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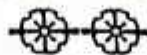
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# PAKISTAN JOURNAL OF HEALTH



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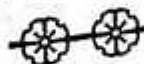
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## CONTENTS

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Pages  |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| 1. | <b>TUBERCULOSIS CONTROL PROGRAMME AND PUBLIC CO-OPERATION :</b><br>by Dr. S. A. Hussain, M.B.,B.S., T.D.D., D.T.M. and H., F.C.C.P.,<br>Officer Incharge, Tuberculosis Centre, Rawalpindi.                                                                                                                                                                                                                                                                    | 45—49  |
| 2. | <b>PRE AND POST TRANSMISSION EPIDEMIOLOGICAL INVESTIGATIONS INTO MALARIA PREVALENCE IN BAHAWALNAGAR DISTRICT (WEST PAKISTAN):</b><br>by Dr. H.A.H. Maashal, M.B.,B.Ch., D.T.M. and H.,W.H.O.,<br>Senior Adviser, Malaria Eradication Programme, West Pakistan,<br>Lahore.                                                                                                                                                                                     | 50—82  |
| 3. | <b>ENTOMOLOGICAL SURVEY OF THE VECTORS OF SCRUB TYPHUS IN WEST PAKISTAN:</b><br>by A.S. Nasir, M.P.H. (Columbia), Entomologist, Entomological<br>Health Department, Institute of Hygiene and Preventive<br>Medicine, Lahore.                                                                                                                                                                                                                                  | 83—85  |
| 4. | <b>INTESTINAL PARASITE INFECTIONS IN CHILDREN OF A PRIMARY SCHOOL OF LAHORE-A:</b><br>by Dr. M. Atiqur Rehman Ansari, Ph. D. (Pb.), Sc. D. (Paris),<br>D. Sc. (Pb.), Professor of Medical Entomology and Parasito-<br>logy, and<br>Dr. Zafar Ali Sepru, B. Sc., M. B.,B.S. (Pb.), D.P.H. (Pb.)<br>D.T.M. and H. (London), W.P.H.S.I, Assistant Professor of<br>Medical Entomology, and Parasitology, Institute of Hygiene<br>and Preventive Medicine, Lahore. | 86—155 |
| 5. | <b>BOOK REVIEWS</b><br>by Dr. Zafar-ul-Aziz, M.B.,B.S., D. Bact. (Lond.), M.C. Path.<br>(Lond.) F.I.C.S., Assistant Professor of Pathology, Dow<br>Medical College, Karachi.                                                                                                                                                                                                                                                                                  | 156    |

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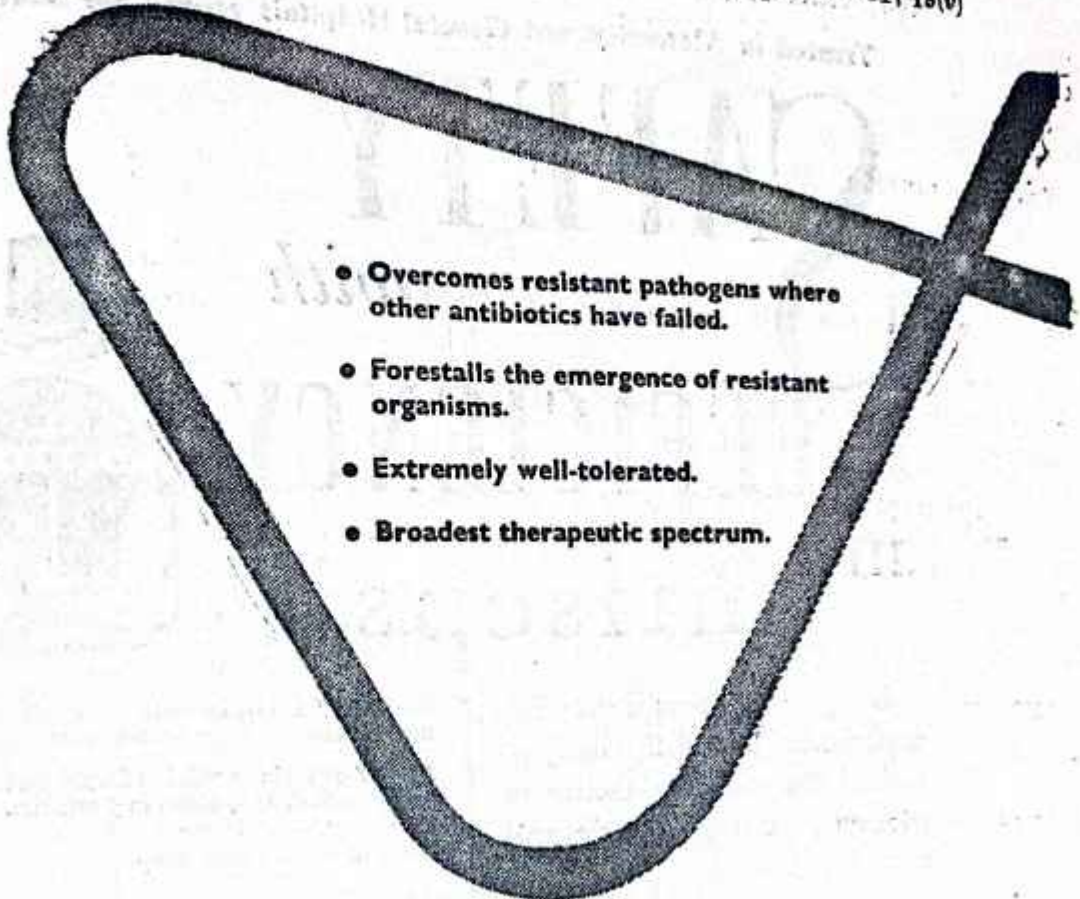
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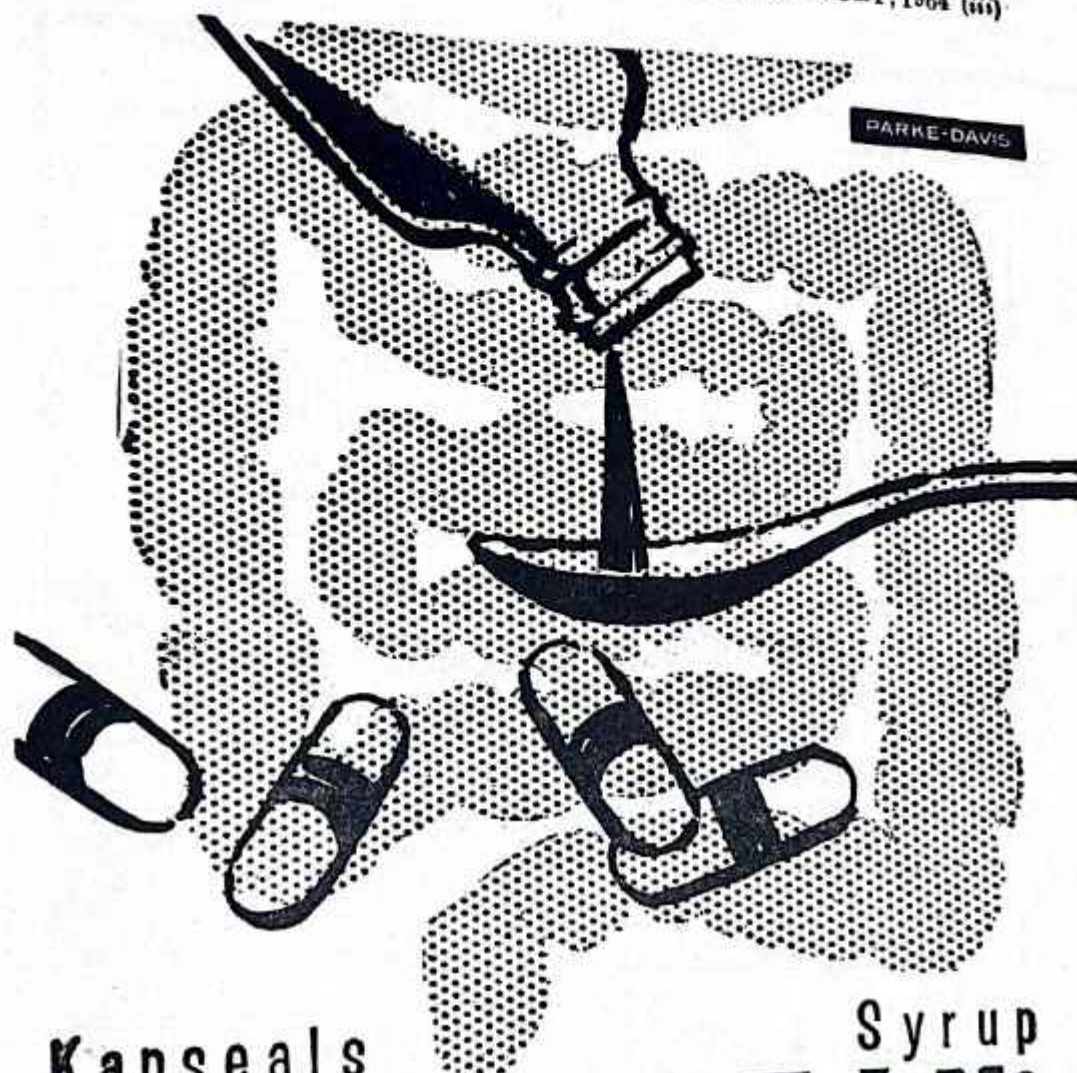
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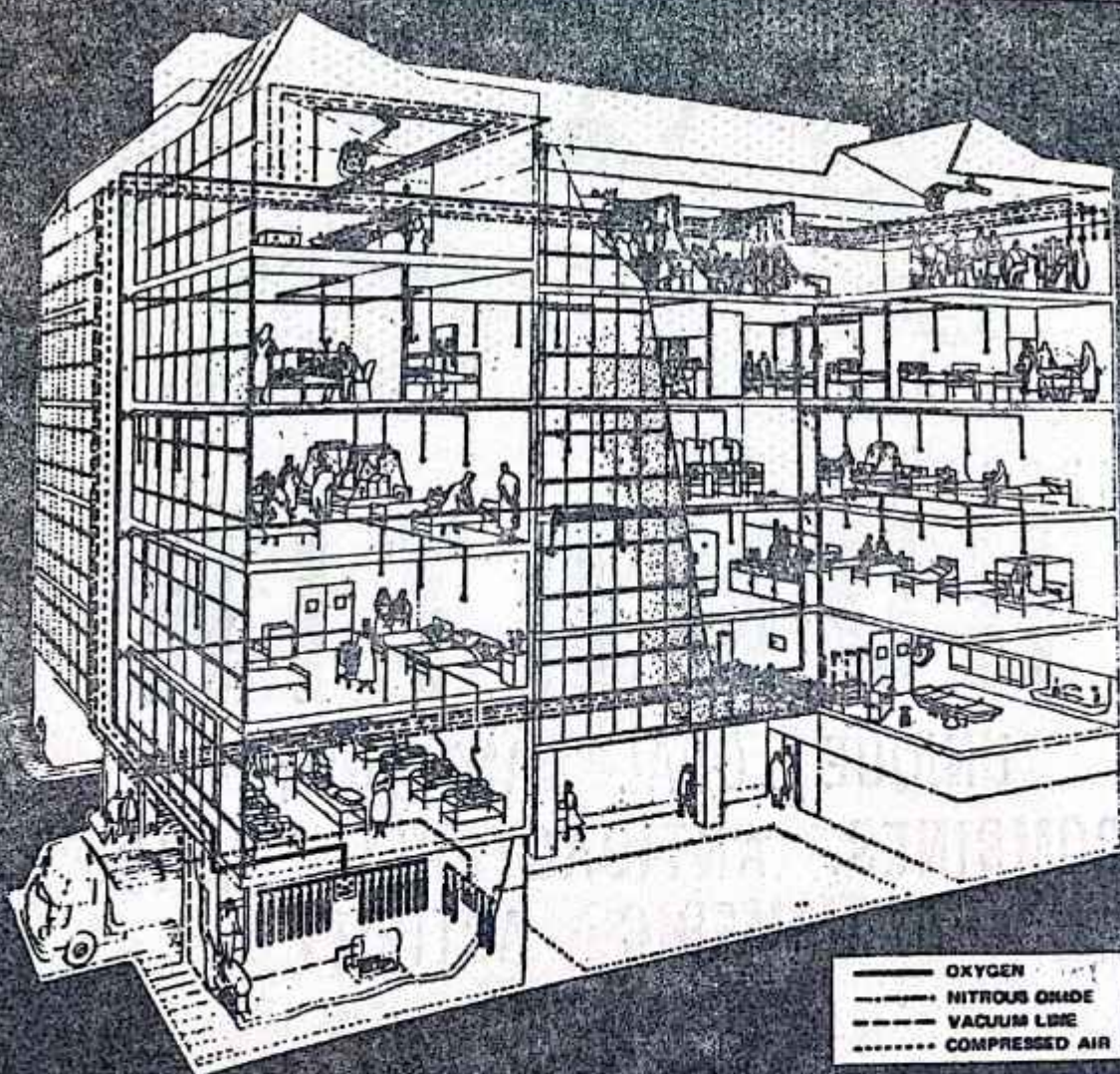
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## TUBERCULOSIS CONTROL PROGRAMME AND PUBLIC CO-OPERATION

Dr. S. A. HUSAIN, M.B., B.S., T.D.D., DTM&H, F.C.C.P.

OFFICER INCHARGE TUBERCULOSIS CENTRE

RAWALPINDI

Tuberculosis, which is an important international public health problem, specially for the under-developed countries, is known to exist as early as 400 B.C. It was first described by Hippocrates, who called it Phthisis or consumption. The havoc caused by it in those days has been mentioned in ancient books. It was known as killing and contagious disease. No one knew how it developed until on March 24, 1882, Robert Koch, a German scientist, discovered that it was caused by a very small living organism which can only be seen by microscope. Since then, the problem of treatment and control of the disease has attracted not only the attention of scientists and physicians, but also monarchs, leaders of public opinion and members of public as well. When King Edward The VII during the time when he was the Prince of Wales was informed of the discovery of the organism, called Koch bacillus, after the name of its discoverer, he had very rightly remarked "If preventable, why not prevent it".

In the world today, at least 15 million people suffer from infectious tuberculosis. It claims between one to two million lives every year. Though in some of the developed countries mortality rates have declined very rapidly but morbidity rates have not shown the same downward trend. In the world as a whole, two to three million new cases occur every year.

In Pakistan alone, roughly 1,200,000 persons suffer from this disease and 200,000 die every year. When this is the magnitude of the problem and national loss, then there can evidently be no truce for tuberculosis.

In under-developed countries, where the disease is common, nearly 75 to 80 per cent of the adults and 50 per cent of the children upto the age of 14 years are infected, i.e., they have received infection from infectious cases. This does not mean that they are suffering from tuberculosis. Only a small percentage among them, whose body resistance gets low, get the disease. The rest keep healthy. Some of the factors which lower the body resistance are :—

- (i) Massive infection by constant contact with highly infectious cases.
- (ii) Adverse socio-economic conditions like :—
  - (a) un-hygienic and congested housing conditions;
  - (b) poor diet;
  - (c) ill health;
  - (d) lack of education and ignorance about simple hygiene;
  - (e) hard work; and
  - (f) mental and physical worries.

For these reasons, the disease is more common in poor class of people. But no nation, community or class of people is immune from it though some races have better natural or racial resistance than others.

**Diagnosis**—The best and quickest method to diagnose tuberculosis in early stage is by means of X-ray of the chest. If it reveals any pathological changes, tuberculosis

is suspected. The examination of sputum in the laboratory to detect Koch bacillus confirms the diagnosis. Normally, about 20 per cent of the cases can be confirmed by direct microscopy examination. The culture of the sputum is a more sensitive test to detect tubercle bacilli but the method is not quick and requires special laboratory.

**Treatment**—Till recently, the treatment of tuberculosis was prolonged rest, fresh air, good food and symptomatic treatment. No specific treatment was available. During the last two decades, specific drugs like Streptomycin, PAS and Isoniazide have been discovered. They are being extensively used and cure of the disease is now possible. The drugs, though very effective, have some limitations. Early diagnosis and prompt treatment without interruption is required at least for one year in early cases and more than a year for moderate and advance cases. The tubercle bacilli develop resistance to the drugs within three months if the drugs are taken singly, haphazardly or in smaller doses. In under-developed countries, where the prevalence of tuberculosis is high and hospital beds are limited, treatment has to be carried out on ambulatory self-administration basis. This has been shown by the Madras trial to be as effective as sanatorium regime with not much danger to the contacts, provided there are strong supervisory arrangements to keep the cases under regular treatment.

The proper supervision of the ambulatory treatment and to ensure that the patients continue taking drugs regularly and in full therapeutic doses is not an easy job. This is more difficult when the treatment defaulters are numerous and the drugs have to be taken daily in divided doses. These defaulters need proper supervision. If instead of daily, drug treatment could be given intermittently, e.g., once a week, medication could be supervised easily. The Madras Chemotherapy Centre has been investigating this possibility. Twice weekly ambulatory treatment with Isoniazide and Streptomycin has given the same spectacular result as daily administration of Isoniazide and PAS. Study on the feasibility of once weekly regime is being carried out. If found effective, it will further revolutionise the ambulatory treatment on self-administration basis. It can then be applied on mass scale with ease, economy and convenience.

**BCG Vaccination**—As for any other infectious disease, protective vaccine has been prepared for tuberculosis as well. It is known BCG or Bacillus Calmette Guérin after the name of two eminent French doctors, Albert Calmette and Camille Guérin, who discovered the tubercle bacillus which had no power to develop the disease, but develops specific body resistance against tuberculosis. It has been proved that it gives 80 per cent protection. In some persons, the disease can develop if the body resistance is lowered due to physical, mental and socio-economic factors.

So far, 150 million people have been vaccinated in more than 61 countries of the world. In Pakistan since 1951, nearly 12 million people have been vaccinated.

**Tuberculosis Control**—Before the discovery of wonder drugs for the treatment of tuberculosis, mass BCG vaccination was the only method which could be employed on preventive side for the control of tuberculosis. Its efficacy is well-established but immunisation alone does not mean the solution of the problem of tuberculosis. The discovery of the anti-tuberculous drugs has changed the concept of tuberculosis control programme. Chemotherapy by directly attacking the source of infection is considered to

be the most valuable prophylactic measure that can be deployed against the spread of the tuberculous infection. Case finding and adequate treatment of cases to make them non-infectious or to prevent those non-infectious from becoming infectious now forms the main philosophy of the tuberculosis control programme. This objective can be achieved by a well-planned programme of early diagnosis, prompt treatment, health education and preventive measures.

Based on the above policies, Pilot Area Projects are being developed in most of the under-developed countries to study and evaluate, under local conditions, the best suited approach which, besides being economical according to the resources of the particular country, may also be practicable and acceptable to the community. Recently, a National Tuberculosis Control Pilot Area Project has been started in Rawalpindi with the assistance of the WHO and UNICEF with the same objectives in view as mentioned above. To achieve these objectives, three different approaches of case finding, prompt treatment on self-administration basis, follow-up, etc, have been proposed in three different sectors of both urban and rural areas of the project. Much stress is being laid on keeping the patients under control for treatment by persuading the defaulters, through home visiting, local social workers and leaders.

The community mass case finding programme has been started in a sector of Rawalpindi City having a population of nearly 30,000. The staff working on the project have been given in-service training in the routine working of the project, accurate filling up of the cards and forms from statistical point of view, art of public dealing and team spirit. The whole sector has been divided into 14 small sections. Each section having a population of a few thousand persons is taken at a time. The two census takers, one male and one female, first start the work one week in advance and go from house to house to fill up the particulars of all the members of each household. Only those households which have a child upto the age of 9 years are included in the case finding survey. Such households are given appointment cards showing the date of next week when the BCG technicians visit for tuberculin test. The census takers explain to them the purpose of the visit and the project.

On the appointed day, the BCG technicians, assisted by female home visitors, go from house to house of all eligible households and give mantoux test, I.T.U. They visit them again in the same way after 72 hours for mantoux test reading. For covering all the members of each household, they have to make several visits as all the members of the households are not available at one time.

After one section is covered by mantoux test, all the households having a mantoux positive child of 0-9 years age group are sorted out. They are eligible for X-ray examination. All such households are informed in advance of the date on which they are required to visit the case finding unit, set up at some suitable site within the section.

On the appointed day, the mobile x-ray unit is set up and x-ray of all the members of the household eligible for X-ray are taken. The mantoux negative children of 0-9 years age group are excluded. In spite of prior information the home visitors have to visit the houses repeatedly to call the household members for X-ray. The X-rays, after processing, are read by two independent medical officers. The common positive findings of both the readers are taken as RELEVANT X-RAY. Spot sputum is collected from all

the persons with RELEVANT X-RAY, when they come for report after 3 days or by visiting them at their houses.

Treatment is prescribed for all cases either confirmed or suspected to be suffering from tuberculosis. One months medicine is given at a time to all such cases and they are asked to continue the treatment regularly. The cases are also asked to visit the Tuberculosis Control, Rawalpindi for follow-up examination for which appointment date is written in the Identity Card given to each case.

After preliminary arrangements, and organisation, the field work of the project was started on December 2, 1963. So far, the entire non-congested area, divided into five sections and two sections of congested area have been covered. The work is in progress in the third section. The preliminary results of the work done in these sections are :—

|                                                         |                                          |
|---------------------------------------------------------|------------------------------------------|
| 1. Total population covered .. .. .                     | 8,428                                    |
| 2. Total population eligible for case finding survey .. | 8,704 (80 per cent of total population). |
| 3. Total mantoux done .. .. .                           | 4,908                                    |
| 4. Total mantoux read .. .. .                           | 4,669 (Coverage 70 per cent).            |
| 5. Total population eligible for X-RAY .. .. .          | 2,319                                    |
| 6. Total X-RAY done .. .. .                             | 1,479 (coverage 64 per cent).            |
| 7. Total number of REL X-RAY .. .. .                    | 112                                      |

The figures, mentioned above give a clear idea that, inspite of taking pains and repeated reminders, the coverage is only 65 to 70 per cent while our target is to cover 95 per cent. In the beginning, the work was started in the morning hours from 9 a.m. to 4 p.m. but it was later changed to 12 noon to 7 p.m. to suit the convenience of the public. In the morning, neither the children nor the male members are available. At times, the team works as late as 10 p.m. to cover the late-comers. The unit is trying its best to cover every eligible person and is staying in one section long enough to persuade the people to submit themselves and their children for examination. 30 to 35 per cent of them refuse to be examined. This shows lack of health consciousness among the people.

On community mass case finding programme, majority of early cases with no symptoms and apparently healthy persons are detected and asked to take pills regularly. Some refuse to accept the diagnosis and other prematurely discontinue the treatment. They do not visit the doctor for follow-up. Elimination of infection from the community can only be achieved by complete treatment of cases. The consequence of defaulting from by treatment are extremely serious. Not only do the patients get worse but they also help in spreading drug resistance bacilli to healthy individuals, who in their turn, become untreatable by normal methods. In the National Pilot Project an effort is being made to remind the treatment and follow-up defaulters to continue treatment by sending the home visitors to their houses repeatedly but the results are not very encouraging. It

is humanly impossible for the project staff to arrange for reminding every defaulting patient on every turn he is supposed to come for the drugs.

Health education of the masses is of fore-most importance for any public health programme to be successful. This makes them health conscious. They learn the simple hygiene and the danger of un-hygienic way of living. Their co-operation can only be achieved if they are properly motivated and understand clearly that "no one is safe until very one is safe from tuberculosis". Besides the general public, the co-operation of the educated people, the social workers, the community leaders, members of the Basic Democracies, rich and philanthropists is very much required. They can educate the masses, exert influence on them to submit to examination, keep a watch on the cases detected, persuade them to continue regular treatment and help in the rehabilitation of the needy patients.

Immunisation, diagnosis and treatment offered on community wide scale are nothing but empty gestures if public is not willing to make full use of these service. There is crying need for active and continuing co-operation of both the individual and the community.

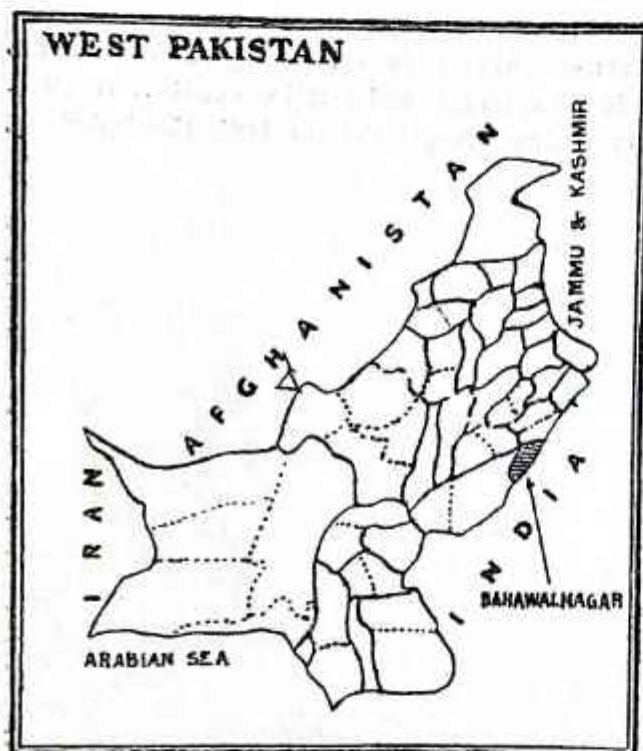
# PRE AND POST TRANSMISSION EPIDEMIOLOGICAL INVESTIGATIONS INTO MALARIA PREVALENCE IN BAHAWALNAGAR DISTRICT (WEST PAKISTAN)

BY  
Dr. H. A. H. Mashaal, M. B., B. Ch., D.T.M&H, WHO Senior Adviser, West Pakistan  
Malaria Eradication Programme.

## I. INTRODUCTION

Since the completion of canal irrigation net work of 5000 miles in 1933, malaria prevalence in Bahawalnagar district was not studied. The present survey conducted in May and repeated in October 1963, revealed that semi-arid areas previously considered as non-malarious, proved to be hyperendemic and represents a typical man-made malaria.

District Bahawalnagar is situated in the south-east region of West Pakistan adjacent



to Montgomery and Bahawalpur districts. It touches the Indian border at Bikaner State and Ferozepur district. The river Sutlej runs for 80 miles along its northern boundary. The surface area of the district is approximately 3428 square miles. Average density per mile is 240 and total number of villages are 1057 (Census 1961).

It is composed of 4 tehsils viz. Minchinabad, Bahawalnagar, Chishtian and Fort Abbas. The first 3 are along Sutlej river in the north whilst the last one is in the arid area of south.

The 3 tehsils Minchinabad, Bahawalnagar and Chishtian are irrigated partially by perennial and partially by non-perennial canals. Some areas of Minchinabad and Bahawalnagar tehsils are subjected to salinity and water-logging.

The greater part of Chishtian

and Fort Abbas tehsils are desert arid areas and since the perennial irrigation extended to this area, new colonies are settled.

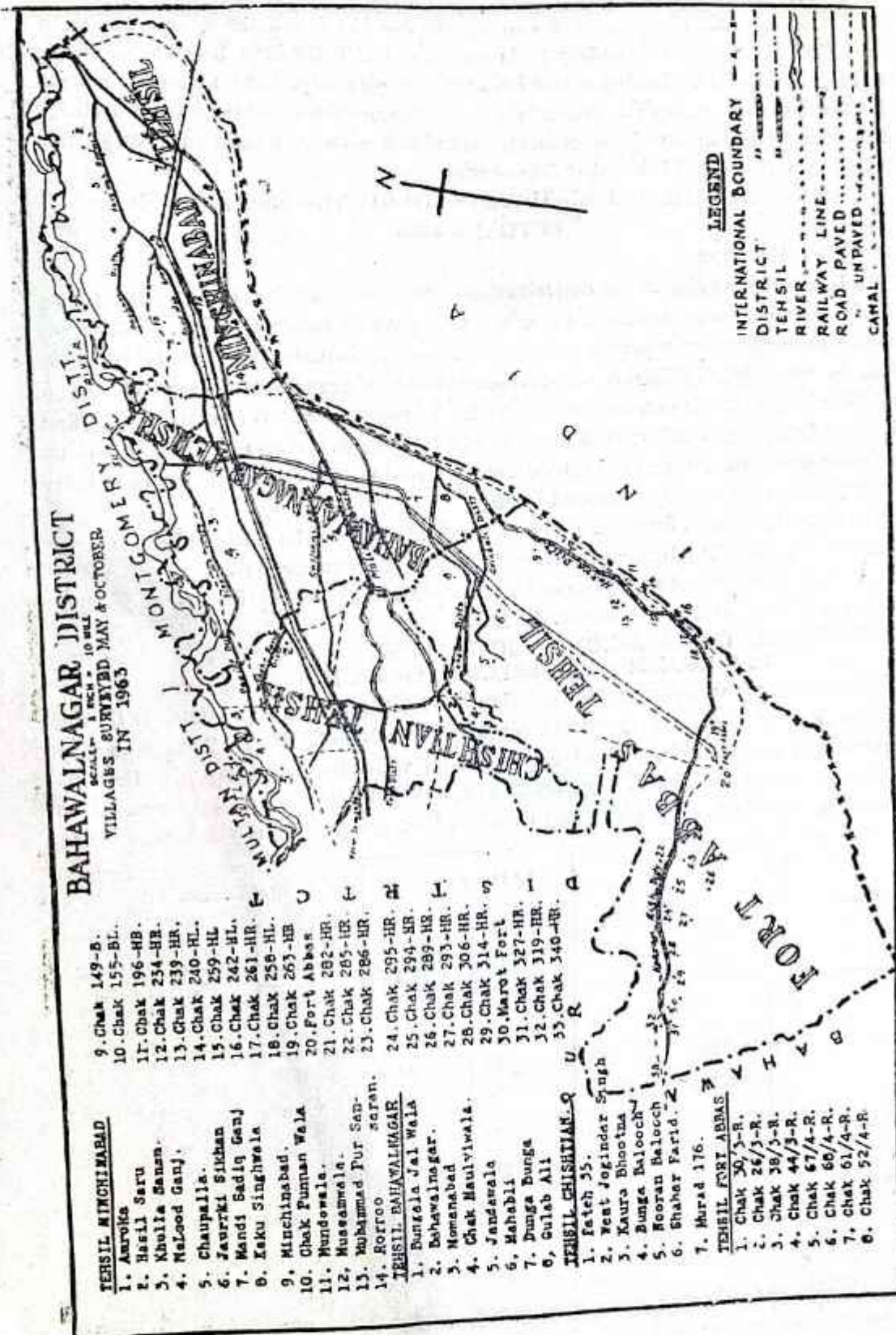
System of irrigation in Bahawalnagar district is controlled mainly by 3 canals and their distributaries:—

*Fordwah Canal* has a non-perennial flow in northern part of Minchinabad and Bahawalnagar tehsils but it becomes perennial in Chishtian tehsil.

*Sadiqia Canal* is a perennial canal distributing water to southern part of Minchinabad, Bahawalnagar and Chishtian.

*Hakra Canal* is a perennial canal distributing water to eastern part of Bahawalnagar tehsil and Fort Abbas tehsil.

The salinity and water-logging account for 3-4 per cent of the total area in Minchinabad and Bahawalnagar tehsils and in smaller proportion of 2-3 per cent in Chishtian non colony area.



## II. CLIMATOLOGY

The mean maximum temperature in summer is  $114.4^{\circ}$  and the mean minimum is  $75.4^{\circ}$ . The hottest months are May to August after which the days become moderately hot and nights tolerable. During winter i.e. December-January, the maximum temperature is  $60^{\circ}$  and the minimum  $40^{\circ}$ . Annual rainfall in the district varies from 1.18" to 10.62" which is generally during the middle of June. Humidity after rainfall reaches 65 per cent whilst during April-June it is less than 50 per cent.

## III. MALARIOMETRIC SURVEYS CONDUCTED IN MAY AND OCTOBER 1963

### 3.1 METHODS

In Bahawalnagar district the delimitation of malarious areas and the determination of malaria endemicity was conducted by spleen and parasite surveys in May, 1963. The degree of splenomegaly was reported and represented in accordance with Hacketts, classification. In every Tehsil (District sub-division) all the thanas were represented. As an average 3-7 villages per thana were investigated. The survey was conducted for the first time in May, 1963. In October, 1963 during the transmission season the survey was repeated in the same villages and the inhabitants selected for the second survey in October were amongst those previously examined in May.

The rooms examined for adult anopheline collection were the same in both surveys although few were modified during the interval between the two surveys.

The malarimetric and entomological results per village are represented in detail for both surveys in the attached annexes. I—XIII.

### 3.2 RESULTS OF MALARIOMETRIC SURVEYS

#### 3.2.1 Tehsil Minchin abad (Annexure I & II)

It is an area of 702 square miles consisting of 271 villages with approximately 138000 inhabitants located in the north-eastern corner of the district. Its northern boundary is the river Sutlej where the irrigation is non-perennial whilst in its southern part the irrigation is more or less perennial. The results of spleen palpation and blood examination for parasite in 14 villages during May and October, 1963 are given in the following table.

| Thana        | Date         |    | SPLEEN  |        | PARASITE |             |             |
|--------------|--------------|----|---------|--------|----------|-------------|-------------|
|              |              |    | No. ex. | SR (%) | No. ex.  | V. rate (%) | F. rate (%) |
| Meleod Ganj  | 1 May 1963   | .. | 133     | 44.4   | 136      | 2.2         | 0.7         |
|              | Oct 1963     | .. | 95      | 56.8   | 96       | 11.4        | 5.2         |
| Sadiq Ganj   | May 1963     | .. | 205     | 16.6   | 214      | 0.5         | 0.0         |
|              | October 1963 | .. | 114     | 15.7   | 120      | 10.8        | 0.8         |
| Minchinabad  | May 1963     | .. | 248     | 35.5   | 256      | 0.4         | 0.4         |
|              | October 1963 | .. | 152     | 46.7   | 157      | 12.1        | 0.6         |
| Total Tehsil | May 1963     | .. | 586     | 30.9   | 606      | 0.8         | 0.3         |
|              | Oct 1963     | .. | 361     | 39.6   | 373      | 11.5        | 1.8         |

The above data are represented in detail village-wise as well as for the different age-groups in annexes I (for May 1963) and II (for October 1963)

The spleen rate in two out of three thanas showed a moderate increase whilst the rate increased Virax remarkably from 0.8 per cent to 11.5 per cent.

The falciparum rate showed a rise from 0.3 to 1.8 per cent. Retabulating the results to represent only the data of individuals who attended both May and October surveys simultaneously, the following emerges:—

| SPLEEN |          |     |      |      |      |              |      |      |      | PARASITE |     |          |   |      |     |     |              |      |    |   |     |       |      |    |      |
|--------|----------|-----|------|------|------|--------------|------|------|------|----------|-----|----------|---|------|-----|-----|--------------|------|----|---|-----|-------|------|----|------|
| Age    | May 1963 |     |      |      |      | October 1963 |      |      |      |          | No. | May 1963 |   |      |     |     | October 1963 |      |    |   |     |       |      |    |      |
|        | No. Ex   | +   | S.R. |      | A.S. | +            | S.R. |      | A.S. | Ex.      |     | V        | F | Mix. | Tot | PR  | +            | Gamt | V  | F | Mix | Total | P.R. | +  | Gamt |
|        |          |     | AES  | A.S. |      |              | AES  | A.S. |      |          |     |          |   |      |     |     |              |      |    |   |     |       |      |    |      |
| 0—     |          |     |      |      |      |              |      |      |      |          | 12  | 0        | 0 | 0    | 0   | 0.0 | 0            | 0.0  | 2  | 0 | 0   | 2     | 16.6 | 2  | 16.6 |
| 1+     | ..       | 13  | 4    | 30.7 | 1.7  | 0.5          | 3    | 23.0 | 1.0  | 0.3      | 13  | 0        | 0 | 0    | 0   | 0.0 | 0            | 0.0  | 2  | 0 | 0   | 2     | 15.3 | 2  | 15.3 |
| 2—4    | ..       | 34  | 7    | 20.5 | 1.3  | 0.2          | 6    | 17.6 | 1.3  | 0.2      | 34  | 1        | 0 | 0    | 1   | 2.9 | 1            | 2.9  | 5  | 0 | 0   | 5     | 14.7 | 4  | 11.7 |
| 5—9    | ..       | 242 | 65   | 26.8 | 1.2  | 0.3          | 92   | 33.0 | 1.3  | 0.4      | 242 | 0        | 2 | 0    | 2   | 0.8 | 2            | 0.8  | 30 | 5 | 0   | 35    | 14.4 | 27 | 11.1 |
| 10+    |          | 72  | 33   | 45.8 | 1.2  | 0.5          | 42   | 58.3 | 1.3  | 0.7      | 72  | 1        | 0 | 0    | 1   | 1.3 | 1            | 1.3  | 4  | 2 | 0   | 6     | 8.3  | 3  | 4.2  |
| Total  | ..       | 361 | 109  | 30.2 | 1.2  | 0.4          | 143  | 39.6 | 1.3  | 0.5      | 373 | 2        | 2 | 0    | 4   | 1.1 | 4            | 1.1  | 43 | 7 | 0   | 50    | 13.4 | 38 | 10.1 |

The examination of 373 inhabitants in both surveys revealed a gross spleen rate 30.2 per cent in May, 39.6 per cent in October whilst the parasite rate revealed higher increase from 1.1 to 13.4 per cent. The increase in parasite rate was noticed among all the different age groups. The slight increase in spleen rate and the predominance of vivax rate is due to early transmission season.

Out of 373 individuals examined, 54 revealed positive blood results. Out of these 4 cases were positive in May and negative in October, 1963. The remaining 50 cases were negative in May and positive in October (43 *P. vivax* and 7 *P. falciparum*).

In Minchinabad, it was noticed that extensive areas were rice fields. The irrigation of these fields is usually done at intervals of 5-6 days. The majority of rice fields dried for approximately one day before irrigation. Malaria showed high degree of mesoendemicity.

In 1963 the area was not flooded but the rice cultivation was a direct factor in its prevalence.

### 3.2.2 BAHAWALNAGAR TEHSIL (ANNEXES III & IV)

It is an area of 668 square miles consisting of 235 villages with approximately 228598 inhabitants. It is located in the northern part of the district along Sutlej river and in between Minchinabad and Chishtian tehsils.

The results of spleen and blood surveys conducted in May and October 1963 in eight villages are summarised as following:—

| Thana           | Date            | SPLEEN  |            | PARASITE |                   |                              |
|-----------------|-----------------|---------|------------|----------|-------------------|------------------------------|
|                 |                 | No. ex. | S. R.<br>% | No. ex.  | Viva<br>rate<br>% | falci-<br>parum<br>rate<br>% |
|                 |                 |         | 1          |          | 2                 | 3                            |
| Bahawalnagar .. | May 1963 ..     | 72      | 23.2       | 74       | 2.7               | 1.3                          |
|                 | October 1963 .. | 30      | 20.0       | 30       | 0.0               | 0.0                          |
| Sadiqpur ..     | May 1963 ..     | 40      | 20.0       | 45       | 4.4               | 0.0                          |
|                 | October 1963 .. | 11      | 9.1        | 11       | 0.0               | 0.0                          |
| Dunga Bunga ..  | May 1963 ..     | 166     | 21.1       | 169      | 0.0               | 1.2                          |
|                 | October 1963 .. | 97      | 16.5       | 97       | 0.0               | 1.0                          |
| Total Tehsil .. | May 1963 ..     | 278     | 21.2       | 288      | 1.4               | 1.0                          |
|                 | October 1963 .. | 138     | 16.6       | 138      | 0.0               | 0.7                          |

For detailed data of each village please refer to annexes III and IV.

The examination of 278 inhabitants in 8 villages during May revealed spleen rate 21.2 per cent vivax rate 1.4 per cent and falciparum rate 1.0 per cent. In October 1963 the examination of 138 inhabitants in the same village revealed S. R. 16.6 per cent, vivax rate 0.0 per cent and falciparum rate 0.7 per cent.

The following table represents the results for both surveys retabulated to represent only the individuals who were able to attend both surveys simultaneously:—

| Age   | No. ex | SPLEEN   |    |        |     |      |              |      |             |     |    | PARASITE |     |     |      |               |              |    |    |     |     |      |               |      |
|-------|--------|----------|----|--------|-----|------|--------------|------|-------------|-----|----|----------|-----|-----|------|---------------|--------------|----|----|-----|-----|------|---------------|------|
|       |        | May 1963 |    |        |     |      | October 1963 |      |             |     |    | May 1963 |     |     |      |               | October 1963 |    |    |     |     |      |               |      |
|       |        | + S.R.   |    | A.E.S. |     | A.S. | + S.R.       |      | A.E.S./A.S. |     | V  | F        | Mix | Tol | P.R. | Gameto + G.R. |              | V  | F  | Mix | Tol | P.R. | Gameto + G.R. |      |
|       |        |          |    |        |     |      |              |      |             |     |    |          |     |     |      |               |              |    |    |     |     |      |               |      |
| 3-1   | ..     | ..       | .. | ..     | ..  | ..   | ..           | ..   | ..          | ..  | .. | ..       | ..  | ..  | ..   | ..            | ..           | .. | .. | ..  | ..  | ..   | ..            | ..   |
| 4     | ..     | 3        | 0  | 0.0    | 0.0 | 0.0  | 1            | 33.3 | 2.0         | 0.6 | 0  | 0        | 0   | 0   | 0.0  | 0             | 0.0          | 0  | 1  | 0   | 1   | 33.3 | 1             | 33.3 |
| 4     | ..     | 8        | 1  | 12.5   | 4.0 | 0.5  | 1            | 12.5 | 3.0         | 0.3 | 0  | 0        | 0   | 0   | 0.0  | 0             | 0.0          | 0  | 0  | 0   | 0   | 0.0  | 0             | 0.0  |
| 9     | ..     | 115      | 19 | 16.5   | 1.0 | 0.2  | 18           | 15.6 | 1.0         | 0.1 | 2  | 0        | 0   | 2   | 1.7  | 2             | 1.7          | 0  | 0  | 0   | 0   | 0.0  | 0             | 0.0  |
| 9+    | ..     | 12       | 2  | 16.6   | 1.0 | 0.1  | 3            | 25.0 | 1.0         | 0.2 | 0  | 0        | 0   | 0   | 0.0  | 0             | 0.0          | 0  | 0  | 0   | 0   | 0.0  | 0             | 0.0  |
| Total | ..     | 138      | 22 | 13.9   | 1.1 | 0.2  | 23           | 16.6 | 1.0         | 0.2 | 2  | 0        | 0   | 2   | 1.5  | 2             | 1.5          | 0  | 1  | 0   | 1   | 0.7  | 1             | 0.7  |

The examination of 138 inhabitants in both surveys revealed 3 positive cases, 2 were *vivax* detected in May and rendered negative results in October and one case *falciparum* detected in October but was negative in May.

From the above data it was remarkable that during the expected transmission season (autumn) the transmission practically did not start. All the villages were visited. Adjacent to Sutlej river villages were surrounded by dry crop areas which are liable to severe floods and even isolation of villages. During survey of 1963 it was noticed that the only source of water was wells in the villages and thus breeding was very limited and the relative humidity was low.

In this area malaria incidence is known to be of great variation yearly depending on the degree of flood and its extent. Because of these factors malaria in this area is typical example of unstable malaria and it is liable to severe epidemics during high flooded years.

### 3.2.3. TEHSIL CHISHTIAN (ANNEXES V & VI)

It is an area of 579 square miles, consisting of 216 villages with approximately 197,500 inhabitants. It is located in the north-western part of Bahawalnagar district alongst Sutlej river between district Multan and Tehsil Bahawalnagar.

The results of spleen and parasite surveys conducted in May and repeated in October 1963 in 7 villages are consolidated as following:—

| Thana        | Date         | SPLEEN  |           | PARASITE |           |           |
|--------------|--------------|---------|-----------|----------|-----------|-----------|
|              |              | No. ex. | S.R.<br>% | No. ex.  | V.R.<br>% | F.R.<br>% |
| Chishtian    | May 1963     | 59      | 30.5      | 65       | 1.5       | 7.7       |
|              | October 1963 | 33      | 33.3      | 38       | 2.6       | 0.0       |
| Shahar Farid | May 1963     | 179     | 15.6      | 200      | 0.5       | 0.0       |
|              | October 1963 | 82      | 8.5       | 91       | 4.4       | 0.0       |
| Dharanwala   | May 1963     | 27      | 29.6      | 27       | 3.7       | 3.7       |
|              | October 1963 | 24      | 33.3      | 24       | 0.0       | 0.0       |
| Total Tehsil | May 1963     | 265     | 20.4      | 292      | 1.0       | 2.1       |
|              | October 1963 | 139     | 18.7      | 153      | 3.2       | 0.0       |

The above results are represented in detail village-wise as well as for the different age groups in annexes V (for May 1963) and VI (for October 1963).

Retabulating the results to represent only the data of individuals who attended both May and October surveys 1963 the following emerges:—

| Age   | SPLEEN     |    |      |     |      |               |      |     |      |            | PARASITE  |   |     |     |      | October, 1963 |        |    |
|-------|------------|----|------|-----|------|---------------|------|-----|------|------------|-----------|---|-----|-----|------|---------------|--------|----|
|       | May, 1963  |    |      |     |      | October, 1963 |      |     |      |            | May, 1963 |   |     |     |      | October, 1963 |        |    |
|       | No.<br>ex. | +  | S.R. | AES | A.S. | +             | S.R. | AES | A.S. | No.<br>ex. | V         | F | Mix | Tot | P.R. | + G.R.        | Gemet. | .. |
|       |            |    |      |     |      |               |      |     |      |            |           |   |     |     |      |               |        |    |
| 0+1   | ..         | .. | ..   | ..  | ..   | ..            | ..   | ..  | ..   | 14         | 0         | 0 | 0   | 0   | 0.0  | 0             | 0.0    | .. |
| 1+    | ..         | 2  | 9.5  | 1.0 | 0.2  | 0             | 0.0  | 0.0 | 0.0  | 21         | 0         | 0 | 0   | 0   | 0.0  | 0             | 0.0    | .. |
| 2-4   | ..         | 3  | 10.3 | 1.0 | 0.1  | 3             | 10.3 | 1.0 | 0.3  | 29         | 0         | 1 | 0   | 1   | 3.4  | 1             | 3.4    | .. |
| 5-9   | ..         | 12 | 16.9 | 1.0 | 0.1  | 13            | 18.3 | 1.1 | 0.2  | 71         | 0         | 1 | 0   | 1   | 1.4  | 1             | 1.4    | .. |
| 10+   | ..         | 18 | 55.5 | 1.3 | 0.7  | 10            | 55.5 | 1.2 | 0.6  | 18         | 1         | 2 | 0   | 3   | 16.6 | 3             | 16.6   | .. |
| Total | 139        | 27 | 19.4 | 1.1 | 0.2  | 26            | 18.7 | 1.1 | 0.2  | 153        | 1         | 4 | 0   | 5   | 3.2  | 5             | 3.2    | .. |

The examination of 139 for splenomegaly in both surveys revealed the drop of spleen rate in May from 19.4 per cent to 18.7 per cent in October. The examination of 153 for parasite revealed parasite rate 3.2 per cent in both surveys. Out of the 153 persons examined in May, 5 revealed blood positive results (4 *P. falciparum* and 1 *P. vivax*) but these revealed negative results on October survey. On the other hand, in October, another 5 *vivax* cases were detected who showed negative results in the previous survey of May.

From these results, it is evident that though gross parasite rate remained stationary in May and October yet transmission took place as evidenced from the new 5 cases of *P. vivax*. However, the incidence of malaria in this Tehsil during 1963 is rather quite low.

Similar to tehsil Bahawalnagar, the villages located alongst Sutlej river though are in an area liable to flood yet in 1963 were subjected to long dry season and it was not flooded, thus malaria incidence was rather low and transmission was at its minimum during the peak of autumn.

#### 3.2.4. TEHSIL FORT ABBAS (ANNEXES FROM VII TO X)

It is an area of 1479 square miles. It consists of 335 villages with approximately 258,600 inhabitants. It is located in the south western part of the district. Majority of villages are located alongst Hakra canal and its distributaries. Few miles south to the canal in thanas Fort Abbas and Marot, the desert (Cholistan) starts. It expands and finally continuous with Bahawalpur district. The residents of the Cholistan area are none colony and are migratory in nature. However, they prefer not to migrate to neighbouring districts and confined their migration to areas within the Tehsil.

During May 1963 out of the total 335 existing villages in all the tehsil a total of 33 villages were investigated. The survey was repeated to cover the same villages and same individuals in October, 1963. The results are tabulated as following:

| Thana           | Date            | SPLEEN  |                  | PARASITE |                  |                  |
|-----------------|-----------------|---------|------------------|----------|------------------|------------------|
|                 |                 | No. ex. | S.R.<br>per cent | No. ex.  | V.R.<br>per cent | F.R.<br>per cent |
| Daharanwala ..  | May 1963 ..     | 155     | 32.9             | 155      | 0.0              | 0.8              |
|                 | October 1963 .. | 124     | 36.2             | 124      | 0.8              | 0.8              |
| Haroonabad ..   | May 1963 ..     | 263     | 49.1             | 272      | 2.5              | 3.3              |
|                 | October 1963 .. | 173     | 42.1             | 177      | 9.6              | 3.9              |
| Fort Abbas ..   | May 1963 ..     | 379     | 69.4             | 382      | 3.6              | 15.7             |
|                 | October 1963 .. | 280     | 73.2             | 283      | 15.5             | 7.4              |
| Marot ..        | May 1963 ..     | 362     | 80.4             | 375      | 4.0              | 10.9             |
|                 | October 1963 .. | 291     | 85.9             | 294      | 13.9             | 7.8              |
| Total Tehsil .. | May 1963 ..     | 1,159   | 63.4             | 1,184    | 3.0              | 9.2              |
|                 | October 1963 .. | 868     | 66.0             | 878      | 11.7             | 5.9              |

The above results are represented in detail village-wise as well as for the different age groups in annexes VII and VIII (for May 1963) and annexes IX and X (for October 1963).

Omitting the results of individuals who attended one survey only the data are retabulated to present the results of those who attended both May and October 1963 surveys. The following table represents the consolidated results:

| SPELLEN |         |           |      |      |      |     |               |     |      | PARASITE     |           |               |     |     |      |       |      |    |    |     |            |      |     |      |  |
|---------|---------|-----------|------|------|------|-----|---------------|-----|------|--------------|-----------|---------------|-----|-----|------|-------|------|----|----|-----|------------|------|-----|------|--|
| Age     | No. ex. | May, 1963 |      |      |      |     | October, 1963 |     |      |              |           | October, 1963 |     |     |      |       |      |    |    |     |            |      |     |      |  |
|         |         | +         | S.R. | AES  | A.S. | +   | S.R.          | AES | A.S. | A.S. No. ex. | May, 1963 |               |     |     |      | Gamto |      |    |    |     | Gametocyte |      |     |      |  |
|         |         |           |      |      |      |     |               |     |      |              | V         | F             | Mix | Tol | P.R. | +     | G.R. | V  | F  | Mix | Tol        | P.R. | +   | G.R. |  |
|         |         |           |      |      |      |     |               |     |      |              |           |               |     |     |      |       |      |    |    |     |            |      |     |      |  |
| 0-1     | ..      | ..        | ..   | ..   | ..   | ..  | ..            | ..  | ..   | 8            | 1         | 2             | 0   | 3   | 37.5 | 3     | 37.5 | 2  | 0  | 0   | 2          | 25.0 | 2   | 25.0 |  |
| 2+      | ..      | 28        | 19   | 67.8 | 1.8  | 18  | 64.2          | 1.6 | 1.0  | 28           | 3         | 2             | 0   | 5   | 17.8 | 5     | 17.8 | 5  | 1  | 0   | 6          | 21.4 | 6   | 21.4 |  |
| 2-4     | ..      | 56        | 28   | 50.0 | 1.7  | 38  | 57.8          | 1.8 | 1.2  | 56           | 7         | 13            | 2   | 18  | 32.1 | 17    | 30.3 | 16 | 9  | 1   | 24         | 42.8 | 22  | 39.2 |  |
| 5-9     | ..      | 429       | 248  | 57.8 | 1.7  | 263 | 59.9          | 1.5 | 0.9  | 429          | 8         | 32            | 2   | 38  | 8.8  | 34    | 7.9  | 48 | 16 | 1   | 63         | 14.6 | 57  | 13.2 |  |
| 10+     | ..      | 225       | 140  | 62.2 | 1.6  | 144 | 64.2          | 1.6 | 1.0  | 225          | 4         | 11            | 0   | 15  | 6.6  | 13    | 5.7  | 12 | 11 | 0   | 23         | 10.2 | 14  | 6.2  |  |
| Total   | ..      | 738       | 435  | 58.9 | 1.7  | 453 | 61.3          | 1.6 | 1.0  | 746          | 23        | 60            | 4   | 79  | 10.5 | 72    | 9.6  | 83 | 37 | 2   | 118        | 15.8 | 101 | 13.5 |  |

The bi-examination of 738 individuals in May and October, 1963 for enlargement of spleen revealed SR 58.9 per cent and 61.3 per cent respectively. The average enlarged spleen revealed 1.7 to 1.6 whilst the average spleen = 1.

One of the most outstanding features in this studies has been the marked increase in the spleen rates associated with an increase in both AES and AS. In none of the three tehsils discussed previously AS exceeds 0.5.

The examination of 746 individuals in May and October for the parasite revealed PR 10.5 per cent and 15.8 per cent respectively. In May 1963 falciparum rate reached 8.1 per cent vivax rate 3.0 per cent, while in October FR 5.0 per cent and VR 11.2 per cent. The predominance of falciparum was noticed in May whilst that of vivax in October.

In such areas where falciparum proved to be predominant during early autumn when the transmission is at its beginning the predominancy of vivax over falciparum is temporary. By end of transmission season and during spring falciparum rate are expected almost always higher if adequate and representative samples are taken.

Malaria in 2 out of 4 thanas of Fort Abbas Tehsil proved to be mesoendemic (thanas Haroonabad and Daharanwala) whilst in the remaining thanas (Marot and Fort Abbas) which are expanding in the middle of the desert malaria is remarkably hyperendemic and is the most malarious area of all the district. The malaria in these 2 thanas are more or less semistable.

During 1963 transmission in Marot and Fort Abbas thanas was rather high inspite of low flood and low transmission rates in all other tehsils. This is due to the establishment of most suitable breeding places for *A. culicifacies* in majority of villages in the area.

The underground water is very deep and frequently not suitable for drinking purposes. The canal water is not in continuous flow. The inhabitants developed an interesting method to ensure an adequate water supply for drinking and for their domestic use by connecting the canal to a depression of land to form a reservoir of water in the form of a pool (100-150 feet diameter) called Toba.

These tobas are frequently refilled by water at intervals of 1-3 weeks from the main canal through small cemented canalicules. Toba water is usually fresh, transparent and growth of grass at its margin is noticed. The frequent filling of toba by fresh water and being a main source of water supply, it is kept clean. Thus they constitute excellent man made breeding places for *A. culicifacies*.

Comparing these tobas with those seen in Punjab and Sind, they are fundamentally different. Tobas of Sind and Punjab are collection of stagnant dirty water unsuitable for breeding of *A. culicifacies* and are usually not connected to canals whilst the mechanism of developing clean and fresh tobas in desert area suitable for *A. culicifacies* breeding is an important factor in establishing semi-permanent malaria with yearly high incidence irregard of flood situation.

### 3.3. ENTOMOLOGICAL INVESTIGATIONS

3.3.1. Results of entomological surveys (anex XI to XIII)—Out of 62 villages examined for spleen and malaria parasite in May 1963, 48 were surveyed (58 rooms examined) and in October a total of 47 villages were examined and in each village one room was

surveyed. All the 47 rooms examined in the 2nd survey were selected from the 58 rooms surveyed in May. The type of rooms examined are as follows :—

| Type of room |    | No. of rooms examined |         |
|--------------|----|-----------------------|---------|
|              |    | May                   | October |
| Animal sheds | .. | 43                    | 31      |
| Living rooms | .. | 4                     | 7       |
| Store        | .. | 8                     | 7       |
| Others       | .. | 3                     | 2       |
| Total        | .. | 58                    | 47      |

The selected rooms were mostly animal sheds or bed rooms adjacent to animal sheds. Flitting method was applied with Pyrethrum 0.2 per cent in Kerosine.

Out of 58 rooms examined in May, 49 revealed positive for *A. culicifacies* while in October out of 47 examined, 40 revealed positive results.

*A. culicifacies* was predominantly high during April. The average density per positive room in May varies between 2 to 341.9 while in October it varied between 0 to 199. The highest density was observed in rice agricultural area in Tehsil Minchinabad and Tehsil Fort Abbas particularly Thana Marot.

The consolidated entomological results of each of the 4 tehsils of Bahawalnagar with average density per room and average density per positive room for *A. culicifacies* during the two surveys are summarised in the following table.

| Tehsil       | Thana            | MAY 1963    |    |               |                        | OCTOBER 1963 |   |               |                        |
|--------------|------------------|-------------|----|---------------|------------------------|--------------|---|---------------|------------------------|
|              |                  | Total rooms |    | Ave. per room | Ave. per positive room | Total rooms  |   | Ave. per room | Ave. per positive room |
|              |                  | ex.         | +  |               |                        | ex.          | + |               |                        |
| Minchinabad  | McLeod Ganj Road | 2           | 2  | 70.4          | 70.0                   | 2            | 2 | 199.0         | 199.0                  |
| Do.          | Mandi Sadiq Ganj | 5           | 3  | 24.0          | 40.0                   | 4            | 3 | 3.7           | 5.0                    |
| Do.          | Minchinabad      | 5           | 5  | 174.2         | 174.2                  | 5            | 5 | 17.8          | 17.8                   |
| Bahawalnagar | Sadiqpur         | 2           | 1  | 1.0           | 2.0                    | 2            | 1 | 0.5           | 1.0                    |
| Do.          | Dunga Bunga      | 7           | 6  | 11.4          | 13.5                   | 4            | 1 | 1.0           | 4.0                    |
| Chishtian    | Chishtian        | 2           | 2  | 132.0         | 132.0                  | 2            | 2 | 55.0          | 55.0                   |
| Do.          | Shahar Farid     | 4           | 1  | 2.5           | 10.0                   | 4            | 4 | 9.2           | 9.2                    |
| Do.          | Dharamanwala     | 1           | 1  | 11.0          | 11.0                   | 1            | 1 | 15.0          | 15.0                   |
| Fort Abbas   | Dharamanwala     | 3           | 3  | 63.3          | 63.6                   | 2            | 0 | 0.0           | 0.0                    |
| Do.          | Harunabad        | 5           | 5  | 54.4          | 54.4                   | 5            | 5 | 17.8          | 17.8                   |
| Do.          | Fort Abbas       | 10          | 8  | 77.9          | 96.5                   | 8            | 8 | 32.0          | 32.0                   |
| Do.          | Marot            | 12          | 12 | 341.9         | 341.9                  | 8            | 8 | 98.6          | 98.6                   |

3.3.2. *Results of susceptibility tests of A. culicifacies and A. stephensi*—The susceptibility tests were conducted recently in April, 1964, for D. D. T. & Dieldrin and the results are summarised as following :—

(A) DDT—

|              |    |                        |                     |
|--------------|----|------------------------|---------------------|
| Tehsil       | .. | FORT ABBAS             | MINCHINABAD         |
| Thana        | .. | MAROT                  | MINCHINABAD         |
| Village      | .. | CHAK NO. 289-HR        | MOHSAMWALA          |
| Date of test | .. | 8—11 APRIL 1964        | 14—16 APRIL 1964    |
| Species      | .. | <i>A. Culicifacies</i> | <i>A. Stephensi</i> |
| Replicate    | .. | 5                      | 5                   |

| DDT Concentration | No. exposed   | % Mortality | No. exposed    | % Mortality |
|-------------------|---------------|-------------|----------------|-------------|
| 0.25 % ..         | 80            | 5.0         | 60             | 1.6         |
| 0.5 % ..          | 79            | 27.8        | 100            | 21.0        |
| 1.0 % ..          | 7             | 60.7        | 100            | 34.0        |
| 2.0 % ..          | 98            | 98.9        | 100            | 84.0        |
| 4.0 % ..          | 97            | 100.0       | 99             | 98.9        |
| Control ..        | 101           | 0.0         | 101            | 0.0         |
| Spraying history  | Never sprayed |             | Never sprayed. |             |

(B) DIELDRIN—

|              |    |                        |                     |
|--------------|----|------------------------|---------------------|
| Tehsil       | .. | FORT ABBAS             | MINCHINABAD         |
| Thana        | .. | MAROT                  | MINCHINABAD         |
| Village      | .. | CHAK NO. 293-HR        | MOHARANWALA         |
| Date of test | .. | 11 APRIL, 1964         | 15—16 APRIL, 1964   |
| Species      | .. | <i>A. Culicifacies</i> | <i>A. Stephensi</i> |
| Replicate    | .. | 2                      | 3                   |

| Dieldrin Concentration | No. exposed      | % Mortality | No. exposed    | % Mortality |
|------------------------|------------------|-------------|----------------|-------------|
| 0.05 % ..              | 39               | 30.7 %      | 40             | 2.5 %       |
| 0.1 % ..               | 39               | 69.2 %      | 60             | 40 %        |
| 0.2 % ..               | 39               | 92.3 %      | 57             | 84. %       |
| 0.4 % ..               | 40               | 100 %       | 56             | 96.4 %      |
| 0.8 % ..               | 41               | 100 %       | 59             | 100 %       |
| 1.6 % ..               | 38               | 100 %       | 60             | 100 %       |
| 4.0 % ..               | ..               | ..          | 40             | 100 %       |
| Control ..             | 40               | 0.0 %       | 60             | 1.6 %       |
| Spraying history       | .. Never sprayed |             | Never sprayed. |             |

From the above results it is evident that *A. culicifacies* and *A. stephensi* are susceptible to both DDT and Dieldrin.

**IV. Discussion**—The detail results of malariometric surveys May and October, 1963, are represented in annexes from I to X. The results reveal that malaria prevalence and endemicity vary considerably from a Tehsil to another due to different determining factors.

In Minchinabad Tehsil, where rice agriculture is rather not uncommon, malaria showed high degree of mesoendemicity. Rice cultivation has a direct influence on its prevalence. The examination of 606 inhabitants for malaria parasite, out of these 586 for splenomegaly in 14 villages during May, 1963 revealed SR=30.9 per cent PR 1.1 % (5 *P. vivax* & 2 *P. falciparum*). On re-survey some villages in October, 1963, a total of 373 persons were examined for blood, out of these 361 for enlarged a spleen, SR=39.6%, PR=13.4% (43 *P. vivax*, 7 *P. falciparum*). Detail data are represented in Annex I & II. Comparing the result of May to October, 1963, it is evident that SR increased and PR remarkably increased. The AES is not increased as the survey was conducted shortly after the commencement of the autumnal seasons. out of the 14 villages examined in this tehsil 12 revealed a remarkable increase in PR. The remaining two villages namely Chaupalia and Punawala are located in a dry area irrigated by neighbouring canals.

In both Bahawalnagar and Chishtian Tehsils rice agriculture is very limited and the two tehsils are mainly dry crop areas. One third of villages are located alongst Sutlej River or in areas subjected to variation of flood. In 1963 the area was completely dry during the flood season, and the inhabitants in these villages were even utilizing wells for water supply. From Annexes III & IV for Bahawalnagar tehsil and V & VI for Chishtian tehsil, malariometric data revealed SR in Bahawalnagar decreased from 21.2% in May to 16.6 % in October, 1963 and in Chishtian from 20.4 % to 18.7% respectively. Similarly parasite rate either slightly dropped or insignificantly increased. One would expect that both SR & PR to be at their highest in Autumn, nevertheless, the rates were rather low on the average due to mainly low flood in 1963 and little rain fall. Evidently the influence of Sutlej water level causing flood and the increase of rainfall are the determining factors in high endemicity of malaria in these two tehsils.

In Fort Abbas Tehsil, two thanas (Dahranwala and Haroonabad) are dry crop area and they are more or less similar to Bahawalnagar & Chishtian tehsils described above. Detail results of malariometric data are represented in Annexes VII & X. On the other hand the remaining two thanas Fort Abbas and Marot, malaria is remarkably hyperendemic. In Fort Abbas thana (Annexes VIII & X) the examination of 382 inhabitants for blood, out of these 379 for splenomegaly in May 1963 revealed SR=69.4% PR: 18.6 % (14 *P. vivax*, 60 *P. falciparum*, 3 mixed). In October the same year the examination of 280 for spleen & 283 for parasite revealed SR=73.2 % & PR=22.6 % (44 *P. vivax*, 21 *P. falciparum*, 1 mixed). Similarly Marot thana the examination of 362 inhabitants for spleen and 375 for parasite in May revealed SR=80.4 %, PR : 14.7 % (15 *P. vivax*, 41 *P. falciparum*, 1 mixed). On repeating the survey in October for 291 inhabitants for spleen and 294 for blood, SR=85.9%, PR=21.4 % (41 *P. vivax*, 23 *P. falciparum*, 1 mixed). By studying the data of these surveys in the other tehsils one would expect SR and PR to be at its lowest in Fort Abbas and Marot Thanas, being located in the desert area. However the, rates were extremely high and hyperendemicity were noticed in 20 villages out of 22 surveyed in October 1963 (Annex X). Also in these two thanas SR & PR in May 1963 prior to the transmission season of 1963, every where proved

to be high (Annex. VIII). From these results it can be seen that both Fort Abbas and Marot thanas are permanently hyperendemic areas. This is due to developing in the majority of villages Tobas (=a depression of land to form a reservoir of water) which are frequently filled by fresh water through cement canalicules connected to the irrigating canal and are kept clean and fresh. This form an ideal permanent breeding places for *A. culicifacies* and consequent in maintaining the malaria hyperendemicity without taking into consideration the flood situation.

The entomological survey revealed the prevalence of *A. culicifacies* all over the district with high densities in tehsil Minchanabad (rice agriculture) and Fort Abbas and Marot thanas (Tobas). *A. stephensi* though prevails in all the district yet its highest densities were detected in Minchanabad (Annexes. XII, XIII). It is interesting to notice that densities of *A. culicifacies* declined remarkably in October compared to May, 1963, although malaria incidence increased considerably in Minchanabad tehsil, Fort Abbas and Marot thanas. The high peak of *A. culicifacies* in May seems to be insignificant for transmission as the relative humidity is lower than 50% and the probably will consequent in high mortality of *A. culicifacies* before the extrinsic cycle of malaria is completed. The determination of parous nulliparous ratio and the estimation of age of *A. culicifacies* during spring are interesting study to confirm these important field observations. Regarding the sporozite index reference is made to Covell & Baily 1930 who did not find any infected specimens of *A. culicifacies* at Larkana, Sind, before the beginning of August when the mean relative humidity rose to over 70 per cent.

#### V. Summary—

5.1. The malariometric survey of 62 villages were conducted in all the thanas of District Bahawalnagar during May, 1963. The examination of 2,370 for parasite and 2,288, for spleen revealed SR : 44.9%, AES : 1.6, AS : 0.7. Parasite rate : 6.8% (48 *P. vivax* 121 *P. falciparum* and 6 mixed). The gametocyte rate 5.9%. In the second survey October 1963, 61 villages out of 62 were re-examined. 1,542 were examined for blood out of these 1,506 were examined for spleen. SR : 50.7%, A.E.S. 1.5, AS : 0.7, parasite rate 13.5% (151 *P. vivax*, 60 *P. falciparum* and 2 mixed). The gametocyte 11.2%.

5.2. The transmission during 1963 seems to be at its minimum in majority of district due to dryness and low flood. In Marot and Fort Abbas transmission was high and hyperendemicity is maintained due to permanent man made breeding places ideal for *A. culicifacies*.

5.3. Results of malariometric surveys per village are represented in detail,—vide annexes. I to X and for entomological survey,—vide annexes. XI to XIII.

5.4. Both *A. culicifacies* and *A. stephensi* are susceptible to DDT and Dieldrin.

#### VI. Acknowledgment—

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The author has to express his gratitude to Mr. Muhammad Hanif Lang, Chief Laboratory Technician, Mr. Mohammed Fazil the experienced Insect Collector and finally Mr. Mohammad Zafar the driver who have helped him in all the field investigations. The

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JULY 64

67

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## ANNEXURE

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# **ANNEXURE V** **RESULTS OF MALARIOMETRIC SURVEYS CONDUCTED IN MAY 1963**

BY

Dr. H. MASHAAL, W.H.O. SENIOR ADVISOR

District—BAHAWALNAGAR

TEHSIL—CHISHTIAN

Consolidated results of 7 villages according to age groups

| Age    | SPLEEN  |                 |    |    |    |    |       |      |     |     | PARASITE |   |   |     |       |     |             |     |
|--------|---------|-----------------|----|----|----|----|-------|------|-----|-----|----------|---|---|-----|-------|-----|-------------|-----|
|        | No. Ex. | Palpable Spleen |    |    |    |    |       | SR   | AES | AS  | No. Ex.  | V | F | Mix | Total | PR  | Gametocytes |     |
|        |         | 1               | 2  | 3  | 4  | 5  | Total |      |     |     |          |   |   |     |       |     | +           | GR  |
| 0-1 .. | ..      | ..              | .. | .. | .. | .. | ..    | ..   | ..  | ..  | 27       | 1 | 0 | 0   | 1     | 3.7 | 1           | 3.7 |
| 1+ ..  | 39      | 2               | 0  | 0  | 0  | 0  | 2     | 5.1  | 1.0 | 0.5 | 39       | 0 | 0 | 0   | 0     | 0.0 | 0           | 0.0 |
| 2-4 .. | 56      | 5               | 1  | 0  | 0  | 0  | 7     | 12.5 | 1.1 | 0.1 | 56       | 0 | 1 | 0   | 1     | 1.7 | 1           | 1.7 |
| 5-9 .. | 134     | 25              | 3  | 1  | 0  | 0  | 29    | 21.6 | 1.1 | 0.2 | 134      | 1 | 2 | 1   | 3     | 2.2 | 3           | 2.2 |
| 10+ .. | 83      | 11              | 5  | 0  | 0  | 0  | 16    | 44.4 | 1.3 | 0.5 | 83       | 1 | 2 | 0   | 3     | 8.3 | 3           | 8.3 |
| Total  | 265     | 44              | 9  | 1  | 0  | 0  | 54    | 20.3 | 1.2 | 0.2 | 265      | 3 | 6 | 1   | 5     | 2.7 | 8           | 2.7 |

The results represented per village.

| Map<br>Serial<br>No.         | Village              | Thana        | Date 1963 | SPLEEN     |                 |   |   |   |   |           |      |     |     | PARASITE   |    |      |                                  |   |   |     |             |     |                     |     |
|------------------------------|----------------------|--------------|-----------|------------|-----------------|---|---|---|---|-----------|------|-----|-----|------------|----|------|----------------------------------|---|---|-----|-------------|-----|---------------------|-----|
|                              |                      |              |           | No.<br>Ex. | Palpable Spleen |   |   |   |   | Tot.<br>a | SR   | AES | AS  | Infants    |    |      | All age groups including infants |   |   |     |             |     |                     |     |
|                              |                      |              |           |            | 1               | 2 | 3 | 4 | 5 |           |      |     |     | No.<br>Ex. | +  | IPR  | No.<br>Ex.                       | V | F | Mix | Tot.<br>tal | PR  | Gametocytes<br>+ GR |     |
| 1                            | 35—Fateh             | Chishtian    | 24th May  | 30         | 7               | 2 | 0 | 0 | 0 | 9         | 30.0 | 1.2 | 0.4 | 2          | 0  | 0.0  | 32                               | 0 | 3 | 0   | 3           | 9.4 | 3                   | 9.4 |
| 2                            | Wasti Joginder Singh | Do           | 26th May  | 29         | 6               | 2 | 1 | 0 | 0 | 9         | 31.0 | 1.4 | 0.4 | 4          | 0  | 0.0  | 33                               | 1 | 2 | 1   | 2           | 6.0 | 2                   | 6.0 |
| Total Chishtian Thana        |                      |              |           | 59         | 13              | 4 | 1 | 0 | 0 | 18        | 30.5 | 1.3 | 0.4 | 6          | 0  | 0.0  | 65                               | 1 | 5 | 1   | 5           | 7.7 | 5                   | 7.7 |
| 3                            | Keura Bhoona         | Shahar Farid | 25th May  | 44         | 3               | 0 | 0 | 0 | 0 | 3         | 6.8  | 1.0 | 0.1 | 0          | 0  | 0.0  | 50                               | 0 | 0 | 0   | 0           | 0.0 | 0                   | 0.0 |
| 4                            | Bunga Balooch        | Do           | Ditto     | 45         | 3               | 0 | 0 | 0 | 0 | 5         | 11.1 | 1.0 | 0.1 | 0          | 0  | 0.0  | 51                               | 0 | 0 | 0   | 0           | 0.0 | 0                   | 0.0 |
| 5                            | Nooran Balooch       | Do           | Ditto     | 42         | 4               | 1 | 0 | 0 | 0 | 5         | 11.2 | 1.2 | 0.1 | 0          | 0  | 0.0  | 49                               | 0 | 0 | 0   | 0           | 0.0 | 0                   | 0.0 |
| 6                            | Shahar Farid         | Do           | Ditto     | 48         | 12              | 3 | 0 | 0 | 0 | 15        | 31.2 | 1.2 | 0.3 | 2          | 1  | 50.0 | 50                               | 1 | 0 | 0   | 1           | 2.0 | 1                   | 2.0 |
| Total Shahar Farid Thana     |                      |              |           | 179        | 24              | 4 | 0 | 0 | 0 | 23        | 15.0 | 1.1 | 0.2 | 21         | 1  | 4.2  | 200                              | 1 | 0 | 0   | 1           | 0.5 | 1                   | 0.5 |
| 7                            | 176—Murad            | Dharaowala   | 23rd May  | 27         | 7               | 1 | 0 | 0 | 0 | 8         | 29.6 | 1.1 | 0.3 | ..         | .. | ..   | 27                               | 1 | 1 | 0   | 2           | 7.4 | 2                   | 7.4 |
| Total Dharaowala Thana       |                      |              |           | 27         | 7               | 1 | 0 | 0 | 0 | 8         | 29.6 | 1.1 | 0.3 | ..         | .. | ..   | 27                               | 1 | 1 | 0   | 2           | 7.4 | 2                   | 7.4 |
| GRAND TOTAL TEHSIL CHISHTIAN |                      |              |           | 265        | 44              | 9 | 1 | 0 | 0 | 54        | 20.4 | 1.2 | 0.2 | 27         | .. | 3.7  | 262                              | 3 | 6 | 1   | 8           | 2.7 | 8                   | 2.7 |

# **ANNEXURE VI** **RESULTS OF MALARIOMETRIC SURVEYS CONDUCTED IN OCTOBER 1963**

BY

District—BAHAWALNAGAR

DR. H. MASHAAL, W.H.O., SENIOR ADVISOR

Tehsil—CHISHTIAN

Consolidated results of 7 villages according to age groups.

| Age   | No. Ex. | SPLEEN          |    |    |    |    |       | PARASITE |     |     |         |   |   |      |       |     |   | Gametocyte |      |
|-------|---------|-----------------|----|----|----|----|-------|----------|-----|-----|---------|---|---|------|-------|-----|---|------------|------|
|       |         | Palpable Spleen |    |    |    |    |       | SR       | AES | AS  | No. Ex. | V | F | Mix. | Total | PR  |   | +          | G.R. |
|       |         | 1               | 2  | 3  | 4  | 5  | Total |          |     |     |         |   |   |      |       |     |   |            |      |
| 0-1   | ..      | ..              | .. | .. | .. | .. | ..    | ..       | ..  | ..  | 14      | 1 | 0 | 0    | 1     | 7.1 | 1 | 7.1        |      |
| 1+    | ..      | 21              | 0  | 0  | 0  | 0  | 0     | 0.0      | 0.0 | 0.0 | 21      | 0 | 0 | 0    | 0     | 0.0 | 0 | 0.0        |      |
| 2-4   | ..      | 29              | 3  | 0  | 0  | 0  | 3     | 10.3     | 1.0 | 0.2 | 29      | 0 | 0 | 0    | 0     | 0.0 | 0 | 0.0        |      |
| 5-9   | ..      | 71              | 11 | 2  | 0  | 0  | 13    | 18.3     | 1.1 | 0.2 | 71      | 4 | 0 | 0    | 4     | 5.0 | 4 | 5.6        |      |
| 10+   | ..      | 18              | 8  | 2  | 0  | 0  | 10    | 55.5     | 1.2 | 0.6 | 18      | 0 | 0 | 0    | 0     | 0.0 | 0 | 0.0        |      |
| Total | ..      | 139             | 22 | 4  | 0  | 0  | 26    | 18.7     | 1.1 | 0.2 | 139     | 5 | 0 | 0    | 5     | 3.2 | 5 | 3.2        |      |

—The results represented per village.

—The results represented per village.

| Map<br>Sr.<br>No.            | Village                  | Thana            | Date 1963        | SPLEEN     |                 |   |   |   |   |            |      |      |     | PARASITE              |                                  |      |            |    |   |     |           |      |         |      |     |
|------------------------------|--------------------------|------------------|------------------|------------|-----------------|---|---|---|---|------------|------|------|-----|-----------------------|----------------------------------|------|------------|----|---|-----|-----------|------|---------|------|-----|
|                              |                          |                  |                  | No.<br>Ex. | Palpable Spleen |   |   |   |   | Total<br>+ | SR   | AES  | AS  | Infants<br>No.<br>Ex. | All age groups including infants |      |            |    |   |     |           |      |         |      |     |
|                              |                          |                  |                  |            | 1               | 2 | 3 | 4 | 5 |            |      |      |     |                       | +                                | IPR  | No.<br>Ex. | V  | F | Mix | Tot<br>al | PR   | Gameto- |      |     |
|                              |                          |                  |                  |            |                 |   |   |   |   |            |      |      |     |                       |                                  |      |            |    |   |     |           |      | +       | GR   |     |
| 1                            | 35—Fateh                 | Chishtian        | 27th<br>Octob    | 16         | 4               | 0 | 0 | 0 | 0 | 0          | 4    | 37.5 | 1.0 | 0.4                   | 1                                | 0    | 0.0        | 17 | 0 | 0   | 0         | 0    | 0.0     | 0    | 0.0 |
| 2                            | Wasti Jogindor<br>Singh. | Do.              | 28th<br>October. | 17         | 4               | 1 | 0 | 0 | 0 | 5          | 29.4 | 1.2  | 0.3 | 4                     | 1                                | 25.0 | 21         | 1  | 0 | 0   | 1         | 4.8  | 1       | 4.8  |     |
| Total Thana<br>Chishtian.    |                          |                  |                  | 33         | 10              | 1 | 0 | 0 | 0 | 11         | 33.3 | 1.0  | 0.3 | 5                     | 1                                | 20.0 | 38         | 1  | 0 | 0   | 1         | 2.6  | 1       | 2.6  |     |
| 3                            | Kaura Bhootna            | Shahar<br>Farid. | 28th<br>October. | 21         | 0               | 2 | 0 | 0 | 0 | 2          | 9.5  | 2.0  | 0.2 | 2                     | 0                                | 0.0  | 23         | 3  | 0 | 0   | 3         | 13.0 | 3       | 13.0 |     |
| 4                            | Bunga Balooch            | Ditto.           | Ditto.           | 22         | 1               | 0 | 0 | 0 | 0 | 1          | 4.5  | 1.0  | 0.4 | 2                     | 0                                | 0.0  | 24         | 0  | 0 | 0   | 0         | 0.0  | 0       | 0.0  |     |
| 5                            | Nooran Balooch           | Ditto.           | Ditto.           | 20         | 2               | 0 | 0 | 0 | 0 | 2          | 10.0 | 1.0  | 0.1 | 5                     | 0                                | 0.0  | 25         | 1  | 0 | 0   | 1         | 4.0  | 1       | 4.0  |     |
| 6                            | Shahar Farid             | Ditto.           | 29th<br>October. | 19         | 2               | 0 | 0 | 0 | 0 | 2          | 10.5 | 1.0  | 0.1 | ..                    | ..                               | ..   | 19         | 0  | 0 | 0   | 0         | 0.0  | 0       | 0.0  |     |
| Total Thana Shahar<br>Farid. |                          |                  |                  | 82         | 5               | 2 | 0 | 0 | 0 | 7          | 8.5  | 1.3  | 0.1 | 9                     | 0                                | 0.0  | 91         | 4  | 0 | 0   | 4         | 4.4  | 4       | 4.4  |     |
| 7                            | 176—Murad                | Dharanwala       | 27th<br>October. | 24         | 7               | 1 | 0 | 0 | 0 | 8          | 33.3 | 1.1  | 0.3 | ..                    | ..                               | ..   | 24         | 0  | 0 | 0   | 0         | 0.0  | 0       | 0.0  |     |
| Total Thana Dha-<br>ranwala. |                          |                  |                  | 24         | 7               | 1 | 0 | 0 | 0 | 8          | 33.3 | 1.1  | 0.3 | ..                    | ..                               | ..   | 24         | 0  | 0 | 0   | 0         | 0.0  | 0       | 0.0  |     |
| GRAND TOTAL TEHSIL CHISHTIAN |                          |                  |                  | 139        | 22              | 4 | 0 | 0 | 0 | 26         | 18.7 | 1.1  | 0.2 | 14                    | 1                                | 7.1  | 153        | 5  | 0 | 0   | 5         | 3.2  | 5       | 3.2  |     |

# ANNEXURE VII

## RESULTS OF MALARIOMETRIC SURVEYS CONDUCTED IN MAY 1963

BY

Dr. H. MASHAAL, W.H.O., SENIOR ADV

Tehsil—FORT ABBAS

District—BAHAWALNAGAR

Consolidated results of 33 villages according to age groups.

| Age   | No. Ex. | SPLEEN          |     |     |    |    |       |      | PARASITE |     |         |    |     |     |     | Gametocyte |     |      |
|-------|---------|-----------------|-----|-----|----|----|-------|------|----------|-----|---------|----|-----|-----|-----|------------|-----|------|
|       |         | Palpable Spleen |     |     |    |    |       | SR   | AES      | AS  | No. Ex. | V  | F   | Mix | Tot | PR         | +   | GR   |
|       |         | 1               | 2   | 3   | 4  | 5  | Total |      |          |     |         |    |     |     |     |            |     |      |
| 0-1   | ..      | ..              | ..  | ..  | .. | .. | ..    | ..   | ..       | ..  | 25      | 1  | 3   | 0   | 4   | 16.0       | 4   | 16.0 |
| 1+    | 63      | 14              | 10  | 8   | 0  | 0  | 32    | 61.9 | 1.7      | 1.1 | 83      | 6  | 6   | 0   | 12  | 19.0       | 12  | 19.0 |
| 2-4   | 114     | 19              | 38  | 16  | 2  | 0  | 65    | 57.0 | 2.0      | 1.1 | 114     | 12 | 21  | 3   | 30  | 26.3       | 28  | 24.5 |
| 5-9   | 609     | 188             | 145 | 60  | 23 | 4  | 420   | 62.7 | 1.8      | 1.1 | 609     | 12 | 59  | 2   | 69  | 10.3       | 58  | 8.6  |
| 0+    | 312     | 101             | 75  | 17  | 6  | 2  | 211   | 67.4 | 1.7      | 1.1 | 312     | 5  | 21  | 0   | 26  | 8.3        | 19  | 6.0  |
| Total | 1189    | 322             | 267 | 109 | 31 | 6  | 735   | 63.4 | 1.8      | 1.1 | 1184    | 36 | 110 | 5   | 141 | 11.0       | 121 | 10.2 |

The results represented per village.

| Map<br>Sr.<br>No. | Village | Thana | Date 1963 | SPLEEN    |                 |   |   |   |   |            |    | PARASITE |    |            |   |     |                                  |   |   |     |     |    |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |
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|                   |         |       |           | No.<br>Ex | Palpable Spleen |   |   |   |   | Tot-<br>al | SR | AES      | AS | Infants    |   |     | All age groups including infants |   |   |     |     |    |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |
|                   |         |       |           |           | 1               | 2 | 3 | 4 | 5 |            |    |          |    | No.<br>Ex. | + | IPR | No.<br>Ex.                       | V | F | Mix | Tot | PR | Gameto-<br>cyte |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |
|                   |         |       |           |           |                 |   |   |   |   |            |    |          |    |            |   |     |                                  |   |   |     |     |    |                 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | </ |

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Chak 268  
Chak 263  
Fort Abbas  
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Chak 285  
Chak 286

Total Thana Abbas.

Chak 293  
Chak 294  
Chak 289  
Chak 293  
Chak 306  
Chak 314  
Marot Fort  
Chak 327  
Chak 319  
Chak 340

Total Thana

GRAND TOTAL

JULY-64

District—BAHAWA NAGAR

## ANNEXURE VIII

75

Continued Table No. Of Annexure VII

Tehsil—FORT ABBAS

| Table No. Of Annexure VII     |             |            |           |            |                 |     |     |    |   | Tehsil-FORT ABBAS |       |     |     |            |    |      |                                  |    |     |     |     |      |                   |      |  |
|-------------------------------|-------------|------------|-----------|------------|-----------------|-----|-----|----|---|-------------------|-------|-----|-----|------------|----|------|----------------------------------|----|-----|-----|-----|------|-------------------|------|--|
| Map<br>Sr.<br>No.             | Village     | Thana      | Date 1963 | No.<br>Ex. | SPLEEN          |     |     |    |   | PARASITE          |       |     |     |            |    |      |                                  |    |     |     |     |      |                   |      |  |
|                               |             |            |           |            | Palpable Spleen |     |     |    |   | To-<br>tal        | SR    | AES | AS  | Infants    |    |      | All age groups including infants |    |     |     |     |      |                   |      |  |
|                               |             |            |           |            | 1               | 2   | 3   | 4  | 5 |                   |       |     |     | No.<br>Ex. | +  | IPR  | No.<br>Ex.                       | V  | F   | Mix | Tot | PR   | Game to-<br>cyle. |      |  |
|                               |             |            |           |            |                 |     |     |    |   |                   |       |     |     |            |    |      |                                  |    |     |     |     |      | +                 | GR   |  |
| 11                            | Chak 196-HB | Fort Abbas | 22nd May  | 52         | 20              | 6   | 0   | 0  | 0 | 26                | 60.0  | 1.2 | 0.6 | ..         | .. | ..   | 52                               | 0  | 1   | 0   | 1   | 1.9  | 1                 | 1.9  |  |
| 12                            | Chak 234-HR | Ditto.     | Ditto     | 13         | 5               | 1   | 0   | 0  | 0 | 6                 | 46.0  | 1.1 | 0.5 | ..         | .. | ..   | 13                               | 0  | 1   | 0   | 1   | 7.7  | 0                 | 0.0  |  |
| 13                            | Chak 239-HR | Ditto      | Ditto     | 15         | 3               | 7   | 4   | 1  | 0 | 15                | 100.0 | 2.2 | 2.2 | ..         | .. | ..   | 15                               | 0  | 1   | 0   | 1   | 6.7  | 0                 | 0.0  |  |
| 14                            | Chak 240-HL | Ditto      | Ditto     | 33         | 15              | 9   | 3   | 0  | 0 | 27                | 81.5  | 1.5 | 1.2 | ..         | .. | ..   | 33                               | 0  | 3   | 0   | 3   | 9.1  | 2                 | 6.0  |  |
| 15                            | Chak 259-HL | Ditto      | Ditto     | 15         | 5               | 5   | 1   | 1  | 0 | 12                | 80.0  | 1.8 | 1.4 | ..         | .. | ..   | 15                               | 1  | 3   | 1   | 3   | 20.0 | 3                 | 20.0 |  |
| 16                            | Chak 242-HL | Ditto      | Ditto     | 48         | 16              | 10  | 4   | 0  | 0 | 30                | 62.5  | 1.6 | 1.0 | ..         | .. | ..   | 48                               | 0  | 11  | 0   | 11  | 22.9 | 11                | 22.9 |  |
| 17                            | Chak 261-HR | Ditto      | Ditto     | 9          | 4               | 4   | 0   | 0  | 0 | 8                 | 88.9  | 1.5 | 1.3 | ..         | .. | ..   | 9                                | 0  | 2   | 0   | 2   | 22.2 | 2                 | 22.2 |  |
| 18                            | Chak 268-HL | Ditto      | 21st May  | 40         | 11              | 8   | 7   | 0  | 0 | 26                | 65.0  | 1.8 | 1.2 | 3          | 2  | 65.7 | 43                               | 7  | 11  | 1   | 17  | 39.5 | 16                | 37.2 |  |
| 19                            | Chak 263-HR | Ditto      | Ditto     | 38         | 10              | 10  | 8   | 1  | 0 | 29                | 76.3  | 2.0 | 1.5 | ..         | .. | ..   | 38                               | 3  | 10  | 1   | 12  | 31.6 | 7                 | 18.4 |  |
| 20                            | Fort Abbas  | Ditto      | Ditto     | 37         | 16              | 2   | 0   | 0  | 0 | 18                | 48.6  | 1.1 | 0.5 | ..         | .. | ..   | 37                               | 0  | 0   | 0   | 0   | 0.0  | 0                 | 0.0  |  |
| 21                            | Chak 282-HR | Ditto      | Ditto     | 37         | 14              | 12  | 4   | 4  | 0 | 34                | 91.9  | 1.9 | 1.6 | ..         | .. | ..   | 37                               | 3  | 7   | 0   | 10  | 27.0 | 5                 | 13.5 |  |
| 22                            | Chak 285-HR | Ditto      | Ditto     | 30         | 15              | 7   | 2   | 0  | 1 | 25                | 83.3  | 1.6 | 1.3 | ..         | .. | ..   | 30                               | 0  | 7   | 0   | 7   | 23.3 | 4                 | 13.3 |  |
| 23                            | Chak 286-HR | Ditto      | Ditto     | 12         | 4               | 3   | 0   | 0  | 0 | 7                 | 58.3  | 1.4 | 0.8 | ..         | .. | ..   | 12                               | 0  | 3   | 0   | 3   | 25.0 | 3                 | 25.0 |  |
| Total Thana Fort Abbas.       |             |            |           | 379        | 138             | 84  | 33  | 7  | 1 | 263               | 69.4  | 1.7 | 1.2 | 3          | 2  | 66.7 | 382                              | 14 | 60  | 3   | 71  | 18.6 | 54                | 14.1 |  |
| 24                            | Chak 293-HR | Marot      | 20th May  | 21         | 4               | 8   | 3   | 0  | 0 | 15                | 71.4  | 1.9 | 1.3 | ..         | .. | ..   | 21                               | 0  | 0   | 0   | 0   | 0.0  | 0                 | 0.0  |  |
| 25                            | Chak 294-HR | Do.        | 21st May  | 25         | 6               | 13  | 5   | 0  | 0 | 24                | 96.0  | 2.0 | 1.8 | ..         | .. | ..   | 25                               | 0  | 1   | 0   | 1   | 4.0  | 1                 | 4.0  |  |
| 26                            | Chak 289-HR | Do.        | Ditto     | 22         | 3               | 9   | 3   | 2  | 0 | 17                | 77.3  | 2.2 | 1.7 | 2          | 0  | 0.0  | 24                               | 0  | 5   | 0   | 5   | 20.8 | 5                 | 20.8 |  |
| 27                            | Chak 293-HR | Do.        | Ditto     | 26         | 6               | 5   | 10  | 3  | 0 | 24                | 92.3  | 2.4 | 2.2 | ..         | .. | ..   | 26                               | 3  | 1   | 0   | 4   | 15.4 | 3                 | 11.5 |  |
| 28                            | Chak 306-HR | Do.        | 20th May  | 32         | 10              | 8   | 4   | 0  | 2 | 22                | 75.0  | 2.1 | 1.5 | ..         | .. | ..   | 32                               | 0  | 3   | 0   | 3   | 9.4  | 2                 | 6.2  |  |
| 29                            | Chak 314-HR | Do.        | Ditto     | 30         | 12              | 5   | 5   | 1  | 0 | 23                | 76.7  | 1.7 | 1.3 | ..         | .. | ..   | 30                               | 0  | 2   | 0   | 2   | 6.7  | 2                 | 6.7  |  |
| 30                            | Marot Fort  | Do.        | Ditto     | 11         | 1               | 5   | 1   | 0  | 0 | 7                 | 63.6  | 2.0 | 1.2 | ..         | .. | ..   | 11                               | 0  | 1   | 0   | 1   | 9.1  | 1                 | 9.1  |  |
| 31                            | Chak 327-HR | Do.        | 19th May  | 49         | 14              | 12  | 6   | 0  | 0 | 32                | 65.3  | 1.7 | 1.1 | ..         | .. | ..   | 49                               | 2  | 3   | 0   | 5   | 10.2 | 5                 | 10.2 |  |
| 32                            | Chak 319-HR | Do.        | Ditto     | 69         | 10              | 25  | 9   | 6  | 1 | 51                | 73.9  | 2.2 | 1.6 | 7          | 2  | 28.6 | 76                               | 3  | 21  | 0   | 24  | 31.6 | 23                | 30.3 |  |
| 33                            | Chak 340-HR | Do.        | Ditto     | 77         | 10              | 36  | 19  | 7  | 2 | 74                | 96.1  | 2.3 | 2.2 | 4          | 0  | 0.0  | 81                               | 7  | 4   | 1   | 10  | 12.3 | 10                | 12.3 |  |
| Total Thana Marot             |             |            |           | 362        | 76              | 126 | 65  | 19 | 5 | 291               | 80.4  | 2.1 | 1.7 | 13         | 2  | 15.4 | 375                              | 15 | 41  | 1   | 55  | 14.7 | 52                | 13.9 |  |
| GRAND TOTAL TEHSIL FORT ABBAS |             |            |           | 1,159      | 322             | 267 | 100 | 31 | 6 | 735               | 63.4  | 1.8 | 1.2 | 25         | 4  | 16.0 | 1,184                            | 36 | 110 | 5   | 141 | 11.9 | 121               | 10.2 |  |

## ANNEXURE XI

## WEST PAKISTAN

RESULTS OF ENTOMOLOGICAL SURVEY (ADULT CAPTURE) CONDUCTED IN BAHAWALNAGAR DISTRICT DURING MAY AND OCTOBER 1963

| Thana               | Map<br>Sr.<br>No. | Village                     | Date 1963        | Room no. |     |         | A. cul. |     | A. steph. |     | A. spb. |     | A. pul. |   | A. ann. |    | + Room |          |
|---------------------|-------------------|-----------------------------|------------------|----------|-----|---------|---------|-----|-----------|-----|---------|-----|---------|---|---------|----|--------|----------|
|                     |                   |                             |                  | No.      | Typ | Remarks | F       | M   | F         | M   | F       | M   | F       | M | F       | M  | A. cul | A. steph |
| TENSIL MICHINARAD   |                   |                             |                  |          |     |         |         |     |           |     |         |     |         |   |         |    |        |          |
| Meehad Ganj         | 1                 | Amruka ...                  | 28th May ...     | 1        | A   | *       | 27      | 9   | 124       | 16  | 1       | 0   | 2       | 0 | 37      | 3  | 1      | 1        |
|                     |                   |                             | 22nd October ... | 1        | A   | *       | 19      | 7   | 6         | 3   | 72      | 17  | 66      | 4 | 8       | 0  | 1      | 1        |
|                     | 2                 | Hasil Saru ...              | 28th May ...     | 1        | A   |         | 59      | 45  | 242       | 26  | 1       | 0   | 3       | 0 | 68      | 3  | 1      | 1        |
|                     |                   |                             | 22nd October ... | 1        | A   | *       | 150     | 222 | 3         | 4   | 108     | 98  | 19      | 0 | 16      | 0  | 1      | 1        |
| Mandi Sadiq Ganj    | 5                 | Chupalia ...                | 28th May ...     | 1        | A   |         | 53      | 18  | 31        | 7   | 0       | 0   | 0       | 0 | 41      | 0  | 1      | 1        |
|                     |                   |                             | 22nd October ... | 1        | A   | *       | 4       | 3   | 2         | 1   | 49      | 1   | 7       | 2 | 1       | 0  | 1      | 1        |
|                     | 6                 | Jaurki Sikhawali ...        | 28th May ...     | 2        | A   |         | 7       | 5   | 9         | 7   | 0       | 0   | 1       | 0 | 29      | 1  | 1      | 1        |
|                     |                   |                             | 22nd October ... | 1        | A   | 3       | 1       | 0   | 0         | 0   | 16      | 1   | 2       | 0 | 0       | 0  | 1      | 0        |
|                     | 7                 | Mandi Sadiq Ganj ...        | 28th May ...     | 1        | S   |         | 0       | 0   | 2         | 0   | 0       | 0   | 0       | 0 | 10      | 5  | 0      | 1        |
|                     |                   |                             | 23rd October ... | 1        | S   | *       | 0       | 0   | 3         | 0   | 60      | 14  | 2       | 0 | 0       | 0  | 0      | 1        |
|                     | 8                 | Kaka Singh Wala ...         | 28th May ...     | 1        | A   |         | 26      | 6   | 9         | 4   | 0       | 0   | 18      | 1 | 247     | 24 | 1      | 1        |
|                     |                   |                             | 22nd October ... | 1        | A   | *       | 4       | 3   | 7         | 3   | 15      | 9   | 15      | 0 | 1       | 0  | 1      | 1        |
| Minobabad           | 10                | Chak Punan ...              | 27th May ...     | 1        | A   | *       | 46      | 160 | 205       | 15  | 0       | 0   | 1       | 0 | 58      | 6  | 1      | 1        |
|                     |                   |                             | 23rd October ... | 1        | L   | +       | 3       | 0   | 43        | 59  | 2       | 6   | 5       | 0 | 0       | 0  | 1      | 1        |
|                     | 11                | Mundowala ...               | 27th May ...     | 1        | A   |         | 350     | 80  | 197       | 121 | 0       | 0   | 3       | 0 | 48      | 4  | 1      | 1        |
|                     |                   |                             | 25th October ... | 1        | A   | *       | 27      | 34  | 39        | 37  | 27      | 25  | 13      | 0 | 0       | 0  | 1      | 1        |
|                     | 12                | Mausemuala ...              | 27th May 1 ...   | 1        | A   |         | 28      | 135 | 322       | 43  | 0       | 0   | 2       | 0 | 30      | 0  | 1      | 1        |
|                     |                   |                             | 33rd October ... | 1        | L   | +       | 4       | 0   | 1353      | 597 | 140     | 160 | 5       | 0 | 0       | 0  | 1      | 1        |
|                     | 13                | Mohammadpura San-<br>satan. | 27th May ...     | 1        | A   |         | 0       | 0   | 2         | 2   | 10      | 2   | 0       | 0 | 7       | 1  | 1      | 1        |
|                     |                   |                             | 24th October ... | 1        | A   | *       | 19      | 1   | 4         | 2   | 100     | 5   | 12      | 0 | 0       | 0  | 1      | 1        |
|                     | 14                | Roroo ...                   | 27th May ...     | 1        | A   |         | 13      | 0   | 62        | 20  | 2       | 0   | 0       | 0 | 1       | 0  | 1      | 1        |
|                     |                   |                             | 24th October ... | 1        | A   | *       | 1       | 0   | 1         | 0   | 350     | 132 | 0       | 0 | 0       | 0  | 1      | 1        |
| TENSIL BAHAWALNAGAR |                   |                             |                  |          |     |         |         |     |           |     |         |     |         |   |         |    |        |          |
| Sadiqpur            | 3                 | Momanabad ...               | 20th May ...     | 1        | L   |         | 0       | 0   | 0         | 0   | 0       | 0   | 0       | 0 | 0       | 0  | 0      | 0        |
|                     |                   |                             | 25th October ... | 1        | L   | *       | 1       | 0   | 10        | 8   | 10      | 8   | 2       | 0 | 0       | 0  | 1      | 1        |
|                     | 4                 | Chak Maulvi Wala ...        | 28th May ...     | 1        | A   |         | 2       | 0   | 1         | 0   | 0       | 0   | 0       | 0 | 0       | 0  | 1      | 1        |
|                     |                   |                             | 25th October ... | 1        | A   | *       | 0       | 0   | 13        | 13  | 13      | 9   | 0       | 0 | 0       | 0  | 0      | 1        |
| Dunga Bunga         | 5                 | Jandwala ...                | 24th May ...     | 1        | A   |         | 3       | 0   | 0         | 0   | 0       | 0   | 0       | 0 | 0       | 0  | 1      | 0        |
|                     |                   |                             | 27th October ... | 1        | A   | *       | 0       | 0   | 0         | 0   | 13      | 3   | 0       | 0 | 0       | 0  | 0      | 0        |
|                     | 6                 | Mahabli ...                 | 24th May ...     | 2        | A   |         | 49      | 24  | 3         | 1   | 1       | 1   | 0       | 0 | 0       | 0  | 2      | 1        |
|                     |                   |                             | 27th October ... | 1        | A   | \$      | 3       | 1   | 0         | 0   | 32      | 15  | 0       | 0 | 0       | 0  | 1      | 0        |
|                     | 7                 | Dunga Bunga ...             | 24th May ...     | 1        | A   |         | 1       | 0   | 3         | 0   | 0       | 0   | 0       | 0 | 0       | 0  | 1      | 1        |
|                     |                   |                             | 24th October ... | 1        | A   | *       | 0       | 0   | 1         | 1   | 64      | 0   | 0       | 0 | 0       | 0  | 0      | 1        |
|                     | 8                 | Gulab Ali ...               | 24th May ...     | 3        | A   |         | 3       | 1   | 3         | 0   | 15      | 4   | 0       | 0 | 1       | 0  | 2      | 1        |
|                     |                   |                             | 24th October ... | 1        | A   | ...     | 0       | 0   | 0         | 0   | 71      | 42  | 0       | 0 | 0       | 0  | 0      | 0        |

A ... Animal Shed.  
 S ... Store Room.  
 L ... Living Room.  
 Sc ... School.  
 \* ... Same room which was examined in May.  
 + ... Same room but modified and changed into a Living Room.  
 \$ ... This room is one of the rooms examined in May.

**ANNEXURE XII**  
**RESULTS OF ENTOMOLOGICAL SURVEY (ADULT CAPTURE) CONDUCTED IN BAHAWALNAGAR**  
**DURING MAY AND OCT. 1963.**

TEHSIL - CHISHTIAN

Continued From Annexure XI

| Thana        | Map Serial No. | Village           | Date 1963 | Room ex. |      | A. CUL. |    | A. STEPH. |   | A. SUB. |    | A. FUL. |   | O. ANN. |   | +Rooms |
|--------------|----------------|-------------------|-----------|----------|------|---------|----|-----------|---|---------|----|---------|---|---------|---|--------|
|              |                |                   |           | No.      | Type | F       | M  | F         | M | F       | M  | F       | M | F       | M |        |
| Chishtian    | 1              | Chak 35 Fateh ..  | 25/5      | 1        | A    | 52      | 25 | 2         | 0 | 2       | 0  | 0       | 0 | 0       | 0 | 1      |
|              |                |                   | 27/10     | 1        | A*   | 4       | 3  | 0         | 0 | 85      | 5  | 0       | 0 | 0       | 0 | 1      |
|              |                |                   | 28/5      | 1        | A    | 162     | 25 | 3         | 1 | 2       | 0  | 0       | 0 | 0       | 0 | 1      |
|              |                |                   | 28/10     | 1        | L +  | 71      | 32 | 5         | 5 | 48      | 17 | 3       | 0 | 0       | 0 | 1      |
| Shahar Farid | 3              | Kaure Bhootne ..  | 25/5      | 1        | S    | 8       | 2  | 2         | 0 | 0       | 0  | 0       | 0 | 0       | 0 | 1      |
|              |                |                   | 28/10     | 1        | S*   | 21      | 6  | 0         | 0 | 10      | 4  | 0       | 0 | 0       | 0 | 0      |
|              | 4              | Bunga Balooch ..  | 25/4      | 1        | L    | 0       | 0  | 0         | 0 | 0       | 0  | 0       | 0 | 0       | 0 | 0      |
|              |                |                   | 28/10     | 1        | L*   | 0       | 4  | 0         | 0 | 8       | 4  | 0       | 0 | 0       | 0 | 1      |
|              | 5              | Nooran Balooch .. | 25/5      | 1        | L    | 0       | 0  | 0         | 0 | 1       | 0  | 0       | 0 | 0       | 0 | 0      |
|              |                |                   | 28/10     | 1        | L*   | 0       | 4  | 0         | 0 | 8       | 4  | 0       | 0 | 0       | 0 | 1      |
|              | 6              | Shahar Farid ..   | 25/5      | 1        | S    | 0       | 0  | 1         | 1 | 1       | 1  | 0       | 0 | 0       | 0 | 1      |
| Dharanwala   | 7              | Chak 176 Murad .. | 23/5      | 1        | A    | 11      | 0  | 0         | 0 | 0       | 1  | 1       | 0 | 0       | 0 | 1      |
|              |                |                   | 27/10     | 1        | A*   | 14      | 1  | 0         | 0 | 80      | 84 | 0       | 0 | 0       | 0 | 1      |

A—Animal shed.

S—Store room

L—Living room

\*—Same room which was examined in May.

+—Same room but modified and converted in to a Living room.

**ANNEXURE X**  
**RESULTS OF ENTOMOLOGICAL SURVEY (ADULT CAPTURE) CONDUCTED IN BAHAWALNAGAR DURING MAY AND OCTOBER 1963**  
**TEHSIL—FORT ABBAS**

| RESULTS OF ENTOMOLOGICAL SURVEY (ADULT CATERPILLARS) |          |             |              |         |      |         |    |          |    |         |     |         |    |          |       |      |        |
|------------------------------------------------------|----------|-------------|--------------|---------|------|---------|----|----------|----|---------|-----|---------|----|----------|-------|------|--------|
| Thana                                                | Map S.No | Village     | Date 1963    | Room Ex |      | A. cul. |    | A. step. |    | A. sub. |     | A. pul. |    | A. ann + |       | Room |        |
|                                                      |          |             |              | No.     | Type | F       | M  | F        | M  | F       | M   | M       | F  | M        | A Cul |      | A Step |
| 1                                                    | 2        | 3           | 4            | 5       | 6    | 7       | 8  | 9        | 10 | 11      | 12  | 13      | 14 | 15       | 16    | 17   | 18     |
| Dahranwala                                           | 1        | Chak 30-3R  | 23rd May     | 1       | S    | 89      | 51 | 4        | 1  | 3       | 0   | 0       | 0  | 0        | 0     | 1    | 1      |
|                                                      |          |             | 30th October | 1       | S*   | 0       | 0  | 0        | 0  | 40      | 0   | 0       | 0  | 0        | 0     | 0    | 0      |
|                                                      | 3        | Chak 38-3R  | 23rd May     | 2       | A    | 43      | 8  | 3        | 0  | 0       | 1   | 0       | 0  | 0        | 0     | 2    | 2      |
|                                                      |          |             | 29th October | 1       | A*   | 0       | 0  | 0        | 0  | 210     | 8   | 0       | 0  | 0        | 0     | 0    | 0      |
| Hateonabad.                                          | 5        | Chak 67-4R  | 23rd May     | 1       | A    | 59      | 9  | 1        | 0  | 0       | 0   | 0       | 0  | 0        | 0     | 1    | 1      |
|                                                      |          |             | 26th October | 1       | A*   | 15      | 3  | 0        | 0  | 225     | 89  | 0       | 0  | 0        | 0     | 1    | 0      |
|                                                      | 6        | Chak 55-4R  | 23rd May     | 1       | A    | 44      | 2  | 0        | 0  | 0       | 0   | 0       | 0  | 0        | 0     | 1    | 0      |
|                                                      |          |             | 26th October | 1       | A*   | 15      | 0  | 0        | 0  | 397     | 103 | 0       | 0  | 0        | 0     | 1    | 0      |
| Fort Abbas                                           | 8        | Chak 52-4R  | 23rd May     | 1       | S    | 2       | 0  | 0        | 0  | 1       | 0   | 1       | 0  | 0        | 0     | 1    | 0      |
|                                                      |          |             | 26th October | 1       | S*   | 1       | 0  | 0        | 0  | 49      | 29  | 0       | 0  | 0        | 0     | 1    | 0      |
|                                                      | 9        | Chak 149-B  | 22nd May     | 1       | A    | 75      | 9  | 0        | 0  | 1       | 0   | 0       | 0  | 1        | 0     | 1    | 0      |
|                                                      |          |             | 31st October | 1       | A*   | 30      | 20 | 0        | 0  | 371     | 140 | 1       | 0  | 2        | 0     | 1    | 0      |
| Fort Abbas                                           | 10       | Chak 155-3L | 22nd May     | 1       | A    | 60      | 9  | 0        | 0  | 0       | 0   | 1       | 0  | 0        | 0     | 1    | 0      |
|                                                      |          |             | 26th October | 1       | A*   | 5       | 0  | 0        | 0  | 110     | 43  | 0       | 0  | 0        | 0     | 1    | 0      |
|                                                      | 11       | Chak 196-AB | 22nd May     | 1       | A    | 8       | 2  | 0        | 0  | 0       | 0   | 0       | 0  | 0        | 0     | 1    | 0      |
|                                                      |          |             | 31st October | 1       | A*   | 3       | 3  | 0        | 0  | 160     | 40  | 0       | 0  | 0        | 0     | 1    | 0      |

## Contd. from Annexure XIII

| 1  | 2           | 3  | 4            | 5  | 6 | 7  | 8   | 9   | 10 | 11 | 12  | 13  | 14 | 15 | 16 | 71 | 18 |
|----|-------------|----|--------------|----|---|----|-----|-----|----|----|-----|-----|----|----|----|----|----|
| 14 | Chak 240-HL | .. | 22nd May     | .. | 2 | A  | 125 | 63  | 2  | 2  | 15  | 2   | 0  | 0  | 0  | 1  | 2  |
| 15 | Chak 242-HL | .. | 1st November | .. | 1 | A  | 23  | 16  | 2  | 2  | 177 | 150 | 0  | 0  | 0  | 1  | 1  |
| 16 | Chak 244-HL | .. | 22nd May     | .. | 1 | A  | 135 | 27  | 4  | 1  | 52  | 34  | 0  | 0  | 0  | 1  | 1  |
| 17 | Chak 246-HL | .. | 1st November | .. | 1 | A  | 9   | 13  | 2  | 1  | 66  | 85  | 0  | 0  | 0  | 1  | 1  |
| 18 | Chak 248-HL | .. | 21st May     | .. | 1 | A  | 170 | 7   | 3  | 0  | 3   | 0   | 1  | 0  | 0  | 1  | 1  |
| 19 | Chak 250-HL | .. | 1st November | .. | 1 | A  | 35  | 7   | 3  | 2  | 665 | 113 | 2  | 0  | 0  | 1  | 1  |
| 20 | Chak 252-HL | .. | 21st May     | .. | 1 | .. | 8   | 2   | 0  | 0  | 3   | 2   | 1  | 0  | 0  | 1  | 0  |
| 21 | Chak 254-HL | .. | 1st November | .. | 1 | .. | 10  | 5   | 2  | 0  | 55  | 13  | 0  | 0  | 0  | 1  | 1  |
| 22 | Chak 256-HL | .. | 22nd May     | .. | 2 | A  | 0   | 0   | 1  | 0  | 0   | 0   | 0  | 0  | 0  | 0  | 1  |
| 23 | Chak 258-HL | .. | 1st November | .. | 1 | A  | 3   | 6   | 0  | 2  | 124 | 39  | 0  | 0  | 0  | 1  | 1  |
| 24 | Chak 260-HL | .. | 21st May     | .. | 1 | A  | 49  | 12  | 1  | 0  | 3   | 5   | 2  | 0  | 0  | 1  | 1  |
| 25 | Chak 262-HL | .. | 1st November | .. | 1 | A  | 20  | 23  | 2  | 2  | 258 | 90  | 1  | 0  | 0  | 1  | 1  |
| 26 | Chak 264-HL | .. | 21st May     | .. | 1 | A  | 130 | 40  | 3  | 0  | 6   | 41  | 0  | 0  | 0  | 1  | 1  |
| 27 | Chak 266-HL | .. | 31st October | .. | 1 | A  | 85  | 35  | 1  | 1  | 245 | 200 | 0  | 0  | 1  | 1  | 1  |
| 28 | Chak 268-HL | .. | 20th May     | .. | 1 | L  | 3   | 0   | 0  | 0  | 1   | 0   | 1  | 0  | 0  | 1  | 0  |
| 29 | Chak 270-HL | .. | 31st October | .. | 1 | L  | 4   | 2   | 2  | 1  | 32  | 6   | 0  | 0  | 0  | 1  | 1  |
| 30 | Chak 272-HL | .. | 21st May     | .. | 1 | So | 25  | 19  | 2  | 0  | 0   | 0   | 0  | 0  | 0  | 1  | 1  |
| 31 | Chak 274-HL | .. | 1st November | .. | 1 | So | 36  | 35  | 2  | 9  | 32  | 6   | 0  | 0  | 0  | 1  | 1  |
| 32 | Chak 276-HL | .. | 21st May     | .. | 1 | S  | 400 | 128 | 4  | 5  | 3   | 0   | 0  | 0  | 0  | 1  | 1  |
| 33 | Chak 278-HL | .. | 1st November | .. | 1 | S  | 200 | 140 | 10 | 10 | 460 | 240 | 5  | 0  | 0  | 1  | 1  |
| 34 | Chak 280-HL | .. | 20th May     | .. | 1 | A  | 103 | 21  | 1  | 0  | 20  | 4   | 0  | 0  | 0  | 1  | 1  |
| 35 | Chak 282-HL | .. | 30th October | .. | 1 | A  | 100 | 5   | 0  | 0  | 230 | 20  | 0  | 0  | 1  | 1  | 1  |
| 36 | Chak 284-HL | .. | 20th May     | .. | 1 | A  | 62  | 10  | 1  | 0  | 8   | 4   | 1  | 0  | 0  | 1  | 1  |

## Contd. from Annexure XIII

| 1  | 2           | 3  | 4            | 5 | 6  | 7    | 8    | 9  | 10 | 11  | 12  | 13 | 14 | 15 | 16 | 17 | 18 |
|----|-------------|----|--------------|---|----|------|------|----|----|-----|-----|----|----|----|----|----|----|
|    |             |    | 30th October | 1 | A  | 44   | 19   | 0  | 0  | 85  | 30  | 1  | 0  | 0  | 0  | 1  | 0  |
| 30 | Fort Marot  | .. | 20th May     | 1 | Sc | 3    | 1    | 0  | 0  | 0   | 0   | 0  | 0  | 2  | 0  | 1  | 0  |
| 31 | Chak 327-HR | .. | 19th May     | 2 | A  | 1617 | 1160 | 12 | 2  | 55  | 42  | 2  | 0  | 15 | 0  | 2  | 2  |
|    |             |    | 30th October | 1 | A  | 25   | 9    | 1  | 0  | 500 | 222 | 0  | 0  | 0  | 0  | 1  | 1  |
| 32 | Chak 319-HR | .. | 19th May     | 2 | A  | 178  | 23   | 2  | 1  | 23  | 6   | 11 | 0  | 6  | 0  | 2  | 2  |
|    |             |    | 30th October | 1 | A  | 29   | 7    | 3  | 3  | 219 | 58  | 2  | 0  | 0  | 0  | 1  | 1  |
| 33 | Chak 340-HR | .. | 19th May     | 2 | S  | 281  | 71   | 6  | 2  | 14  | 7   | 12 | 0  | 0  | 0  | 2  | 2  |
|    |             |    | 30th October | 1 | S  | 84   | 50   | 1  | 2  | 122 | 50  | 1  | 0  | 0  | 0  | 1  | 1  |

.. Animal Shed.  
 .. Living room.  
 .. Store.  
 .. School.  
 .. Same room which was examined in May.  
 .. One of the rooms examined in May.  
 .. Another room.

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# ENTOMOLOGICAL SURVEY OF THE VECTORS OF SCRUB TYPHUS IN WEST PAKISTAN

by

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The Typhus group of fevers has often followed wars, labour movement and large scale migrations of human population, resulting in enormous numbers of deaths and wide spread devastation. Under normal conditions these diseases due to their modest behaviour may continue unrecognised and unapprehended in confined areas.

Modern medicine in recent years has come up with excellent chemotherapeutics against these diseases and hence, though highly fatal when untreated, Typhus seldom ends in the death of hospital patients.

Localised epidemics of Typhus type fevers have long been reported from certain areas of West Pakistan. The yearly influx of Pawindas from Afghanistan was formerly suspected responsible for spreading the infection in the areas of their temporary encampments during the winter months, though there is no conclusive evidence of any epidemic of Typhus fever having occurred amongst Pawindas exclusively. The last epidemic of Typhus fever occurred in Dera Ismail Khan during 1956-57, causing only, 8 deaths in its wake. Following the ban on the entry of Pawindas into West Pakistan in 1961, no cases of Typhus have been reported from any part of the country. But this alone in no way proves the non-existence of the disease from West Pakistan in the absence of Pawindas. There are strong reasons suggesting that the disease may be endemic in certain mountainous and sub-mountainous terrains of North-West Frontier in West Pakistan, which escape detection due to lack of diagnostic facilities and unalarming incidence.

The occurrence of scrub typhus and its recognition during 1961 in Sialkot may be cited as an interesting instance, where the discovery of the disease was only incidental. Immediately after a group of persons not formerly exposed to this disease inhabited a particular piece of land, cases of scrub typhus started coming to the notice of the expert medical staff available to the group. Majid (1963) and Nur Ahmad and Burney (1962) have already published their findings on this situation.

There is no doubt that the disease must have existed in this area long before its detection. This is evident from the positive sera of some of the civilian patients of that area (Majid, *op. cit.*) and the recovery of Rickettsial agent from wild rats and pool of mites. (Nur Ahmad and Burney *op. cit.*) What kept the disease unrevealed for so long a period has been perhaps the sporadic occurrence of cases in the otherwise immune local population amongst which the outbreak is hardly ever sudden and dramatic, in contrast to the incidence witnessed amongst the unimmune controlled group.

Scrub Typhus was noticed as early as 1948 (Kalra and Rao, 1951), when ten cases of this disease were diagnosed in Kashmir State, and from two of them *Rickettsia tsutsu* ~~gamushi~~ was isolated. According to these authors the province of Jammu in Indian Occupied Kashmir, which borders the West Pakistan territories near Sialkot falls in line with Siwalik range which extends from Assam to Afghanistan and can be called the Northern Scrub Typhus Belt of India. In this belt fall the hilly tracts and the highly

endemic areas of scrub typhus like Jammu, Kangra, Simla, Kumaon and Asaam hills, which is also the home of *T. deliensis* the notorious vector of scrub typhus.

In this context attention is drawn to the Entomological survey conducted under the auspices of the Typhus Inquiry Commission in Simla hills (Metha, 1937). Amongst the various ectoparasites obtained from rodents in this area, 5 species of larval *Trombicula* were recovered, namely: *Trombicula indica*, *Trombicula oudemeansi*, *Trombicula deliensis*, *Trombicula n. sp.*, *Trombicula acuscutelleris*. In their report Kalra and Rao (op. cit.) refer only to *T. deliensis* and correlate its distribution with scrub typhus in Kashmir.

During the autumn of 1961 and 1962 we carried out trapping of field rodents in localities around Sialkot from which cases of scrub typhus had been reported earlier. A large number of larval mites were recovered from four species of rodents found attached on the hairless parts of the hosts, the predominant location being inside the ears.

Trapping of rats was also carried out simultaneously in Lahore city and its suburbs. Larval trombiculid mites were found attached on rats and mice in houses and also amongst rats trapped in the fields. This collection has not as yet been fully worked out, but representative specimens were sent to Dr. Nadchatram of the Institute of Medical Research, Kuala Lumpur, Malaya, for identification. The report from Dr. Nadchatram has since been received and the portion relevant to this paper is reproduced as given hereunder :

#### TROMBICULIDAE

##### 1. *Leptotrombidium* (*Leptotrombidium*) *deliensis* (Walch)

2-specimens ex No. 12 and No. 15, *Suncus murinus* Charwa, Sialkot.

2-specimens ex No. 13, *Rattus rattus*, Charwa, Sialkot.

This specie is widely distributed and is a well established vector of Scrub Typhus in Asia.

##### 2. *Leptotrombidium* (L) *Jayawickremi* (Womersly)

6 specimens ex Nos. 318, 418, 31, 263, *Rattus rattus*, Lahore City.

3 specimens ex Nos. 28, 355, 329, *Mus musculus*, Lahore City.

1 specimen ex No. 450, *Rattus rattus*, Sheikhupura District.

1 specimen ex No. 17, *Nesokia* sp., Lahore City.

##### 3. *Gahrlepiea* (*Schoengastiella*) *ligula* Radford

3 specimens ex Nos. 16, 15, 23, *Suncus murinus*; the former two from Charwa, Sialkot and the latter from Lahore City.

##### 4. *Ascoshoengastia* (*Laurentella*) *indica* (Hirst)

1 specimen No. 260 ex *Rattus rattus*, Lahore City.

##### 5. *Schoutedenichia* sp. nov.

2 specimens ex No. 351, *Rattus rattus*, Lahore City.

It may be noticed that in all, 5 species of larval trombiculid mites have been recovered of which some are common to both Lahore and Sialkot areas. It may further be noted that *Trombicula* (*Leptotrombidium*) *deliensis* (Walch) was present in the Sialkot area adjacent to Jammu Province at the time the cases of scrub typhus started showing up. At the same time from the material collected in Lahore, *T. deliensis* is missing. This fact may be taken to partially confirm the vectorial role of *T. deliensis* in the transmission of scrub typhus in Sialkot area. It is possible though that besides *T. deliensis* other larval trombiculid mites may also be involved in the transmission of this disease. Research in this direction would be highly desirable and is already overdue.

Whether or not this disease is absent from the plains of West Pakistan is as yet to be determined. Though there is no evidence of scrub typhus having ever been recorded in the plains, this does not rule out the existence of the disease unless proven through a proper scientific study. *T. deliensis* has not been collected from the plains so far, but could easily have been missed in collections made to date. Extensive studies are therefore required to further our knowledge of the various aspects of scrub typhus in

West Pakistan and the biology of its vectors. The above-named species of trombiculid mites are here recorded for the first time from these regions of West Pakistan. It is possible that scrub typhus which has been identified only lately from Sialkot may be much more widespread than evident heretofore. Scrub typhus may therefore constitute a potential danger to the inhabitants of the city and to the tourists who are becoming increasingly interested in exploring the hitherto remote parts of the country in business pursuits, for agricultural and industrial development, for scientific investigation or in search of peace and solitude. In the mountains and valleys of the Himalayas, studded with springs and lakes, the gentle slopes and magnificent mountains carpeted with vistas of unending greenery in the scrub islands in between may lurk teeming invisible mites, lying in wait for their innocent victims.

#### SUMMARY

About the middle of September 1961 a sudden outbreak of a malady accompanied by high fever and severe prostration was reported amongst Sultej Rangers stationed in village Charwa in Sialkot district. The disease occurred only in persons who were reported to have visited a small piece of ground full of wild grass, reeds and verdure. Similar cases occurred amongst the military personnel who occupied this area a few days later. Upon the serological analysis of the cases a verdict was given by the bacteriologist at this Institute that the disease was "Scrub Typhus". A few sera from the civilian population in Charwa village who suffered from an identical malady were also examined and these gave results similar to that from personnel of Sultej Rangers, (Majid *op. cit.*).

Scrub typhus had never been reported before from this locality although Indian reports were available showing that the disease had been endemic just across the border, a short distance from Charwa. The Entomology Department was duly prompted to look into the affair and collections of larval mites were made from field rodents trapped in the area. In all 5 species of trombiculid mites were recovered both from Sialkot and from Lahore. *Trombicula deliensis* was the dominant species from Sialkot area, which fact further confirmed the disease to be scrub typhus. This area in fact falls within the scrub typhus belt of India as defined by Kalra *et al.* (1951).

#### ACKNOWLEDGEMENT

I am grateful to Dr. -M. Nadehatram of Institute of Medical Research Kuala Lumpur, Malaya, who very kindly examined the material sent to him and communicated the identification speedily which enabled the information to be published. I also thank him for the offer to assist in the identification of material in future.

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**INTESTINAL PARASITE INFECTIONS IN CHILDREN OF  
A PRIMARY SCHOOL OF LAHORE—A  
PRELIMINARY SURVEY**

**BY**

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**INTRODUCTION**

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## INTRODUCTION

*Nature's Law**That man was made to mourn, (Burns)*

It has been estimated that there are 9,123,004 children between the ages of 5—14 years in West Pakistan. Every year our population increases at the rate of 2.73 per cent. Although children in our society are considered privileged persons, yet they are not protected with ardour and zeal. It is shocking that much of the money available for their welfare goes to the witch doctors, talisman givers, magic healers, medicine men and exorcists. Due to the socio-economic and medical factors, the problems of paediatrics in our country are very much different from those of other countries. Intestinal parasitism, especially *ascariasis* and *ancylostomiasis*, is said to be wide spread in this country. These notions may be exaggerated. Our present knowledge is mostly based on figures obtained from out patient clinics and hospital attendance registers and therefore, does not represent an over-all situation. Moreover, there is gross under-reporting and poor recording also. To be candid, we do not fully know the problem of our children. This survey report for intestinal parasites from a primary school children is a modest contribution to our knowledge. Although a small beginning, yet sufficient to draw inference on the magnitude of the problem.

## CORPORATION PRIMARY SCHOOL SAMANABAD.

*God made the globe and man made the town,  
Clouds brought showers and happy were peasant and clown,  
Mason built houses, beautiful, entire and clean,*

*where pastor wearing gown, allured Ibne-Adam and taught him Account.*  
(Ansari-True Tale)

Believe it or not, but the fact-remains that Samanabad Primary School, which has nearly 750 taughts on its rolls, is without a building. It is a caricature of *Shanti-Nakshan* of Tagore.

The classes are held in an open courtyard, adjacent to one of the Corporation's overhead service reservoirs. A boundary wall exists on its three sides, but the fourth side facing north is without a hedge or a fence either. A private plot of land separates it from the service road of the main bazar.

*Antiquities*, is one of the weakness of Lahorites. They like museums and relics and are enviously zealous of reviving old traditions. We could not find out, if this medieval pattern of school was founded to appease or satisfy the sentiments of the inhabitants or the open air school was an only means to an end. It may not be a model primary schools but does amply demonstrate that a school can still be made to function without a proper shelter today as it used to run in early days of our history. This attitude may be recessive in nature. A primitive school in an area where educated people live is an apology. It is a slur or a contrast when an up-to-date model school exists next doors in the locality. The presumption is entirely based upon the cultural tendencies of Lahorites. Lahore Corporation is not financially handicapped as to grudge spending money on works requiring such priority as the construction of a school building. An open air school has some bare requirements. If these requirements are not fulfilled, it is mockery of education. Good education cannot be imparted in bad environments.

The Samanabad open-air school is situated about 150 ft. off the service lane of the main road of the satellite township, towards the western limit of the main market and is nearly 300 ft. due east of the round-about at Poonch Road crossing.

More number of boys and girls, on the role of this school, is not a testimony to its popularity. It is an indirect proof of scarcity of schools in the locality. The availability of schools in a locality is a decisive factor to limit attendance. If the number of schools in a vicinity is small, the number of students to each school swells. This question of supply and demand has made education prohibitive to some cross section of the public.

Mainly due to free education, there is great rush in some schools. The middle class families are unable to secure admission of their wards in other schools. They have no choice but endure herd-training and put up with half-baked turn out. The poor class people beside "no cost schooling" find it economically convenient as well as safe to send their boys and girls to schools which are nearer their places of habitation. Unfortunately one hazard yields place to another danger in this school, which to our mind is more serious.

At the time of our survey, there were 750 boys and girls on the rolls of the school. The children attending the school appeared to like their almahatremendously. They have more holidays in this schools than others in the locality may have. This school is entirely at the mercy of meteorological conditions. A slight dust storm is enough to obstruct teaching. Periodical interruption usually occurs due to rains. Shelterlessness is more felt when the summer sun is at its highest glory. The winter winds gnaw inwards and bruise the tender faces. These events shape hope and fears in quick succession. It is *Positive injustice* to the cause of education, *positive wrong* to the parents, and *positive injury* to the future generations. Aristotle used to say "*They who educate children well are more to be honoured than they who produce them; for the latter give them life alone, but the former give them the art of living well.*"

*Environmental Conditions*—The Samanabad Primary School is mixed school in the sense that both boys and girls study in the same compound. There occurs a strict state of compromise between co-education and sex separatism, as the two sexes are seated and taught separately by male and female teachers respectively.

The immediate neighbourhood of this school is dirty and venomous. The privately owned plot of land, lying between the school compound and the service road, is filth depot in all its description. The local people collect all sort of rubbish in this peice of land. In the darkness of night it affords an urge of privacy and one can see promiscuous defaecation. For school children also, it serves as a field privy. A refuse bin is also installed in one of the corners of the school yard, which almost constantly remains over charged with refuse and night soil. The sweepers working in the neighbouring houses throw the sweepings in this bin. This place constitutes a very favourite haunt for house flies. Egg laying occurs here uninterrupted, larvae hatch round the clock and thus reproduction proceeds in geometric progression. Almost opposite to the school and just across the road is a row of public water closets which attract clients from far and wide. The popularity of these latrines can be judged from the fact that there is always a good Queue. A large number of people may be sighted waiting, especially in the early morning hours. Some, who are impatient or under the influence of greater pressure or whom the nature does not permit to wait long, do not mind sitting in the open or walking a few steps and defaecate behind a wall. Most of the people domestic servants, houseless families, etc., do not know the use of the water closet. Others, either intentionally or through ignorance, usually spill their excreta around the squatting plates. Mud balls (dhele) or stones, used to desoil

the anal region, may be thrown into the WCs. In the choked WCs, the faecal matter is not easily flushed away. It usually regurgitates into the WCs and emits abnoxious smell and stinky odour and interferes with the enjoyment of an otherwise, healthy environment. It is offensive to the sense of smell in the school also.

To maintain "stream-lined primitiveness," the school is deprived of modern equipment and basic sanitary requirements. There are no benches, desks or stools. The students sit on jute mattings, which are spread on the courtyard every morning and rolled up and shoved into a cubicle built under the water tower when the school is closed. Before laying on the floor, the children violently shake up the mats and dislodge the germladen dust. The dirt may also be heavily charged with protozoan cysts, and stuffed with helminthic eggs. The potential danger, involved in inhaling and even imbibing the dust they thus raise is little realised.

Although the school is under a water supply tower, yet there are most unsuitable arrangements for drinking water. There are a few large earthen pitchers (*matkas*) probably as old as the school itself, which are just rinsed and filled daily to meet the requirements. Their outside is almost plastered with mud. Small plants viz., lichen and moss, successfully grow on this seedbed. A metal mug is tethered to each *matka*. This mug is dual purpose can and serves both for drawing water from the *matka* as well as for drinking. The fingers of the children usually dip in the *matka*. It is dangerous, if they are suffering from any gastro-intestinal, respiratory or throat infections. There are chances of having profuse and dangerous contamination with the infective stages of some intestinal parasites.

The school has no latrine or urinals of its own. The 750 souls either pass urine in or around the compound of the school or go to the Public Water-closets.

Filth, faeces, foul odours, flies and fouled food constitute the hall mark of the insanitary environments of the school. The bad school hygiene and environmental insanitation provide ideal conditions for the spread of communicable diseases and protozoal and helminthic parasites of the intestinal tract.

#### SOCIO-ECONOMIC STATUS—

*Through tattered clothes small vices do appear ;  
Robes and furred gowns hide all.*

*Famine is in thy cheeks, Need and oppression starveth in thine eyes,  
Contempt and beggary hang upon thy back,  
The world is not thy friend, nor the world's law,  
The world affords no law to make the rich.*

(SHAKESPEARE)

The socio-economic status of the general body of the children is fairly low. Parents of over 90 per cent children belong to the income group ranging between Rs. 0-100 and the income of the remaining ranges between Rs. 100—200 per month.

The efficiency of the parents is said to overcome the effects of poverty. However, it has also been found that general behaviouristic pattern of a community may not change much if there are no means to change it.

Lack of funds always stand in the way of improvement of health facilities. It is too much to expect people with meagre means to make arrangements for latrines in

their small houses and provide other facilities for the sanitary disposal of excreta. The community cannot also provide improved water supply from within their own resources. Pooling of resources however, may be an answer.

The average size of each family is 4.5. All the members of the family usually sleep together in one tightly packed room. Often there is no courtyard. The dooryard is the public road itself. Poor socio-economic condition may not permit these people to put a stop to "promiscuous defaecation". We wonder if spread of education alone can make these people aware of health hazards their children may face by living under these conditions. We believe that two thousand rupees a year can make all doctrine plain and viclear. Pakistan has vividly demonstrated that "*Jiddi Kothi danen, oode kamle wisyanne*

Poverty and malnutrition are closely associated. It has been observed that many children acquire a heavy burden of intestinal Parasites during the period of maximum malnutrition. Malnutrition becomes more serious when *ancylostomiasis* is endemic in the community. Because the amount of R B Cs and plasma is drained more than what it can be recouped with the food available. *Ascariasis* may exaggerate malnutrition and growth retardation. This parasites uses significant quantity of protein and vitamin from the food taken. It intereferes appreciably with food absorption and meddles terribly with calories available within the food. Most of the children of this school, presenetd a picture of semi-starvation. Vivid signs of malnutrition, under nutrition, deficiency states were written on their faces.

Let us hope that necessity will have its war and the present day "nothingness" will not dismay us. We should not forget Fielding who said *who resolves, has God on its side*". Sages remind us that "*Our remedies often in ourselves do lie, which we ascribe to heaven.*" Much wisdom one also derives from "*There is a tide in the affairs of men, which taken at the floods, leads into fortunes; Omitted, all the voyage of their life is bound in shallows and in miseries.*" (Shakes pear)

### PERSONAL HYGIENE AND HABITS

*Man's thoughts are according to their inclinations,  
Their discoures according to their opinions.  
But their action according to their HABITS*  
(Lord Bacon)

*La proprete est la toilette du pauvre*  
(Josephine)',

Very poor state of personal hygiene prevailing amongst children is largely due to ignorance and poverty and is in keeping with the model of the school it represents. Dirty clothes, unwashed faces, unbathed bodies, long dirt-charged nails, unclean mouth, defective gums and carious teeth was a conspicuous feature of these children. The girls, however, did not present this disgusting picture.

The standard of cleanliness far too low to be described. They do not grudge eating thing whch are apparently dirty and demoted and w ll not mind picking up fallen and spilled stuff without caring cleaning and wash ng before pass ng to mouth Hands of the majority were extremely dirty. Most of them would not wash hands before or after eating. Washing after defaecation is also an unkown practice with them. Quite a good

1. *Wealth, how so ever got, in England makes Lord of mechanics, gentleman of rakes.* (Defoe)

percentage of children move about bare footed. Either they do not possess any foot wear or take them off when they reach the school. Almost every body is bare footed when playing in the contaminated field. In such children, risk of hook worm infection is sure and certain.

Vendors haunting the school premises supply cheap, adulterated and most unhygienically prepared sweat meats. Cut fruits, ice balls, and ice-cream candies are also in great supply here. The stuff available to the children from the hawkers is invariably top-dressed with the road dust. The music from the swarms of filth flies is another attraction. A small layer of fly-vomits and fly-excrements is another special decoration on all the food available with these vendors. We would not say a word about the food-handlers. Each vendor was found to be compatible in all details with the environments in which he trades. He is specimen of uncleanness and sells packets of filth laden sweets to the precious souls.

*Castly thy habit as thy purse can buy, But not expressed in fancy; rich, not gaudy; For the apparel oft proclaims the man.*

(HSAKESPEARE)

### ORIGINAL OBSERVATIONS

#### INCIDENCE OF INTESTINAL PROTOZOAN AND HELMINTHIC IN PARASITES CHILDREN

A perusal of Table I will show that 279 (80.6 per cent) out of 346 boy students on roll at the school at the time of survey, were carrying either protozoan or helminthic parasites or both. The actual rate of infection may probably be still higher if the repeated stool examination are carried out (Ansari and Sapru, 1963)

Four species of protozoan and five species of helminths were found involved. 25.8 per cent of the boys were with protozoan parasites as against 30.82 per cent who had helminths. The mixed infection with protozoan cysts and helminthic ova was however, detected in 43.37 per cent positive cases only.

The non-pathogenic strain of dysentery amoeba (*Entamoeba histolytica*) was discovered from 16 (4.6 per cent) cases examined. All these cases had neither dysentery nor diarrhoea at the time of examination. Past history available was not of much use. No attempts were made to differentiate *E. hartmanni* from this lot.

Infection rates with *E. coli*, *I. butschlii* and *G. intestinalis* were more or less five times more than *E. histolytica* cases. Marked uniformity of infection occurred with *E. coli* (28.7 percent) and *I. butschlii* (28.5 percent) while infection rate with *G. intestinalis* (25.5 per cent) was slightly less than the above two cases.

Cases of infection with *Chilomastix mesnili*; are not being reported. Few cases, which were examined repeatedly, however, showed the presence of this flagellate and we, therefore, presume that this parasite is present but in very few percent of cases. Moreover, the presence of this parasite is detected after repeated examinations, which is a

1. Cleanliness is an emblem of purity of mind, delicacy of manners, mark of good breeding, letter of commendation, delicacy of manners, motive of affection, and pretervation of health.

a rare practice in routine surveys. This parasite is also said to have greater affinity for older persons.

The helminth parasites alone were detected from 86 (30.82 per cent) cases. The number of cases harbouring both protozoan and helminthic parasites was, however, 111 (43.37 per cent).

The highest number of children were found infected with *Ascaris lumbricoides*. This round worm was present in 131 cases (37.6 per cent). As we have said before (Ansari and Sapru, 1963), the giant round worm is one of the most familiar parasite of the Lahorites. The cases carrying males, young females, quiescent and spent females can not be conveniently accounted for and therefore, 37.6 per cent infection in this batch of children, is a most conservative estimate where 25 per cent of the negative cases give history of occasionally passing round worms of having abdominal pain and of having capricious appetite. Moreover, the majority come from poor families who live in slums and well in congested localities. The dietary habits of one and all are indiscriminate and personal hygiene in large majority of cases is most disgusting. The physical condition of most students is below par and all of them are under nourished or malnourished.

In all 52 cases (18.7 per cent) of hook worm infections were detected in this batch. Although most of these children came from an area, where appropriate conditions for the development of hook worm occur, yet the incidence of hook worm was below our expectation. However, this information give us a clue to the fact that incidence of *ascariasis* is inversely proportionate to *ancylostomiasis*. This does not indicate that these parasites are antagonistic to each other but one may safely infer that the environments more suitable for the development of one may not be suitable for the other. If *ascariasis* is an indoor infection the *ancylostomiasis* is out-door infection. Flies and vegetables (usually consumed raw and produced under most unhygienic condition of cultivation, play important role in the transmission of *Ascaris* eggs. Dust storm is also another mode of dispersal for the viable eggs.

TABLE I

SHOWING INCIDENCE OF VARIOUS INTESTINAL PARASITES AMONG CHILDREN IN CORPORATION PRIMARY SCHOOL, SAMANABAD, LAHORE

| Place                      | Age | Eh | Ec | Ib | Gi | Hw | Al | Ev | Tt | Hn |
|----------------------------|-----|----|----|----|----|----|----|----|----|----|
| SINGLE PARASITE INFECTIONS |     |    |    |    |    |    |    |    |    |    |
| Samanabad ..               | 6   | .. | 1  | .. | .. | .. | .. | .. | .. | .. |
| Nawankot ..                | 6   | .. | .. | .. | 2  | .. | .. | .. | .. | .. |
| Nawankot ..                | 6   | .. | .. | .. | 0  | .. | .. | .. | .. | .. |
| Samanabad ..               | 6   | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad ..               | 6   | .. | .. | .. | 3  | .. | .. | .. | .. | .. |
| Nawankot ..                | 6   | .. | .. | .. | .. | .. | .. | .. | .. | 4  |
| New Mozang ..              | 6   | .. | .. | R  | .. | .. | .. | .. | .. | .. |
| Samanabad ..               | 6   | .. | .. | .. | .. | .. | 2  | .. | .. | .. |
| Nawankot ..                | 6   | .. | 1  | .. | .. | .. | .. | .. | .. | .. |
| Nawankot ..                | 6   | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Nawankot ..                | 6   | .. | R  | .. | .. | .. | .. | .. | .. | .. |
| Nawankot ..                | 6½  | .. | .. | .. | .. | .. | 2  | .. | .. | .. |
| New Mozang ..              | 6½  | .. | .. | .. | .. | .. | R  | .. | .. | .. |
| Samanabad ..               | 7   | .. | .. | .. | .. | .. | .. | .. | 1  | .. |
| Samanabad ..               | 7   | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Samanabad ..               | 7   | .. | R  | .. | .. | .. | .. | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | .. | .. | 4  | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | .. | .. | .. | R  | .. | .. |
| Samanabad ..               | 7   | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Nawankot ..                | 7   | .. | R  | .. | .. | .. | .. | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | .. | 1  | .. | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | .. | .. | 3  | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | 2  | .. | .. | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | R  | .. | .. | .. | .. | .. | .. |
| Samanabad ..               | 7   | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | 1  | .. | .. | 1  | .. | .. |
| Muslim Colony ..           | 7   | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Nawankot ..                | 7   | .. | .. | .. | .. | .. | .. | .. | .. | .. |

| Place | Age | Eh | Ec | Ib | Gi | H <sub>cy</sub> | Al | Ev | Tt | Hn |
|-------|-----|----|----|----|----|-----------------|----|----|----|----|
|-------|-----|----|----|----|----|-----------------|----|----|----|----|

## SINGLE PARASITE INFECTIONS

|              |    |    |    |    |    |    |    |    |    |    |
|--------------|----|----|----|----|----|----|----|----|----|----|
| New Mozang   | .. | 7  | .. | .. | .. | R  | .. | .. | .. | .. |
| New Mozang   | .. | 7  | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad .. | .. | 7  | .. | 1  | .. | .. | .. | .. | .. | .. |
| Nawankot ..  | .. | 7  | .. | .. | .. | .. | 1  | .. | .. | .. |
| Nawankot ..  | .. | 7  | .. | .. | .. | 1  | .. | .. | .. | .. |
| New Mozang   | .. | 7  | .. | .. | 1  | .. | .. | .. | .. | .. |
| Nawankot ..  | .. | 7  | .. | .. | .. | 1  | .. | .. | .. | .. |
| Nawankot ..  | .. | 7  | .. | .. | .. | .. | 1  | .. | .. | .. |
| New Mozang   | .. | 7  | .. | .. | 1  | .. | .. | .. | .. | .. |
| Samanabad .. | .. | 7  | .. | .. | .. | .. | 1  | .. | .. | .. |
| Nawankot ..  | .. | 7  | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad .. | .. | 7  | .. | 1  | .. | .. | .. | .. | .. | .. |
| Nawankot ..  | .. | 7  | .. | .. | .. | R  | .. | .. | .. | .. |
| Samanabad .. | .. | 7  | .. | .. | 2  | .. | .. | .. | .. | .. |
| Samanabad .. | .. | 7  | .. | 1  | .. | .. | .. | .. | .. | .. |
| Samanabad .. | .. | 7  | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad .. | .. | 7  | .. | .. | .. | .. | 0  | .. | .. | .. |
| Nawankot ..  | .. | 7  | .. | .. | .. | .. | .. | .. | .. | 1  |
| Samanabad .. | .. | 7  | .. | .. | .. | 1  | .. | .. | .. | .. |
| Pakki Thati  | .. | 7  | .. | .. | .. | 2  | .. | .. | .. | .. |
| New Mozang   | .. | 7  | .. | .. | .. | .. | 1  | .. | .. | .. |
| Nawankot ..  | .. | 7  | .. | .. | .. | 1  | .. | .. | .. | .. |
| Samanabad .. | .. | 7  | .. | .. | .. | 1  | .. | .. | .. | .. |
| Samanabad .. | .. | 7  | .. | .. | .. | 1  | .. | .. | .. | .. |
| Nawankot ..  | .. | 7½ | .. | .. | R  | .. | .. | .. | .. | .. |
| Nawankot ..  | .. | 7½ | .. | .. | .. | R  | .. | .. | .. | .. |
| Samanabad .. | .. | 7½ | .. | .. | .. | R  | .. | .. | .. | .. |
| Nawankot ..  | .. | 7½ | .. | R  | .. | .. | .. | .. | .. | .. |
| Samanabad .. | .. | 7½ | .. | .. | .. | .. | .. | .. | .. | R  |
| Samanabad .. | .. | 7½ | .. | .. | .. | R  | .. | .. | .. | .. |
| Samanabad .. | .. | 7½ | .. | R  | .. | .. | .. | .. | .. | .. |

| Place                      | Age | Eh | Ec | Ib | Gi | Hw | Al | Ev | Tt | Hn |
|----------------------------|-----|----|----|----|----|----|----|----|----|----|
| SINGLE PARASITE INFECTIONS |     |    |    |    |    |    |    |    |    |    |
| Samanabad ..               | 7½  | .. | .. | .. | .. | .. | .. | .. | .. | 0  |
| Samanabad ..               | 7½  | .. | .. | .. | .. | .. | .. | .. | .. | 1  |
| Samanabad ..               | 8   | .. | .. | .. | .. | .. | R  | .. | .. | .. |
| Samanabad ..               | 8   | .. | .. | .. | .. | .. | I  | .. | .. | .. |
| Nawankot ..                | 8   | .. | .. | .. | .. | .. | R  | .. | .. | .. |
| Samanabd ..                | 8   | .. | .. | .. | R  | .. | .. | .. | .. | .. |
| Samanabad ..               | 8   | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Samanabad ..               | 8   | .. | .. | .. | .. | R  | .. | .. | .. | .. |
| Samanabad ..               | 8   | .. | .. | .. | R  | .. | .. | .. | .. | .. |
| Samanabad ..               | 8   | R  | .. | .. | .. | .. | .. | .. | .. | .. |
| Samanabad ..               | 8   | .. | .. | .. | .. | .. | 0  | .. | .. | .. |
| New Mozang                 | 8   | .. | R  | .. | .. | .. | .. | .. | .. | .. |
| Samanabad ..               | 8½  | .. | .. | .. | .. | 1  | .. | .. | .. | .. |
| Samanabad ..               | 8½  | .. | .. | 1  | .. | .. | .. | .. | .. | .. |
| Nawankot                   | ..  | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Nawankot ..                | 9   | .. | .. | 2  | .. | .. | .. | .. | .. | .. |
| Bagh Gul Begum             | 9   | .. | 1  | .. | .. | .. | .. | .. | .. | .. |
| New Mozang                 | 9   | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| New Mozang                 | 9   | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad ..               | 9   | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Nawankot ..                | 9   | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Samanabad ..               | 9   | .. | .. | .. | R  | .. | .. | .. | .. | .. |
| Samanabad ..               | 9   | .. | 1  | .. | .. | .. | .. | .. | .. | .. |
| Ichhra ..                  | 9   | .. | .. | .. | .. | .. | .. | .. | 1  | .. |
| Samanabad ..               | 9   | .. | .. | .. | .. | .. | .. | .. | .. | 1  |
| Samanabad ..               | 9   | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad ..               | 9½  | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Samanabad ..               | 10  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| New Mozang                 | 10  | .. | .. | .. | .. | .. | 2  | .. | .. | .. |
| Samanabad ..               | 10  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad ..               | 10  | .. | .. | .. | .. | 1  | .. | .. | .. | .. |
| Samanabad ..               | 10  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad ..               | 10  | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Samanabad ..               | 10  | .. | .. | .. | .. | .. | .. | .. | .. | .. |

| Place                      |    | Age | Eh | Ec | Ib | Gi | Hw | Al | Ev | Tt | Hu |
|----------------------------|----|-----|----|----|----|----|----|----|----|----|----|
| SINGLE PARASITE INJECTIONS |    |     |    |    |    |    |    |    |    |    |    |
| Nawankot ..                | .. | 10  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad ..               | .. | 10  | .. | 1  | .. | .. | .. | .. | .. | .. | .. |
| Nawankot ..                | .. | 10  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Nawankot ..                | .. | 10  | .. | .. | .. | .. | .. | .. | .. | 1  | .. |
| Samanabad ..               | .. | 10  | .. | .. | .. | .. | .. | .. | .. | .. | R  |
| Nawankot ..                | .. | 10  | .. | R  | .. | .. | .. | .. | .. | .. | .. |
| Samanabad ..               | .. | 10  | .. | .. | .. | R  | .. | .. | .. | .. | .. |
| Ichhra ..                  | .. | 10  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Nawankot ..                | .. | 10  | .. | 0  | .. | .. | .. | .. | .. | .. | .. |
| Nawankot ..                | .. | 10  | .. | .. | .. | .. | R  | .. | .. | .. | .. |
| New Mozang                 | .. | 10  | .. | .. | .. | .. | .. | .. | .. | .. | 1  |
| Nawankot ..                | .. | 10  | .. | .. | .. | .. | .. | .. | .. | .. | R  |
| Nawankot ..                | .. | 10  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad ..               | .. | 10  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad ..               | .. | 10  | .. | .. | .. | .. | .. | 2  | .. | .. | .. |
| Nawankot ..                | .. | 10  | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| New Mozang                 | .. | 10  | .. | .. | 1  | .. | .. | .. | .. | .. | .. |
| Nawankot ..                | .. | 10  | .. | .. | .. | .. | .. | .. | .. | .. | 1  |
| Nawankot ..                | .. | 10  | .. | .. | .. | .. | .. | .. | .. | .. | 1  |
| Samanabad ..               | .. | 10½ | .. | .. | .. | .. | .. | 2  | .. | .. | .. |
| Samanabad ..               | .. | 10½ | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad ..               | .. | 10½ | .. | .. | .. | .. | 1  | .. | .. | .. | .. |
| Muslim Colony (Samanabad). | .. | 11  | .. | 1  | .. | .. | .. | .. | .. | .. | .. |
| Muslim Colony (Samanabad). | .. | 11  | .. | .. | .. | .. | 1  | .. | .. | .. | .. |
| Nawankot ..                | .. | 11  | .. | .. | .. | .. | .. | 4  | .. | .. | .. |
| Samanabad ..               | .. | 11  | .. | 1  | .. | .. | .. | .. | .. | .. | .. |
| New Mozang                 | .. | 11  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Sodhiwal ..                | .. | 11  | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Nawankot ..                | .. | 12  | .. | R  | .. | .. | .. | .. | .. | .. | .. |
| Samanabad ..               | .. | 12  | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| New Mozang                 | .. | 12  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Nawankot ..                | .. | 12  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
|                            | .. | 12  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |

| Place        | Age | Eh | Ec | Ib | Gi | Hw | Al | Ev | Tt | Hn |
|--------------|-----|----|----|----|----|----|----|----|----|----|
| Samanabad .. | 12  | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Samanabad .. | 12  | .. | .. | .. | .. | .. | 1  | .. | .. | .. |
| Nawankot ..  | 13  | .. | .. | O  | .. | .. | .. | .. | .. | .. |
| Samanabad .. | 13  | .. | .. | .. | R  | .. | .. | .. | .. | .. |
| Totals ..    |     | 1  | 19 | 11 | 35 | 9  | 38 | 1  | 3  | 12 |

## TWO PARASITE INFECTIONS

|              |    |    |    |    |    |    |    |    |    |    |
|--------------|----|----|----|----|----|----|----|----|----|----|
| Samanabad .. | 6  | .. | 1  | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad .. | 6  | .. | .. | .. | .. | R  | 2  | .. | .. | .. |
| Samanabad .. | 6½ | .. | .. | 1  | R  | .. | .. | .. | .. | .. |
| Samanabad .. | 7  | .. | .. | 1  | .. | .. | .. | .. | O  | .. |
| Ichhra ..    | 7  | R  | .. | .. | O  | .. | .. | .. | .. | .. |
| Nawankot ..  | 7  | .. | R  | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad .. | 7  | .. | .. | R  | .. | .. | O  | .. | .. | .. |
| Nawankot ..  | 7  | .. | .. | .. | 1  | .. | 2  | .. | .. | .. |
| Nawankot ..  | 7  | .. | 1  | 1  | .. | .. | .. | .. | .. | .. |
| Nawankot ..  | 7  | .. | R  | 1  | .. | .. | .. | .. | .. | .. |
| New Mozang   | 7  | 1  | .. | .. | .. | 1  | .. | .. | .. | .. |
| Nawankot ..  | 7  | .. | 1  | .. | .. | .. | 2  | .. | .. | .. |
| Nawankot ..  | 7  | .. | .. | 1  | .. | .. | 1  | .. | .. | .. |
| Nawankot ..  | 7  | .. | .. | 1  | .. | .. | .. | .. | .. | 2  |
| Nawankot ..  | 7  | .. | 1  | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad .. | 7  | .. | .. | .. | 1  | .. | 2  | .. | .. | .. |
| Nawankot ..  | 7  | .. | .. | .. | 1  | .. | .. | .. | .. | 1  |
| Nawankot ..  | 7  | .. | .. | .. | 1  | .. | 1  | .. | .. | .. |
| New Mozang   | 7  | .. | .. | .. | .. | .. | 4  | .. | .. | .. |
| Samanabad .. | 7  | R  | .. | .. | 1  | .. | 4  | .. | .. | .. |
| Nawankot ..  | 7  | .. | .. | .. | 1  | .. | .. | .. | .. | 1  |
| New Mozang   | 7  | .. | .. | .. | 1  | .. | .. | .. | .. | 3  |
| Nawankot ..  | 7  | .. | .. | .. | .. | .. | 2  | .. | .. | .. |
| New Mozang   | 7  | 1  | .. | .. | .. | .. | .. | .. | .. | 2  |
| New Mozang   | 7  | .. | .. | 1  | .. | .. | .. | .. | .. | .. |

| Place | Age | Elh | Elh | Ib | Gl | Hw | Al | Ev | Tt | Hn |
|-------|-----|-----|-----|----|----|----|----|----|----|----|
|-------|-----|-----|-----|----|----|----|----|----|----|----|

## TWO PARASITE INFECTIONS

|               |    |    |    |    |    |    |    |    |    |    |
|---------------|----|----|----|----|----|----|----|----|----|----|
| Nawankot ..   | 7  | .. | 1  | .. | .. | .. | .. | .. | .. | 2  |
| Samanabad ..  | 7  | .. | .. | 1  | .. | .. | 2  | .. | .. | .. |
| Nawankot ..   | 7  | .. | .. | 1  | .. | .. | 1  | .. | .. | .. |
| Samanabad ..  | 7  | .. | .. | .. | R  | .. | 1  | .. | .. | .. |
| Nawankot ..   | 7  | .. | .. | 1  | .. | .. | 2  | .. | .. | .. |
| Nawankot ..   | 7  | .. | 1  | .. | .. | .. | .. | .. | .. | 1  |
| New Mozang    | 7  | R  | .. | .. | .. | .. | 4  | .. | .. | .. |
| Nawankot ..   | 7  | .. | .. | 1  | .. | .. | 3  | .. | .. | .. |
| Nawankot ..   | 7  | .. | 2  | .. | .. | 1  | .. | .. | .. | .. |
| Samanabad ..  | 7  | .. | .. | .. | 1  | .. | 1  | .. | .. | .. |
| Samanabad ..  | 7  | .. | .. | .. | .. | .. | 4  | .. | 1  | .. |
| Samanabad ..  | 7  | .. | .. | 2  | .. | .. | 2  | .. | .. | .. |
| New Mozang    | 7  | .. | .. | .. | 1  | .. | .. | 1  | .. | .. |
| Nawankot ..   | 7  | .. | .. | 1  | .. | .. | 1  | .. | .. | .. |
| Samanabad ..  | 7  | .. | 1  | .. | .. | .. | 4  | .. | .. | .. |
| Samanabad ..  | 7  | .. | 1  | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad ..  | 7  | .. | 1  | .. | .. | .. | 1  | .. | .. | .. |
| Samanabad ..  | 7½ | R  | .. | .. | R  | .. | .. | .. | .. | .. |
| Samanabad ..  | 7½ | .. | .. | .. | 1  | 1  | .. | .. | .. | .. |
| Samanabad ..  | 7½ | .. | .. | .. | 0  | .. | .. | .. | .. | R  |
| Naunaurian .. | 8  | .. | .. | .. | 1  | R  | .. | .. | .. | .. |
| Samanabad ..  | 8  | .. | 1  | R  | .. | .. | .. | .. | .. | .. |
| Samanabad ..  | 8  | .. | .. | .. | .. | R  | .. | .. | .. | .. |
| Samanabad ..  | 8  | .. | .. | .. | .. | 0  | R  | .. | .. | .. |
| New Mozang    | 8  | R  | .. | .. | .. | 0  | 0  | .. | .. | .. |
| New Mozang    | 8  | .. | .. | 1  | .. | 1  | 1  | .. | .. | .. |
| Samanabad ..  | 8½ | .. | .. | .. | 1  | .. | .. | .. | .. | 1  |
| Naunaurian .. | 9  | .. | .. | 2  | .. | .. | .. | .. | .. | .. |
| Nawankot ..   | 9  | .. | .. | 1  | .. | R  | 1  | .. | .. | 1  |
| Samanabad ..  | 9  | .. | .. | .. | .. | .. | 2  | .. | .. | .. |
| Nawankot ..   | 9  | .. | .. | .. | .. | 1  | .. | R  | .. | .. |
| Samanabad ..  | 9  | .. | .. | .. | .. | .. | 2  | .. | .. | .. |
|               |    |    | 1  | .. | .. | .. | 2  | .. | .. | .. |

| Place                   | Age | Eh | Ec | Ib | Gi | Hw | Al | Ev | Tt | Hn |
|-------------------------|-----|----|----|----|----|----|----|----|----|----|
| TWO PARASITE INFECTIONS |     |    |    |    |    |    |    |    |    |    |
| Bakar mandi ..          | 9   | .. | .. | .. | .. | R  | 2  | .. | .. | .. |
| Samanabad ..            | 9   | .. | .. | .. | .. | 1  | .. | .. | .. | 1  |
| Nawankot ..             | 9   | .. | .. | .. | R  | .. | 1  | .. | .. | .. |
| Samanabad ..            | 9   | .. | R  | R  | .. | .. | .. | .. | .. | .. |
| Samanabad ..            | 9   | .. | 1  | .. | .. | .. | .. | .. | R  | .. |
| Samanabad ..            | 9½  | .. | .. | 1  | .. | .. | 2  | .. | .. | .. |
| Samanabad ..            | 9½  | .. | .. | .. | .. | 1  | 1  | .. | .. | .. |
| Samanabad ..            | 9½  | .. | .. | .. | .. | 1  | .. | .. | .. | 1  |
| New Mozang ..           | 9½  | .. | .. | .. | R  | .. | R  | .. | .. | .. |
| Nawankot ..             | 10  | .. | .. | .. | 1  | .. | 3  | .. | .. | .. |
| Samanabad ..            | 10  | .. | .. | 1  | .. | .. | 2  | .. | .. | .. |
| Nawankot ..             | 10  | .. | R  | R  | .. | .. | .. | .. | .. | .. |
| Samanabad ..            | 10  | .. | .. | 1  | .. | .. | 2  | .. | .. | .. |
| Mohajarabad ..          | 10  | .. | 1  | .. | .. | R  | .. | .. | .. | .. |
| New Mozang ..           | 10  | .. | .. | .. | 1  | .. | .. | .. | .. | 1  |
| Ichhra ..               | 10  | .. | .. | R  | .. | .. | 1  | .. | .. | .. |
| Samanabad ..            | 10  | .. | .. | .. | 1  | .. | 1  | .. | .. | .. |
| Nawankot ..             | 10  | .. | 1  | .. | .. | .. | 2  | .. | .. | .. |
| Nawankot ..             | 10  | .. | .. | .. | .. | .. | 2  | 1  | .. | .. |
| Nawankot ..             | 10  | .. | .. | 1  | .. | 1  | .. | .. | .. | .. |
| Nawankot ..             | 10  | .. | .. | .. | 1  | .. | 1  | .. | .. | .. |
| Nawankot ..             | 10  | .. | 1  | .. | .. | .. | 4  | .. | .. | .. |
| Samanabad ..            | 10  | .. | .. | .. | .. | 1  | 4  | .. | .. | .. |
| Nawankot ..             | 11  | .. | .. | .. | .. | R  | 1  | .. | .. | .. |
| Nawankot ..             | 11  | .. | .. | .. | .. | 1  | 3  | .. | .. | .. |
| Naunaurian ..           | 12  | .. | .. | .. | .. | 1  | 2  | .. | .. | .. |
| Naunaurian ..           | 12  | .. | .. | .. | .. | 2  | .. | .. | .. | .. |
| Nawankot ..             | 12  | .. | 1  | .. | .. | .. | .. | .. | .. | .. |
| Nawankot ..             | 12  | .. | 1  | 1  | .. | .. | .. | .. | .. | .. |
| Utam Nagar ..           | 12  | .. | .. | .. | .. | R  | 4  | .. | .. | R  |
| Nawankot ..             | 12  | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Nawankot ..             | 12  | .. | R  | .. | R  | .. | .. | .. | .. | .. |
| Nawankot ..             | 12  | .. | R  | .. | .. | 0  | .. | .. | .. | .. |
| Nawankot ..             | 12  | .. | .. | R  | .. | .. | .. | .. | .. | .. |
| Nawankot ..             | 12  | .. | 1  | 1  | .. | .. | .. | .. | .. | .. |
| Samanabad ..            | 12  | .. | .. | .. | .. | .. | .. | .. | .. | .. |

| Place        | Age | Eh | Ec | Ib | Gi | Hw | Al | Ev | Tt | Ha |
|--------------|-----|----|----|----|----|----|----|----|----|----|
| Nawankot ..  | 12  | .. | .. | .. | R  | .. | 1  | .. | .. | .. |
| Samanabad .. | 12  | .. | 1  | .. | .. | .. | 1  | .. | .. | .. |
| Naunauria .. | 13  | .. | 1  | .. | .. | .. | 1  | .. | .. | .. |
| Nawankot ..  | 13  | .. | R  | .. | .. | .. | 2  | .. | .. | .. |
| Nawankot ..  | 13  | .. | .. | .. | .. | 0  | 4  | .. | .. | .. |
| Samanabad .. | 13  | .. | R  | .. | 1  | .. | .. | .. | .. | .. |
| Total ..     |     | 7  | 29 | 28 | 26 | 24 | 55 | 4  | 3  | 14 |

## THREE PARASITE INFECTIONS

|               |   |    |    |    |    |    |    |    |    |    |
|---------------|---|----|----|----|----|----|----|----|----|----|
| Ichhra ..     | 6 | .. | .. | .. | .. | .. | R  | R  | .. | 1  |
| Nawankot ..   | 7 | .. | 1  | 1  | .. | .. | .. | .. | .. | 00 |
| New Mozang    | 7 | .. | .. | 1  | R  | .. | 2  | .. | .. | .. |
| New mozang    | 7 | .. | .. | 1  | 1  | 2  | .. | .. | .. | .. |
| Nawankot ..   | 7 | 1  | .. | 1  | .. | .. | 2  | .. | .. | .. |
| Samanabad ..  | 7 | .. | .. | 1  | .. | .. | 2  | .. | .. | 1  |
| New Mozang    | 7 | 0  | .. | .. | .. | .. | 4  | .. | .. | R  |
| New Mozang    | 7 | .. | .. | 1  | 1  | .. | .. | .. | .. | 7  |
| New Mozang    | 7 | .. | 1  | 1  | .. | .. | 1  | .. | .. | .. |
| Nawankot ..   | 7 | .. | 1  | 1  | .. | .. | 1  | .. | .. | .. |
| Samanabad ..  | 7 | .. | 2  | 3  | 1  | .. | .. | .. | .. | .. |
| Nawankot ..   | 7 | .. | 1  | .. | .. | .. | 1  | .. | 1  | .. |
| Samanabad ..  | 7 | .. | 1  | 1  | .. | 0  | .. | .. | .. | .. |
| Nawankot ..   | 7 | .. | 1  | 1  | .. | .. | 2  | .. | .. | .. |
| Samanabad ..  | 7 | .. | 1  | 1  | .. | .. | .. | .. | 1  | .. |
| Naunaurian .. | 8 | .. | .. | .. | .. | 2  | 2  | .. | .. | 1  |
| Samanabad ..  | 8 | .. | R  | 2  | .. | R  | .. | .. | .. | .. |
| Samanabad ..  | 8 | 1  | 1  | 2  | .. | .. | .. | .. | .. | .. |
| Samanabad ..  | 8 | .. | 0  | 1  | .. | .. | R  | .. | .. | .. |
| Nawankot ..   | 8 | R  | .. | 1  | .. | .. | 3  | .. | .. | .. |
| Naunaurian .. | 9 | .. | 1  | .. | .. | 1  | 2  | .. | .. | .. |
| Chah Bohrwala | 9 | .. | 1  | 1  | .. | .. | 1  | .. | .. | .. |
| Nawankot ..   | 9 | .. | .. | R  | .. | 0  | .. | .. | .. | R  |
| Samanabad ..  | 9 | .. | .. | .. | .. | 2  | 2  | .. | .. | 2  |

| Place                     |    | Ago | Eh | Ec | ib | Gi | Hw | Al | Ev | Tt | Hn |
|---------------------------|----|-----|----|----|----|----|----|----|----|----|----|
| THREE PARASITE INFECTIONS |    |     |    |    |    |    |    |    |    |    |    |
| Nawankot ..               | .. | 9   | .. | .. | .. | .. | 1  | 2  | .. | .. | 1  |
| Nawankot ..               | .. | 9   | .. | .. | 0  | .. | .. | 1  | .. | 1  | .. |
| New mozang ..             | .. | 9   | .. | .. | 0  | .. | R  | .. | .. | .. | R  |
| Pakki Thati ..            | .. | 9   | .. | 1  | 2  | .. | .. | 2  | .. | .. | .. |
| Samanabad ..              | .. | 9½  | 1  | .. | R  | .. | .. | .. | .. | 0  | .. |
| Samanabad ..              | .. | 9½  | .. | .. | R  | R  | .. | 3  | .. | .. | .. |
| Nawankot ..               | .. | 10  | .. | 1  | 1  | .. | .. | 2  | .. | .. | .. |
| Samanabad ..              | .. | 10  | .. | .. | 2  | .. | 1  | 2  | .. | .. | .. |
| Nawankot ..               | .. | 10  | .. | .. | 0  | .. | .. | 3  | .. | .. | 1  |
| Nawankot ..               | .. | 10  | .. | 0  | 1  | .. | 1  | .. | .. | .. | .. |
| Nawankot ..               | .. | 10  | .. | 1  | .. | .. | 2  | 2  | .. | .. | .. |
| Samnabad ..               | .. | 10  | .. | R  | R  | .. | .. | 1  | .. | .. | .. |
| Sodiwal ..                | .. | 10  | .. | R  | R  | R  | .. | .. | .. | .. | .. |
| Samanabad ..              | .. | 10  | .. | .. | .. | R  | .. | 1  | R  | .. | .. |
| Samnabad ..               | .. | 10  | .. | 1  | R  | .. | .. | .. | .. | R  | .. |
| Nawankot ..               | .. | 11  | .. | .. | .. | .. | 1  | 2  | .. | 0  | .. |
| Nawankot ..               | .. | 11  | .. | 1  | .. | .. | .. | .. | R  | R  | .. |
| Nawankot ..               | .. | 11  | .. | .. | .. | .. | 2  | 1  | R  | .. | .. |
| Naunaurian ..             | .. | 12  | .. | .. | .. | .. | 1  | 4  | .. | 1  | .. |
| Nawankot ..               | .. | 12  | .. | .. | .. | .. | .. | .. | .. | .. | R  |
| New Mozang ..             | .. | 12  | .. | 1  | .. | .. | R  | .. | .. | .. | 12 |
| Total                     | .. | ..  | 5  | 22 | 30 | 7  | 16 | 28 | 4  | 8  | 12 |

|                          |    |     |    |    |    |    |    |    |    |    |    |
|--------------------------|----|-----|----|----|----|----|----|----|----|----|----|
| FOUR PARASITE INFECTIONS |    |     |    |    |    |    |    |    |    |    |    |
| Samanabad ..             | .. | 7   | .. | 1  | 1  | 1  | .. | 1  | .. | .. | .. |
| Samanabad ..             | .. | 9   | 0  | 0  | 0  | .. | .. | 2  | .. | .. | .. |
| Samanabad ..             | .. | 10  | .. | 1  | .. | .. | 1  | 2  | .. | 0  | .. |
| Nawankot ..              | .. | 10  | .. | 0  | 1  | .. | .. | 4  | .. | 0  | .. |
| Samnabad ..              | .. | 10  | .. | 0  | 1  | .. | .. | 4  | .. | 0  | .. |
| Samanabad ..             | .. | 10  | .. | 0  | 1  | 1  | .. | .. | .. | .. | 0  |
| Samanabad ..             | .. | 10  | .. | 1  | 1  | 1  | .. | .. | R  | R  | R  |
| Samanabad ..             | .. | 10  | .. | .. | 1  | .. | .. | 1  | .. | .. | .. |
| Samnabad ..              | .. | 10  | .. | R  | R  | R  | .. | 2  | .. | .. | .. |
| Samanabad ..             | .. | 10½ | .. | R  | R  | 0  | .. | 2  | .. | .. | .. |
| Samanabad ..             | .. | 11  | .. | R  | 1  | .. | 1  | .. | .. | .. | .. |
| Samnabad ..              | .. | 13  | .. | .. | .. | .. | .. | 8  | 1  | 4  | 2  |
| Total                    | .. | ..  | 3  | 9  | 9  | 2  | 2  | 8  | 1  | 4  | 2  |

| Place                                   | Age | Eh  | Ec   | Ib   | Gi   | Hw   | Al   | Ev  | Tt  | Hn   |
|-----------------------------------------|-----|-----|------|------|------|------|------|-----|-----|------|
| FIVE PARASITE INFECTIONS                |     |     |      |      |      |      |      |     |     |      |
| Nawankot .. ..                          | 10  | ..  | 1    | ..   | 1    | 4    | R    | O   | ..  | ..   |
| Single infections (129) ..              | ..  | 1   | 19   | 11   | 35   | 9    | 38   | 1   | 3   | 12   |
| Double infections (95) ..               | ..  | 7   | 29   | 28   | 26   | 24   | 56   | 4   | 3   | 14   |
| Triple infections (44) ..               | ..  | 5   | 21   | 30   | 7    | 16   | 28   | 4   | 8   | 12   |
| Quadruple Infetions (10) ..             | ..  | 3   | 9    | 9    | 2    | 2    | 8    | 1   | 4   | 2    |
| Quintuple infections (1) ..             | ..  | ..  | 1    | ..   | 1    | 1    | 1    | 1   | ..  | ..   |
| Total positive (279)                    | ..  | 16  | 79   | 78   | 71   | 52   | 131  | 11  | 18  | 40   |
| Percentages of the total infected       | ..  | 5.7 | 28.7 | 28.5 | 25.5 | 18.7 | 46.7 | 3.9 | 6.5 | 14.4 |
| Percentages of the total (346) examined | ..  | 4.6 | 23.1 | 22.5 | 20.5 | 15.1 | 37.6 | 3.2 | 5.2 | 11.6 |

## EXPLANATION

|    |                                       |
|----|---------------------------------------|
| .. | .. Absent.                            |
| O  | .. Occasional.                        |
| R  | .. Light infection.                   |
| 1  | .. Mild infection.                    |
| 2  | .. Moderate infection.                |
| 3  | .. Heavy infection.                   |
| 4  | .. Severe infection.                  |
| Eh | .. <i>Entamoeba histolytica</i> .     |
| Ec | .. <i>Entamoeba coli</i> .            |
| Ib | .. <i>Iodamoeba butschlii</i> .       |
| Gi | .. <i>Giardia intestinalis</i> .      |
| Hw | .. Hook- worms.                       |
| Al | .. <i>Ascaris lumbricoides</i> .      |
| Ev | .. <i>Enterobius vermicularis</i> .   |
| Tt | .. <i>Trichocephalus trichiurus</i> . |
| Hn | .. <i>Hymenolepis nana</i> .          |

*H. nana* Infections were next to hook worm cases in number. The incidence was found to be 14.4 per cent and most of the positive cases occurred in children of 6—10 years of age.

*T. trichiurus* infections were detected from 6.5 per cent cases examined. This is a parasite of young children and young people. Its rate of infection is also below our expectations. Probably the environments round the localities from which these children hail are not favourable for the eggs which readily perish in temporary drought and heat. Direct sunlight and severe cold is also detrimental to the eggs of this parasite. Extensive decomposition in manures is also harmful. The proportion of viable eggs left to infect new cases is probably very small.

The ova of seat worm (*E. vermicularis*) were detected in 12 (3.2) per cent cases. These figures may not be taken as reliable because the presence of seat worm eggs in stools is rather a matter of accident and not a fact.

*The child that is not clean and neat, with lot of toys and things to eat, He is a naughty child, I, am sure—Or else his dear papa is poor.*

(R. L. Stevenson)

#### SINGLE AND MULTIPLE PARASITIC INFECTIONS (TABLES II-III)

1. *Single parasite infections*—Out of 346 cases examined, there were 129 (37.28 per cent) with pure infections. In order to obtain a satisfactory information, all the stools, from these subjects were repeatedly examined both by direct and concentration methods but no other infection could be detected. 66 children (51.12 per cent) were infected with protozoan parasites as against 63 (48.88 per cent.) with helminthic parasites. Pure infection with the non-pathogenic strain of *E. histolytica* was found in one student. Infections with *E. coli*, *I. butschlii* and *G. intestinalis* were detected from 19, 11 and 35 individuals respectively. Presence of duodenal flagellate in 27.13 per cent cases appears to be low for children, when the rate of infection in an adult group was found to be as high as 29 per cent (Ansari and Sapru, 1963).

*A. lumbricoides* was found to be most prevalent helminthic parasite amongst pure infection cases. An infection rate (29.46 per cent) in children, who do not observe personal hygiene laws and live and play on polluted soil, is far too low. Pure infections of *H. nana*, hook worms, *T. trichiurus* and *E. vermicularis* were in 12, 9, 3 and one cases respectively.

2. *Multiple infections*—It was not uncommon to find two or more species of parasites in a single child. In this batch there were 150 (53.76 per cent) cases with multiple infections. Out of 150 cases, there are 95 double infections, 44 triple infections, 10 quadruple infections and one quintuple infection.

(a) *Double infections*—Amongst double infections, in 67 cases, the association occurred between protozoans and helminthic parasites. In 17 cases the association was involved within helminths alone as against 11 cases in which only protozoan parasites were involved. The organisms involved in the association between protozoan and helminths are given below:—

- (i) *E. histolytica* was found associated either with hook-worm (one case) or with *A. lumbricoides* (4 cases).
- (ii) 20 cases in which *E. coli* was involved, the association occurred either with *A. lumbricoides* (12 cases), hook-worms (3 cases), *H. nana* (3 cases), *E. vermicularis* (one case) or *T. trichiurus* (one case).
- (iii) In 17 cases the association occurred between *I. butschlii* and one of the helminthic parasite, viz., *A. lumbricoides* (11 cases), hook-worm (3 cases) *H. nana* (2 cases) and *T. trichiurus* (one case).
- (iv) In 23 cases, the association was found to be between *G. intestinalis* and the helminths, viz., *A. lumbricoides* (14 cases), *H. nana* (6 cases), hook-worms (2 cases) and *E. vermicularis* (1 case).

From these observations, we find that the giant round worm is involved in highest number of associations (40 cases). Hook worms and *H. nana* occurred in 12 and 11 cases respectively.

The association amongst helminthic parasites alone was found to have occurred between :

- |                                                       |    |    |          |
|-------------------------------------------------------|----|----|----------|
| (i) hook-worms and <i>A. lumbricoides</i>             | .. | .. | 11 cases |
| (ii) hook-worms and <i>H. nana</i>                    | .. | .. | 2 cases. |
| (iii) hook-worms and <i>E. vermicularis</i>           | .. | .. | 1 case.  |
| (iv) <i>A. lumbricoides</i> and <i>H. nana</i>        | .. | .. | 1 case.  |
| (v) <i>A. lumbricoides</i> and <i>E. vermicularis</i> | .. | .. | 1 case.  |
| (vi) <i>A. lumbricoides</i> and <i>T. trichiurus</i>  | .. | .. | 1 case.  |

The organisms involved in the association between protozoan parasites alone are given below :—

- (i) *E. histolytica* was found associated with *G. intestinalis* in 2 cases.
- (ii) *E. coli* was either associated with *I. butschlii* (7 cases) or with *G. intestinalis* (one case).
- (iii) In one instance, the association was found to have occurred between *I. butschlii* and *G. intestinalis*.

(b) *Triple infections*—There were 44 cases in which triple infections were detected. In 21 cases, the association was between two protozoans and one helminthic parasite as against 13 in which the order reversed. In 7 cases only helminthic parasites were involved while in 3 only protozoan cyst were found.

(i) 21 cases of association between two protozoans and a helminthic parasite :—  
*E. histolytica* and *E. coli* were found associated either with *A. lumbricoides* (2 cases) or with *T. trichiurus*.

*E. coli* and *I. butschlii* were found associated either with *A. lumbricoides* (8 cases) or hook worms (3 cases). One case of each was detected in which the association was found to have occurred with *E. vermicularis*, *T. trichiurus* or *H. nana* respectively.

*I. butschlii* and *G. intestinalis* together were found either with *A. lumbricoides* 2 (2 cases) or with hook worm (one case) *H. nana* (one case).

(ii) In 13 cases the association was found established between two helminths and a protozoan parasite.

*E. histolytica* occurred in one solitary case. Its partners were *A. lumbricoides*

and *H. nana*.

*E. coli* was associated in 6 cases. In two cases its partners were hook worms and *A. lumbricoides* while in other two, the hook worm was replaced by *T. trichiurus*. In one case each the helminths involved were either *H. nana* and hook-worm or *H. nana* and *A. lumbricoides*.

In 5 cases, *I. butschlii* was associated either with hook-worm and *A. lumbricoides* (one case) or hook-worm and *H. nana* (2 cases). In two cases the partners of colon amoeba were, however, *A. lumbricoides* and *H. nana*.

The duodenal flagellate was found associated with hook-worm and *E. vermicularis* in one case only.

(iii) In 7 cases, the three parasites involved were only helminths. In two cases each, the association occurred between either hook-worm, *A. lumbricoides* and *T. trichiurus* or hook worms, *A. lumbricoides* and *H. nana*. Two cases were also found in which the round-worm was involved with *E. vermicularis* and *H. nana*. In one case the partners were hook-worms *A. lumbricoides* and *E. vermicularis*.

(iv) In three cases, the partnership only occurred between three protozoans parasites. In two cases *E. coli*, *I. butschlii* and *G. intestinalis* were involved while in one the duodenal flagellate was replaced by the non-pathogenic strain of dysentery amoeba.

(c) *Quadruple infections*—There were 10 cases in which four parasites were incriminated.

It is most interesting to note that the partnership between protozoan and helminthic parasites alone was not discovered in these ten cases. There were 5 cases, in which the association was found established between three protozoans and a helminth. In three cases the protozoans involved were *E. histolytica*, *E. coli* and *I. butschlii* and their helminthic partner was *A. lumbricoides*. In two cases, however, *E. histolytica* was replaced by *G. intestinalis* and the helminthic parasite involved was either *A. lumbricoides* or *H. nana*.

In three cases the partnership was established between two protozoans and two helminths. In all the these cases *E. coli*, *I. butschlii* and *A. lumbricoides* invariably occurred. In two cases the fourth partner was *T. trichiurus* while in one it was the hook-worm which was involved. There were two cases in which the organism involved in the association were three helminths and a protozoan. *T. trichiurus* was present in both the cases. In one case the additional partners were *E. coli*, hook-worms and *A. lumbricoides* while in the other *I. butschlii*, *E. vermicularis* and *H. nana* were involved.

(d) *Quintuple cases*—There was only one solitary case, in which two protozoan and three helminthic parasites were incriminated. The organisms involved were *E. coli*, *G. intestinalis*, hook-worms, *A. lumbricoides* and *E. vermicularis*.

Pretty in amber to observe the forms  
Of hairs, or straws, or dirt, or grubs, or worms!  
The things, we know, are neither rich nor rare,  
But wonder how the devil they got here.  
(Pope).

**TABLE II**  
**SHOWING PURE AND MIXED PROTOZOAN AND HELMINTHIC INFECTIONS IN SCHOOL CHILDREN OF SAMANABAD**

| Age Groups      | Infection   | No. of Children Positive | No. of Children with Protozoans | No. of Children with Helminths | No. of Children with Proto & Helm |
|-----------------|-------------|--------------------------|---------------------------------|--------------------------------|-----------------------------------|
| 6-7 years       | Single      | 54                       | 33:60·74                        | 21:39·26                       | 35:85·36                          |
|                 | Double      | 41                       | 4:9·75                          | 2: 4·89                        | 13:86·68                          |
|                 | Triple      | 15                       | 1: 6·66                         | 1:6·66                         | 1:100·00                          |
|                 | Quad.       | 1                        | ..                              | ..                             | 1:100·00                          |
|                 | Total       | 111                      | 38:34·24                        | 24:21·62                       | 49:44·14                          |
| 7·1—8·9 years   | Single      | 21                       | 11:52·38                        | 10:47·62                       | ..                                |
|                 | Double      | 10                       | 2:20·00                         | 2:20·00                        | 6:60·00                           |
|                 | Triple      | 5                        | 1:20·00                         | 1:20·00                        | 3:60·00                           |
|                 | Total       | 36                       | 14:38·88                        | 13:36·12                       | 9:25·00                           |
| 9-10 years      | Single      | 37                       | 15:40·55                        | 22:59·45                       | ..                                |
|                 | Double      | 27                       | 2:7·41                          | 7:25·91                        | 18:66·68                          |
|                 | Triple      | 19                       | 1:5·26                          | 2:10·53                        | 16:84·21                          |
|                 | Quad.       | 6                        | ..                              | ..                             | 6:100·00                          |
|                 | Quint.      | 1                        | ..                              | ....                           | 1:100·00                          |
|                 | Total       | 90                       | 18:20·00                        | 31:34·44                       | 41:45·56                          |
| 10·1—11·9 years | Single      | 9                        | 3:33·33                         | 6:66·67                        | ..                                |
|                 | Double      | 2                        | ..                              | 2:100·00                       | ..                                |
|                 | Triple      | 2                        | ....                            | 1:50·00                        | 1:50·00                           |
|                 | Quad.       | 2                        | ....                            | ..                             | 2:100·00                          |
|                 | Total       | 15                       | 3:20·00                         | 9:60·00                        | 3:30·00                           |
| 12-13 years     | Single      | 8                        | 5:62·50                         | 3:37·50                        | ..                                |
|                 | Double      | 15                       | 4:26·67                         | 4:26·67                        | 7:46·66                           |
|                 | Triple      | 3                        | ..                              | 2:66·67                        | 1:33·33                           |
|                 | Quad.       | 1                        | ..                              | ..                             | 1:100·00                          |
|                 | Total       | 27                       | 9:33·33                         | 9:33·33                        | 9:33·33                           |
|                 | Grand Total | 279                      | 82:25·81                        | 86:30·82                       | 111:43·37                         |

TABLE III  
SHOWING INCIDENCE OF VARIOUS PARASITES IN DIFFERENT AGE GROUPS

| Age Group     | Infection      | Eh    | Ec    | Ib    | Gi    | Hw    | Al    | Ev   | Tt   | Hn    |
|---------------|----------------|-------|-------|-------|-------|-------|-------|------|------|-------|
| 6-7 years     | ..             | ..    | 8     | 6     | 18    | 3     | 15    | 1    | 1    | 2     |
|               | Single (54)    | ..    | 12    | 14    | 12    | 3     | 25    | 2    | 2    | 7     |
|               | Double (41)    | ..    | 8     | 12    | 4     | 2     | 9     | 1    | 2    | 5     |
|               | Triple (15)    | ..    | 1     | 1     | 1     | ..    | 1     | ..   | ..   | ..    |
| Total         | Quad. (1)      | ..    | 7     | 33    | 35    | 8     | 50    | 4    | 5    | 14    |
|               | 111            | 7     | 29    | 33    | 35    | 8     | 50    | 4    | 5    | 14    |
|               | 40             | 6.31  | 26.12 | 29.73 | 31.53 | 7.21  | 45.10 | 3.61 | 4.51 | 12.62 |
|               | Percentages .. | 6.31  | 26.12 | 29.73 | 31.53 | 7.21  | 45.10 | 3.61 | 4.51 | 12.62 |
| 7-1-8-9 years | ..             | 1     | 3     | 2     | 5     | 2     | 4     | ..   | ..   | 4     |
|               | Single (21)    | ..    | 1     | 2     | 5     | 5     | 3     | ..   | ..   | 2     |
|               | Double (10)    | ..    | 3     | 4     | ..    | 2     | 3     | ..   | ..   | 1     |
|               | Triple (5)     | ..    | 7     | 8     | 10    | 9     | 10    | ..   | ..   | 7     |
| Total         | 36             | 5     | 7     | 8     | 10    | 9     | 10    | ..   | ..   | 7     |
|               | 13             | 13.77 | 19.44 | 22.22 | 27.77 | 25.00 | 27.77 | ..   | ..   | 19.44 |
|               | Percentages .. | 13.77 | 19.44 | 22.22 | 27.77 | 25.00 | 27.77 | ..   | ..   | 19.44 |
|               | 9-10 years     | ..    | 5     | 2     | 8     | 2     | 12    | ..   | 2    | 6     |
| 9-10 years    | Single (37)    | ..    | 7     | 9     | 6     | 8     | 17    | 2    | 1    | 4     |
|               | Double (27)    | ..    | 9     | 14    | 3     | 8     | 13    | 1    | 3    | 25    |
|               | Triple (10)    | ..    | 1     | ..    | ..    | ..    | ..    | ..   | ..   | ..    |

TABLE III  
SHOWING PURE AND MIXED PROTOZON AND HELMINTHIC INFECTION IN SCHOOL CHILDREN OF SAMANABAD

| Age Group     | Infection   | Ec    | Ib    | Gl    | Hw    | Al    | Ev    | Tt    | Hn    |
|---------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 10-11-9 years | Quad (6)    | 1     | 5     | 1     | 1     | 4     | 1     | 4     | 2     |
|               | Quint (1)   | ..    | ..    | 1     | 1     | 1     | 4     | ..    | ..    |
|               | Total       | 2     | 30    | 19    | 20    | 47    | 5     | 10    | 17    |
|               | Percentages | 2.22  | 33.33 | 21.11 | 22.22 | 52.22 | 5.55  | 11.11 | 18.88 |
|               | Single (9)  | ..    | ..    | 1     | 2     | 4     | ..    | ..    | ..    |
| 12-13 years   | Double (2)  | ..    | ..    | ..    | 2     | 2     | ..    | ..    | ..    |
|               | Triple (2)  | ..    | ..    | ..    | 1     | 1     | 1     | 2     | ..    |
|               | Quad (2)    | 2     | 2     | ..    | ..    | 2     | ..    | ..    | ..    |
|               | Total       | 2     | 2     | 1     | 5     | 9     | 2     | 1     | ..    |
|               | Percentages | 13.33 | 13.33 | 6.66  | 33.33 | 60.00 | 6.66  | 13.33 | ..    |
| Grand Total   | Single (8)  | ..    | 1     | 3     | ..    | 3     | ..    | ..    | ..    |
|               | Double (15) | ..    | 3     | 3     | 6     | 8     | ..    | ..    | 1     |
|               | Triple (3)  | ..    | ..    | ..    | 3     | 2     | 1     | 1     | 1     |
|               | Quad (1)    | ..    | 1     | ..    | 1     | 1     | ..    | ..    | ..    |
|               | Total       | ..    | 5     | 6     | 10    | 14    | 1     | 1     | 2     |
| Percentages   | Percentages | ..    | 44.44 | 18.52 | 22.22 | 37.03 | 51.85 | 3.71  | 7.41  |
|               | Grand Total | 16    | 80    | 71    | 52    | 130   | 11    | 18    | 40    |
|               | Percentages | 5.7   | 28.7  | 25.5  | 18.7  | 46.7  | 3.9   | 6.5   | 14.4  |
|               | Grand Total | 80.63 | 28.5  | 25.5  | 18.7  | 46.7  | 3.9   | 6.5   | 14.4  |
|               | Percentages | ..    | 28.7  | 25.5  | 18.7  | 46.7  | 3.9   | 6.5   | 14.4  |

## INCIDENCE OF INTESTINAL PARASITES IN DIFFERENT LOCALITIES

109

## (TABLE IV)

An outstanding feature of the children, constituting the subjects of this survey, is that they come from a contiguous area, which is an important slice of the oldest satellite of Lahore city.

Samanabad is a modern locality, where planned construction of new houses may be seen. There is net work of proper roads, good lanes and streets in this colony. Drainage and other essential sanitary requirements are provided. We would not offer our own comments about the working of sewage disposal system. Whispering tongues poison ears. We have heard people singing:

*"The best laid scheme o'mice and men Gang aft-a-gley, And lea'e us nought but grief and pain For promised joy"* (Burns). The neighbouring localities are, however, below standards and therefore, for transmission of intestinal parasites, the conditions in this locality are proverbially favourable.

Nawan Kot, New Mozang, Naumarian, Ichhra, Pakkithatti, Sodiwal and other villages lie on the periphery, usually due south-east and south-west of Samanabad and are within a radius of about a mile from the Corporation Primary School, the venue of our survey.

These villages are inhabited by middle class or low income group people. The majority earn their livelihood from the land and their supplement income may come from the sale of milk and its products. A very small proportion, however, is employed in Government offices or private establishments. In other cases, the income is fixed and economic stress and strain does not relax as to enable them to shoulder any other financial burden. Except Samanabad alone, the housing conditions are highly insanitary. Although they do understand standards of cleanliness and yet are neither capable of appreciating nor practising these properly. Some houses are furnished with surface privies. The conservancy system in all these localities is of old and of medieval type. For most adults, cultivated fields, the grove of trees and the clump of bushes still satisfy the urge of privies. The servants and the poor-income group of Samanabad also stroll down to the fields of these villages for defecation. The method of removal and disposal of filth and night soil in these localities is most deplorable. These villages have tremendous house-hold waste of their own. They also procure the rubbish, domestic sweeping and kitchen refuse from adjoining localities and dump as hillocks in their fields. The heaps may also be sighted in front of many houses. The washings and liquid wastes of the household decomposes here and there and fills the atmosphere with pungent and offensive smell. Apart from being public nuisance, these plague spots disperse and disseminate the intestinal parasites with ease and alacrity.

The land on the periphery of these villages do not only provide an important place and satisfy necessary urge of privacy during defecation to village poorfolks, servants and poor income groups from Samanabad, but are seed beds of intestinal parasites. Human excreta animal, refuse, house and street sweepings find ultimate repose in these fields. Extensive use of manures and promiscuous defecation in the

fields makes the agricultural field notorious hatcheries for some of the intestinal parasites of man in these villages, and does not only elevate chances of dissemination, but also facilitates a rise in their incidence in the community.

The village community does not seem to pay any heed to the requirements of hygiene and aesthetics. The drainage and sewage disposal has never bothered them. Deep pits and shallow pits may be witnessed throughout the length and breadth of the villages and give an unsightly panorama. Fly breeding continues all the year round. The harm reaches its climax during the months of March and April and July and August each year.

There has been a marked increase in the population of these villages during the last 10—12 years. The housing facilities remained unsatisfactory. In some houses, foul and filthy surface privies are provided for *stay-at-home* people, invalids and toddlers. The children, however, are encouraged to defecate in the streets or courtyards. One feels disgusted when one finds a grown up child easing in the drain and later rubbing his buttocks against the road surface with a view to clean the anal region.

Shallow insanitary wells sunk in some hoary past are still in use in these villages. Few houses, however, derive their water-supply from hand pumps installed in the foul and filthy courtyard near the dilapidated latrines. The moral sense is doubly offended when one finds the kitchen and the privy just separated with a lateral transverse septum.

**Incidence of Parasites**—In all the cases carrying *E. histolytica*, the burden was comparatively highest in New Mozang (14.7 per cent). The incidence was almost half of this in Samanabad (6.8 per cent), which claims to have protected water-supply and an efficient sewage disposal system. The figures obtained from Nawan Kot (1.9 per cent), however, were comparatively very low.

The incidence of *E. coli* in Samanabad (29.7 per cent) and Nawan Kot (30.8 per cent) is almost of uniform pattern. The infection rate in New Mozang (8.8 per cent), however, was considerably low.

The incidence of *I. butschlii* was almost of uniform level in the three localities. It fluctuated between 25 per cent (Nawan Kot) and 32.4 per cent (New Mozang). About 30—40 per cent carriers complained of vague abdominal pain. It is, however, not possible to fix cause and effect in these cases with certainty as other parasites were either detected or were suspected. For some yet unexplainable reasons, the infection rate with duodenal flagellate (*G. intestinalis*) in the children from the three localities (Samanabad, Nawan Kot and Nawan Mozang) was found to be approximately the same as for *I. butschlii* above. This marked uniformity in the incidence of the two parasites in not only interesting but amazing. Do the two parasites survive best under similar conditions is the question. We may, however, say for certain that the sewage disposal system alone does not help in the reduction of intestinal parasites, if the practice of promiscuous defecation and dumping of manures continue next door. Custom is an unwritten law by which the people always kept even the king in awe. The love for manure must die. The present study warrants a thorough study of epidemiological requirements of the two parasites. However, there does not seem to be any special affinity between the two protozoas.

Hook-worm infection in the three localities oscillated between 13—21 per cent. The incidence was highest in Nawan Kot (21.2 per cent), which provides more favourable conditions for defecation in fields than the other localities. In Samanabad, hook-worm infection in children was 13.5 per cent as against 17.6 per cent in Nawan Mozang.

More or less fifty per cent children in these localities had an active round worm infection. If those, who gave a history of occasionally passing round worms, in also taken into consideration, the incidence may be estimated at 75.80 per cent. The high percentage of infection is a reward to these children for promiscuous defecation and polluting of their court and door yards. It is also a warning to the parents who encourage their children to contaminate their premises.

The ova of *E. vermicularis* were detected in 2.9—4.8 per cent cases. As we have said else where, these figures may not be taken to represent the real level of seat worm infection rate. We presume that the presence of ova in stools is a clear indication of heavy infection.

The children from Nawan Mozang were found free from *T. trichiurus* infection. In the children from Nawan Kot and Samanabad the infection rate was, however, as high as 6.7 and 9.3 per cent respectively. If we compare these figures with round worm infection rates in the three localities we infer that direct sunlight available in New Mozang may be detrimental to the whipworm. Type of soil available may also hamper with the development of eggs in the locality. High humidity, shady moist soils are responsible for its extrinsic development and successful transmission. If these environments are denied, the incidence usually dwindles.

The incidence of dwarf tapeworm (*H. nana*) was found to be appreciably conspicuous in this batch of children. Highest rate of infection was detected in children from New Mozang (23.5 per cent). The incidence was about half this figure in children from Samanabad (12.7 per cent) and a little more than half (15.4 per cent) in children from Nawan Kot. This parasite is said to be more common in children than adults. It was found to be more frequent in children between 6—10 years. The infection rate appeared to decline thereafter.

Let dogs delight to bark and bite,  
For God hath made them so;  
Let bears and lions growl and fight,  
For tis their nature too.

(Isaac Watts)

**TABLE IV**  
**SHOWING LOCALITY-WISE DISTRIBUTION OF INTESTINAL**  
**PARASITES**

| Place                      | Eh        | Ec | Ib | Gi | Hw | Al | Ev | Tt | Hn |
|----------------------------|-----------|----|----|----|----|----|----|----|----|
|                            | SAMANABAD |    |    |    |    |    |    |    |    |
| Pure infections (58 cases) | 1         | 8  | 3  | 16 | 4  | 17 | 1  | 2  | 6  |
| Double infections          | 1         | .. | .. | .. | .. | 1  | .. | .. | .. |
| (36 cases)                 | 1         | .. | .. | 1  | .. | .. | .. | .. | .. |
|                            | ..        | 7  | .. | .. | .. | 7  | .. | .. | .. |
|                            | ..        | 1  | .. | .. | .. | .. | .. | 1  | .. |
|                            | ..        | 2  | 2  | .. | .. | .. | .. | .. | .. |
|                            | ..        | .. | 6  | .. | .. | 6  | .. | .. | .. |
|                            | ..        | .. | 1  | .. | .. | .. | .. | 1  | .. |
|                            | ..        | .. | 2  | 2  | .. | .. | .. | .. | .. |
|                            | ..        | .. | .. | 1  | 1  | .. | .. | .. | .. |
|                            | ..        | .. | .. | 4  | .. | 4  | .. | .. | .. |
|                            | ..        | .. | .. | 2  | .. | .. | .. | .. | 2  |
|                            | ..        | .. | .. | .. | 4  | 4  | .. | .. | .. |
|                            | ..        | .. | .. | .. | 2  | .. | .. | .. | 2  |
|                            | ..        | .. | .. | .. | .. | 1  | .. | 1  | .. |
|                            | ..        | .. | .. | .. | .. | 1  | .. | .. | 1  |
| Total (double)             | 2         | 10 | 11 | 10 | 7  | 24 | .. | 3  | 6  |
| Triple infections          | 1         | 1  | 1  | .. | .. | .. | .. | .. | .. |
| (15 cases)                 | 1         | .. | 1  | .. | .. | .. | .. | 1  | .. |
|                            | ..        | 3  | 3  | .. | .. | 3  | .. | .. | .. |
|                            | ..        | 2  | 2  | .. | .. | .. | .. | 2  | .. |
|                            | ..        | 2  | 2  | .. | 2  | .. | .. | .. | .. |
|                            | ..        | 1  | 1  | 1  | .. | .. | .. | .. | .. |
|                            | ..        | .. | 1  | .. | .. | 1  | .. | .. | 1  |

| Place | Eh | Ec | Ib | Gi | Hw | Al | Ev | Tt | Hn |
|-------|----|----|----|----|----|----|----|----|----|
|-------|----|----|----|----|----|----|----|----|----|

|                                   |     |      |      |      |      |      |     |     |      |
|-----------------------------------|-----|------|------|------|------|------|-----|-----|------|
|                                   | ..  | ..   | ..   | ..   | 1    | 1    | ..  | ..  | 1    |
|                                   | ..  | ..   | 1    | 1    | ..   | 1    | ..  | ..  | ..   |
|                                   | ..  | ..   | 1    | ..   | 1    | 1    | ..  | ..  | ..   |
|                                   | ..  | ..   | ..   | 1    | ..   | 1    | 1   | ..  | ..   |
| Total (Triple)                    | 2   | 9    | 13   | 3    | 4    | 8    | 1   | 3   | 2    |
| Quadruple infections<br>(9 cases) | 3   | 3    | 3    | ..   | ..   | 3    | ..  | ..  | ..   |
|                                   | ..  | 1    | 1    | 1    | ..   | 1    | ..  | ..  | ..   |
|                                   | ..  | 2    | 2    | ..   | ..   | 2    | ..  | 2   | ..   |
|                                   | ..  | 1    | 1    | ..   | 1    | 1    | ..  | ..  | ..   |
|                                   | ..  | ..   | 1    | ..   | ..   | ..   | 1   | 1   | 1    |
| Total (Quadruple)                 | 8   | 8    | 9    | 2    | 1    | 7    | 1   | 3   | 2    |
| Grand Total (118 cases)           | 8   | 35   | 36   | 31   | 16   | 56   | 3   | 11  | 15   |
| Percentages                       | 6.8 | 29.7 | 30.5 | 26.8 | 13.5 | 47.5 | 2.5 | 9.3 | 12.7 |

|                              |          |    |    |    |    |    |    |    |    |
|------------------------------|----------|----|----|----|----|----|----|----|----|
|                              | NAWANKOT |    |    |    |    |    |    |    |    |
|                              | ..       | 7  | 4  | 13 | 3  | 14 | .. | 1  | 5  |
| Pure infections (48 cases)   | ..       | 2  | .. | .. | 2  | .. | .. | .. | .. |
| Double infections (38 cases) | ..       | 3  | .. | .. | .. | 3  | .. | .. | .. |
|                              | ..       | 1  | .. | .. | .. | .. | 1  | .. | .. |
|                              | ..       | 3  | .. | .. | .. | .. | .. | .. | 3  |
|                              | ..       | .. | 3  | .. | 3  | .. | .. | .. | .. |
|                              | ..       | .. | 4  | .. | .. | 4  | .. | .. | .. |
|                              | ..       | .. | 1  | .. | .. | .. | .. | .. | 1  |
|                              | ..       | .. | .. | 8  | .. | 8  | .. | .. | .. |

| Place                         | Rh  | Ec   | Ib   | Gi   | Hw   | Al   | Jv  | Tt  | Hn   |
|-------------------------------|-----|------|------|------|------|------|-----|-----|------|
|                               | ..  | ..   | ..   | 2    | ..   | ..   | ..  | ..  | 2    |
|                               | ..  | 4    | 4    | ..   | ..   | ..   | ..  | ..  | ..   |
|                               | ..  | 1    | ..   | 1    | ..   | ..   | ..  | ..  | ..   |
|                               | ..  | ..   | ..   | ..   | 4    | 4    | ..  | ..  | ..   |
|                               | ..  | ..   | ..   | ..   | 1    | ..   | 1   | ..  | ..   |
|                               | ..  | ..   | ..   | ..   | ..   | 1    | 1   | ..  | ..   |
| Total (double)                | ..  | 14   | 12   | 11   | 10   | 20   | 3   | ..  | 6    |
| Triple infections (16 cases)  | 2   | ..   | 2    | ..   | ..   | 1    | ..  | ..  | ..   |
|                               | ..  | 1    | 1    | ..   | 1    | ..   | ..  | ..  | ..   |
|                               | ..  | 3    | 3    | ..   | ..   | 3    | ..  | ..  | ..   |
|                               | ..  | 1    | 1    | ..   | ..   | ..   | ..  | ..  | 1    |
|                               | ..  | 1    | ..   | ..   | ..   | ..   | 1   | 1   | ..   |
|                               | ..  | 1    | ..   | ..   | ..   | 1    | ..  | 1   | ..   |
|                               | ..  | 1    | ..   | ..   | 1    | 1    | ..  | ..  | ..   |
|                               | ..  | ..   | 2    | ..   | 2    | ..   | ..  | ..  | 2    |
|                               | ..  | ..   | 1    | ..   | ..   | 1    | ..  | 1   | ..   |
|                               | ..  | ..   | ..   | ..   | 2    | 2    | ..  | 2   | ..   |
|                               | ..  | ..   | ..   | ..   | 1    | 1    | ..  | ..  | ..   |
| Total (triple)                | 2   | 8    | 10   | ..   | 7    | 11   | 1   | 5   | 4    |
| Quadruple infections (1 case) | ..  | 1    | ..   | ..   | 1    | 1    | ..  | 1   | ..   |
| Quintuple infections (1 case) | ..  | 1    | ..   | 1    | 1    | 1    | 1   | ..  | ..   |
| Grand Total (104 cases)       | 2   | 32   | 26   | 25   | 22   | 47   | 5   | 7   | 15   |
| Percentages                   | 1.9 | 30.8 | 25.0 | 24.1 | 21.2 | 45.1 | 4.8 | 6.7 | 14.4 |

| Place | Eh | Ec | Ib | Gi | Hw | Al | Ev | Tt | Ha |
|-------|----|----|----|----|----|----|----|----|----|
|-------|----|----|----|----|----|----|----|----|----|

## NEW MOZANG

Pure infections (16 cases)

Double infection (11 cases)

Total (double)

Triple infections (7 cases)

Total (triple)

Grand Total (34 cases)

Percentages

|    |      |     |      |      |      |      |     |    |      |
|----|------|-----|------|------|------|------|-----|----|------|
| .. | ..   | 1   | 4    | 3    | 1    | 6    | ..  | .. | 1    |
| .. | 1    | ..  | ..   | ..   | 1    | ..   | ..  | .. | ..   |
| .. | 3    | ..  | ..   | ..   | ..   | 3    | ..  | .. | ..   |
| .. | ..   | ..  | 1    | ..   | 1    | ..   | ..  | .. | ..   |
| .. | ..   | ..  | 1    | ..   | ..   | ..   | ..  | .. | 1    |
| .. | ..   | ..  | ..   | 2    | ..   | 2    | ..  | .. | ..   |
| .. | ..   | ..  | ..   | 1    | ..   | ..   | 1   | .. | ..   |
| .. | ..   | ..  | ..   | 2    | ..   | ..   | ..  | .. | 2    |
| .. | 4    | ..  | 2    | 5    | 2    | 6    | 1   | .. | 3    |
| .. | 1    | ..  | ..   | ..   | ..   | 1    | ..  | .. | 1    |
| .. | ..   | 1   | 1    | ..   | ..   | 1    | ..  | .. | ..   |
| .. | ..   | 1   | ..   | ..   | 1    | ..   | ..  | .. | 1    |
| .. | ..   | ..  | 1    | 1    | 1    | ..   | ..  | .. | ..   |
| .. | ..   | ..  | 1    | 1    | ..   | 1    | ..  | .. | ..   |
| .. | ..   | ..  | 1    | 1    | ..   | ..   | ..  | .. | 1    |
| .. | ..   | ..  | 1    | ..   | 1    | ..   | ..  | .. | 1    |
| .. | 1    | 2   | 5    | 3    | 3    | 3    | ..  | .. | 4    |
| .. | 5    | 3   | 11   | 11   | 6    | 14   | 1   | .. | 9    |
| .. | 14.7 | 8.8 | 32.4 | 32.4 | 17.6 | 41.2 | 2.9 | .. | 23.5 |

## NAUNABIAN

Double infections (5 cases)

Total (double)

|    |    |    |    |    |   |    |    |    |
|----|----|----|----|----|---|----|----|----|
| .. | 1  | .. | .. | .. | 1 | .. | .. | .. |
| .. | .. | 1  | .. | .. | 1 | .. | .. | .. |
| .. | .. | .. | 1  | 1  | 2 | .. | .. | .. |
| .. | .. | .. | .. | .. | 2 | .. | .. | .. |
| .. | 1  | 1  | 1  | 3  | 4 | .. | .. | .. |

| Place                       | Eh | Ec | Ib | Gi | Hw | Al | Ev | Tt | Hn |
|-----------------------------|----|----|----|----|----|----|----|----|----|
| Triple infections (3 cases) | .. | 1  | .. | .. | 1  | 1  | .. | .. | .. |
|                             | .. | .. | .. | .. | 1  | 1  | 4  | .. | .. |
|                             | .. | .. | .. | .. | 1  | 1  | .. | .. | 1  |
| Total (triple)              | .. | 1  | .. | .. | 3  | 3  | 1  | .. | 1  |
| Grand Total (8 cases)       | .. | 2  | 1  | 1  | 6  | 7  | 1  | .. | 1  |
| ICHHRA                      |    |    |    |    |    |    |    |    |    |
| Pure infection (2 cases)    | .. | 1  | .. | .. | .. | 1  | .. | .. | .. |
| Double infections (2 cases) | 1  | .. | .. | 1  | .. | .. | .. | .. | .. |
|                             | .. | .. | 1  | .. | .. | 1  | .. | .. | .. |
| Total (double)              | 1  | .. | 1  | 1  | .. | 1  | 1  | .. | .. |
| Triple infection (1 case)   | .. | .. | .. | .. | .. | 1  | 1  | .. | 1  |
| Grand Total                 | 1  | 1  | 1  | 1  | .. | 2  | 1  | .. | 1  |
| PAKKI THATTI                |    |    |    |    |    |    |    |    |    |
| Pure infection (1 case)     | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Triple infection (1 case)   | .. | 1  | 1  | .. | .. | 1  | .. | .. | .. |
| Grand Total                 | .. | 1  | 1  | 1  | .. | 1  | .. | .. | .. |
| SODIWAL                     |    |    |    |    |    |    |    |    |    |
| Pure infection (1 case)     | .. | .. | .. | 1  | .. | .. | .. | .. | .. |
| Triple infection (1 case)   | .. | 1  | 1  | 1  | .. | .. | .. | .. | .. |
| Grand Total                 | .. | 1  | 1  | 2  | .. | .. | .. | .. | .. |
| BAKAR MANDI                 |    |    |    |    |    |    |    |    |    |
| Double infection (1 case)   | .. | .. | .. | .. | 1  | 1  | .. | .. | .. |
| MOHAJANABAD                 |    |    |    |    |    |    |    |    |    |
| Double infection (1 case)   | .. | 1  | .. | .. | 1  | .. | .. | .. | .. |

| Place                      | Eh | Ec | Ib | Gi | Hw | Al | Ev | Tt | Ha |
|----------------------------|----|----|----|----|----|----|----|----|----|
| UTTAM NAGAR                |    |    |    |    |    |    |    |    |    |
| Double infections (1 case) | .. | 1  | 1  | .. | .. | .. | .. | .. | .. |
| BAGH GUL BEGUM             |    |    |    |    |    |    |    |    |    |
| Pure infections (1 case)   | .. | 1  | .. | .. | .. | .. | .. | .. | .. |
| MUSLIM COLONY              |    |    |    |    |    |    |    |    |    |
| Pure infection (3 case)    | .. | 1  | .. | 1  | 1  | .. | .. | .. | .. |

## SUMMARY

| Type of Infections | Samana-<br>abad | Nawan<br>Kot | New<br>Mozang | Nauna<br>rian | Ichhra | Pakki-<br>thati | Sodi-<br>wal | Others |
|--------------------|-----------------|--------------|---------------|---------------|--------|-----------------|--------------|--------|
| Pure infections    | 58              | 48           | 15            | ..            | 2      | 1               | 1            | 4      |
| Two parasites      | 36              | 38           | 11            | 5             | 2      | ..              | ..           | 3      |
| Three parasites    | 15              | 16           | 7             | 3             | 1      | 1               | 1            | ..     |
| Four parasites     | 9               | 1            | ..            | ..            | ..     | ..              | ..           | ..     |
| Five parasites     | ..              | 1            | ..            | ..            | ..     | ..              | ..           | ..     |
| Total (279)        | 118             | 104          | 33            | 8             | 5      | 2               | 2            | 7      |
| Percentages        | 43.01           | 36.56        | 11.82         | 2.87          | 1.78   | 0.72            | 0.72         | 2.51   |

# DISTRIBUTION OF INTESTINAL PARASITES WITH REFERENCE TO SOCIO-ECONOMIC STATUS OF THE PARENTS (TABLE V AND VI)

We made efforts to obtain the statements, as to the socio-economic status of each student examined. Satisfactory information, however, was collected from 135 students. This information is tabulated in Table V and VI.

Of these 135 persons, only 13 (9.6 per cent) were from middle class families while all the others belonged to very poor section of the community. Ten had not had any complaints to report, two complained of occasional abdominal pain and one reported of passing small thread worms (probably *E. vermicularis*)—in the normally passed stools. On examination of stool samples three (23.1 per cent) were found free from any infection while ten were passing either protozoal cysts, or helminthic ova or both. Out of seven (53.9 per cent) passing protozoal cysts, one was passing cysts of non-pathogenic strain of *E. histolytica*, 3 *E. coli*, 5 *I. butschlii* and 2 *G. intestinalis*. Out of nine cases passing helminthic ova, 2 had hook worms—3 *A. lumbricoides*, 1 *E. vermicularis*, 4 *T. trichiurus* and 2 *H. nana*.

Oh, wad some power the giftie gie us,  
To see oursel's as others see us !  
It wad frae mony a blander free us,  
And foolish notion.

(Burns)

JULY 64

SHOWING SOCIO-ECONOMIC ENVIRONMENTS AND

TABLE V

119

| 1   | 2               | 3                             | 4               | 5                | 6                                       | 7                              |
|-----|-----------------|-------------------------------|-----------------|------------------|-----------------------------------------|--------------------------------|
| Age | Economic status | Environmental home sanitation | Dietary habits  | Personal hygiene | Physical conditions                     | Family history                 |
| 6   | Poor ..         | Slum dweller                  | Indiscriminate. | Disgusting ..    | Below par and anaemic.                  | ..                             |
| 7   | Do.             | Do.                           | Ditto           | Do.              | Just on the average.                    | ..                             |
| 7   | Do.             | Satisfactory                  | Ditto           | Do.              | Under-nourished below par.              | ..                             |
| 7½  | Do.             | Slum dweller                  | Ditto           | Do.              | Under-nourished anaemic.                | ..                             |
| 7½  | Do.             | Do.                           | Ditto           | Do.              | Ditto                                   | ..                             |
| 7½  | Do.             | Do.                           | Ditto           | Do.              | Ditto                                   | ..                             |
| 7½  | Do.             | Do.                           | Ditto           | Do.              | Ditto                                   | ..                             |
| 7½  | Do.             | Do.                           | Ditto           | Do.              | Ditto                                   | ..                             |
| 8   | Do.             | Do.                           | Ditto           | Do.              | Ditto                                   | ..                             |
| 8   | Do.             | Do.                           | Ditto           | Do.              | Ditto                                   | ..                             |
| 8   | Do.             | Do.                           | Ditto           | Do.              | Under-nourished, anaemic and below par  | ..                             |
| 8   | Do.             | Do.                           | Ditto           | Do.              | Anaemic and below par.                  | ..                             |
| 8   | Do.             | Do.                           | Ditto           | Do.              | Under-nourished, anaemic and below par. | ..                             |
| 8   | Do.             | Do.                           | Ditto           | Do.              | Anaemic and below par.                  | ..                             |
| 8   | Do.             | Do.                           | Ditto           | Do.              | Ditto                                   | ..                             |
| 8   | Do.             | Do.                           | Ditto           | Do.              | Ditto                                   | ..                             |
| 8   | Do.             | Do.                           | Ditto           | Do.              | Under-nourished, and anaemic.           | One brother passes round worms |
| 8   | Do.             | Do.                           | Ditto           | Do.              |                                         |                                |

**TABLE V**  
DISTRIBUTION OF INTESTINAL PARASITES

| 8                                                               | 9                        | i                      | ii              | iii                 | iv                    | v         | vi                    | vii                      | viii                      | ix                |
|-----------------------------------------------------------------|--------------------------|------------------------|-----------------|---------------------|-----------------------|-----------|-----------------------|--------------------------|---------------------------|-------------------|
| Complaints                                                      | Haemoglobin per-centage. | Entamoeba histolytica. | Entamoeba coli. | Iodamoeba butschli. | Giardia intestinalis. | Hook worm | Ascaris lumbricoides. | Enterobius vermicularis. | Trichocephalus Trichin's. | Hymenolepis nana. |
| No complaints ..                                                | 70                       | —                      | +               | —                   | —                     | —         | —                     | —                        | —                         | —                 |
| Ditto                                                           | 95                       | —                      | —               | +                   | —                     | —         | —                     | —                        | —                         | —                 |
| Occasionally passes seat worms.                                 | 70                       | —                      | —               | —                   | +                     | —         | —                     | —                        | —                         | —                 |
| Occasionally passes round worms. Capricious appetite.           | 65                       | —                      | —               | +                   | —                     | —         | —                     | —                        | —                         | —                 |
| No complaints ..                                                | 65                       | —                      | +               | —                   | —                     | —         | —                     | —                        | —                         | —                 |
| Occasionally passes thread worms.                               | 60                       | —                      | —               | +                   | —                     | —         | —                     | —                        | —                         | —                 |
| Occasionally abdominal pain                                     | 60                       | +                      | —               | —                   | +                     | —         | —                     | —                        | —                         | —                 |
| Occasionally passes seat-worms and Round worms.                 | 65                       | —                      | —               | —                   | +                     | —         | —                     | —                        | —                         | —                 |
| Ditto                                                           | 60                       | —                      | —               | —                   | —                     | —         | —                     | —                        | —                         | +                 |
| Occasionally abdominal pain.                                    | 65                       | —                      | —               | —                   | +                     | —         | —                     | —                        | —                         | —                 |
| No complaints ..                                                | 60                       | x                      | +               | +                   | —                     | —         | —                     | —                        | —                         | —                 |
| Occasionally passes round worms. Capricious appetite.           | 65                       | —                      | —               | —                   | +                     | +         | —                     | —                        | —                         | —                 |
| Occasionally passes round worms. Abdominal pain.                | 50                       | —                      | —               | —                   | —                     | +         | +                     | —                        | —                         | +                 |
| Occasionally passes round worms.                                | 60                       | —                      | —               | —                   | —                     | —         | +                     | —                        | —                         | —                 |
| Occasionally passes round worms.                                | 60                       | —                      | —               | +                   | —                     | —         | +                     | —                        | —                         | —                 |
| No complaints ..                                                | 65                       | —                      | —               | —                   | —                     | —         | +                     | —                        | —                         | —                 |
| Occasionally passes seat-worms and round worms. Abdominal pain. | 60                       | —                      | —               | —                   | —                     | —         | +                     | —                        | —                         | —                 |

JULY 64

SHOWING SOCIO-ECONOMIC ENVIRONMENTS AND

TABLE V 12\*

| 1   | 2               | 3                             | 4              | 5                | 6                               | 7                                                |
|-----|-----------------|-------------------------------|----------------|------------------|---------------------------------|--------------------------------------------------|
| Age | Economic status | Environmental home sanitation | Dietary habits | Personal hygiene | Physical conditions             | Family history                                   |
| 8   | Poor ..         | Slum dweller                  | Indiscriminate | Disgusting ..    | Under-nourished                 | ..                                               |
| 8½  | Do.             | Do.                           | Ditto          | Do.              | Moderate physique               | ..                                               |
| 8½  | Do.             | Do.                           | Ditto          | Do.              | Moderate physique               | ..                                               |
| 8½  | Do.             | Do.                           | Ditto          | Do.              | Below par                       | ..                                               |
| 9   | Do.             | Congested ..                  | Ditto          | Do.              | Ditto                           | Family members occasionally pass round worms.    |
| 9   | Do.             | Slum dweller                  | Ditto          | Do.              | Under-nourished very thin.      | ..                                               |
| 9   | Do.             | Do.                           | Ditto          | Do.              | Under-nourished and anaemic.    | Sister occasionally passes round worms.          |
| 9   | Do.             | Do.                           | Ditto          | Do.              | Under-nourished spleen 1+       | ..                                               |
| 9   | Do.             | Do.                           | Ditto          | Do.              | Malnourished anaemic. Spleen 1+ | ..                                               |
| 9   | Do.             | Do.                           | Ditto          | Do.              | Physique poor anaemic spleen 1+ | ..                                               |
| 9   | Do.             | Do.                           | Ditto          | Do.              | Under-nourished anaemic.        | ..                                               |
| 9   | Do.             | Do.                           | Ditto          | Do.              | Under-nourished poor physique.  | Brothers and sisters do not complain.            |
| 9   | Do.             | Do.                           | Ditto          | Do.              | Under-nourished                 | ..                                               |
| 9   | Do.             | Do.                           | Ditto          | Do.              | Under-nourished anaemic.        | Younger brother occasionally passes round worms. |
| 9   | Do.             | Do.                           | Ditto          | Do.              |                                 |                                                  |

## DISTRIBUTION OF INTESTINAL PARASITES.

| 8                                                        | 9                      | i                      | ii              | iii                  | iv                   | v          | vi                    | vii                      | viii                       | ix                |
|----------------------------------------------------------|------------------------|------------------------|-----------------|----------------------|----------------------|------------|-----------------------|--------------------------|----------------------------|-------------------|
| Complaints                                               | Hemoglobin percentage. | Entamoeba histolytica. | Entamoeba coli. | Iodamoeba batzschii. | Gardia intestinalis. | Hook worm. | Ascaris lumbricoides. | Enterobius vermicularis. | Trichocephalus trichiurus. | Hymenolepis nana. |
| Occasionally passes thread worms. Abdominal pain.        | 65                     | -                      | +               | +                    | -                    | +          | -                     | -                        | -                          | -                 |
| No complaints ..                                         | 65                     | -                      | -               | -                    | +                    | -          | -                     | -                        | -                          | +                 |
| No complaints ..                                         | 65                     | -                      | -               | +                    | -                    | -          | -                     | -                        | -                          | -                 |
| Abdominal pain R. B. Cs. and pus cells in stool.         | ..                     | -                      | -               | -                    | -                    | +          | -                     | -                        | -                          | -                 |
| Occasionally passes round worms.                         | 65                     | +                      | +               | +                    | -                    | -          | +                     | -                        | -                          | -                 |
| No complaints ..                                         | 70                     | -                      | -               | -                    | +                    | -          | -                     | -                        | -                          | -                 |
| Periodic abdominal pain                                  | 65                     | -                      | +               | +                    | -                    | +          | -                     | -                        | -                          | +                 |
| Occasionally abdominal pain                              | -                      | -                      | -               | +                    | -                    | +          | -                     | -                        | -                          | -                 |
| [No complaints ..                                        | 65                     | -                      | -               | -                    | +                    | -          | -                     | -                        | -                          | -                 |
| Passed round worms a week before.                        | 55                     | -                      | -               | -                    | -                    | +          | +                     | -                        | -                          | -                 |
| Occasionally abdominal pain.                             | 70                     | -                      | -               | +                    | +                    | -          | -                     | -                        | -                          | -                 |
| Ditto                                                    | 60                     | -                      | -               | -                    | +                    | -          | -                     | -                        | -                          | -                 |
| Ditto                                                    | 60                     | -                      | -               | -                    | +                    | -          | -                     | -                        | -                          | -                 |
| Occasionally abdominal pain.<br>(Hook worm) occasionally | 75                     | -                      | -               | -                    | -                    | +          | -                     | x                        | -                          | -                 |

JULY, 64

## SHOWING SOCIO-ECONOMIC ENVIRONMENTS AND TABLE

123

| 1     | 2                | 3                              | 4               | 5                | 6                                  | 7                                                  |
|-------|------------------|--------------------------------|-----------------|------------------|------------------------------------|----------------------------------------------------|
| Age   | Economic status. | Environmental home Sanitation. | Dietary habit   | Personal hygien. | Physical conditions                | Family history.                                    |
| 9     | Poor             | Slum dwellers                  | Indiscriminate  | Disgusting       | Under-nourished anaemic, spleen 1+ | ..                                                 |
| 9     | Do.              | Ditto                          | Do.             | Do.              | Under-nourished                    |                                                    |
| 9     | Do.              | Ditto                          | Do.             | Do.              | Under-nourished, anaemic.          | Brother and sister do not complain of round worms. |
| 9     | Do..             | Congest ed ..                  | Do.             | Do.              | Ditto                              | ..                                                 |
| 9     | Do.              | Congested and filthy.          | Poor ..         | Do.              | Ditto                              | ..                                                 |
| 9     | Do.              | Slum dweller                   | Indiscriminate. | Do.              | Ditto                              | A sister occasionally passes round worms.          |
| 9     | Do.              | Do.                            | Do.             | Do.              | Ditto                              | ..                                                 |
| 9     | Do.              | Satisfactory                   | Do.             | Do.              | Malnourished, anaemic.             | ..                                                 |
| 9     | Do.              | Most filthy                    | Do.             | Do.              | Below par                          | ..                                                 |
| 9     | Do.              | Satisfactory                   | Indiscriminate  | Do.              | Below par                          | ..                                                 |
| 9     | Middle ..        | Slum dweller                   | Do.             | Do.              | Satisfactory                       | ..                                                 |
| 9     | Poor ..          | Do.                            | Do.             | Do.              | Malnutrition anaemic.              | ..                                                 |
| 9     | Middle ..        | Do.                            | Do.             | Do.              | Below par                          | ..                                                 |
| 9 1/2 | Do.              | Do.                            | Do.             | Do.              | Ditto                              | ..                                                 |
| 9 1/2 | Do.              | Do.                            | Do.             | Do.              | Anaemic                            | ..                                                 |
| 9 1/2 | Do.              | Do.                            | Do.             | Do.              | Moderate constitution.             | ..                                                 |
| 9 1/2 | Poor ..          | Insanitary ..                  | Do.             | Do.              | Ditto                              | ..                                                 |
| 9 1/2 | Middle ..        | Slum dweller                   | Do.             | Satisfactory     | Well-nourished ..                  | ..                                                 |
| 9 1/2 | Poor ..          | Do.                            | Do.             |                  |                                    |                                                    |

## DISTRIBUTION OF INTESTINAL PARASITES

| 8                                                                                                     | 9                      | i                     | ii             | iii                 | iv                   | v         | vi                   | vii                     | viii                      | ix               |
|-------------------------------------------------------------------------------------------------------|------------------------|-----------------------|----------------|---------------------|----------------------|-----------|----------------------|-------------------------|---------------------------|------------------|
| Complaints.                                                                                           | Haemoglobin percentage | Entamoeba histolytica | Entamoeba coli | Iodamoeba butschlii | Giardia intestinalis | Hook worm | Ascaris lumbricoides | Enterobius vermicularis | Trichocephalus trichiuris | Hymenolepis nana |
| Occasionally abdominal pain                                                                           | 80                     | —                     | —              | —                   | —                    | —         | +                    | —                       | —                         | —                |
| Occasionally passes round worms. Occasionally abdominal pain. Capricious appetite.                    | —                      | —                     | —              | —                   | —                    | —         | +                    | —                       | —                         | —                |
| Abdominal pain when hungry.                                                                           | 70                     | —                     | —              | +                   | —                    | —         | —                    | —                       | —                         | —                |
| Occasionally abdominal pain                                                                           | 55                     | —                     | +              | —                   | —                    | +         | +                    | —                       | —                         | —                |
| Ditto                                                                                                 | 60                     | —                     | —              | +                   | —                    | —         | +                    | —                       | —                         | —                |
| Occasionally passes seat worms.                                                                       | 70                     | —                     | +              | +                   | —                    | —         | +                    | —                       | —                         | —                |
| Occasionally abdominal pain.                                                                          | 65                     | —                     | +              | —                   | —                    | —         | +                    | —                       | —                         | —                |
| Diarrhoea, abdominal pain. Passed round worms in vomit once a year ago and perrectum three days back. | 80                     | —                     | —              | —                   | +                    | —         | —                    | —                       | —                         | —                |
| Occasionally passes round worms. Abdominal pain.                                                      | —                      | —                     | —              | —                   | —                    | —         | —                    | —                       | —                         | +                |
| No complaints                                                                                         | —                      | —                     | —              | —                   | —                    | —         | —                    | —                       | +                         | —                |
| No complaints                                                                                         | 65                     | —                     | —              | —                   | —                    | +         | —                    | —                       | —                         | +                |
| Occasionally passes seat worms.                                                                       | 55                     | —                     | +              | —                   | —                    | —         | —                    | —                       | +                         | —                |
| No complaints                                                                                         | 60                     | —                     | —              | —                   | —                    | +         | —                    | —                       | —                         | +                |
| Abdominal pain                                                                                        | 60                     | —                     | —              | +                   | +                    | —         | +                    | —                       | —                         | —                |
| No complaints                                                                                         | 65                     | +                     | —              | +                   | —                    | —         | —                    | —                       | +                         | —                |
| No complaints                                                                                         | 60                     | —                     | —              | —                   | +                    | —         | +                    | —                       | —                         | —                |
| Ditto                                                                                                 | 70                     | —                     | —              | +                   | —                    | —         | +                    | —                       | —                         | —                |

JULY 64

## SHOWING SOCIO-ECONOMIC ENVIRONMENTS AND TABLE

125

| 1   | 2               | 3                             | 4               | 5                | 6                                                  | 7                                                     |
|-----|-----------------|-------------------------------|-----------------|------------------|----------------------------------------------------|-------------------------------------------------------|
| Age | Economic status | Environmental home sanitation | Dietary habits  | Personal hygiene | Physical conditions                                | Family history                                        |
| 9½  | Poor            | Slum dwellers                 | Indiscriminate. | Disgusting ..    | Under-nourished, anaemic.                          | ..                                                    |
| 9½  | Do.             | Ditto                         | Do.             | Do.              | Ditto                                              | ..                                                    |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Moderate ..                                        | ..                                                    |
| 10  | Slum ..         | Ditto                         | Do.             | Do.              | Under-nourished                                    | ..                                                    |
| 10  | Poor ..         | Ditto                         | Do.             | Do.              | Ditto                                              | ..                                                    |
| 10  | Do. ..          | Ditto                         | Do.             | Do.              | Malnourished, anaemic.                             | Younger brother occasionally passes round worms.      |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Under-nourished anaemic                            | Brother and sister do not complain of worm infection. |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Ditto spleen 1+                                    | ..                                                    |
| 10  | Do.             | Ditto                         | Do.             | Do.              | ..                                                 | One sister occasionally passes round worms.           |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Under-nourished, thin and lean anaemic, spleen 1+. | ..                                                    |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Undernourished anaemic spleen 1+.                  | ..                                                    |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Undernourished poor physique, anaemic.             | Brothers and sister occasionally pass round worms.    |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Under-nourished poor physique spleen 2+.           | Elder brother occasionally passes round worms.        |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Under-nourished anaemic. Spleen 1+.                | ..                                                    |
| 10  | Do.             | Ditto                         | Do.             | Do.              |                                                    |                                                       |

## DISTRIBUTION OF INTESTINAL PARASITES

| 8                                                                     | 9                      | i                      | ii              | iii                  | iv                    | v          | vi                    | vii                      | viii                       | ix                |
|-----------------------------------------------------------------------|------------------------|------------------------|-----------------|----------------------|-----------------------|------------|-----------------------|--------------------------|----------------------------|-------------------|
| Complaints                                                            | Hemoglobin percentage. | Entamoeba histolytica. | Entamoeba coli. | Iodamoeba butschlii. | Giardia intestinalis. | Hook worm. | Ascaris lumbricoides. | Enterobius vermicularis. | Trichocephalus trichiuris. | Hymenolepis nana. |
| No complaints ..                                                      | —                      | —                      | —               | —                    | —                     | +          | +                     | —                        | —                          | —                 |
| Abdominal pain Rickety, chest.                                        | —                      | —                      | —               | —                    | —                     | —          | +                     | —                        | —                          | —                 |
| No complaints ..                                                      | 75                     | —                      | —               | —                    | —                     | —          | +                     | —                        | —                          | —                 |
| Occasionally abdominal pain and fever.                                | 65                     | —                      | —               | —                    | —                     | —          | +                     | —                        | —                          | —                 |
| Passed round worms a few days back.                                   | 75                     | —                      | —               | —                    | +                     | —          | —                     | —                        | —                          | —                 |
| Passed round worms 6 months back. And occasionally passes seat worms. | 60                     | —                      | —               | —                    | +                     | —          | +                     | —                        | —                          | —                 |
| Occasionally passes round worms since a year. Capricious appetite.    | 65                     | —                      | +               | —                    | —                     | —          | +                     | —                        | —                          | —                 |
| Occasionally passes thread worms.                                     | 75                     | —                      | —               | —                    | —                     | —          | —                     | —                        | —                          | +                 |
| Often passing round worms since 1 month.                              | 60                     | —                      | —               | —                    | —                     | —          | +                     | +                        | —                          | —                 |
| No complaints ..                                                      | 65                     | —                      | —               | —                    | +                     | —          | +                     | —                        | —                          | —                 |
| Had malaria ..                                                        | 65                     | —                      | —               | —                    | —                     | —          | —                     | —                        | —                          | +                 |
| Occasionally abdominal pain.                                          | 70                     | —                      | —               | +                    | —                     | —          | +                     | —                        | —                          | —                 |
| Occasionally passes round worms and thread worms. Abdominal pain.     | 65                     | —                      | +               | —                    | —                     | +          | —                     | —                        | —                          | —                 |
| No complaints ..                                                      | 65                     | —                      | —               | —                    | —                     | —          | —                     | —                        | —                          | +                 |

# SHOWING SOCIO-ECONOMIC ENVIRONMENTS AND TABLE AND

127

| 1   | 2               | 3                             | 4               | 5                | 6                                   | 7                                                         |
|-----|-----------------|-------------------------------|-----------------|------------------|-------------------------------------|-----------------------------------------------------------|
| Age | Economic status | Environmental home sanitation | Dietary habits  | Personal hygiene | Physical conditions                 | Family history                                            |
| 10  | Poor            | Slum dwellers                 | Indiscriminate. | Disgusting       | Undernourished, anaemic             | ..                                                        |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Undernourished                      | ..                                                        |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Undernourished                      | ..                                                        |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Well-nourished                      | ..                                                        |
| 10  | Do.             | Congested, unhealthy.         | Do.             | Do.              | Ditto                               | ..                                                        |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Undernourished ..                   | Younger brother recently passed round worms.              |
| 10  | Middle ..       | Congested ..                  | Do.             | Do.              | Ditto                               | ..                                                        |
| 10  | Do ..           | Slum dwellers                 | Do.             | Do.              | Under-nourished, anaemic.           | ..                                                        |
| 10  | Poor ..         | Overcrowding insanitary.      | Do.             | Do               | Under nourished, anaemic.           | ..                                                        |
| 10  | Do. ..          | Insanitary ..                 | Do.             | Do.              | Under nourished, below par.         | ..                                                        |
| 10  | Do. ..          | Congested insanitary.         | Do.             | Do.              | Undernourished                      | ..                                                        |
| 10  | Do. ..          | Slum dwellers.                | Do.             | Do.              | Ditto. ..                           | ..                                                        |
| 10  | Do. ..          | Ditto                         | Do.             | Do.              | Under nourished, poor constitution. | ..                                                        |
| 10  | Do. ..          | Filthy ..                     | Do.             | Do.              | Under nourished                     | ..                                                        |
| 10  | Do.             | Do.                           | Do.             | Do.              | Do.                                 | ..                                                        |
| 10  | Do. ..          | Do.                           | Do.             | Do.              | Under nourished, weak, anaemic.     | A young brother and sister occasionally pass round worms. |
| 10  | Do. ..          | Overcrowding filthy.          | Do.             | Do.              |                                     |                                                           |

## DISTRIBUTION OF INTESTINAL PARASITES

| 8                                                                                                          | 9                       | i                      | ii              | iii                  | iv                    | v          | vi                    | vii                      | viii                       | ix                |
|------------------------------------------------------------------------------------------------------------|-------------------------|------------------------|-----------------|----------------------|-----------------------|------------|-----------------------|--------------------------|----------------------------|-------------------|
| Complaints                                                                                                 | Haemoglobin percentage. | Entamoeba histolytica. | Entamoeba coli. | Iodamoeba butschlii. | Giardia intestinalis. | Hook worm. | Ascaris lumbricoides. | Enterobius vermicularis. | Trichocephalus trichiurus. | Hymenolepis nana. |
| Passes round worms for five consecutive days after a dose of an anthelmintic. Occasionally abdominal pain. | 70                      | —                      | —               | —                    | —                     | —          | —                     | —                        | —                          | +                 |
| Occasionally passes loose motions.                                                                         | 65                      | —                      | —               | —                    | +                     | —          | —                     | —                        | —                          | +                 |
| No complaints ..                                                                                           | 65                      | —                      | —               | —                    | —                     | —          | +                     | —                        | —                          | —                 |
| Ditto ..                                                                                                   | 95                      | —                      | +               | —                    | —                     | —          | —                     | —                        | —                          | —                 |
| Ditto ..                                                                                                   | 95                      | —                      | +               | —                    | —                     | —          | —                     | —                        | —                          | —                 |
| Passed 34 round worms a month back after a dose of anthelmintic was administered.                          | 70                      | —                      | +               | +                    | —                     | —          | —                     | —                        | —                          | —                 |
| No complaints ..                                                                                           | 95                      | —                      | —               | —                    | —                     | +          | —                     | —                        | —                          | —                 |
| Ditto ..                                                                                                   | 70                      | —                      | —               | +                    | —                     | —          | —                     | +                        | +                          | +                 |
| Occasionally abdominal pain.                                                                               | 60                      | —                      | +               | +                    | —                     | —          | +                     | —                        | —                          | —                 |
| Occasionally passes round worms.                                                                           | 55                      | —                      | —               | +                    | —                     | +          | +                     | —                        | —                          | —                 |
| Occasionally passes round worms, periodic abdominal pain.                                                  | 55                      | —                      | +               | —                    | —                     | +          | +                     | —                        | +                          | —                 |
| Occasionally passes round worms.                                                                           | 70                      | —                      | +               | +                    | —                     | —          | +                     | —                        | +                          | —                 |
| Occasionally abdominal pain.                                                                               | 60                      | —                      | —               | —                    | —                     | —          | —                     | —                        | +                          | —                 |
| Occasionally passes round worms.                                                                           | 60                      | —                      | +               | —                    | —                     | —          | —                     | —                        | —                          | —                 |
| Ditto ..                                                                                                   | —                       | —                      | —               | +                    | —                     | —          | +                     | —                        | —                          | +                 |
| Ditto ..                                                                                                   | 70                      | —                      | —               | —                    | —                     | —          | +                     | —                        | —                          | —                 |
| No complaints ..                                                                                           | 60                      | —                      | +               | +                    | —                     | +          | —                     | —                        | —                          | —                 |

## SHOWING SOCIO-ECONOMIC ENVIRONMENTS AND TABLE

| 1   | 2               | 3                             | 4               | 5                | 6                                                         | 7                                                |
|-----|-----------------|-------------------------------|-----------------|------------------|-----------------------------------------------------------|--------------------------------------------------|
| Age | Economic status | Environmental home sanitation | Dietary habits  | Personal hygiene | Physical conditions                                       | Family history                                   |
| 10  | Poor            | Overcrowding insanitary       | Indiscriminate. | Disgusting       | Undernourished lean.                                      | Younger brother occasionally passes round worms. |
| 10  | Do ..           | Slum dwellers                 | Do.             | Do.              | Under-nourished anaemic.                                  | Sister-in-law passes round worms.                |
| 10  | Do. ..          | Congested                     | Do.             | Do.              | Undernourished anaemic, poor.                             | ..                                               |
| 10  | Middle ..       | Slum dwellers                 | Do.             | Do.              | Satisfactory ..                                           | ..                                               |
| 10  | Do. ..          | Ditto                         | Do.             | Do.              | Wellnourished anaemic.                                    | ..                                               |
| 10  | Poor ..         | Ditto                         | Do.             | Do.              | Undernourished anaemic                                    | ..                                               |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Undernourished anaemic, palpable tender liver, spleen 1+. | ..                                               |
| 10  | Do.             | Poor, congested unhygienic    | Do.             | Do.              | Undernourished anaemic.                                   | ..                                               |
| 10  | Do.             | Slum dwellers                 | Do.             | Do.              | Ditto                                                     | A brother occasionally passes round worms.       |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Undernourished weak constitution                          | ..                                               |
| 10  | Do. ..          | Ditto                         | Do.             | Fair ..          | Poor, weak constitution.                                  | ..                                               |
| 10  | Do.             | Ditto                         | Do.             | Disgusting       | Undernourished anaemic.                                   | ..                                               |
| 10  | Do.             | Ditto                         | Do.             | Do.              | Anaemic ..                                                | ..                                               |
| 10  | Do.             | Ditto                         | Do.             | oor ..           | Undernourished anaemic.                                   | ..                                               |
| 10½ | Do. ..          | Ditto                         | Do.             | Fair ..          | Ditto                                                     | ..                                               |
| 10½ | Do. ..          | Ditto                         | Do.             |                  |                                                           |                                                  |

## DISTRIBUTION OF INTESTINAL PARASITES

| 8                                                             | 9                       | i)                     | ii              | iii                  | iv                    | v          | vi                    | vii                      | viii                       | ix                |
|---------------------------------------------------------------|-------------------------|------------------------|-----------------|----------------------|-----------------------|------------|-----------------------|--------------------------|----------------------------|-------------------|
| Complaints                                                    | Haemoglobin percentage. | Entamoeba histolytica. | Entamoeba coli. | Iodamoeba butschlii. | Giardia intestinalis. | Hook worm. | Ascaris lumbricoides. | Enterobius vermicularis. | Trichocephalus trichiuris. | Hymenolepis nana. |
| No complaints ..                                              | 65                      | —                      | +               | —                    | —                     | +          | +                     | —                        | —                          | —                 |
| Occasionally abdominal pain.                                  | 60                      | —                      | —               | —                    | —                     | —          | +                     | —                        | —                          | —                 |
| No complaints ..                                              | 75                      | —                      | —               | —                    | +                     | —          | —                     | —                        | —                          | —                 |
| No complaints ..                                              | —                       | —                      | +               | +                    | —                     | —          | —                     | —                        | +                          | —                 |
| No complaints ..                                              | 75                      | —                      | —               | +                    | —                     | —          | —                     | —                        | —                          | —                 |
| No complaints ..                                              | —                       | —                      | —               | +                    | —                     | —          | +                     | —                        | —                          | —                 |
| Pain over right hypochondrium. Had amebic dysentery.          | 60                      | —                      | +               | +                    | +                     | —          | —                     | —                        | —                          | —                 |
| Indigestion. abdominal pain                                   | 55                      | —                      | +               | —                    | —                     | +          | +                     | +                        | +                          | —                 |
| Occasionally passes round worms in the stools.                | 65                      | —                      | —               | —                    | +                     | —          | +                     | —                        | —                          | —                 |
| Occasionally abdominal pain and thoracic pain.                | —                       | —                      | —               | —                    | —                     | —          | +                     | —                        | —                          | —                 |
| No complaints ..                                              | —                       | —                      | —               | —                    | +                     | —          | +                     | +                        | —                          | —                 |
| Pain round umbilicus ..                                       | —                       | —                      | —               | —                    | —                     | —          | +                     | —                        | —                          | —                 |
| Occasionally abdominal pain. Passes round worms in stool.     | 55                      | —                      | —               | —                    | +                     | —          | —                     | —                        | —                          | —                 |
| Occasionally passes round worms and small worms (Hook worms). | 55                      | —                      | —               | —                    | +                     | —          | —                     | —                        | —                          | —                 |
| Occasionally passes seat worms.                               | —                       | +                      | +               | +                    | —                     | —          | +                     | —                        | —                          | —                 |

TABLE V SHOWING SOCIO-ECONOMIC ENVIRONMENTS AND

| 1   | 2               | 3                             | 4              | 5                | 6                                     | 7                                             |
|-----|-----------------|-------------------------------|----------------|------------------|---------------------------------------|-----------------------------------------------|
| Age | Economic status | Environmental home Sanitation | Dietary habits | Personal hygiene | Physical conditions                   | Family history                                |
| 10½ | Poor ..         | Satisfactory ..               | Indiscriminate | Disgusting ..    | Moderate ..                           | Family members pass round worms occasionally. |
| 10½ | Do. ..          | Slum dwellers                 | Do.            | Do.              | Under-nourished, anaemic.             | Father tubercular.                            |
| 11  | Middle ..       | Ditto                         | Do.            | Do.              | Satisfactory ..                       | ..                                            |
| 11  | Poor ..         | Ditto                         | Do.            | Do.              | Under-nourished, anaemic.             | ..                                            |
| 11  | Do. ..          | Ditto                         | Do.            | Do.              | Ditto                                 | ..                                            |
| 11  | Do. ..          | Ditto                         | Do.            | Do.              | Under-nourished, emaciated, Spleen 1+ | Family members pass round worms occasionally. |
| 11  | Do. ..          | Ditto ..                      | Do. ..         | Do. ..           | Moderate ..                           | Many members in the family pass round worms.  |
| 12  | Do. ..          | Ditto ..                      | Do. ..         | Do. ..           | Under-nourished, anaemic.             | ..                                            |

## DISTRIBUTION OF INTESTINAL PARASITES

| 8                                                  | 9                      | i                     | ii             | iii                 | iv                   | v         | vi                   | vii                     | viii                      | ix               |
|----------------------------------------------------|------------------------|-----------------------|----------------|---------------------|----------------------|-----------|----------------------|-------------------------|---------------------------|------------------|
| Complaints                                         | Haemoglobin percentage | Entamoeba histolytica | Entamoeba coli | Iodamoeba butschlii | Giardia intestinalis | Hook worm | Ascaris lumbricoides | Enterobius vermicularis | Trichycephalus trichiurus | Hymenolepis nana |
| Passed round worms 2 years ago.                    | 70                     | —                     | —              | —                   | —                    | —         | +                    | —                       | —                         | —                |
| Abdominal pain. ..                                 | —                      | —                     | —              | —                   | —                    | —         | +                    | —                       | —                         | —                |
| No complaint ..                                    | —                      | +                     | +              | +                   | —                    | —         | +                    | —                       | —                         | —                |
| Passes round worms. Abdominal pain.                | 65                     | —                     | —              | —                   | —                    | —         | +                    | —                       | —                         | —                |
| No complaint ..                                    | —                      | —                     | +              | —                   | —                    | —         | —                    | +                       | +                         | —                |
| Occasionally passes round worms. Abdominal pain.   | 65                     | —                     | —              | —                   | —                    | +         | +                    | —                       | +                         | —                |
| Occasionally passes round worms.                   | 65                     | —                     | —              | —                   | —                    | +         | +                    | —                       | —                         | —                |
| Occasionally abdominal pain. Did pass round worms. | 60                     | —                     | —              | —                   | —                    | —         | +                    | —                       | —                         | —                |

TABLE VI—SHOWING SOCIO-ECONOMIC ENVIRONMENTS

| No. | Age | Economic Status | Environmental condition       | Dietary habits    | Personal Hygiene |
|-----|-----|-----------------|-------------------------------|-------------------|------------------|
| 1   | 7   | Middle ..       | Slum dwellers ..              | Indiscriminate .. | Disgusting       |
| 2   | 7½  | Poor ..         | Ditto ..                      | Do. ..            | Do.              |
| 3   | 7½  | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 4   | 7½  | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 5   | 7½  | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 6   | 8   | Do. ..          | Slum dwellers, over-crowding. | Do. ..            | Do.              |
| 7   | 8   | Do. ..          | Slum dwellers ..              | Do. ..            | Do.              |
| 8   | 8   | Middle ..       | Ditto ..                      | Do. ..            | Do.              |
| 9   | 8½  | Poor ..         | Ditto ..                      | Do. ..            | Do.              |
| 10  | 9   | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 11  | 9   | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 12  | 9   | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 13  | 9   | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 14  | 9   | Do. ....        | Ditto ..                      | Do. ..            | Do.              |
| 15  | 9   | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 16  | 9   | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 17  | 9   | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 18  | 9   | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 19  | 9   | Do. ..          | Satisfactory                  | Do. ..            | Do.              |
| 20  | 9½  | Do. ..          | Slum dwellers                 | Do. ..            | Satisfactory     |
| 21  | 9½  | Do. ..          | Satisfactory                  | Do. ..            | Disgusting       |
| 22  | 10  | Do. ..          | Slum dwellers                 | Do. ..            | Do.              |
| 23  | 10  | Do. ..          | Ditto ..                      | Do. ..            | Do.              |
| 24  | 10  | Do. ..          | Ditto ..                      | Do. ..            | Do.              |

## OF SOME NEGATIVE CASES.

| Physical conditions                      | Family History                                           | Complaints                                                             | Hg% |
|------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------|-----|
| Under-nourished ..                       | ..                                                       | No complaints ..                                                       | 90  |
| Under-nourished, anaemic ..              | 1 sister passes round worms.                             | Occasionally passes seat worms                                         | 65  |
| Ditto ..                                 | Some brothers and sisters occasionally pass round worms. | Occasionally passes, round worms.                                      | 60  |
| Under-nourished anaemic, lean spleen 1+. | ..                                                       | No complaints ..                                                       | 65  |
| Under-nourished, anaemic. ..             | ..                                                       | Occasionally passes thread worms and round worms. Capricious appetite. | 65  |
| Ditto ..                                 | ..                                                       | Occasionally passes round worms. Abdominal pain.                       | 60  |
| Ditto ..                                 | ..                                                       | Occasionally passes seat worms                                         | 75  |
| Under-nourished ..                       | ..                                                       | No complaints ..                                                       | 90  |
| Ditto ..                                 | ..                                                       | Occasionally abdominal pain.                                           | ..  |
| Ditto ..                                 | ..                                                       | No complaints ..                                                       | 75  |
| Ditto ..                                 | Brother, sister do not complain of round worms.          | Occasionally passes seat worms.                                        | 65  |
| Under-nourished, thin and lean           | ..                                                       | No complaints ..                                                       | 70  |
| Malnourished, anaemic ..                 | ..                                                       | Occasionally passes seat worms                                         | 70  |
| Malnourished, thin and lean, anaemic.    | ..                                                       | No complaints ..                                                       | 65  |
| Under-nourished, anaemic, spleen 2+.     | A sister passes seat worms                               | Occasionally passes seat worms                                         | 65  |
| Under-nourished, anaemic ..              | ..                                                       | Abdominal pain ..                                                      | 65  |
| Ditto ..                                 | ..                                                       | Occasionally abdominal pain                                            | 60  |
| Ditto ..                                 | ..                                                       | No complaints ..                                                       | 65  |
| Under-nourished, weak constitution.      | ..                                                       | Occasionally passes round worms.                                       | 65  |
| Under-nourished, anaemic ..              | ..                                                       | Occasionally abdominal pain                                            | 60  |
| Rickety chest ..                         | ..                                                       | No complaints ..                                                       | 70  |
| Under-nourished, anaemic, spleen 1+.     | Cousin sister occasionally passes round worms.           | Occasionally passes round worms.                                       | 75  |
| Under-nourished, anaemic ..              | ..                                                       | No complaints ..                                                       | 65  |

JULY 64

135

| Serial No. | Age | Economics Status | Environmental condition   | Dietary habits    | Personal Hygiene |
|------------|-----|------------------|---------------------------|-------------------|------------------|
| 25         | 10  | Poor ..          | Slum dwellers ..          | Indiscriminate .. | Disgusting       |
| 26         | 10  | Do. ..           | Ditto ..                  | Do. ..            | Satisfactory     |
| 27         | 10  | Do. ..           | Ditto ..                  | Do. ..            | Disgusting       |
| 28         | 10  | Do. ..           | Ditto ..                  | Do. ..            | Do.              |
| 29         | 10½ | Middle ..        | Ditto ..                  | Do. ..            | Do.              |
| 30         | 11  | Poor ..          | Congested ..              | Do. ..            | Do.              |
| 31         | 12  | Do. ..           | Slum dwellers, congested. | Do. ..            | Fair             |
| 32         | 12  | Do. ..           | Slum dwellers ..          | Do ..             | Disgusting       |

| Physical conditions                          | Family History                            | Complaints                                      | Hg% |
|----------------------------------------------|-------------------------------------------|-------------------------------------------------|-----|
| Under-nourished, ..                          | ..                                        | No complaints ..                                | 75  |
| Under-nourished, anaemic, spleen 1+.         | ..                                        | Occasionally passes round worms. since long.    | 65  |
| Well-built ..                                | ..                                        | No complaints ..                                | 80  |
| Under-nourished, anaemic, weak constitution. | ..                                        | Occasionally abdominal pain passes seat worms.  | 66  |
| Under-nourished ..                           | ..                                        | Occasionally abdominal pain                     | 60  |
| Under-nourished, anaemic ..                  | ..                                        | Abdominal pain ..                               | 65  |
| Under-nourished, anaemic and emaciated.      | ..                                        | Occasionally passes round worms.                | 60  |
| Slightly anaemic ..                          | ..                                        | No complaints. ..                               | 65  |
| Under-nourished, dull, anaemic               | A young sister passes worms occasionally. | Occasionally passes round worms and seat worms. | 65  |

## BLOOD PICTURE AND INTESTINAL PARASITES (TABLE VII—X)

Routine laboratory investigations are recognised as valuable means, either to confirm clinical diagnosis or to suggest further lines of investigations, for pinning down the correct cause. Frequently laboratory findings surprisingly reveal a different etiological agent of the trouble than what a clinician might have been tempted to suspect on the basis of clinical history or signs and symptoms alone. The modern medicine, therefore, is justified to lay more emphasis on laboratory investigations, where possible. It is beyond the scope of this note, however, to go into details of the significance of various types of laboratory findings. The Corprological investigations carried out are given in details elsewhere. We would discuss here hæmatological changes brought about by or consequent upon intestinal parasitic infestation since this is one of the principal investigations which has got some bearing on the intestinal parasitism.

### 1. THE ERYTHROCYTES

The normal erythrocytic picture in various age groups as well as under various physiological influences is give in Table VII. The pathological variations of erythrocytes may be one of the types briefly defined below:—

1. *Poikilocytosis* denotes variability, in the shape of the red cells, which may deviate from the normal and resemble flask, a pear or a bean. This change is strikingly noticeable in all cases of severe anæmias, especially in pernicious anæmia, i.e., fish-tape worm (*Diphyllobothrium latum*) infections of long standing.

2. *Anisocytosis* variability is size of erythrocytes, most often occurring in pernicious anaemia, and in chronic cases of Fish-tape-worm infections. Large sized cell predominate and colour under usually above unity (macrocytic, hyperchromic anamia) in the case of fish-tape-worm infection.

3. *Polychromatophilia* or *polychromasia* denotes colour variation in red cells. In health, the red cells (except the central pale area) are coloured bright pink with Leishman's stain. In severe cases of anæmias, however, the red cells may either stain blue, bluish-red or bright pink. The cells staining blue are young and in polychromat. ophilia they predominate in the blood. Fish tap-worm in ffection is perhaps the only instance of intestinal parasitism in which polychromasia may be observed.

4. *Punctate basophilia* is differentiated by the presence of blue dots in the pink cytoplasm of the stained R.B.Cs. These blue dots constitute the same material which is responsible for the blueness in the polychromasia. Sometimes one or two much larger blue bodies, known as Howel-Jolly bodies, are seen and are believed to be nuclear remnants. Punctate basophilia is seen in severe and anaemias, pernicious anaemia or in anaemia due to Fishtape-worm infection or lead posioning.

5. *Reticulocytes* are red cells showing net like structure within when stained superavitaly. These are recently formed young erythrocytes and their number indicates the rate at which erythropoiesis proceedings. Normally they are present upto 1 per cent of total count. Helminthic or protozeal infection may indirectly induce reticulocytosis, especially during the stage of recovery from a long standing severe infestation.

6. *Nucleated red cells* are found in conditions like pernicious anæmias, anæmia due to fish-tape-worm infection, severe secondary anæmias, and in splenomedullary leukemia.

There is usually great reduction in the number of R.B.Cs. In some cases, however, the fall in R.B.C. count is not appreciable.

The nucleated cells more or less resemble lymphocytes in size. Three different forms of nucleated red cells are usually recognised. The *normoblasts* are much larger in size and is with polychromatic cytoplasm. The *megaloblast* is a large cell, with a finely woven nuclear structure, often with acidophilic cytoplasm which may be polychromatic. The *megaloblasts* show most primitive type of blood regeneration and are frequently seen in pernicious anaemia and rarely in chronic fish-tape-worm infections.

*Intestinal parasitism and the Erythrocytes Table VIII*—Some degree of anaemia, is always associated in prolonged parasitic infections of the human intestines. Poor socio-economic status low nutritional standards and bad environmental sanitation aggravate the conditions. The condition is intensified further if the parasites involved either ingest R.B.Cs. or destroy them or live on digested food of the host. Normal erythropoiesis may also be interfered with by such factors as absorption of toxic products and the super-added bacterial infection of the intestinal mucosa. The hook worm and fish-tape worm infections in particular disturb the normal erythrocytic picture.

In *ankylostomiasis*, the anaemia is due to chronic loss of blood, absorption of toxins, secretion of anticoagulant ferments and possibly invasion of damaged mucosa of small intestine with pathogenic bacteria. This anaemia is typically of hypochromic, microcytic type. The erythrocytic count may be as low as one million (average 1,400,000), Haemoglobin may fall to 10 per cent and the colour index may range between 0.5—0.7. Mean corpuscular volume falls below normal and in severe cases there may be normoblasts with reticulocyte count upto 3 percent and this may be accompanied by generalised oedema, sometimes with increase in adipose tissue and signs of effusion into serious cavities. Cardiac dilatation is one of the serious sequelae of severe cases of hook-worm infection.

Factors responsible for anaemias in Fish-tape-worm infections have been extensively studied. The anaemia, though uncommon, is of a pernicious type with hyperchromia, macrocytosis, anisocytosis, poikilocytosis, polychromasia, etc. The experimental evidence shows that anaemia is caused by marked affinity of the worm for Vitamin B<sub>12</sub>, which it absorbs from the food and deprives the host of this important extrinsic factor for normal haemopoiesis.

In heavy whip-worm infections an erythrocytic count of 2,500,000 or less and haemoglobin reduction to 25—20 percent may be found.

It will not be out of place to refer to anaemias caused in testinal *amobiasis*. In this case there is simple normocytic anaemia. The R.B.Cs. count usually ranges from 4 to 4.5 million. In chronic cases of long standing, however, the count may fall to 3 million or even to 2.5 million. Similar picture has also been referred to in severe cases of *giardiasis*. It may probably also occur in cases of infection with *Iodamoeba butchlii* when its vegetative form assumes pathogenic role.

## 2. THE LEUCOCYTES

The normal and total differential leucocyte count in various age groups as well as in different physiological conditions is given in Table VII.

The departure from the normal in respect of total and differential leucocytic count in consequence of or associated with intestinal parasitic infection is summarised below.

*Total leucocyte count*—Pathological leucocytosis is characterised by the total count exceeding 10,000 c.m.m. together with an altered ratio of all types. Generally.

TABLE VII  
SHOWING RANGE OF LEUKOCYTES (DIFFERENTIAL COUNTS) DURING DIFFERENT PERIOD OF HUMAN LIFE  
(INFANT, CHILDREN AND ADOLESCENTS, ETC.)

| Total count                                                                                         | Neutrophils   | Eosinophils   | Basophils    | Lymphocytes | Monocytes     | Neutrophilic Myelocytes |
|-----------------------------------------------------------------------------------------------------|---------------|---------------|--------------|-------------|---------------|-------------------------|
| <b>Infants:</b> (Forkner, C.E. (1929): <i>Bull. John Hopkins Hosp.</i> , 34:75):                    |               |               |              |             |               |                         |
| 1st day                                                                                             | 15,250—45,000 | 53.82—5% (61) | 0—6% (2.2)   | 5.56% (31)  | 15.34% (5.8)  | 0—13%                   |
| 3—5th day                                                                                           | 4,000—18,800  | 32.59%        | 1.5—13%      | 15—44%      | 10—23%        | 0.1—1.5%                |
| 6—8th day                                                                                           | 7,600—16,400  | 26.5—67%      | 0—1.5%       | 17—61%      | 7—19%         | 0—3%                    |
| 9—11th day                                                                                          | 8,100—16,500  | 18.5—46%      | 0—2% (0.4)   | 22—69% (61) | 8.5—28% (4.8) | 0—1%                    |
| <b>Children:</b> (Kolmer, J.A. and Boerner, F. (1945): <i>Approved Lab. Tech.</i> ):                |               |               |              |             |               |                         |
| 3 months—3 years                                                                                    | ..            | 40—50%        | 0—0.5%       | 50—60%      | 0.5—5%        | ..                      |
| 3 years—5 years                                                                                     | ..            | 50—60% (42)   | 0—0.5% (0.6) | 40—50% (50) | 0.5—5% (5)    | ..                      |
| 5 years—15 years                                                                                    | ..            | 55—65% (57)   | 0—0.5% (0.5) | 30—40% (35) | 0.5—6% (5.1)  | ..                      |
| <b>Adolescents:</b> (Kolmer J.A. & Boerner, F. (1945): <i>App. Lab. Technic.</i> ):                 |               |               |              |             |               |                         |
| 15 years and over                                                                                   | 6—10,000      | 60—70% (59)   | 0—0.5% (0.5) | 20—30% (34) | 2—6% (4.0)    | ..                      |
| <b>Pregnancy</b> (Bethell, F.H. Hartsell, F.E. & Farrell, C. (1943): <i>Physical Rev.</i> , 23:270) |               |               |              |             |               |                         |
| 2nd month                                                                                           | 10,182        | 58.00         | 0.00         | 34.00       | 4.90          | ..                      |
| 3rd Month                                                                                           | 10,022        | 66.71         | 0.17         | 27.85       | 3.93          | ..                      |
| 4th month                                                                                           | 10,420        | 67.66         | 0.11         | 27.51       | 3.35          | ..                      |
| 5th month                                                                                           | 10,888        | 67.72         | 0.15         | 26.96       | 4.11          | ..                      |
| 6th month                                                                                           | 10,539        | 69.56         | 0.12         | 25.21       | 3.98          | ..                      |
| 7th month                                                                                           | 10,875        | 69.68         | 0.15         | 25.30       | 4.41          | ..                      |
| 8th month                                                                                           | 10,518        | 69.47         | 0.12         | 25.11       | 4.47          | ..                      |
| 9th month                                                                                           | 10,339        | 68.96         | 0.09         | 25.32       | 4.46          | ..                      |
| Post partum                                                                                         | ..            | ..            | ..           | ..          | ..            | ..                      |
| 5—9th week                                                                                          | 8,192         | 51.29         | 0.31         | 41.28       | 4.26          | ..                      |
| 10th 11th month                                                                                     | 8,072         | 54.63         | 0.26         | 39.52       | 3.83          | ..                      |

the increased count is due to an increase in the neutrophilic granular leucocytes except in allergic conditions, parasitic infections, etc., where the eosinophils disturb the relative proportion of the leucocytes their preponderance.

Marked leucocytosis has been observed in all cases of intestinal obstructions, both arising from intestinal parasitic invasions or from some other causes. Allergic toxicity caused by the absorption of metabolites derived from parasites may also induce leucocytosis. Excepting of a chronic leucocytosis in *ascariasis* and *ankylostomiasis* and possibly in tape-worm infections may not be a farfetched idea. Leucocytosis may also be expected to occur in intestinal parasites which may cause internal hæmorrhage. Rise in leucocytes has been observed in hepatic amoebiasis. Several workers have recorded a rise (upto 17,000 W.B.Cs. per cumm.) followed by a fall to normal or below in leucocyte count with a predominant eosinophilia in serious *ancylostomiasis*. Parasites which provoke inflammatory conditions in the intestinal mucosa may also cause leucocytosis. Definite rise followed by a fall has been recorded in *trichocephaliasis*, *strongyloidiasis*, *taeniasis* and *diphyllobothriocephaliasis*.

*Differential leucocyte count*—(1) *Eosinophils*—Relatively marked increase in the proportion of eosinophils occurs in helminthic infections, especially in *ankylostomiasis* where it may rise up to 15 per cent (of 10,000 total count). In *ascariasis*, *taeniasis*, *caryuriasis*, there is a definite increase in eosinophilic count although it is not constant. In *echinococcosis* the count may go upto as high as 50 per cent of the normal total count. In amoebic infection also there is some degree of eosinophilia although it is not a constant feature.

*Lymphocytosis* and *monocytosis* are of no significance in intestinal parasitism and therefore, left out without any comments.

*The cattle are grazing,  
Their heads never raising,  
There are forty feeding like one*

(Wordsworth)

TABLE VIII  
SHOWING DEVIATION OF BLOOD PICTURE  
FROM THE NORMAL IN INTESTINAL INFECTIONS

| Etiological agent                      | Total R.B.Cs.                                           | Blood picture |                                                          |                                    |                         |                                  |                           |        |        |                                    |                |
|----------------------------------------|---------------------------------------------------------|---------------|----------------------------------------------------------|------------------------------------|-------------------------|----------------------------------|---------------------------|--------|--------|------------------------------------|----------------|
|                                        |                                                         | Hg%           | Neutrophils                                              | Eosino-<br>phils                   | Large Mono-<br>nucleare | Total W.B.Cs.                    | Total W.B.Cs.             |        |        |                                    |                |
| 1. <i>Entamoeba histolytica</i> ..     | Probably fall both in intestinal and hepatic amoebiasis | Probably fall | Probably falls both in intestinal and hepatic amoebiasis | Rise in hepatic amoebiasis only.   | Probably rise           | Rise in hepatic amoebiasis only. | Probably rise.            | Ditto. | Ditto. | Probably rise is followed by fall. | Probably rise. |
| 2. <i>Balanidium coli</i> ..           | Probably fall                                           | Probably fall | Probably fall                                            | Rise in followed by fall ..        | Rise                    | Rise                             | Probably rise             | Do.    | Do.    | Probably rise is followed by fall. | Probably rise. |
| 3. <i>Trichocephalus trichiurus</i> .. | Ditto                                                   | Ditto         | Ditto                                                    | Ditto                              | Do.                     | Do.                              | Do.                       | Do.    | Do.    | Probably rise is followed by fall. | Probably rise. |
| 4. <i>Strongyloides stercoralis</i> .. | Ditto                                                   | Fall          | Fall                                                     | Probably fall                      | Do.                     | Do.                              | Do.                       | Do.    | Do.    | Probably rise is followed by fall. | Probably rise. |
| 5. <i>Anchylostoma duodenale</i> ..    | Probably fall                                           | Probably fall | Probably fall                                            | ..                                 | Probably rise           | ..                               | ..                        | ..     | ..     | ..                                 | ..             |
| 6. <i>Ascaris lumbricoides</i> ..      | Probably fall                                           | ..            | ..                                                       | Rise is followed by fall ..        | Rise                    | ..                               | Rise is followed by fall. | Ditto. | Ditto. | Probably rise is followed by fall. | Probably rise. |
| 7. <i>Enterobius vermicularis</i> ..   | Probably fall                                           | ..            | Probably fall                                            | ..                                 | ..                      | ..                               | ..                        | ..     | ..     | ..                                 | ..             |
| 8. <i>Trueta saginata</i> ..           | Probably fall                                           | ..            | Probably fall                                            | ..                                 | ..                      | ..                               | ..                        | ..     | ..     | ..                                 | ..             |
| 9. <i>Diphyllobothrium latum</i> ..    | Ditto                                                   | Ditto         | Ditto                                                    | Ditto                              | Do.                     | Do.                              | Do.                       | Do.    | Do.    | ..                                 | ..             |
| 10. <i>Hymenolepis nana</i> ..         | Ditto                                                   | Ditto         | Ditto                                                    | Ditto                              | Do.                     | Do.                              | Do.                       | Do.    | Do.    | ..                                 | ..             |
| 11. <i>Echinococcus granulosus</i> ..  | ..                                                      | ..            | ..                                                       | Probably rise is followed by fall. | Ditto                   | ..                               | ..                        | ..     | ..     | ..                                 | ..             |
| 12. <i>Hirudinaria</i> :               | ..                                                      | ..            | ..                                                       | ..                                 | ..                      | ..                               | ..                        | ..     | ..     | ..                                 | ..             |
| (a) External—                          | Probably fall                                           | Probably fall | Probably fall                                            | ..                                 | ..                      | ..                               | ..                        | ..     | ..     | ..                                 | ..             |
| (i) <i>Haemadipsa zelandica</i> ..     | Probably fall                                           | Probably fall | Probably fall                                            | ..                                 | ..                      | ..                               | ..                        | ..     | ..     | ..                                 | ..             |
| (ii) <i>Haemadipsa montana</i> ..      | Ditto                                                   | Ditto         | Ditto                                                    | Probably rise                      | ..                      | ..                               | ..                        | ..     | ..     | ..                                 | ..             |
| (b) Internal—                          | ..                                                      | ..            | ..                                                       | ..                                 | ..                      | ..                               | ..                        | ..     | ..     | ..                                 | ..             |
| (i) <i>Lymnaea nilotica</i> ..         | Ditto                                                   | Ditto         | Ditto                                                    | ..                                 | ..                      | ..                               | ..                        | ..     | ..     | ..                                 | ..             |
| (ii) <i>Lymnaea granulosa</i> ..       | Ditto                                                   | Ditto         | Ditto                                                    | ..                                 | ..                      | ..                               | ..                        | ..     | ..     | ..                                 | ..             |

TABLE IX  
SHOWING BLOOD PICTURE IN SOME SCHOOLS CHILDREN CARRYING PROTOZOAN/HELMINTHIC INFECTIONS

142

VOL: XIV No2

142

| Serial No. | Age | D.L.C. |    |    |    |    | PROTOZOAN |     |     |    | HELMINTHIC |     |     |     | Complaints |                                                     |
|------------|-----|--------|----|----|----|----|-----------|-----|-----|----|------------|-----|-----|-----|------------|-----------------------------------------------------|
|            |     | P      | L  | M  | E  | B  | Eh.       | Ec. | lb. | G. | Hw         | Al. | Ev. | Tb. |            | Hn.                                                 |
| 1          | 8   | 58     | 26 | .. | 16 | .. | ..        | ..  | ..  | .. | -          | +   | -   | -   | -          | Passes round worms.                                 |
| 2          | 8½  | 47     | 46 | -  | 7  | -  | -         | +   | -   | -  | -          | -   | -   | -   | -          | No complaints.                                      |
| 3          | 8½  | 50     | 50 | -  | -  | -  | -         | -   | -   | +  | +          | -   | -   | -   | -          | Occasionally abdominal pain.                        |
| 4          | 9   | 80     | 18 | 2  | -  | -  | -         | -   | -   | -  | -          | -   | -   | -   | +          | Occasional abdominal pain and passes round worms.   |
| 5          | 9   | 75     | 23 | 2  | -  | .. | -         | -   | +   | -  | -          | -   | -   | -   | -          | Occasionally abdominal pain.                        |
| 6          | 9   | 55     | 40 | 3  | 2  | -  | -         | -   | -   | -  | -          | -   | -   | +   | -          | No complaints.                                      |
| 7          | 9½  | 62     | 34 | -  | 4  | -  | -         | -   | -   | -  | +          | +   | -   | -   | -          | Occasional abdominal pain.                          |
| 8          | 9½  | 45     | 55 | -  | -  | -  | -         | -   | -   | +  | -          | -   | -   | -   | -          | No complaints.                                      |
| 9          | 9½  | 68     | 25 | 6  | 1  | -  | -         | +   | +   | -  | -          | -   | -   | -   | -          | Occasionally abdominal pain.                        |
| 10         | 9½  | 47     | 51 | 1  | 1  | -  | -         | -   | -   | -  | +          | +   | -   | -   | -          | No complaints.                                      |
| 11         | 10  | 55     | 40 | 5  | -  | -  | -         | -   | -   | -  | -          | -   | -   | -   | -          | Occasional abdominal pain.                          |
| 12         | 10  | 64     | 34 | -  | 2  | -  | -         | -   | -   | +  | +          | +   | -   | -   | -          | No complaints.                                      |
| 13         | 10  | 55     | 40 | 3  | 2  | -  | -         | -   | -   | -  | -          | -   | -   | -   | -          | Ditto                                               |
| 14         | 10  | 86     | 12 | .. | 2  | -  | -         | -   | -   | -  | -          | -   | -   | -   | -          | Occasionally pain around umbilicus                  |
| 15         | 10  | 72     | 26 | 2  | -  | -  | -         | +   | -   | -  | -          | -   | +   | -   | -          | No complaints.                                      |
| 16         | 10  | 50     | 44 | 1  | 5  | .. | -         | +   | -   | -  | -          | -   | -   | -   | -          | Ditto                                               |
| 17         | 10½ | 64     | 84 | -  | 2  | -  | -         | -   | -   | -  | -          | -   | -   | -   | -          | Occasionally passes round worms.                    |
| 18         | 10½ | 50     | 43 | 6  | 1  | -  | -         | -   | -   | -  | -          | -   | -   | -   | -          | Occasionally abdominal pain.                        |
| 19         | 10½ | 57     | 42 | 1  | -  | -  | +         | +   | +   | -  | -          | -   | -   | -   | -          | Occasionally passes thread worms.                   |
| 20         | 11  | 72     | 24 | -  | 4  | -  | +         | +   | +   | -  | -          | -   | -   | -   | :          | No complaints.                                      |
| 21         | 11  | 42     | 58 | -  | -  | -  | -         | -   | -   | -  | -          | -   | +   | +   | :          | Ditto                                               |
| 22         | 12  | 60     | 33 | 1  | -  | -  | -         | -   | -   | -  | -          | -   | -   | -   | -          | Occasionally abdominal pain and passes round worms. |

TABLE X  
SHOWING BLOOD PICTURE OF SOME NEGATIVE CASES

SHOWING BLOOD PICTURE OF SOME NEGATIVE CASES

| Serial No. | Age | Economic status | Environ-mental condition | Dietary habits  | Personal hygiene | Physical condition                          | Family history                                  | Complaints                                                  | BLOOD PICTURE |    |    |    |    |    |
|------------|-----|-----------------|--------------------------|-----------------|------------------|---------------------------------------------|-------------------------------------------------|-------------------------------------------------------------|---------------|----|----|----|----|----|
|            |     |                 |                          |                 |                  |                                             |                                                 |                                                             | P             | L  | M  | E  | B  | Hg |
| 1          | 8   | Poor            | Slum dweller             | Indiscrimi-nate | Disgusting       | Under nourish-ed, anæmic                    | ..                                              | Occasionally passes round worms. Abdo-minal pain.           | 59            | 39 | 2  | .. | .. | .. |
| 2          | 8½  | Do.             | Ditto                    | Ditto           | Ditto            | Ditto                                       | ..                                              | Occasionally abdominal pain.                                | 84            | 12 | 4  | .. | .. | .. |
| 3          | 9   | Do.             | Ditto                    | Ditto           | Ditto            | Under nourished                             | ..                                              | No complaints                                               | 66            | 33 | 1  | .. | .. | .. |
| 4          | 9½  | Do              | Ditto                    | Ditto           | Ditto            | Under nourish-ed, anæmic                    | ..                                              | Occasionally abdominal pain.                                | 53            | 45 | 1  | 1  | .. | .. |
| 5          | 9½  | Good            | Good                     | Ditto           | Satisfactory     | Rickety chest                               | ..                                              | No complaints                                               | 64            | 34 | 2  | .. | .. | 70 |
| 6          | 10  | Poor            | Slum dweller             | Ditto           | Disgusting       | Under nourish-ed, anæmic constitution weak. | ..                                              | Occasionally passes seat worms, abdo-minal pain.            | 66            | 28 | 4  | 2  | .. | 65 |
| 7          | 10  | Do.             | Ditto congested.         | Ditto           | Ditto            | Well built con-stitution.                   | ..                                              | No complaints                                               | 64            | 35 | 1  | .. | .. | 80 |
| 8          | 10½ | Do.             | Slum dweller             | Ditto           | Ditto            | Under nourish-ed, anæmic                    | ..                                              | Occasionally abdominal pain                                 | 52            | 48 | .. | .. | .. | 65 |
| 9          | 12  | Do.             | Ditto                    | Ditto           | Ditto            | Under nourish-ed, dull, anæ-mic.            | 1 young sister occasionally passes round worms. | Occasion ally passes round worms.                           | 61            | 34 | .. | 5  | .. | 65 |
| 10         | 12  | Do.             | Slum dwellers congested  | Ditto           | Satisfactory     | Slightly anæmic                             | ..                                              | No complaints                                               | 61            | 35 | .. | 4  | .. | .. |
| 11         | 12  | Do.             | Slum dwellers            | Ditto           | Disgusting       | Under nourish-ed anæmic.                    | ..                                              | Occasionally troubled by seat worms and passes round worms. | 64            | 32 | 2  | 2  | .. | 65 |

## DISCUSSION

DELIGHTFUL TASK TO REAR THE TENDER THOUGHT TO TEACH  
THE YOUNG IDEA HOW TO SHOOT (J. THOMSON)

The Children, on the whole, are not well looked after in our rural and suburban communities. The economically depressed families are not financially fit to do proper justice to their progeny and therefore, the children are left to themselves from an early stage of life. Usually the children in this country are taken care of by other children in the family. The toddlers spend three-fourth of the day either in the court-yard or door-yard while the others may be seen either in a field or a play-ground.

Most houses in this country are without proper latrines. Wherever a privy is found, it is used for women, stay-at-home folks and invalids. The surface privy, existing in most houses, may provide privacy during defecation but does not at all fulfill the basic modern sanitary standards.

An average child in this country lives in poor environmental conditions. He treads on contaminated fields, eats polluted food and drinks improper water. Most parents encourage promiscuous defaecation because it saves them lot of responsibility involved in looking after. This habit increases chances of contamination of food and spread of intestinal parasites in the community. Children use privies only under certain special circumstances. Ordinarily, court-yard, door-yard, street drains and open fields are commonly sighted latrines for them and change gradually in the order given with the age of the children.

Methods of removal and disposal of excreta from the houses, is not only defective but hideous and harmful and becomes still greater source of contamination of water and food.

Swarms of house-frequenting flies originate in excrementous material. Promiscuous defecation, disposal of kitchen waste in the field or heaping the same in front of the houses, the back yard or alley does tremendous harm. It does not only increase fly menace but otherwise also plays important role in contamination of the environments, and later in the spread of intestinal parasites. Flies in this country are nuisance of great magnitude. Although active all the year round, their abundance during spring is most disgusting. The flies wintering over, compete with man for sun-lit spots and do not permit the basking few to enjoy the sun perfectly. Flies invade all the shops. The vendors, the peddlers and the hawkers are specially chased. To get clean and tidy foods from these sources is too much to expect. Progeny in this country cannot avoid temptation of buying sweets worth an anna just to have later a vermicide or lmoebicide for a rupee as a local sage may say "*aane ki chatni mathi, rupe ki marham patti.*"

The life on the periphery of the town is rural in real sense of the word. Externally it may appear *modified urban* but is all rural. Modern plumbing is unknown. It may not even be found in houses of wealthy families. A hand pump may be a luxury for some. Most of the families have to obtain their daily water supply from a common hand pump, which is frequently installed near a waste patch of land or a garbage heap or near a vil

smelling ditch or water collection. A poor water supply increases chances for the spread of intestinal parasites.

Children of today are leaders of tomorrow is a word to the wise. The children are most important resources and valuable assets of our nation and have the right to be afforded opportunities to live in peace and safety. Optimum environments, so essential for their physical and mental development and social growth, must be provided to them by the nation at all cost.

The child is the father of man is a time-honoured axiom. A single life may be very valuable to the nation no one knows when. It is one of the five things, the knowledge of which the kind and Merciful God has not given to His men. No body can say that a particular soul will play an important role in carrying the destiny of the nation in near or far future. The health and welfare of our children warrants top priority. We must assure that they are not exposed to risks of parasites and pestilence which cause considerable inconvenience to some children and constitute a worrisome problem for the parents and the family physicians. The intestinal parasites cause enormous damage to the growing child which is not generally realised. A badly infected child is not only distressed and consequently emaciated and enematosised but is also predisposed to the attack of some inter-current infections. In Lahore alone ratio of deaths due to dysenteries and diarrhoeas varies from 0.25 (females) to 0.28 (males), while overall death ratio is 0.26. Very frequently the pre-school children (1-4 years) suffer more from entero-gastric troubles.

The epidemiological data available to us suggest that protozoal and helminthic infections are highly contagious. Some of these parasites are much prevalent in children and young adults than in advance age group adults. Degree of susceptibility and tolerance in an individual is related to the duration of exposure. Presence of seed beds of infection, chances of intimate contacts of infected persons with the others and occupation often have a decisive effect on the amount and degree of parasite transmission. A small incidence is not due to immunity but to remote chances of exposure to infections. The parasites spread both with the local and regional movements of the children. Children coming from rural areas may have higher incidence of hookworm while giant round worm is more common in urban children. Hook worm, although present, is generally not able to complete its life-cycle in the environments available in the city. Giant round worm on the other hand finds more suitable environments for its development and dispersal in cities.

| Parasites                                        | Children                                                                                                                                                                                                                                                                                                                                                | Adults                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. <i>E. histolytica</i>                         | .. Incidence in children below 5 years much lower than in older children and young adults.                                                                                                                                                                                                                                                              | Incidence greatest in adults between 20—35 years and definite decline occurs there after.                                                                                                                                                                                                                                                                  |
| 2. <i>G. intestinalis</i>                        | .. Much more prevalent in children, definite decline may be noticed about the time of puberty.                                                                                                                                                                                                                                                          | Incidence in adults usually does not exceed one third or one fifth of the peak infection in children.                                                                                                                                                                                                                                                      |
| 3. <i>T. trichiurus</i>                          | .. In endemic areas, heavy infection occurs in small children. Infection rate in primary school children, who readily contaminate door yard with their faeces and later imbibe fully embryonated eggs, is however highest.                                                                                                                              | Incidence in adults is usually of moderate nature. It may occur due to eating raw and unwashed carrots, red cabbage, turnips and salads. In our cities such vegetables are raised on copious amount of human faeces. Sewers supply both water and fertilizer to vegetable fields.                                                                          |
| 4. <i>S. stercoralis</i>                         | .. Infection rate in children is usually very low.                                                                                                                                                                                                                                                                                                      | More prevalent in adults. Commonly reported from Institutional groups (mental hospitals, prisons, asylums etc.)                                                                                                                                                                                                                                            |
| 5. <i>A. duodenale</i> ,<br><i>N. americanus</i> | We recorded heavy hookworm infection in a child of 2 years who was made to play on moist, shaded patches of land under small trees while the mother worked in the fields.                                                                                                                                                                               | Hookworm disease is directly or indirectly an occupational hazard. Exposure largely occurs in male adults of an agricultural community.                                                                                                                                                                                                                    |
| 6. <i>B. vermiculari</i>                         | .. Most common in children. The worm burden being high, may cause severe anal pruritis.                                                                                                                                                                                                                                                                 | Adults, usually harbour the infection without demonstrable signs therefore, lost sight of.                                                                                                                                                                                                                                                                 |
| 7. <i>Al. lumbricoides</i>                       | .. Young children are more commonly infected in subtropical countries than tropical countries. Essentially a door-yard or a household infection. Soil immediately around the house, which is heavily seeded by the droppings of small children, becomes fully suspicious. The children, pick up viable eggs on their fingers, and pass on to the mouth. | All ages are heavily parasitised in tropical countries. In subtropical countries however, the incidence in adults is not very high. The adults usually acquire infection by eating raw vegetables (carrot, reddish, salad) produced in contaminated fields. Fully embryonated eggs are also taken by flies and dust storm to human foods and water supply. |
| 8. <i>D. caninum</i>                             | .. Children are highly susceptible to dipylidiasis.                                                                                                                                                                                                                                                                                                     | Infection in adults is rare, suggesting both age resistance and lesser chances of exposure.                                                                                                                                                                                                                                                                |
| 9. <i>H. nana</i>                                | .. Much more prevalent in children ..                                                                                                                                                                                                                                                                                                                   | It is particularly common in families and institutional groups than in general community.                                                                                                                                                                                                                                                                  |
| 10. <i>T. saginata</i>                           | .. Taeniasis in this country is most uncommon in children because of remote chances of eating raw or semi cooked meat.                                                                                                                                                                                                                                  | In adults the infection varies from 0.3—0.7 per cent. Probably shish kababs, smoked beef and other such preparations are responsible for these infection.                                                                                                                                                                                                  |

The problem of intestinal parasites is crucial and complicated in places where gross faecal contamination of water is common and transmission of amoebiasis and giardiasis is allowed to continue unchecked.

In Lahore alone, death rate due to *amoebic* dysentery and diarrhoea is 0.28 in males and 0.25 in females whereas the overall ratio of death in 10,000 of population is 0.26. According to Professor S. M. K. Wasti, diarrhoea and dysentery are still the worst public health problems in our country. The cases occur more frequently among people of low income strata and particularly in communities who consume bad food and drink unprotected water (private communication).

Several workers have collected most relevant data and have shown that great rate of infection by pathogenic protozoa occurred in dysenteric diarrhoeic convalescents than in non-dysenteric diarrhoeic convalescents. Literature on the subject is vast to be dealt with here. Some of the available figures given below will probably suffice to know the condition.

| Source with relevant history                                | Eh   | Ec   | En   | Ib  | Cm  | Gi   |
|-------------------------------------------------------------|------|------|------|-----|-----|------|
| 1. Liverpool (1916-17) Dysenteric Convalescents.            | 5.9  | 95.5 | ..   | ..  | ..  | 11.3 |
| 2. Mackinnon (1918) Dysenteric Cases (East).                | 16.1 | 26.2 | 19.0 | ..  | 5.1 | 13.6 |
| 3. Mackinnon (1918) Dysenteric Cases (France).              | 11.1 | 26.2 | 17.7 | ..  | 5.0 | 13.4 |
| 4. Mathew and Smith (1919) Dysenteric Convalescents.        | 7.0  | 15.2 | ..   | ..  | 3.0 | 9.9  |
| 5. Boeck and Stiles (1923) Dysenteric Cases (Home).         | 5.4  | 13.5 | 10.8 | 5.4 | ..  | 13.5 |
| 6. Boeck and Stiles (1923) Dysenteric (Foreign).            | 5.4  | 8.1  | 5.4  | 2.1 | 2.1 | 4.3  |
| 7. Boeck and Stiles (1923) History of Dysentery (Home).     | ..   | 13.1 | ..   | 6.6 | ..  | ..   |
| 8. Boeck and Stiles (1923) No history of Dysentery (Home).  | 3.6  | 19.3 | 12.5 | 6.0 | 3.1 | 6.1  |
| 9. Boeck and Stiles (1923) Non-dysenteric Cases (Home).     | 2.5  | 10.2 | 9.8  | 4.6 | 0.3 | 5.0  |
| 10. Boeck and Stiles (1923) Non-dysenteric cases (Foreign). | 2.3  | 12.0 | 11.7 | 4.2 | 1.0 | 5.8  |
| 11. Liverpool (1917) Non-dysenteric convalescents.          | 6.4  | 14.2 | ..   | ..  | ..  | 10.8 |
| 12. Smith and Mathew (1919) Non-dysenteric Convalescents.   | 6.4  | 14.2 | ..   | ..  | 2.0 | 6.0  |
| 13. Boeck and Stiles (1923) Diarrhoeic Cases (Home).        | 3.5  | 8.7  | 5.2  | 3.5 | 5.2 | 7.0  |
| 14. Boeck and Stiles (1923) Diarrhoeic Cases (Foreign).     | 5.1  | 11.3 | 8.4  | 3.7 | 1.8 | 5.6  |
| 15. Boeck and Stiles (1923) History of diarrhoea (Foreign). | 7.9  | 19.0 | 3.1  | 1.3 | ..  | 6.3  |
| 16. Boeck and Stiles (1923) Non diarrhoeic (Home).          | 2.6  | 10.1 | 9.9  | 4.8 | 0.7 | 4.9  |

| Source with relevant history                                   | Eh   | Ec   | En   | Ib   | Om   | Gi  |
|----------------------------------------------------------------|------|------|------|------|------|-----|
| 17. Boeck and Stiles (1923) Non diarrhoeic (Foreign).          | 2.1  | 11.6 | 12.0 | 4.2  | 1.0  | 5.6 |
| 18. Boeck and Stiles (1923) No-history of diarrhoea (Foreign). | 2.3  | 13.0 | 12.0 | 4.2  | 1.5  | 5.4 |
| 19. O'Conner (1919) Dysenteric/Diarrhoeal (white troops).      | 7.5  | 23.0 | 5.4  | ..   | 5.1  | 7.5 |
| 20. O'Conner (1919) Dysenteric/Diarrhoeal (Egyptians).         | 10.5 | 25.8 | 4.8  | ..   | 4.5  | 4.1 |
| 21. O'Conner (1919) Dysenteric Diarrhoeal (Indians).           | 14.1 | 30.3 | 14.1 | ..   | 12.1 | 3.1 |
| 22. O'Conner (1919) Healthy (Egyptian Labour).                 | 7.3  | 24.2 | 2.7  | ..   | 1.4  | 3.4 |
| 23. Dabell (1921) English Civilians ..                         | 3.4  | 18.1 | 4.6  | 0.25 | 2.9  | 9.3 |

A perusal of principal vital statistics of the province will show that clinical amoebic dysentery forms one of the most important cause of mortality in the country. These figures may not be presumed to indicate the real depredations due to *E. histolytica* or due to other intestinal zooparasites because the stools are very seldom subjected to laboratory examinations. A routine examination of all dysenteric and diarrhoeic cases may probably give us true picture and help us in the differentiation of real and unreal cases of *amoebiasis*. We are still of the view that there is too much of phobia and needs to be dispelled from the mind of the common man. The principle of the general protection of people warrants that active studies should be taken up early in the country whenever facilities are available.

The protection of children rests both with the natural and national guardians. The present day civilisation imposes duties and rights on parents, guardians and custodians to safe-guard their interests. All the machinery available should move when the valuable national asset is under an increasing threat of noxious parasites. The parasites, when present, are found by millions in each individual and feed continuously on the vital fluids with ruthless efficiency. We preach the importance of drilled wells and proper sewage disposed. Our attitude is based upon previous experience, or training or both. Few hours conversation may impress the community but may not bring any change in its behaviour. For behavioristic changes, the community needs to be intimately associated with these matters. Good health cannot be forced upon the public. Creation of environments, in which the community may consider its needs and plan what it wants to do is need of the day. Much can be achieved with strong and effective health education programme. With a view to make the programme more effective, efforts should be made to develop potential leadership.

TABLE 1 INCIDENCE OF INTESTINAL PARASITES IN DIFFERENT AGE GROUPS IN NEW ORLEANS (FAUST AND HEAD LEE 1936)

|               | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11-15 | 16-20 | 21-30 | 31-40 | 41   | Total average |
|---------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|------|---------------|
| Eh            | 0.80 | 3.0  | 6.4  | 6.1  | 7.1  | 7.2  | 9.4  | 8.5  | 12.6 | 8.0  | 11    | 20.8  | 17.3  | 14.3  | 20.0 | 8.3           |
| Ec            | 2.6  | 8.0  | 8.0  | 8.4  | 12.8 | 11.7 | 14.0 | 14.9 | 16.5 | 12.1 | 18.7  | 28.3  | 19.0  | 20.7  | 5.0  | 12.4          |
| En            | 10.3 | 12.5 | 16.4 | 13.7 | 21.0 | 19.3 | 22.2 | 23.1 | 26.4 | 22.3 | 24.3  | 24.5  | 22.3  | 16.8  | 13.3 | 19.6          |
| Tb            | ..   | ..   | 0.2  | 1.0  | 0.6  | 0.9  | 1.2  | 1.2  | 1.0  | 0.9  | 2.5   | 5.6   | 1.6   | ..    | ..   | 0.9           |
| Gi            | 8.6  | 13.8 | 18.8 | 19.0 | 18.5 | 18.0 | 19.3 | 15.9 | 18.5 | 13.8 | 20.4  | 9.4   | 9.1   | 6.5   | 3.0  | 16.6          |
| Cm            | ..   | 0.9  | 0.6  | 0.5  | 1.6  | 2.2  | 1.7  | 1.2  | 1.6  | 1.5  | 1.8   | 0.7   | 6.6   | 3.8   | 3.3  | 1.6           |
| Th            | ..   | 0.7  | 0.4  | 0.5  | 0.3  | 0.8  | 0.8  | 0.6  | 1.0  | 0.6  | 1.4   | 7.7   | 5.8   | 1.3   | 1.7  | 0.9           |
| Al            | 3.4  | 10.1 | 10.0 | 10.2 | 8.4  | 6.5  | 5.2  | 6.9  | 4.4  | 4.0  | 5.0   | 7.5   | 7.4   | 3.9   | ..   | 6.8           |
| Hw            | ..   | ..   | ..   | 0    | 0.3  | 0.8  | 1.2  | 0.3  | 2.0  | 1.5  | 2.5   | 11.3  | 9.1   | 7.8   | ..   | 8.4           |
| Tt            | 3.4  | 3.4  | 8.4  | 8.2  | 11.2 | 10.8 | 9.9  | 10.3 | 11.9 | 11.2 | 10.8  | 5.6   | 3.3   | 3.9   | 1.7  | 0.9           |
| Se            | ..   | ..   | 0    | 0.5  | ..   | 0.5  | 1.2  | 0.6  | 2.0  | 0.9  | 1.4   | 1.9   | 1.7   | 5.2   | 3.3  | 9.4           |
| Ev            | ..   | ..   | 1.1  | 1.7  | 1.8  | 2.7  | 3.8  | 2.4  | 3.6  | 2.8  | 3.5   | 1.9   | 0.8   | ..    | ..   | 0.14          |
| Ts            | ..   | ..   | ..   | 0.3  | ..   | ..   | ..   | 0.3  | 0.3  | 0.3  | 0.4   | ..    | ..    | ..    | ..   | 0.14          |
| Hn            | ..   | ..   | ..   | ..   | ..   | ..   | ..   | 0.0  | 1.0  | 0.3  | 0.4   | ..    | ..    | ..    | ..   | 40            |
| Protoz        | 18.1 | 26.9 | 36.7 | 35.4 | 44.3 | 42.8 | 43.1 | 42.7 | 48.3 | 42.8 | 49.0  | 47.3  | 51.2  | 33.8  | 33.3 | 16.3          |
| Helm-<br>inth | 6.1  | 12.8 | 17.1 | 16.0 | 17.4 | 17.4 | 17.0 | 17.2 | 15.5 | 19.5 | 19.3  | 18.8  | 21.9  | 17.0  | 5.0  | 16.3          |

Children pass through a period of accelerated growth during some part of their life. Diet defective in quality and quantity during this period does not only interfere with the proper development but also reduces their body resistance against parasitic invasions. Food contaminated with infective stages of intestinal parasites adds fuel to the fire. Unprotected, indiscriminated and insanitary water supply results in the spread of parasitic intestinal infestations.

Environmental sanitation has a profound effect on the health of the children. Defective sanitation of the house and the surroundings increases chances of transmission of the parasites and pestilence several folds. *Ascariasis* spreads freely from the polluted court yard while contaminated fields are responsible for much of our hookworms disease problems. Our method of disposal of human excreta is most defective. Dumping of it in "manure heaps" does more harm than good and serves as breeding places for filth-flies and increases chances of transmission of helminthic eggs and protozoan cysts.

The crucial and complicated problem of intestinal parasites warrants us to know the incidence of various species in different communities and age groups. We have not created awareness amongst the masses about the seriousness of intestinal parasites. Commonly, the communities do not cooperate with us in the collection of statistical evidence. In our experience, illiteracy is not a positive hurdle. Ignorance, misunderstanding, superstitions play substantial role in this regard. The status of the husband is more intoxicating to the house wife. An educated mother is more obstinate. False vanity, dignity consciousness and superiority complex does not usually permit her to listen to reason. The public health workers are not able to collect proper data an important pre-requisite to community problems—because the house-wife presumes that we are after *lies and damned lies*. She frets and frowns when requested for stool samples. She does not grudge travelling long distances to beg or buy a prick or prescription. Her premises are out of bound for preventive man who wants to render service without any obligation. He is an uninvited and unwelcome soul. She goes to the curative man and pays for the cure of disease which is preventable at insignificant cost. Due to lack of motivation, a laboratory man has to deal with most unreliable smears and ghost stools in this country. Frequently we find that the stool samples bearing the names of *Khalil, Khaleeqe, Khaliq, Khalid, Khalida, Khadim Khadma* are either from the granny or a servant or a dog or a cat.

*Wide spread awareness* has not been created. The common man does not understand the urgency and magnitude of common health problems. He does not know that the hook worm infection is picked up from the infested soil and the adults *milk out* lymph red-blood cells and plasma from the host's intestines and cause *microcytic hypochromic anaemia*. The degree of pathologic changes and symptoms are directly proportionate to the number of worms, age of infection, degree of resistance in the host and chances of super infections.

The future of the country depends upon physically healthy and mentally sound mand power. Children, brought up in an environment which is safe for their physical growth and optimum for their mental development, are reliable assets and can guarantee a bright future for the country. An investment made on private or government sectors to achieve this end will be suitably paid back and need not be grudged. Children are important resources of the nation. It is now accepted far and wide that a nation with well looked after children is a living nation.

Children of today do not only need how to read and write and pass examinations. They need to be made useful members of the modern society. Social, economical and cultural levels of the community influence the health of the child. His needs are directly proportionate to his family background and his age. The child inherits certain attitudes and behaviour from his parents. When the child comes to the school he has already formed certain habits and his faith is based on certain whims. For him, disease is due to vengeance of the gods and goddesses. Diseases are also earnings for the sins in which one indulges.

"Shaping and reshaping" the life of a child for better health is the problem of the day. The preposition is to liberate him from confining limits of ignorance, healthful practices and prejudices. He needs to be enabled to transform habits into intelligently directed actions. It is essential that the health principles are presented to him in a way that he becomes a part of his experience and understanding. The subject must be established and taught in the context of the lives the children live. Initiate a personal activity and foster a willingness before expecting the children to accept new attitudes. Never err to dictate him but try to direct him "is a golden rule. Give him an opportunity to choose his own ways, select his own methods and choose his own ends. Do not reprimand a child, if in early stages he revolts. He may become apathetic or live in opposition to what you teach. He needs to be informed and aided repeatedly and not to be threatened and forced to accept the solutions. Give him time to adjust.

Health Education efforts may not bear fruit if the programme is not extended beyond the school to the home and the community and into adult life. A group action can only be hastened if the parents are also motivated and involved in the programme. A leader of quality is a crucial factor round which the success and development of health education programme mainly revolves.

Health Education is both process and programme and implies changes and improvements in individual development, attitudes and behaviours. The aim of health education is to bring drastic change in the fatalistic attitudes and basic state of mind without uttering even a word against the faith. Straight away condemnation of certain habits is unworthy and may create a state of anxiety and state of tension in the child, the parent and the school and therefore, should be avoided at all cost. The school teachers are the right persons who can create *health mindedness* in their pupils. It is upto them to give children elementary notions of hygiene and prevention. The school health programme should be made attractive. The child should be made to think independently. The closer he is brought to an understanding, the better prepared will he be to meet the demands the life makes upon him. A child understands more from what he sees than what he is taught. The ideas should be presented to him in a practical way so that he conveniently adopts good hygienic habits through simple every-day practices. He would learn to be clean, if he would see cleanliness being practiced in the premises. He must see real cleanliness before he is made to practice it. Washing of hands before and after handling an eatable can become his habit, if he witnesses it being practiced by his seniors. He will abstain buying things from the dirty vendor if whole-some food is made available to him. Audio-visual techniques have helped children else where and may fashion child's personality in this country also.

The first few months of a child in a school are days of trials and errors. Mentally he struggles hard to choose between what he has been practicing and what he sees in school. Most precious good habits may be diagonally opposite to what his parents practice. Amazing ignorance and inculcated stupidity some times does not allow him to make any suitable decision. Therefore, he is likely to become unhappy. The attitude of the teacher towards the child counts a lot in moulding him properly. An experienced teacher will never make him restless and awkward, rather he will give him full freedom to adapt to the new environments slowly and steadily.

*Nor love thy life, nor hate, but thou liv'st  
Live well, how long or short, permit to Heaven. (Milton).*

## SUMMARY

الَّذِينَ إِذَا أَصَابَتْهُمْ مُصِيبَةٌ قَالُوا إِنَّا لِلَّهِ وَإِنَّا  
إِلَيْهِ رَاغِبُونَ  
سُبْحَنَهُ وَتَعَالَى عَمَّا يَقُولُونَ عُلُوًّا كَبِيرًا  
(القرآن)

346 Children, between the ages of 6-13 years, were examined from an urban primary school, Lahore during the period commencing from November 23, 1962 and ending with January 23, 1963. Parents of over 90 per cent of these children had very low socio-economic status. The income of the others however, was bare minimum. Most of these children presented a state of semi-starvation. Standard of personal hygiene was in general of very low level. Dirty clothes, unwashed faces, unbathed bodies, long dirt charged nails, unclean mouths, defective gums and carious teeth were some of the conspicuous features of this group. The responsibility of the deplorable conditions may be conveniently levelled against ignorance. The premises of the school were also unclean and untidy. Promiscuous defecation has been a great headache. Children were not only living in bad environments but were also consuming food which was prepared under unhygienic conditions, kept under unclean environments and supplied by filthy hands.

The stool examination of the school children has shown that on an average 80.6 per cent of the children in Lahore pass either protozoan cysts, or helminthic ova or both. The protozoan parasites may be in 25.8 per cent as against 30.82 per cent who may be carrying helminthic parasites. Mixed infection, however, may occur in 43.37 per cent children.

Notorious *E. histolytica* was detected in 4.6 per cent cases examined. Amoebic dysentery/diarrhoea/did not occur in these cases. Cases of *E. coli*, *I. butschlii* and *G. intestinalis* were five or six times as numerous as of *E. histolytica*.

The rate of infection with intestinal worms was very alarming. Pronounced infection occurred with *A. lumbricoides*. The history of the negative cases and other factors, accounted for, will give us a conservative figure of 50 per cent which we presume to be not much in children living in contaminated quarters.

The hook worm infection was detected in 15.7 per cent cases. It shows that very small proportion of the urban or suburban children may have a chance to trotter in contaminated fields.

The dwarf tape worms occurred in 14.4 per cent cases. Highest number of positive cases was found in children between 6-10 years of age.

\*Who, when a misfortune befalls them, say ; Surely we are Allah's, and to Him we shall surely return.

Glory be to Him and exalted be He in high exaltation above what they say.  
(Al Quran)

Contrary to our expectations, the whipworm infections occurred only in 0.5 percent children. The credit probably may go to direct sun rays and decomposition which are known to lower viability rate of the eggs.

Seat worm infections were detected in 3.2 per cent cases. When compared with an incidence of 14.7 per cent found in conservancy staff in Lahore, this figure appears to be too low. These observations also show that those people who are infected with *T. trichiurus* to a great extent, generally have little of seat worms. There are four cases of *E. vermicularis* and three cases of *T. trichiurus* under double infection series but the two did not occur together. In triple infection series, *E. vermicularis* and *T. trichiurus* are involved four and eight times respectively, but in one case only the two happen to compromise. Under quadruple infection series *E. vermicularis* and *T. trichiurus* were detected one and four times respectively. In this series the seat worm does not occur alone. In quintuple infection series each parasite occurs once but not in the same case.

Human behaviour is influenced by various kinds of changes likely to occur by different methods of motivation. Habit is something rigid and cannot be expected to change by mere gospels. Force invites resistance. Conditions may, therefore, be created for the young learner to pick and choose. One learns early through the eyes and the ears are not cent per cent reliable for this purpose. Seeing is believing. Young mind is stimulated by soft words. Step-by-step suggestions coupled with demonstrations have lasting effect. The child must see daily what one expects him to follow. Our schools are in dire need of a health education programme.

“

.....  
 —to see good put in action  
 Is what every body needs.  
 If you'll let me see it done;  
 I can see your hands in action  
 But your tongue too fast may run  
 And the lecture you deliver  
 May be fine and true,  
 But I'd rather get my lesson  
 By observing what you do.  
 .....

”

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## BOOK REVIEWS

**Diseases of the Liver and Biliary System** by Sheila Sherlock, M.D., F.R.C.P., F.R.C.P.E. Third Ed. 1963 (Pp xv+714, 235 illustrations, 70 s). Oxford: Blackwell Scientific Publications.

This book has been revised and brought up-to-date. It presents a comprehensive account of the diseases of the liver and biliary tract. It is a well-written and adequately illustrated book which will be of great interest to the Physician, Surgeon and Pathologist.

**Understanding Bronchitis and Asthma** by Robert Kemp, TD., MD., M.R.C.P., 1963 (Pp. vii 109, 17s 6d) London: Tavistock Publications.

Dr. Robert Kemp has written this book as a practical guide for the patients suffering from Bronchitis and Asthma. He has advised them how to improve their health by adjusting life and habits to this disability.

**Anatomy Regional and Applied** by R. Last, M.B., B.S., F.R.C.S. Third Ed. 1963 (Pp xvi+849, 406 illustrations, 120s). London: J. & A. Churchill Ltd.

This is a well written and adequately illustrated book of immense value in understanding Human Anatomy. It has been thoroughly revised and like its predecessor will be of great help to those preparing for examination in anatomy.

**Practical Haematology** by V. Dacis, M.D., F.R.C.P. and S.M. Lewis, B. SC., M.D., D.C.Pt. 3rd Ed 1963 (Pp 435, 40s) London: J. & A. Churchill Ltd.

This book has been revised and brought up-to-date. New chapters on the use of radio-isotopes in haematology, blood volume, production of erythrocytes estimation of their life span and investigations of megaloblastic anaemias have been incorporated. It will be useful guide for the Pathologists, Physicians, Laboratory Technicians and the Post-graduate students preparing for Diploma in Clinical Pathology.

**Auscultation of the Heart** by R.W.D. Turner, O.B.E., M.A., M.D., F.R.C.P., F.R.C.P.E., Second Ed. 1964. (Pp v+40, 4s). Edinburgh: E. & S. Livingstone.

This booklet was first published in 1963 and contains three articles appearing in *Res Medica*: the Journal of the Royal Medical Society during 1960-61. The fact that the second edition has appeared so soon proves the usefulness of this well written book. It is strongly recommended to under-graduate and postgraduate students.

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