

## A REVIEW OF ACHIEVEMENTS OF THE NATIONAL SCHISTOSOMIASIS CONTROL PROGRAM IN MIDDLE AND UPPER EGYPT AREAS

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*In Egypt the "national schistosomiasis control program" was formulated to control transmission by reduction of prevalence and intensity of current infections, and thereby achieve an acceptable level of schistosomiasis disease control. The program was implemented foremost in Middle Egypt (1977) and Upper Egypt (1980), collectively extending 800 km alongside of the River Nile and accomodate about 10.5 million people. Schistosoma haematobium has been essentially the prevailing species infection in both areas. The strategy of control entailed both area-wide mollusciciding with niclosamide, and selective population chemotherapy with metrifonate. Evaluation in 1986 showed that prevalence dropped from pre-control 29.4% in Middle Egypt and 26.3% in Upper Egypt to 6% and 7.8% respectively, together with a remarkable drop of infections among children. Also mean intensity attained low levels consistent of low grade infections. It is evident therefore that in these areas where an enhancement of schistosomiasis infections had been anticipated the employment of the twofold strategy effected a state of low-prevalence/low-intensity signifying a lowered reservoir of infection and a substantial interference with the potentials of transmission.*

In Egypt schistosomiasis (bilharziasis) continues as a leading public health problem due to widespread prevalence, serious morbidity and a significant implication of the national economy. The problem has been steadily aggravating during late years on account of implementation of energetic irrigation and drainage projects associated with land reclamation schemes that entailed construction of an elaborate network of canals and drains, nevertheless preventive environmental measures were not adequately incorporated.

Campaigns for control of schistosomiasis in Egypt date back to 1922 and essentially employed chemotherapy or snail control measures. The latest campaign "the national schistosomiasis control program" was formulated on account of a rather alarming situation as regards a flare of infections among the rural population. The program aimed to control transmission by reduction of prevalence and intensity of current infections, and thereby achieve an acceptable schistosomiasis disease control beyond a public health problem. For implementation Egypt was subdivided into 10 "control areas" sharing common geographic boundries, environmental features and/or source of irrigation. Priority was assigned foremost in Middle Egypt in 1977 and in Upper

Egypt in 1980, justified by: 1) an enhanced prevalence of the prevailing schistosomiasis haematobium on account of a thorough changeover of the system of irrigation from basin to perennial; 2) implementation of vast water development projects in both areas; and 3) the areas had been under the imminent threat of invasion by *Schistosoma mansoni* species infections prevailing in the Nilo Delta, forasmuch as *Biomphalaria* snails lately established habitat in the main water courses.

### AREA AND POPULATION

Collectively Middle Egypt and Upper Egypt extend for almost 800 km alongside of the River Nile and cover an area of 2.2 million feddans (acres) of cultivated land, and a population of 10.5 million accomodated in 7 governorate at 1,267 villages. The total length of water courses, i. e., canals and drains, is about 100,000 km (Fig. 1).

### METHODS

The strategy comprized employment of a combination of area-wide mollusciciding and selective population chemotherapy simultaneously.

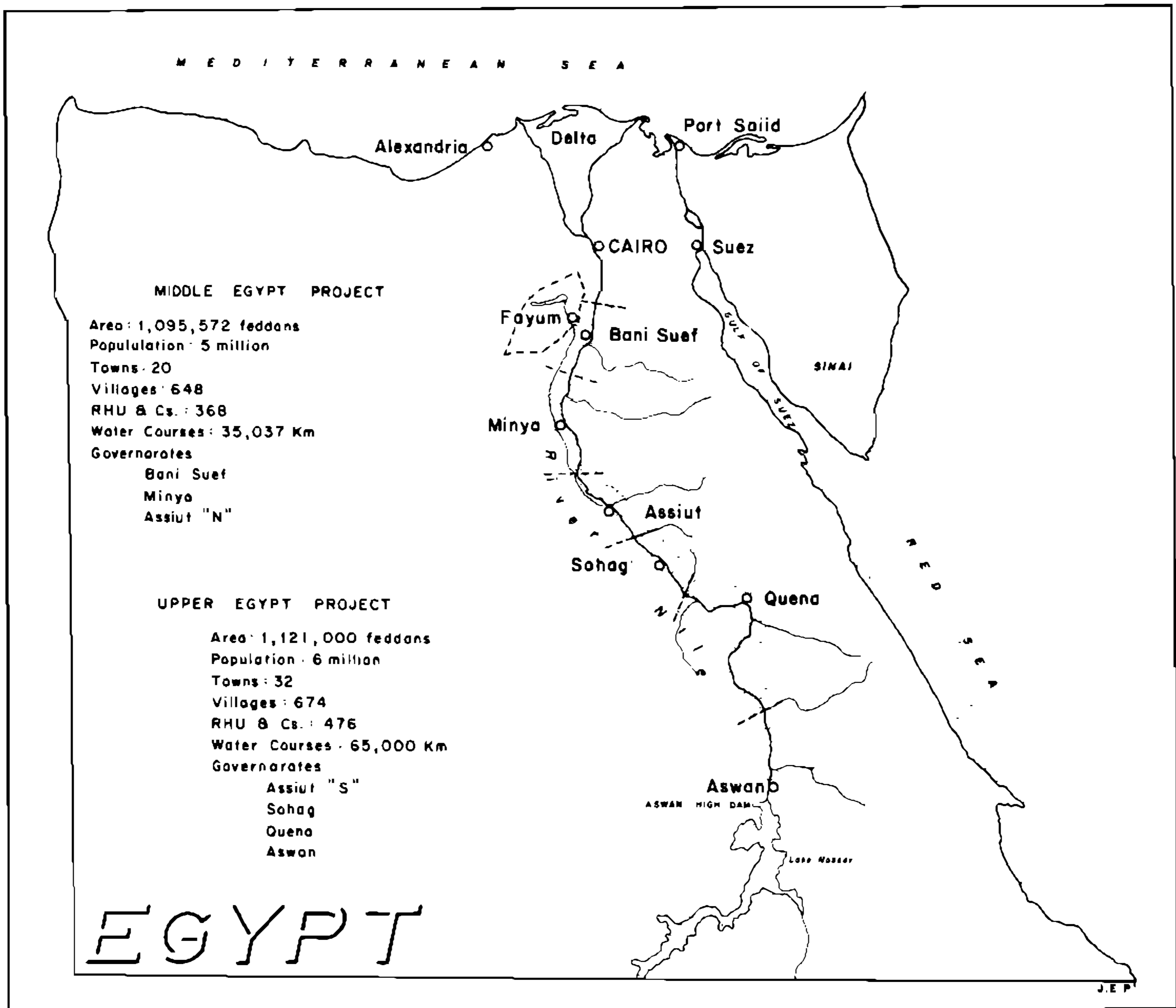


Fig. 1: map showing Middle and Upper Egypt.

A — Area-wide (blanket) mollusciciding entailed application of niclosamide at sites of origin of main canals to achieve a concentration of 1-2 p.p.m. for 8 hours. The applications were phased: 3 times/year during the "active intervention" for 3 years, twice/year during "consolidation" for 3 years, and maintain a single Summer application each year thereafter. Surveillance and focal mollusciciding of static waterbodies have been undertaken periodically as well. Mollusciciding has been carried out by "snail units and inspectorates", 215 in Middle Egypt and 296 in Upper Egypt.

B — Selective population chemotherapy, based on perpetuation of a total population screening coverage every year; school children handled as a target population have been examined and cases treated twice during each school year. Metrifonate (Bilarcil) 10 mg/kg body weight every 2 weeks for 3 doses had been the regimen adopted for cases. However

praziquantel 40 mg/kg body was innovated in 1983 to supplement chemotherapy of *S. haematobium* among the overall population at villages that maintained a higher prevalence than the average for the district, and at the villages where *S. mansoni* cases showed, as well as exclusively for cases among school children at all villages. Delivery of chemotherapy had been approached horizontally by integration among services of basic health care undertaken by the "rural health units and centers" (R.H.U.), 347 in Middle Egypt and 476 in Upper Egypt, each serving a population of about 5,000.

Evaluation both "self" and "independent" had been an integral component of the control campaign and paralleled all control procedures.

## RESULTS

The results are shown on Tables I and II.

TABLE I  
Middle Egypt Project – Prevalence, *S. haematobium*, 1977-1986

Year		Outpatients R.H.U.s	Sample surveys	School children	COHORT
1977/78	Examined	2,745,769	27,405	213,179	27,405
	<i>S. haematobium</i> %	29.4	29.4	23.5	29.4
1979	Examined	1,316,637	302,272	219,612	21,986
	<i>S. haematobium</i> %	19.5	16.1	21.5	16.0
1980	Examined	1,135,578	211,630	212,125	22,840
	<i>S. haematobium</i> %	16.4	16.4	24.4	11.0
1981	Examined	1,373,982	396,401	277,841	22,183
	<i>S. haematobium</i> %	16.3	14.0	20.9	11.6
1982	Examined	1,603,232	730,289	281,112	23,386
	<i>S. haematobium</i> %	15.4	13.4	21.2	11.4
1983	Examined	1,466,056	627,125	338,657	21,189
	<i>S. haematobium</i> %	12.1	10.5	21.6	9.9
1984	Examined	794,934	801,964	378,200	20,667
	<i>S. haematobium</i> %	12.5	9.1	17.1	9.1
1985	Examined	833,369	854,461	411,555	21,642
	<i>S. haematobium</i> %	10.1	7.4	14.2	6.6
1986	Examined	782,605	926,178	477,620	24,516
	<i>S. haematobium</i> %	8.9	6.0	14.2	5.5

Results of examinations:

Outpatients, R.H.U.s, at all villages.

Stratified random sample surveys, each 5-10% of the total households, at all villages.

School children examinations, at all villages.

Fixed sample "COHORT" surveys, at index villages.

TABLE II  
Upper Egypt Project – Prevalence, *S. haematobium*, 1980-1986

Year		Outpatients R.H.U.s	Sample surveys	School children	COHORT
1980	Examined	1,726,222	180,210	306,859	180,612
	<i>S. haematobium</i> %	26.7	26.3	30.9	25.8
1981	Examined	839,418	657,681	440,631	70,786
	<i>S. haematobium</i> %	21.1	23.6	29.0	17.9
1982	Examined	1,721,935	830,994	494,799	69,744
	<i>S. haematobium</i> %	20.4	17.8	28.3	9.2
1983	Examined	2,583,594	1,222,236	527,532	71,299
	<i>S. haematobium</i> %	16.0	13.4	25.4	9.4
1984	Examined	801,143	868,216	555,782	37,846
	<i>S. haematobium</i> %	15.5	12.3	23.1	13.6
1985	Examined	772,939	1,104,722	600,269	38,126
	<i>S. haematobium</i> %	15.9	11.4	22.6	8.8
1986	Examined	734,442	1,092,273	644,194	36,426
	<i>S. haematobium</i> %	14.1	7.8	21.0	8.4

Results of examinations:

Outpatients, R.H.U.s, at all villages.

Stratified random sample surveys, each 5-10% of the total households, at all villages.

School children examinations, at all villages.

Fixed sample "COHORT" surveys, at index villages.

*Pre-control:* stratified random sample surveys denoted a prevalence 29.4% in Middle Egypt, and 26.3% in Upper Egypt. Although data about the intensity of the infections were not thoroughly comprehensive there had been ample information indicating that in both areas average ova counts outranked a geometric mean 200/10 ml urine.

*Post-control:* evaluation in 1986 showed that prevalence of *S. haematobium* in Middle Egypt dropped to 6% (reduction: 79.6%), and in Upper Egypt to 7.8% (reduction: 70.3%). Intensity dropped to 15.9 ova in Middle Egypt and 20.9 in Upper Egypt. Incidence of new infections measured as conversion among subsamples of "negative" school children followed after a year; in Middle Egypt dropped from 27% in October 1978 to 9% in Oct. 1985, and in Upper Egypt from 37.5% in Oct. 1980 to 12.5% in Oct. 1985.

#### DISCUSSION

In both control areas where an aggravation of the already enhanced *S. haematobium* infections had been anticipated the employment of the twofold strategy effected remarkable issues as had been evidenced by a significant reduction of all parameters of the infection. It is manifest that *S. haematobium* infections thereby attained a state of low prevalence-low intensity consistent of a lowered reservoir of infection, and expectedly an adequate morbidity control. However transmission could not be eliminated a substantial interference with its potentials was achieved; persistence of transmission at that rather limited caliber was explained as an issue of habitual re-infections, perseverance of behaviour and life-style and inadequate sanitation in the village, besides the impact of implementation of water development schemes in the areas. Nevertheless the decline of prevalence of *S. haematobium* infections in Middle Egypt was not symmetrical but fluctuated in accordance with the varied bulk and degree of perfection at which the control measures were employed. Lagging of the prevalence curve (Fig. 2) during the "consolidation phase" 1980-1982 coincided with a sizeable reduction of mollusciciding, both in accordance with the plan of operation and on account of incidental logistic and operational problems and a meantime imperfect screening coverage. However the competence of metrifonate to act "single handed" as the

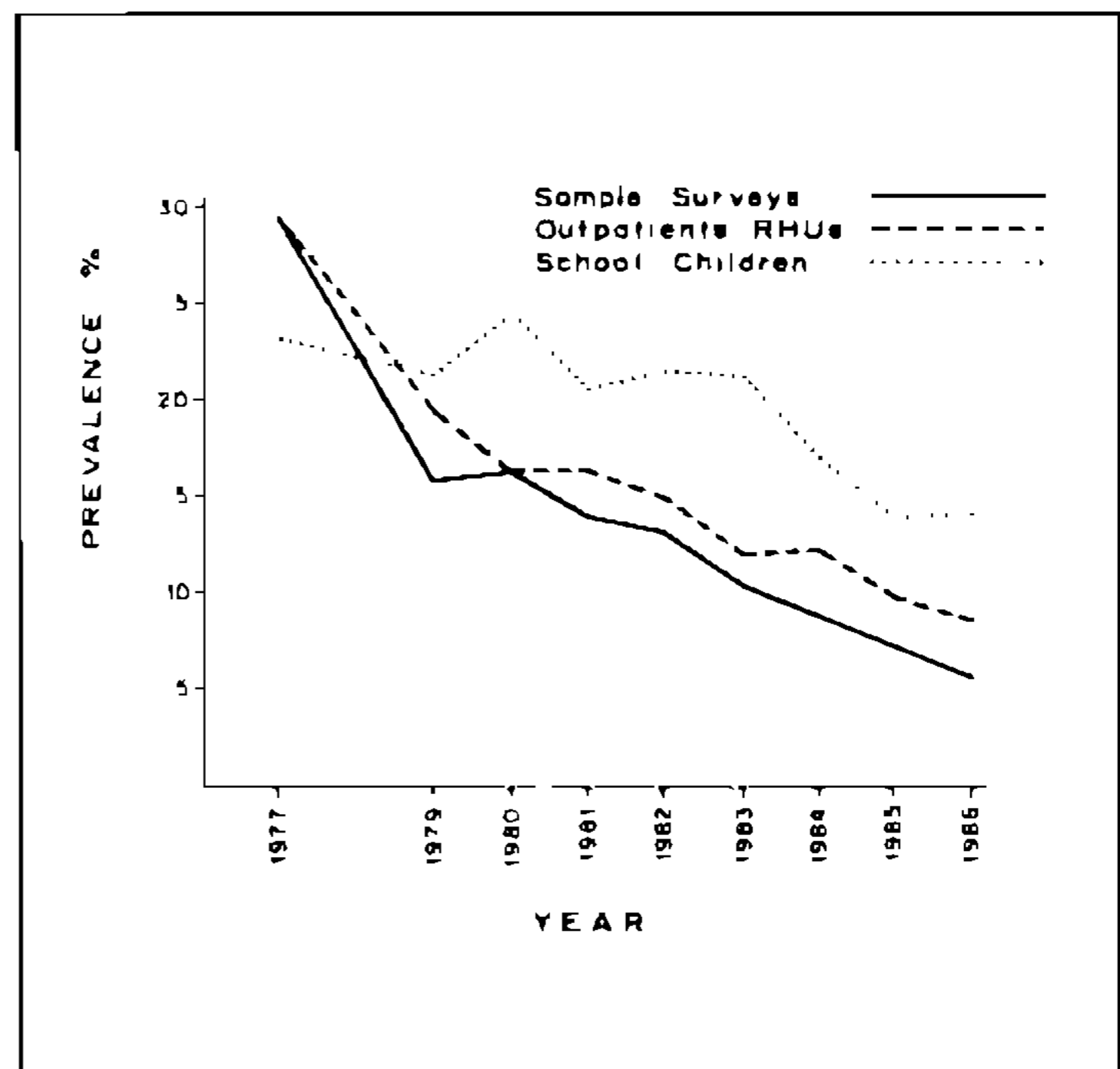


Fig. 2: Middle Egypt project - Prevalence, *Schistosoma haematobium*, 1977-1986.

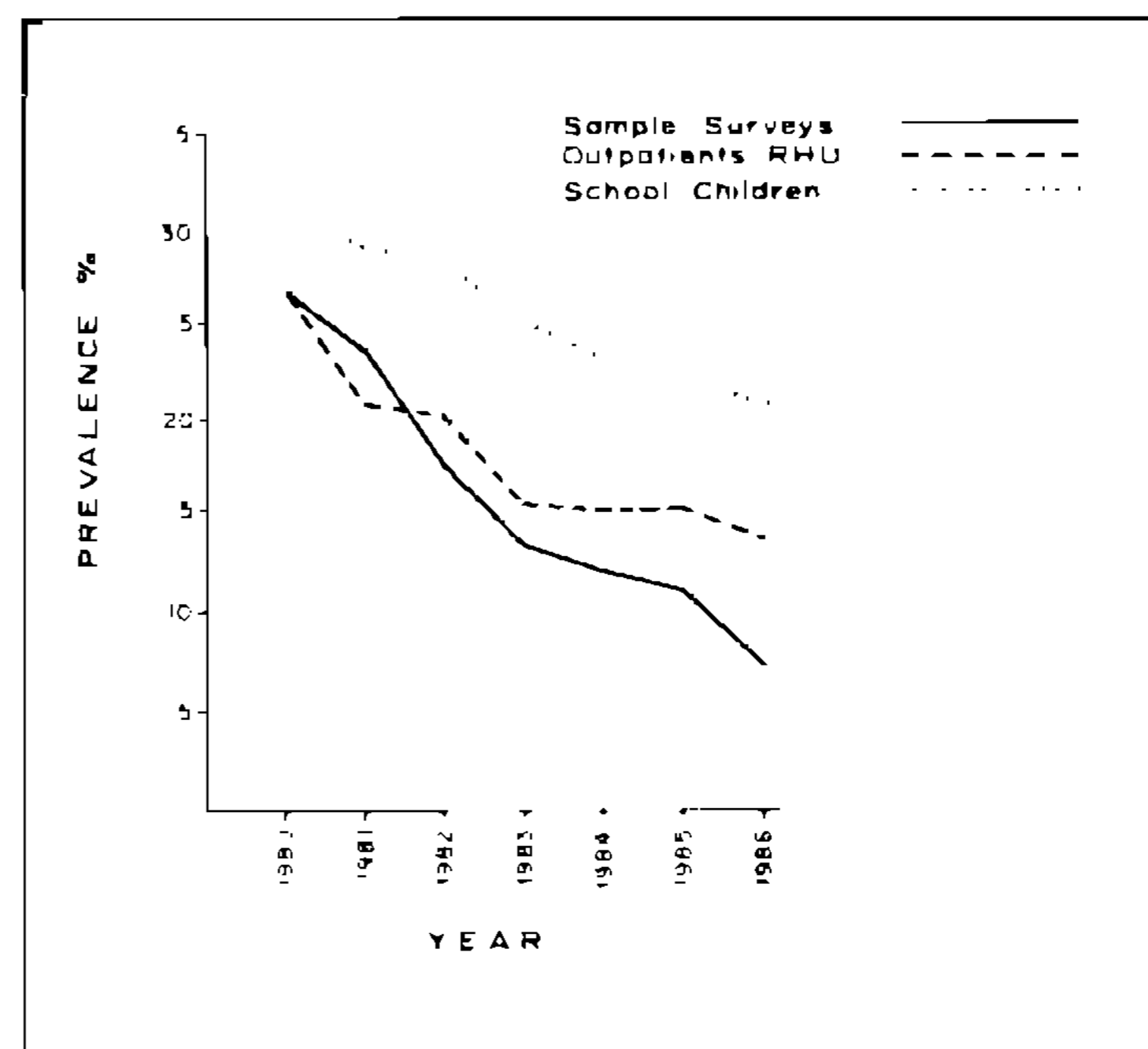


Fig. 3: Upper Egypt project - Prevalence, *Schistosoma haematobium*, 1980-1986.

tool of chemotherapy became questionable in view of a growing lack of acceptance, regimen in 3 doses and a significant failure rate. Eventually the innovation of praziquantel to supplement chemotherapy proved a most rational amendment to the campaign that issued a significant uplift of its potentials, and adapted its objectives to "morbidity control" as a more feasible goal than transmission control. Besides the employment of praziquantel almost eliminated problems of compliance, acceptance and coverage, and



TABLE III

The analysis of cost in Middle Egypt control project, 1977-1984

Total cost of control = L. E. 26 million – Allocations.

	Snail control	Chemotherapy	Total
Salaries and incentives	23%	86.4%	42.6%
Molluscicides	71		49
Chemotherapeutics		11.3	3.5
Vehicles			0.8
Current expenses			4.1
Total	69.1%	30.9%	100.0%

Obs.:

- The mean expenditure/year: L. E. 3,259,983.
- The per capita cost of the project: L. E. 0.64 (=64 piastres).
- The cost of control per person at risk: L. E. 0.76.
- Sources of finance: – Ministry of Health, in local currency: 63%; – Loans, in hard currency: 37%.

probably effected a considerable depletion of the reservoir of infection in man. Consequently the prevalence of *S. haematobium* among school children that continued refractory for 7 years at a range 21-24% dropped to 14.2% in 1985. Simultaneously a system “selective-area mollusciciding” was advocated to replace area wide applications and to economize on their cost which exhausted almost 70% of the total cost of control (Table III). The system depended on current epidemiological trends and periodic snail surveillance data, and entailed dispensing niclosamide in secondary canals or focally at sites showing high prevalence and/or dense snail population.

The campaign also issued remarkably as regards “transitory fencing” of the areas against flare of *S. mansoni* infections by virtue of repeated snail surveillance, snail control and active case finding programs.

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