

THE CURRENT SITUATION OF PARASITIC INFECTIONS IN INDONESIA

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ABSTRACT

Parasitic infections are highly prevalent in Indonesia, especially in rural areas, suburbs and slums of big cities. Twenty two species of protozoa and 32 species of helminths have been reported infecting man in Indonesia. Among the 16 species of intestinal protozoa, nine are constantly found in stool surveys, but only *Entamoeba histolytica* and *Giardia lamblia* are real pathogens. Among the blood and tissue protozoa, the most important are the malaria parasites. The most frequently encountered and widely distributed species are *Plasmodium falciparum*, and *P. vivax*. *P. malariae* is at present more difficult to find, while *P. ovale* has been reported only from Flores, Timor and Irian Jaya. The non human parasites so far has not been diagnosed in human. Among the 80 species of Anopheline mosquitoes in Indonesia, 16 have been reconfirmed as vectors. Among the other tissue protozoa, *Trichomonas vaginalis* is frequently found in the Gynaecological clinic, while *Toxolasma gondii* is found only in special studies.

Among the 13 species of intestinal nematodes, five are highly prevalent namely : *Ascaris lumbricoides*, *Necator americanus*, *Ancylostoma duodenale*, *Trichuris trichiura* and *Oxyuris vermicularis*, while *Strongyloides stercoralis* is getting more difficult to find. Filariasis is widely distributed and is still highly endemic in certain areas. Both urban and rural *Wuchereria bancrofti* are prevalent, but *B. malayi* is causing more public health problems in rural areas. Both the human and the zoonotic type are prevalent. *B. timori* so far has been described only from the south eastern part of Indonesia. The filarial worms have different vectors and are therefore different in epidemiology and distribution. Non human filarial worms have not been reported infecting man in Indonesia. Among the 12 species of Trematodes, only *Schistosoma japonicum* is endemic in Central Sulawesi, and recently an endemic area of *Fasciolopsis buski* was discovered in a restricted area in South Kalimantan. *Echinostoma lindoense* which was highly endemic in lake Lindu area has disappeared completely. Among the 8 species of Cestodes, *Taenia saginata* and *T. solium* with its cysticercus are found more often. While endemic in a few areas only, cases been reported from many places. Infections with other Cestodes have been reported occasionally.

On the whole, parasitic infections in Indonesia have been decreasing. Some parasites which were prevalent in the older days, have dissappeared, and human infections with animal parasites have been reported occasionally because of the difficult diagnosis.

INTRODUCTION

Although very much decreased, in Indonesia, parasitic infections are highly prevalent, especially in rural areas, and the

suburbs and slums of big cities. Multiple infections are very common. Twenty three species of protozoans and 40 species of helminths have been reported infecting man in Indonesia. Since 1971, extensive surveys on

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parasitic infections have been conducted in many areas in Indonesia, resulting in more than 30 published papers. Among the arthropods not many species have been reported parasitizing man, but many species act as important vectors of diseases.

PROTOZOAL INFECTIONS

General information

Although more than 20 species have been reported infecting man in Indonesia, only 10 may be considered as real pathogens. Constantly found were : *Entamoeba histolytica*, *E. coli*, *E. hartmanni*, *Endolimax nana*, *Iodamoeba butschlii*, *Giardia lamblia* and *Chilomastix mesnili*. While in surveys of the mouth, *E. gingivalis* and *Trichomonas tenax* were always present¹. *Balantidium coli* and *Trichomonas hominis* were found occasionally in stool surveys. Other intestinal protozoa which have been described were *E. polecki*², *Isospora hominis*³, *Eimeria spp*⁴, *Isospora belli*⁵ and *Dientamoeba fragilis*. Cryptosporidium infection has been found only recently in diarrhoeic stool of children in the Paediatric Department⁶. Among the blood and tissue protozoa, the most important are the malaria parasites. Other parasites of importance are *Trichomonas vaginalis* and *Toxoplasma gondii*.

Important Pathogenic protozoa

Entamoeba histolytica

All forms of amebiasis have been reported in Indonesia. However, the most frequently encountered were symptoms of amebic dysentery⁷. In routine examination of stool of patients with gastrointestinal

symptoms, 39.6 % were cases of amebic dysentery, with the findings of the histolytica forms of the parasite⁸. The next most frequently found was the amebic liver abscess. Every year, a few cases of amebic liver abscess were treated in the big hospitals. Not too rarely seen in the Gynecology Departments is vaginitis caused by *E. histolytica*⁷. Ameboma of the cecum and amebic skin lesions have also been reported, while appendicitis and brain abscess are very rare. Although *E. histolytica* has been found in all stool surveys, the prevalence found was usually not high, ranging between 1-14 % . Serological studies in the rural areas showed 1.6 - 34 % positives.

Giardia lamblia

Not too many studies have been conducted on giardiasis. So far only diarrhoea has been described as the most encountered clinical symptom. De Langen has reported cases of cholecystitis caused by *G. lamblia* in 1933 and 1955.

Although *G. lamblia* has been found in stool surveys, the prevalence found was not high ranging between 1-5 % .

Balantidium coli

This parasite, usually found in pigs and other animals, have been described causing severe disease in man. Human cases of balantidiosis have been reported by Brug in 1919, 1926 and 1927. Case reports were also published by Bintari Rukmono in 1956 and others. This parasite may be found occasionally in stool surveys, and a highly endemic area in Irian Jaya has been discovered by Couvee and Rijpstra in 1962⁹. Although quite prevalent in animals, infection in man has not been reported recently.

Malaria parasites

Malaria is the most important protozoal disease in Indonesia, causing big public health problems. Four species of malaria parasites have been described infecting man in Indonesia, *Plasmodium falciparum*, *P. vivax*, *P. malariae* and *P. ovale*. While the first 3 species were widely distributed, *P. malariae* is now very rarely encountered. *P. ovale* so far has been described from Irian Jaya, Timor and Flores¹⁰. During the surveys, carried out with NAMRU II, malaria prevalences ranging between 1 and 34 % were found. High endemicities have been found on the islands of Flores, Timor and Irian Jaya. Spleen rates of over 90% have been encountered in Irian Jaya¹¹.

Population movements have caused big problems of malaria. High prevalences may be found in new settlements, as in transmigration, production and development areas, because of the development of man made breeding places for the vector mosquitoes and the import of non immunes into the endemic areas. Currently most of the big cities have been considered malaria free. However, many cases are still being imported from the endemic areas. Travelling Government officials, business men, students doing field studies and people on vacation may contract the disease in the endemic areas.

Chloroquine resistant *P. falciparum* is now widely distributed in Indonesia. Cases of Fansidar resistance have been encountered in Irian Jaya and East Timor, but in vitro tests showed fansidar resistance and multiple drug resistance of *P. falciparum* from many places in Indonesia¹².

Induced malaria, due to transfusion, injection and congenital malaria have been reported.

Vectors of malaria

Stoker and Waktudi (1949) have described more than 90 species of Anopheles mosquitoes, and 16 species have been reconfirmed as malaria vectors.

DDT resistance of *An. aconitus* and *An. sundanicus* is now a big problem, especially on the island of Java. Control measures, mostly directed against the vector mosquitoes have been implemented on the islands of Java and Bali and in development and production areas and in transmigration areas.

Toxoplasma gondii

The first attempt to investigate toxoplasmosis in Indonesia was done by Catar and Sri Oemijati in 1963, using intra dermal test on people in Jakarta, with a 20 % positives as results. During surveys done by NAMRU II, the CDC of the Ministry of Health and the Department of Parasitology, Faculty of Medicine, University of Indonesia, blood was also collected for serological studies. By Indirect Hemagglutination positive titers were found in all areas in a prevalence of 2-51 %, Partono and Cross (1975)¹³ conducted a survey on students in Jakarta and found a seropositive rate of 18% in Indonesian students and 7% in students of Chinese origin. Srisasi Gandahusada^{14,15} conducted a study on patients with and without a history of abortion, but could not find a significant difference, while in patients with ocular lesions high titers were found. Durfee *et al.* (1974)¹⁶ did serological studies and parasite isolation in swines at a slaughter house, and found 29% positive for the parasite in the diaphragm muscles.

Trichomonas vaginalis

The first report on trichomoniasis was published by Eerkens in 1937, describing a

case of urethritis caused by *Trichomonas*. In 1964 Wiratmadja¹⁷ wrote a thesis on *Trichomonas vaginalis* infection in women in Jakarta. In gynecological patients a prevalence of 24% was found. The first treatment trial with Flagyl was done in 1964. Sri Hidayati *et al.* in 1981 found the parasite in the urine of Leucorrhoea patients caused by *T. vaginalis*. In Menado, North Sulawesi Tumewu *et al* found 6.1 % positive in patients in the gynecology clinic. The highest rate was found in the 21-30 years age group.

HELMINTHIC INFECTIONS

General information

Most important and widely distributed are the soil transmitted helminths, consisting of *Ascaris lumbricoides*, *Trichuris trichiura*, *Necator americanus*, and *Ancylostoma duodenalis*. While *Strongyloides stercoralis*, which Sri Oemijati (1956)¹⁸ found 9.4 % positive among hospital patients and 16.3 % positives in autopsies in Jakarta, is now found only occasionally in stool surveys. Also disappearing are *Trichostrongylus colubrififormis* and *T. axei*, which Lie Kian Joe¹⁹ in 1942 found 47% in autopsies. Other intestinal nematodes found in autopsies are *Ancylostoma caninum*²⁰, *A. ceylanicum*²¹, *A. braziliense*, *Oesophagostomum apiostomum*²² and *Acanthocephala* which was found only once. While *Gnathostoma spinigerum*^{23,24} was found in clinical cases. Cases of creeping eruption are seen now and then²⁵, while the causative agents have not been identified. Another important nematode is *Oxyuris vermicularis*. Although the prevalence is not low, this infection has been underdiagnosed because of the special technic needed to identify the infection. Among the blood and tissue

nematodes lymphdwelling filarial worms constitute a major health problem in Indonesia. *Angiostrongylus cantonensis* have been reported in Indonesia. Trematode infections are not very important as a cause of public health problems except *Schistosoma japonicum* and *Fasciolopsis buski*, which are endemic only in a few restricted areas. However, 15 species of Trematodes have been reported infecting man in Indonesia. Five species of Echinostoma have been described *Echinostoma lindoense*, *E. ilocanum*, *E. revolutum*, *E. recurvatum* and *E. malayanum*^{26,27}. Before the second world war, *Echinostoma lindoense* was endemic in Lake Lindu area, Central Sulawesi, with a prevalence of 24-96% . As intermediate host was found a mussel *Corbicula lindoense*, which was consumed daily by the local inhabitants usually undercooked²⁸. After the war, no *Corbicula* could be collected in the area and stool surveys gave negative results for *Echinostoma* eggs²⁹. Other Trematodes reported from man were: *Haplorchis yokogawai*, *H. taichui*, *Paralecithodendrium molenkampii*, *Phaneropsolus bonnei* and *Plachiorchis javensis*. Among the Cestodes, 7 species have been reported from man in Indonesia. Most prevalent are *Taenia saginata* and *T. solium*. Although endemic areas have been reported, cases of taeniasis *saginata*, taeniasis *solium* and cysticercosis have been reported from the non endemic areas. Other tape worms have been reported, mostly as case reports. Bakar³⁰ (1942) reported a high prevalence of *Hymenolepis nana* infection in a mental hospital in Malang, East Java. Other cases have been reported by Beukema (1941), Kleevens and Hass (1941), Tjong Giok Pin and Sri Oemijati (1968); an endemic area was discovered in Irian Jaya quite recently. Other tapeworms reported were *Hymenolepis diminuta*³¹, *Dipylidium*

cacinum, *Railletina madagascariensis*, *Bertiella studeri*.

Important Nematode Infections

Among the Nematodes, the most prevalent are the soil transmitted helminths, especially *Ascaris lumbricoides*, *Trichuris trichiura*, *Necator americanus* and *Ancylostoma duodenale*, but the prevalence and the intensities of the infections are decreasing. While Sri S. Margono in 1972-1979 reported high prevalences. Reports from the Department of Health in 1985 showed low prevalences, which is partly due to the mass treatment campaigns in the National Control Programme launched in 1975. The symptoms of these infections are usually not prominent, but actually disturbing as abdominal pain, diarrhoea and anemia. Complications of these infections are found not too rarely. Intestinal obstruction and symptoms of acute appendicitis were described most often, and occasionally jaundice due to obstruction of the bile duct have been reported³². Control measures using mass treatment has been implemented in the National Control Programme, especially in the production and development areas. Among the other Nematodes, *Oxyuris vermicularis* is also very common. This parasite is not only affecting the low socio economic group as orphanages and overcrowded living quarters, but is also found very common among school children of the higher socio economic groups.

Blood and tissue Nematodes

Among the blood parasites, lymphdwelling filarial worms are very important. The infection is widely distributed and although in general very much decreasing in many areas³³, the disease still constitute a major health problem. Although pre-

dominantly a lowland disease, filariasis may be found also in some hilly areas. So far 3 species consisting of at least 5 epidemiologically different types have been confirmed infecting man in Indonesia. Both urban and rural *Wuchereria bancrofti* are prevalent, but the urban type, with *Culex quinquefasciatus* as vector, is confined to some small areas only, while the rural type is widely distributed and has many species of mosquitoes as vector.

Brugia malayi has been found strictly rural. Both forms, with and without reservoir host are prevalent, while periodicity studies showed a nocturnal periodic, nocturnal sub-periodic and non periodic forms. The zoophylic type which may infect animals has mostly *Mansonia* mosquitoes as vectors as the *Mn. uniformis*, *Mn. indiana*, *Mn. dives* and others, while the anthropophylic type has mostly *An. barbirostris* as vector. *B. timori* so far has been found endemic in the south eastern part of the Archipelago and involves the provinces of Nusa Tenggara Timur, East Timor and the southern part of Maluku. So far *An. barbirostris* has been incriminated as vector. *Angiostrongylus cantonensis*, is quite prevalent in rats, and although the larval stages may be found frequently in snails and slugs,³⁴ human infections have been reported only twice in Indonesia³⁵.

Important Trematode infections

Schistosomiasis

The most important among the Trematodes is *Schistosoma japonicum*, which constitutes a public health problem, but only in 2 areas in Central Sulawesi, involving 10.000 people. The first discovery of the endemic area was an autopsy report by Muller and Tesch in 1937³⁶ followed by an investigation

disclosing the endemic area at Lake Lindu by Brug and Tesch (1937)³⁷. By direct stool examination 8% was found positive with *Schistosoma* eggs, while 47% was found positive with *Echinostoma* eggs. Further studies conducted by Bonne and coworkers in the years 1940-1942, showed an overall infection rate of 53 %³⁸.

Although extensive studies have been carried out, the snail intermediate host was not found until studies after 1970, which was conducted by the team from NAMRU II, CDC of the Ministry of Health and the Department of Parasitology, Faculty of Medicine, University of Indonesia. The snail has been identified as *Oncomelania hupensis lindoensis*³⁹ and many animals have been reported harbouring the infection. A second endemic area was discovered at Napu Valley, with more than 7000 people involved, and an infection rate of 43 % was found⁴⁰.

After control measures by repeated mass treatment with Praziquantel, the infection rates dropped until 1.5 %. At lake Lindu area, trials with agroengineering gave very good results.

Fasciolopsis buski

Until recently no autochthonous infection with *Fasciolopsis buski* had been reported. The first autochthonous case was reported in 1982⁴¹ followed by the discovery of an endemic area in an inland area of South Kalimantan Province. In the village of Sei Papuyu, District of Babirik, an infection rate of 27 % was found, with the highest infection rate of 79.1 % among school children⁴² with diarrhoea as the most prevalent clinical manifestation. Further studies are still in progress to disclose the intermediate host.

Taeniasis and cysticercosis

The most prevalent are infections with *Taenia saginata* and *Taenia solium*. The first report was published by Luchtmans⁴³ in 1876, describing a high prevalence among the Dutch in Malang, East Java, who were very fond of eating beefsteak. In 1885 Westhoff⁴⁴ reported a case of taeniasis in a 18 month old baby who has been fed regularly with chopped beefsteak. Endemic areas in Indonesia have been found scattered, and closely related to the sanitary conditions and the habits of the people in those areas as Bali, Tapanuli in North Sumatra, Timor. Lately a highly endemic area was discovered in the Paniai highlands in Irian Jaya, where every month 60-100 patients with taeniasis and cysticercosis came to the hospital; respectively 8% taeniasis and 4.25 % with palpable cysts were found⁴⁵. Brain cysticercosis was also prevalent in that area, and the patients were admitted in the hospital because of burns. While the temperature in the area was quite low, the patients fell into the fire because of epileptic seizures, caused by cysticercosis⁴⁶. On the island of Samosir, Lake Toba, North Sumatra, another highly endemic area was discovered⁴⁷. The parasite has been identified as resembling the Taiwan strain infecting the aborigines and the species is still being studied further.

ARTHROPOD INFECTIONS

Not many species of Arthropods have been reported as human parasites in Indonesia. The most encountered is the scabies mite, *Sarcoptes scabiei*. Scabies is found mostly among the low socio economic group with overcrowded living quarters. Norwegian scabies which was described as a severe form of scabies, mostly found in leprosy patients

was first reported in Indonesia by Brug et al. in 1930 and Van Joost in 1932⁴⁸. Only in 1988 the disease has been redescribed by Nadia et al., and at present detailed studies are being conducted in a leprosy hospital near Jakarta.

Heavy infestation with the head louse, *Pediculus capitis*, are now very rarely found. During the difficult years during the war, many cases of infestations with the head louse were found among the poor with secondary infections. Also infestations with the body louse *Pediculus corporis* are disappearing. Cases of infestations with the crab louse (*Phthirus pubis*) have been referred to the Department of Parasitology for correct diagnosis, not only involving the pubic region, but the eye lashes especially in babies. Myiasis in man has been reported since the older days and cases are still found occasionally.

As causative agent, mostly found is *Crypsomyia bezziana*, involving many organs, as the nose, ears etc.

Intestinal myiasis caused by *Musca domestica* has also been reported. Mite infestations are not very important, although bites of Trombiculidae mites have been encountered.

Recently tick bites among the Army personnel in the bushes are studied in East Timor. The lesions mostly encountered are hard blackish nodules, with itch as the predominant symptom, which is very disturbing and difficult to cure and many develop into ulcers. A detailed publication about ticks in Indonesia is a book by Anastos (1950)⁴⁹ which only mentioned that for certain species, man has been found as host. Other publications are only descriptions of ticks found in Indonesia.

More important is the role of Arthropods as vector of diseases, involving many species of mosquitoes as vectors of malaria, filariasis and probably encephalitis. Other important

Arthropods are Trombiculid mites as vectors of scrubtyphus which is widely distributed and involved at least 5 species. Many other Arthropodes have been described as parasites and vectors of animals, but so far human involvements are not very important.

PROBLEMS IN THE STUDY OF PARASITIC INFECTIONS

Many parasites have been recognised as causes of diseases of man and animals. However, many aspects are still obscure and need to be studied more carefully with more sensitive methods. Problems may be encountered in establishing a correct diagnosis of the infection in individual cases as well as in surveys in a community. The diagnosis of parasitic infections is mostly based on the findings of certain stages of the parasites in blood, urine and stools and other specimens. While in epidemiological studies, the findings of those stages in soil, mosquitoes and other vectors are essential.

The methods applied very often gave unsatisfactory results. Later immunological diagnostic technics have been developed, but are sometimes also not very sensitive.

Many animal parasites have been incriminated as causative agents of human disease. Since man is not the natural host for these parasites, the clinical symptoms are usually not clear, and diagnosis is difficult to establish, because the parasites are difficult to be found in the usual manner.

In Indonesia, Visceral larva migrans has never been diagnosed, while *Toxocara canis* and *T. cati* are quite prevalent in dogs and cats.

Occult filariasis has been recognised as an unusual manifestation of filariasis, where the microfilariae are very difficult to be found in blood. As causative agents many species of

filarial worms have been incriminated, but the correct diagnosis is still very difficult to establish.

Primate malaria is prevalent in Indonesia and in remote areas, human infections with these parasites are always possible. However, it is very difficult to establish the correct diagnosis, based on the morphological features of the parasites.

In epidemiological studies of malaria and filariasis, it is essential to find the correct vectors, for control purposes. It is well known, that to find the correct vector of filariasis, wild caught mosquitoes, after being identified, must be dissected to find the infective stages, the 3rd stage larvae (L3). Since there are so many species of non human filarial worms, the findings of L3 in mosquito, does not mean that the vector is found, since morfological features of the L3 stages are sometimes not confirmative for differentiation. The same is valid for malaria, since many non human malaria parasites may use the same mosquito species as vectors.

These are examples of the needs of more sensitive and reliable methods for the diagnosis of individual cases as well as in surveys and epidemiological studies.

It is hoped that with the development of the biotechnology, more sensitive and accurate technics will be found to be applied in the laboratory as well as in the field.

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QUESTIONS AND ANSWERS :

1. Question: For diagnosis of human protozoan infections do you do permanent stained smears ?
 Answer : For surveys usually only concentration methods were applied. Only when any suspicion arise stained smears were produced.
2. Question: Will you elaborate further on that peculiar "not *T.saginata* and not *T.solium*" *Taenia* sp. you showed on the slide ?
 Answer : The parasite resembles *T.saginata*, but people at Samosir never eat beef, only goat and pork (same as the aborigine in Taiwan). The scolex sometimes showed rudimentary hooks on the rostellum.
3. Question: You put 3 priorities of the problems : diagnosis, epidemiology and vaccines. Could you probably mention some parasites which are highly recommended to use vaccines and thus people should work on that, since certain parasite might not need vaccine (sufficient by public health prevention).
 Answer : Priorities for malaria, schistosomiasis (both killing) and filariasis which is not killing, but when calculated in loss of working hours, cause a considerable economic loss. Moreover with the active transmigration programme, nonimmune populations are transferred into endemic areas and we know that new comers are highly susceptible.