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EPIDEMIOLOGY AND CONTROL OF SCHISTOSOMIASIS IN THE PHILIPPINES: PROGRESS REPORT AS OF 1987 MR-9

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1. HISTORICAL REVIEW

The occurence of **Schistosoma japonicum** in the Philippines was first described by Paul G. Wooley in 1906. Thereafter the infection was detected among the inmates of the Bilibid Prison in Manila during the course of examination for intestinal helminths and among patients admitted to the Philippine General Hospital. As a large proportion of the discovered cases came from Leyte, Tubangui in 1932 visited the area in search of the intermediate host; he found **Oncomelania sp.** in a pond and a small brook in the barrio of Gacao in Palo. He was led by the proximity of the habitat to the residence of the infected individuals and succeeded in establishing that the snail was the intermediary host of parasite.

The first reliable field surveys were organized and reported on by the then Bureau of Health of the Philippines in 1940 and 1941 in the islands of Mindanao, Leyte and Mindoro. Three small field units of the Bureau started detection and treatment of cases and attempted snail control by the use of unslaked lime and fire. África and Garcia (1941) and Tubangui and Águila (1941) continued research on the parasite and treatment of schistosomiasis until war broke out in the Philippines in 1941, bringing all progress to a standstill. Paradoxically enough the same war brought the problem of schistosomiasis to the forefront when an epidemic of the infecton occured among the United States and allied forces landing in Leyte in October 1944. A rush of papers appeared in the period 1945-1947 on the Leyte experience, mostly on the clinical and pathological aspects of the disease relative to the protection of fighting forces, and at the same time some studies were made of the problem as it concerned the local population.

During the period July 1949 to June 1950, under the auspices of schistosomiasis research programs established in the then Department of Health of the Philippines, concerted efforts were made to survey the different endemic areas (Pesigan, 1950). Following this survey, the importance of the problem of schistosomiasis in the Philippines came to be recognized, and the Philippine Government created the Division of Schistosomiasis in the then Department of Health in 1952. At the request of the Government, the World Health Organization sent a team of

consultants to the Philippine in 1952. They spent approximately three months studying the problem and submitted a very valuable report in which the problem of schistosomiasis in the Philippines was described as an extremely complicated one. It was also considered that thinly spread effort to deal with the disease would be more or less unrewarding, and therefore suggested that they should be terminated and an attack made on the problem form a new angle. The team therefore recommended the concentration of funds and efforts on a pilot project, with the World Health Organization providing three advisers for the programme and the Division of Schistosomiasis supplying opposite numbers, technicians, assistants and laborers. The team suggested that parts of Eastern Leyte, Which appeared to be most important endemic, be used for a pilot project of six years duration, with an absolute minimum of three years. The Philippine government acted quickly on the recommendation of the WHO schistosomiasis team made in September 1952, in initiating a schistosomiasis control project in Leyte, and WHO assisted the project by supplying three international personnel. Assistance was also received from the then Foreign Operations Administration of the USA in the form of supplies and from the then Philippine Council for United States Aid. A fully equipped project-centre building, including laboratories, was constructed and staffed, and the Project officially started functioning in June 1953.

After 1959, various control measures were formulated and found effective in the pilot area of Palo. These measures brought the prevalence of the disease in Palo form 38.9% to 32.8% (Pesigan and Hairston, 1961). These were initially tried in 3 pilot towns of Mayorga, La Paz and Burauen all in the Province of Leyte.

With the relative success in the 3 pilot municipalities of Leyte, national schistosomiasis control program was formulated in 1961. Due to the relatively huge financial outlay that was needed, the control program was integrated into the total health program of the Rural Health Units at the local level. Responsibility was assumed by the Provincial Health Officer at the provincial level and the Regional Health Director at the Regional level.

Methods of control included the 4 progend approaches consisting of agro-engineering methods of snail control, environmental sanitation measures, health education and to a certain extent, treatment of cases with Stibophen. Cooperation and participation of other government agencies particularly the Public Works and Agricultural Departments for snail control and the schools for health education were enlisted.

Constraints then were: a) Agro-enginerring methods

were expensive if charged to public health alone. The Agriculatural benefits, therefore, is expected to offset the cost, which otherwise, would be prohibitively expensive, b) Environmental sanitation and health education, on the other hand, have to cope up with established human habits and cultural patterns, and would require much time, aside from the economic consideration before any substantial effect can be demonstrated; c) Mass treatment, at that time, is not possible due to the absence of a truly effective non-toxix and economical drug.

The then Schistosomiasis Control Pilot Project (SCPP) now the Schistosomiasis Research and Training Center, continued to serve as a training and research center, to explore new avenues of control.

From the experience gained for a period of 3 years, it became evident that control efforts could not be effectively pursued due to lack of facilities and manpower on the part of the Rural Health Unit (RHU) and lack of good response from cooperating agencies which may be due poor understanding and hazy delineation of responsibilities among the officials not only in the different levels of the health structure but also in the different agencies involved.

On the local level, there is indifference by some RHUs to the additional work imposed on them by the integration of schistosomiasis into their functions. On the provincial level, most officials are sympathetic to the control program bu the poor state of their finances would not allow for their more active participation. On the national level, recruitment of Medical Officers has been difficult. Under this setting, therefore, integration was found workable but not entirely satisfactory.

Recognizing the need for an effective administrative machinery for coordination and integration of activities, a National Schistosomiasis Control Commission (NSCC) was created in June 1, 1964. The objectives then of the Commission were the formulation of a comprehensive national schistosomiasis control programm, foster effective coordination among agencies whose work are related with schistosomiasis control including the establishment of an effective liason with participating agencies, and the submission to the President of recommendations in administrative or legislative measures that will effectivevy carry out a national control program for the disease. Among the more important undertakings of the NSCC was the request for the immediate release of Public Works appropriations which has a bearing on drainage of schistosomiasis snail infested areas and recommendations for appropriations where no funds for flood control and drainage projects in

endemic areas has been alloted.

The NSCC has also piloted the Juban-Irosix Valley in Sorsogon to demonstrate how integration and coordination of the various agencies would work with assistance from the US/AID Food for Peace Program that started in 1966. This was extended to Leyte during the year 1967-1969. Major problems encountered were storage of the foodstuffs, suitability of the food stuffs especially bulgur wheat and transport facilities.

With a more attractive food commodities a plan of operations was agreed upon between the Philippine Government and the United Nations World Food Program and covered a 5-year period from 1971 to 1976. This was approved on October 20, 1970. Food stuffs consisted of wheat flour, skimmed milk, pulses, canned fish, dried eggs, vegetable oil and dried fruits. Project areas included 26 selected endemic localities in the endemic provinces of Oriental Mindoro, Sorsogon, Leyte, Western Samar, Lanao del Norte and Agusan. These food commodities were used as incentives to attract and mobilize voluntary workers to perform 629,155 mandays of labor over a period of 5 years to carry out agro-engineering control measures. The results showed a reduction in snail density but not in the prevalence of the disease among the school children in Grades I,II and III. Problems encountered were as follows:

a) Pilferage - the political and religious conflict in areas like Lano del Norte resulted in the ransacking of their bodega by bad elements.
b) Spoilage of food stuffs due to typhoons.
c) Problems of flour weavils and petty overweighing.
d) Inadequacy of logistics arreangements from handling, storage (Central, sub-depot, and distribution centers), transport and distribution.
e) Irregular shipment of food commodities.

The NSCC was subsequently strengthened in 1976 by reconstituting it into the Schistosomiasis Control Council under Presidental Decree 893 with the Schistosomiasis Control Research Service as the technical arm of the then Department of Health for the implementation of control and preventive measures. Schistosomiasis control components were included in 2 integrated rural development programs (Mindoro Integrated Rural Development Projects (MIRDP) and Samar Integrated Rural Development Project (SIRDP), and 5 Irrigation Development Projects (First and Second National Irrigation Systems Improvement Projects in Leyte, Misamis Occidental, North Cotabato, Zamboanga Sur

and Davao del Norte), 2nd and 3nd Davao River Irrigation Projects and the Bukidnon Irrigation Project. There were a total of 13 endemic provinces included in these foreign assited loan projects, all under a vertical program directly under the then Ministry of Health.

Starting 1984 with the reorganization of the Ministry of Health, all schistosomiasis control programs were again integrated with the newly formed Integrated Provincial Health Offices.

By 1985, observations showed that chemotheraphy appears to produce more immediate impact on disease transmission and morbidity compared to other forms of preventive and control interventions. Accordingly, control measures is now centered on chemotheraphy with its health education component. Sanitation and control of snails will be carried out as sumpplementary measures whenever resources permit, such as in foreign loan assisted projects.

2. ITS DISTRIBUTION AND THE EXTENT OF THE PROBLEM

Schistosomiasis or snail fever is one of the important disease problem in the Philippines. Primarily rural in distribution, schistosomiasis had socio-economic ramification as it affect mostly farmers and their families and thus hamper agricultural productivity.

Prior to 1980, there are more than half a million cases distributed in 22 endemic provinces. They are, Oriental Mindoro and Sorsogon in Luzon; the three (3) Samar Provinces, Leyte and Bohol in the Visayas; and all the provinces of Mindanao except Misamis Oriental, Manguindano and Sulu. Recently **O. quadrasi** snails were discovered in some previously unsurveyed parts of Manguindanao and Davao Oriental so that the number of endemic provinces went up to 24. In these endemic provinces, the poppulation at risk is 5.1 million and there are 2,987 snail colonies with an approximate area amounting to 28,731 hectares. (Table I). The exposed population in the 1,160 barangays is about. 1.5 million as of 1987. (Table 2)

2.1 Climatic Factors:

Observations have shown that there is a definite relation between geographical distribution of the disease and the annual rainfall pattern. This is supported by the observation that the affected provinces are limited to areas that under either Type II or IV of the PAGASA classification of climate in the Philippines. The Type II does not have a dry season but has a very pronounced maximum rainfall from November to January, while Type IV a rainfall more or less envenly distributed throughout the year. The type of rainfall is a contributory factor to the existence of the snail intermediate host. (Fig. 1)

2.2 Health Status:

The overall prevalence of schistosomiasis as of 1987 in 24 affected province is 6.6%. (Table 3)

Number of deaths annually due to schistosomiasis according to studies in Leyte is 1.78% of the estimated positive cases[2].

2.3 Prevalence according to age, sex and occupation:

It was observed that the infection during childhood and adolescence builds up rapidly until it reaches the adult period and a general downward trend follows.

As far as age and sex distribuition of infected individuals are concerned, there are significant sex differences between age groups past childhood with the rates being higher for males than for females. Children of both sexes run an equal risk but the differences begins to schow up after 14 years, by which time males become more active in the field and run greater chances of acquiring the infection.

Prevalence in respect of occupation showed that farmers as a class have the highest infection rate (74.1%). When not planting or harvesting rice, they engage themselves as fisherman, unskilled laborers or tuba gatherers, which would explain the next highest prevalence among this group of proffessions which is over 60%. The occupation that would bring people most in contact with infected waters are farming and inland fishing. Seagoing fishermen who live mostly in the coastal division, would naturally be the people less exposed to infection in rivers, swamps and streams. The class of workers with the lowest rates (exclusive of the pre-scholl children) are for obvious reasons the office workers and the professional group with an overall infection rate ranging between 16% to 26%. The rest (student, house-keepers and "jobless" persons) occupy an intermediate position between the first two groups mentioned, with a range approximately 51% to 58%.

Significant differences in the general prevalence of infection in the 3 environments exist (Poblacion, Coastal and Inland), with the highest prevalence rate (61.1%) on the inland division. The differences as one would expect are due to the opportunities for infection and the general sociological makeup of the population.

The prevalence, therefore, in respect of age, sex, occupation and environment follows a pattern explainable on the basis of opportunities for contact with infection. A factor in respect of age, namely, the downward trend with advancing age after the peak is reached may be explained on the basis of a host reaction arising from humoral response to infection with a possible immunity mechanism coming into play, or from host-cell reaction around infiltrated eggs tending to wall them off in the intestinal tissues, or

from both.

2.4 The reservoir host of transmission

The disease is not limited to man, as it likewise affects domestic animals (pigs, dogs, goats, cats, carabaos, cows) and even wild life (field rats and monkeys) which act as reservoirs of infection. Cross infection studies of the parasite from man, cow, dog, pig and rat in the Leyte Pilot Project have shown that schistosomiasis belong to one strain. This therefore indicates that transmission of the disease could be attributed to all these sources. Studies on the relative role of man and the reservoir hosts showed that man contributes 75% while animals 25% of transmission.

2.5 Its Socio-economic importance:

Schistosomiasis may be considered a very serious menace to the inhabitants of the rural areas especially the farmers, for it causes not only suffering and death but it reduces tremendously their working efficiency. In a study carried out by Blas et. al., an average of 45.4 mandays per year per infected person is lost. Since the farmers are the mainstay of our country, this disease could affect advserly our agricultural economy. The people can not produce the crops in quantities sufficient for their needs because they are sick and account of sickness they produce less and so the cycle continues on and on.

This disease is identified as one of the prevailing major health problems in the Philippine today. Annual economic loss due to cost of treatment and manpower loss due to disability and death is estimated to be about 375 million pesos per annum.

3. METHODS OF CONTROL AND PREVENTION

On the basis of the knowledge of the life cycle of the parasite, the methods of approach to the prevention and control of schistosomiasis are four fold, all intended to break the weak links in the cycle. These are as follows:

3.1 Case Finding and Treatment with the use of Praziquantel.

3.2 Environmental Sanitation -

This will consist of: a) proper waste or excreta disposal and control of stray animals to prevent the schistosome egg from getting into snail infested areas; b) provision of safe source of water supply for laundering, bathing,etc., to prevent exposure to cercaria landen waters in streams, rivers, or creeks; c) building of footbridges to avoid coming in contact with the cercaria infested waters; and d) control of stray animals.

3.3 Snail Control -

Control of the snail intermediate host will include, a) drainage of water-logged areas by stream channelization seepage control,diversion and intercepting channels together with irrigation schemes; b) ponding; c) filling; d) modern methods of farming; and e) chemical control or molluscicide as terminal measure on remaining small pockets of snails following agro-engineering measures.

3.4 Health Education

4. THE PRESENT PROGRAM THRUST

With the huge expense for stopping transmission, control measures by the Department of Health are now directed more towards mobitidy or disease control mainly through case finding and treatment of cases and health education utilizing IEC materials. Whenever possible, monitoring of the activities of other agencies of the government that will redown totransmission control especially by National Irrigation Administration (NIA), Department of Public Works and Highways (DPWH), Department of Agriculture and Food (DAF) and other government agencies will be made.

Based on limited resources especially of microscopists under the Integrated Povincial Health Office, instead of spreading efforts too thinly in all endemic municipalities, and to cope with manpower constraints, only 50% of the endemic barangays or endemic municipalities in the 16 of the 24 endemic provinces will be covered for 1988 and the other 5o% for 1989 and alternately thereafter up to year 1992. In the endemic provinces with less than 4 endemic municipalities (Bhol, Zamboanga Norte, Davao Sur, Davao Oriental, South Cotabato, Sultan Kudarat, Lanao Sur and Maguindanao) a 100% coverage will be targetted for case finding and treatment of cases.

For 1989, coverage of mass stool examination and treatment will take into consideration stratification in terms of prevalence where areas with higher endemicity will be covered for a number of years until it ceases to be of major public health problem.

5. PROGRAM IMPACT ON THE PREVALENCE OF THE DISEASE

The result of the schistosomiasis efforts during the last seven (7) years (1982 to 1987) showed an encouraging trend, with the prevalence dropping from the weighted 5-year average baseline of 10.4% to 7.4% in 1986, to 6.6% in 1987; or a percent reduction of 28.8% in 1986 and 10.8% in 1987. (Table 3)

Table 3
THE PREVALENCE OF **S. JAPONICUM** INFECTION
From 1981-1985*, 1986 and 1987

Y E A R	Number Examined	Number (+)	% (+)
1981-1985*	1,817,594	189,065	10.4%
1986	459,291	34,150	7.4%
1987	683,918	44,925	6.6%

6. CONCLUDING REMARKS

With an effective campaign for case finding and treatment of cases, it is reasonable to predict that there will be less and less humam cases of schistosomiasis and consequently, surveillance and maintenance phase follows. In addition, the medical, malacological and public health engineering staff could then intensify their role as coordinators in controlling the snail intermediate host and alteration of the snail habitat or the environment. Such a role is necessary in maintaining whatever has been achieved in the chemotheraphy phase of schistosomiasis control program.

TABLE I

THE SCHISTOSOMIASIS ENDEMIC PLACES AND SNAIL AREAS
IN THE PHILIPPINES AS OF 1987

PROVINCE	NO. OF ENDEMIC TOWNS/CITIES	POPULATION	SNAIL COLONIES NUMBER	SNAIL COLONIES AREAS (HAS.)
01. Oriental Mindoro	4	114,961	49	333.811
02. Sorsogon	5	110,538	69	67.115
03. Bohol	2	61,611	18	23.524
04. Leyte	24	571,037	711	1,431.124
05. West Samar	13	346,311	251	2,319.869
06. North Samar	14	288,643	334	10,897.039
07. East Samar	11	180,409	216	3,533.393
08. Zamboanga del Norte	2	37,821	12	612.305
09. Zamboanga del Sur	10	233,879	255	1,496.830
10. Bukidnon	5	252,970	98	67.220
11. Misamis Occidental	3	139,094	43	50.663
12. Agusan del Norte	8	304,927	159	563.183
13. Agusan del Sur	13	265,030	138	1,086.824
14. Surigao del Norte	12	192,959	187	423.516
15. Surigao del Sur	4	145,835	43	348.425
16. Davao del Norte	15	584,281	157	2,724.783
17. Davao del Sur	3	710,711	65	459.400
18. Oriental Davao	2	29,740	3	1.105
19. South Cotabato	2	102,773	12	208.150
20. Lanao del Norte	4	77,279	120	1,600.485
21. Lanao del Sur	4	47,166	4	1.300
22. North Cotabato	5	246,176	35	357.420
23. Sultan Kudarat	2	58,373	7	123.680
24. Maguindanao*	3	–	–	–
TOTAL	170	5,103,524	2,987	28,731.524

* NOTE: Province of Maguindanao was just recently discovered endemic.

TABLE 2

EXPOSED POPULATION IN SCHISTOSOMIASIS ENDEMIC BARANGAYS
As of 1987

ENDEMIC PROVINCES	: NUMBER OF ENDEMIC BARANGAYS :	EXPOSED POPULATION
1. Oriental Mindoro	31	41,670
2. Sorsogon	30	39,821
3. Bohol	6	7,738
4. Leyte	268	210,978
5. Western Samar	138	94,323
6. Northern Samar	143	140,096
7. Eastern Samar	88	88,851
8. Zamboanga del Norte	5	5,942
9. Zamboanga de Sur	71	87,448
10. Bukidnon	27	92,945
11. Misamis Occidental	15	23,764
12. Agusan del Norte	37	65,127
13. Agusan del Sur	68	134,502
14. Surigao del Norte	43	50,078
15. Surigao del Sur	19	74,503
16. Davao del Norte	73	192,727
17. Davao del Sur	8	25,480
18. Davao Oriental	2	4,297
19. South Cotabato	10	49,173
20. Lanao del Norte	45	69,421
21. Lanao del Sur	8	4,051
22. North Catabato	14	28,577
23. Sultan Kudarat	5	12,318
24. Maguindanao	3	2,063
TOTAL	1,157	1,545,893

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