' perception of the infection and of their reasons for visiting the clinic.

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