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Orabolin

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PROTOZOAN AND METAZOAN PARASITES OF CHILDREN SUFFERING FROM DIARRHOEA AND DYSENTERY

By

Prof. Dr. M. Atiqur Rahman Ansari*

1. INTRODUCTION

According to the consensus of opinion, more or less one fifth of the total number of deaths in children are due to diarrhoeas and dysenteries. The entero-gastric troubles due to zooparasites are not spectacular in out break and therefore the public does not take the amount of notice the intestinal parasites may deserve. Some of the parasites, which have extensive capacity to produce damage, however, have been constantly engaging the attention of the public health workers in this country.

The socio-economic status of a community has a distinct bearing on the incidence and prevalence of diarrhoeas and dysenteries. The incidence may be very high in children coming from low income groups. It has been seen that those, who live in the thickly populated areas of the city, suffer more from the gastro-intestinal troubles as compared with similar groups living in open environments. Ignorance, lack of means to apply the principles of hygiene and absence of good water supply obviously play important role in the distribution of entero-gastric troubles in the children.

The diarrhoeas and dysenteries in children may be acute or fulminating, subacute, chronic or latent in nature. An experienced physician usually gets a fair idea of the trouble after systematic macroscopic examination of the stools. Bacteriological and parasitological examination of the faeces however, remain practical means of dealing with the carrier problem.

1.2. Diarrhoeas and Dysenteries : Diarrhoea is undue precipitation or speed in the passage of faeces. It may not be accompanied by tenesmus. The irritation causing the disturbance is not usually momentary. In acute cases, the number of stools may vary from one to several.

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Either the presence of different bacterias, protozoas and helminths in the intestinal tract may be responsible for the sequela or the morbid condition may be a mechanical, chemical, metabolic, functional or an allergic manifestation. Severe diarrhoeas are also caused by the activities of viruses. Large number of the disorders, which disturb the motility of the bowel are due to disturbed reflex action. The impulses may either originate in the mucosa or the wall of the intestines and rectum. Sometimes the abdominal viscera, kidneys, somatic roots may urge action. While at another time the intrinsic bowel lesion may stimulate activity. Food poisoning, parasitic invasion and cathartics also produce mucosal irritation and marked para-sympathetic stimulation. Diarrhoea and dysentery may also be due to an increased neuro-muscular excitability. Semi dietary disorders and mild infections may be responsible for temporary diarrhoeas. Emotionally upset individuals may pass diarrhoeal stools spontaneously. Shocking news and an injury may work like a cathartic and tempt one to move to the lavatory. Persistent loose motions however, are important symptoms and call for an immediate attention. A brief description of familiar conditions, in which diarrhoeas and dysenteries may occur, are given below for ready reference.

1.2. 1. **Bacillary dysentery** is an acute epidemic colitis. Its onset is rapid. The febrile condition follows with equal swiftness. Pyrexia and rapid pulse are the symptoms of toxic absorption. Discharge of blood stained mucus in the stools is a characteristic feature. Tenesmus may be severe. Number of stools is greater while the bulk is less. Stools are odourless and alkaline in reaction. It is usually seasonal in incidence. Frequent in rainy season, most prevalent in autumn and minor epidemic may occur in spring. Although clinical picture and the presence of inflammatory exudates in the stools may be very suggestive, yet culture of the stools for the causative organisms (*Shigella* species) must always be done.

1.2. 2. **Spirochaetal dysentery** is a concomitant infection, generally super imposed upon amoebic ulceration of the intestinal wall.

1.2. 3. A **virus** may be the precise factor of some diarrhoeal troubles. Chill, after exposure to high temperature and damp weather, is one of the favouring circumstances for viral infection of the intestines. The calls to stool in this case are apt to be sudden. The passage is usually attended with a sense of relief.

1.2. 4. **Amoebic dysentery** is a chronic endemic disease. Sudden attack of diarrhoea is a general complaint. The onset is associated with looseness of bowels. The number of stools is less, while the amount is generally copious. The number

of evacuations may generally vary on an average from 6 to 8 and rarely the number may exceed 12.

The stools are blood stained, acidic in reaction and of very offensive smell due to decomposition of the blood. The course is generally prolonged. Tenesmus not accentuated and colic is unusual. There may be lesions, immediately inside the anus. In acute attacks the caecum, descending colon and sigmoid flexure may show palpable thickenings, tender on pressure. There is no fever. Severity usually subsides spontaneously after a couple of days.

Latency is a most striking characteristic feature of amoebic dysentery. The condition may continue for years. Attacks thereafter may follow after a lapse of days, weeks and months.

1.2.5. *Giardia enteritis* is a common coeliac-like disease in children. Rarely it may occur in adults also. It is an indefinite digestive disturbance with passage of spru-like stools. The clinical manifestation may consist of abdominal discomfort and presence of watery stools. Often the stools are of clay colour and pultaceous. The relapses are periodic in nature. In one child, who remained under observation from one to 16 years of age, the trouble occurred every year during the months of February, March and April. The symptoms always subside after an Atabrine course of a week and recurred following year, during the above mentioned months. The periodicity was repeated every year, until the child was of 12 years. No trouble however, was experienced in most cases thereafter.

1.2.6. *Balantidiasis* is severe and chronic form of dysentery. Some cases are also asymptomatic. The symptomatic cases pass bloody muscoid stools. Clinically the ciliate colitis may resemble severe amoebic dysentery. The trouble is of common occurrence in those, who tend and rear pigs. We have not yet recorded any case of balantidiasis from Pakistan however, cases from parts of Bharat are on record.

1.2.7. In serious subtertian malaria, an intestinal haemorrhage is of common occurrence. The blood-stained discharge from the anus is inauspicious. Clinical aspect of the patient will suggest malarial recrudescence.

Clinically the trouble is indistinguishable from acute bacillary dysentery. Frequency, presence of bloody mucus, epithelial and other cellular debris and presence

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of pus cells are indicative. Abdomen is tender and retracted. Nausea and vomiting are common. Body temperature is high and remittent in nature. Parasitemia is always extremely high.

1.2.8. In advance cases of Kala Azar, blood and mucus may be passed in the faeces. It occurs when ulceration has occurred in the bowels.

1.2.9. Internal piles, tubercular ulceration of the large bowel, ulcerative and haemorrhagic colitis may also be confused for amoebic dysentery.

1.2.10. The helminthic diarrhoeas and dysenteries are of common occurrence. Beef tapeworm (*T. saginata*) infection, towards the end of incubation period, usually causes a typical diarrhoea. In dwarf-tapeworm (*H. nana*) infection, there is moderate or profuse bloody-mucous diarrhoea. The digestive troubles due to fish-tapeworm (*D. latum*) also include vague abdominal distress and diarrhoea. The giant intestinal fluke (*Fasciolopsis buski*) infection causes severe, colicky diarrhoea. Mucous diarrhoea has also been found in *H. heterophyes* infection. The passage of bloody fluke eggs (*Schistosoma sp*) through the coat of intestinal wall causes severe ulceration and the stool of the victims are rich in yellow or bile-stained mucus. The blood clots and mucus streaks are rich in typical eggs. The mucus diarrhoea and dysentery may also occur in whipworm (*T. trichiura*) and human thread worm (*S. stercoralis*) infections. Viscous and reddish black diarrhoeal and dysenteric stools are passed in hook worm infection (*A. duodenale*).

2. PREDISPOSING FACTORS

The dysenteries and diarrhoeas are always due to insanitary habits of the communities. The complaints are more prevalent in communities leading primitive conditions of life. Constant, to and fro, movement of the flies from the filth to the food plays an important role in the spread of diarrhoeas and dysenteries. Water is also an important medium of transmission of infections. Shallow hand pumps, specially when sunk near a drain, always supply contaminated water. Much trouble may be evaded if pure water supply is secured and unwholesome and contaminated foods are avoided. Isolation of cases may help in checking readily communicable type of diarrhoeas and dysenteries.

The episodes of diarrhoeas and dysenteries are usually of periodic nature. In Lahore, the sporadic cases continue occurring throughout the year. Lowest number of cases may be recorded during driest parts of January to April. A sort of paral-

lelism has been noticed between the onset of the monsoon and rise in diarrhoea and dysentery cases. Maximum cases may occur during hot and humid monsoon months of August and September. The outbreak may be rare in winter.

Maximum number of filth diarrhoea cases are known to occur in those areas of a city, where there is no controlled water supply. Contamination by surface washing during rains obviously occurs in shallow wells and open water collections. Fruits and green vegetables are abundant during rainy season. Excess consumption of fruits and vegetables frequently set up mild irritation of the bowel and predispose the case to loose motions.

In Lahore the incidence of diarrhoeas and dysenteries run along the graph of rain and floods. Death due to this single trouble, expressed as percentage of death from all causes, may vary from 1.14—1.65. Most of the cases are reported from areas which remain inundated and where the water supply is through the hand pumps. The figures collected in the Pediatric Unit, Mayo Hospital give us an idea of month-wise incidence of dysenteries and diarrhoeas in infants below 2 years of age (Wasti and Haneef, 1963, *Mother and Child*, 1(5): 39-44). The hospital figures do not give any glimps of the incidence in any particular community. This data is from a selected group. However an idea of seasonal fluctuation may be had.

Month		Total Admissions	Gastro-enteritis	Gastro-enteritis as % of total infestation
January	...	127	5	4.0
February	...	104	105	9.6
March	...	148	36	24.3
April	...	266	101	38.0
May	...	314	112	35.6
June	...	279	67	24.0
July	...	211	56	26.5
August	...	201	51	25.3
September	...	241	63	26.1
October	...	296	50	16.8
November	...	200	27	13.5
December	...	82	8	10.0
Total	...	3269	581	17.7

Despite the prevalence of diarrhoeas and dysenteries, the laboratories often fail to find a causative agent in the stool samples. It is also assumed that number of cases, due to physiological stress of the changing season, is rather more than the number due to infections. It may be interesting to know that the number of male children admitted to the hospital is about 60 per cent.

3. LABORATORY DIAGNOSES

In order to prevent and control the spread of diarrhoeas and dysenteries, it is important to recognise the causative agents as early as possible.

Physical condition of the stools may give an idea of the type involved. As mentioned elsewhere, the daily number of evacuations differ considerably in number in different infections. The character of the stool varies in various types

of dysenteries. The odour and reaction of the stools to the litmus paper and character of exudations are also some of the distinguishing features.

The laboratory examination of the stool samples must be considered to be a pre-requisite to the confirmation of clinical diagnosis. Staining by rapid and more prolonged iron-haemotoxylin method will help in differentiating closely allied protozoas, tissue cells and macrophages,

Saline-purged stools, or faeces obtained after an enema, may give definite clues of intestinal parasites.

Sigmoidoscopic examination may afford valuable information. Small yellowish ulcers with surrounding hyperaemia are seen in amoebiasis. Examination of microscopic specimen, obtained during proctoscopy by aspiration, by scraping or obtained by punch biopsies, may demonstrate living organisms even when stool examination is futile. The passage of instrument causes a feeling of discomfort and the patients generally do not submit to this test.

The symptoms attributed to different types of diarrhoeas may not be generally very much diagnostic. In some individuals the manifestations may be extremely exaggerated and the mistakes usually committed, may be known after experience. The gross and microscopic character of the stool may give very reliable information regarding the type of dysentery involved. The search for the responsible parasite is usually prompted by clinical suspicions, sound and accurate diagnosis of the parasites is made after a very careful scrutiny of the micro-organisms.

Identification of *E. histolytica* is not an easy affair. It may be considered in all cases complaining of vague abdominal pain and an urgent desire to defaecate. Sigmoidal-recto infection causes copious dysentery. Blood and mucus are evacuated with formed stools. The disease has a "hide and seek" attitude. After 3—4 days of illness, there is a complete lull. Abdominal cramps and prodromal episodes of diarrhoea may return again after a couple of weeks or months. It warrants an intensive treatment and a conscientious follow up.

We secured 321 stool samples of children between the ages of 2 months to 12 years. All had gastro-enteritis and were attending dispensaries for regular

treatment. Each stool sample was examined both by direct and concentration techniques. The information collected is presented in the following pages.

4. THE DATA

Out of 321 children examined, 122 (38.01 per cent) were found harbouring intestinal parasites, 29 children (9.03/23.77 per cent) had protozoa, 84 children (26.17/68.85 per cent) had helminths, while 9 children (2.81/7.37 per cent) had both. Pure infections were found in 95 cases (29.6 per cent) as against 27 cases (8.41/22.13 per cent) infected with two or more parasites (mixed infections).

4.1. *Giardia intestinalis* (Lambl, 1859) cysts were found in 24 children (7.48/19.67 per cent). It was alone in 18 (14.75 per cent) cases and was also encountered in 6 (4.92 per cent) two-parasite cases.

This data is neither from representative community nor from any fixed area. The information is obtained from children having diarrhoea or dysentery.

Duodenal flagellate is usually common intestinal parasite of children. It causes definite duodenal disturbances in young age groups. As the child advances in age, so the severity of symptoms decrease. The power of tolerance in adults, in general is good. The common complaint is chronic diarrhoea. Atabrine has been found a drug of choice. It is administered at the rate of 1½ g. (Adult dose), three times daily, for 5 days. In some cases, it is difficult to eradicate the parasite with one course. Another course of the drug is usually given 6—10 days after the first treatment. Serious efforts to guard against reinfections must have to be made in endemic areas.

3.2. *Entamoeba histolytica* Schaudinn, 1903 cysts were found in 4 cases. In 3, it was the only intestinal parasite, while in one it was with *E. coli*. The history sheet of the 4 cases provide following information.

- (i) Male, 2½ yrs. : Stools semiformed, abdomen tender. Blood-tinged mucus passed in the stools. Trophozoites found.
- (ii) Male, 3 yrs. : Abdominal cramps, no regional colitis. Entire abdomen tender. Considerable amount of blood and mucus evacuated.

(iii) Female, 9 yrs. : Pain in epigastrium, relieved after meals. Stools mixed with blood and mucus. Superimposed with *E. coli*.

(iv) Female, 12 yrs. : Dull pain in epigastrium. Vague abdominal distress. History of previous dysentery.

When compared with the high figures of bowel diseases in children, the classical amoebic dysentery appears to exist in very small proportion. Incidence in children below 5 years is almost negligible. A child of 5—12 yrs. in this country is usually unmindful of the laws of hygiene. He eats, chews and drinks whatever is offered by the school vendor. This increases the chances of infection. During this age, the child has also no resistance to infections. The frequency of bacillary infections is most common in this age-group as a whole and in school going ages in particular. Much of the trouble is conveyed by the school vendor who sells contaminated food to drink and eat. Unhygienic living conditions and lack of personal hygiene also aggravate the possibility.

Amoebic infection occurs when one imbibes a very heavy dose of viable cysts. Beaver *et al.* (1956) succeeded in establishing an infection in the volunteers after feeding 2,000 cysts of *E. histolytica* as against 100 cysts of *E. coli*. Moreover, *E. histolytica* does not develop when suitable enteric bacterias adjacent to caecal mucosa do not provide low oxygen reduction potential. The young trophozoite, is extremely catholic and certainly does not do well, if during the period it is obliged to stay outside the tissue where special metabolic requirements are not available. This is a critical period in the life cycle of this amoeba. Bacterias needed for the survival are no more required, once the tissue invasion is effected.

4.3. *Entamoeba coli* (Grassi, 1879) was recorded for the first time from Calcutta (1870). Grassi (1879) found it both in healthy and sick persons. It was found to be harmless inhabitant of the colon by a number of workers.

It is generally most prevalent amoeba. It was found only in 7 cases in this series. It was found alone in 2, in 4 cases it was involved with *E. histolytica* (1), *E. nana* (2) and *A. lumbricoides* (1). In a solitary case, its companion were *T. trichiurus* and *A. lumbricoides*. Excepting *E. nana*, all the other parasites involved with it are pathogenic to man.

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4.4. *Endolimax nana* (Wenyon and O'Conner, 1917) was reported for the first time in 1908. Its distribution is more or less like *E. coli*. Since it is non-pathogenic and known to produce no symptoms, it is usually not looked for seriously by the microscopists. Heavy infections however, do not escape detection. The incidence figures given in various survey reports are therefore not real.

In this series, it was found in 5 cases only. In 2 cases, it was the only infection while in 3 cases, it occurred along with *E. coli* (2 cases) and *A. duodenale* (1 case).

4.5. *Iodamoeba butschlii* (von Prowazak, 1911) was found much less common in these series. It was found in one solitary case. The case complained of intermittent diarrhoea. No history of passing worms and no traces of abdominal distress was available. Our data, though meagre, does not support Derric (1948).

4.6. *Trichocephalus trichiurus* (Linnaeus, 1771) has not so far been found common in Lahore. The surveys carried out during the last 4-5 years show both its incidence and intensity of infection low. High rains, high humidity and dense shade create good ecological condition for the extrinsic development of the eggs and thereafter its carry over to a suitable host. Lahore, in general, does not provide all these favourable conditions and therefore, the incidence of whipworm remains very low.

The whipworm eggs were found in 3 cases. In 2 cases its companion was either *A. lumbricoides* or *H. nana* while in a solitary case it occurred with *A. lumbricoides* and *E. coli*.

The symptoms, in one with *H. nana* were pain in epigastrium region and profuse mucous diarrhoea while others complained of abdominal pain and passing of blood streaked diarrhoeal stools.

4.7. *Ancylostoma duodenale* (Dubini, 1843) is always common in communities used to promiscuous defaecation. Its incidence is also high in areas where human faeces are used for raising vegetables and fodder crops. All the epidemiological conditions, essential for the extrinsic development of free living stages, are fully available on the periphery of the town.

In 15 cases, *A. duodenale* was the only parasite found. All these cases were Some complained of epigastric pain and intermittent fever while others

did not know of anything but lassitude. One case gave the history of pain in the left iliac region and intermittent diarrhoea.

In 13 cases it was superimposed by *G. intestinalis* (3 cases), *E. nana* (one case), *E. vermicularis* (one case), *A. lumbricoides* (7 cases) and *H. nana* (one case). Abdominal pain, extensive appetite and passing of small worms was common complaint.

In one solitary case *A. duodenale* was found together with *E. coli* and *T. trichiurus*.

The hookworm infection was found in children ranging from 3—11 years in age. In two cases however, the age was only 10 months. The history of an infant girl was available. She was poorly nourished, and extremely enemic. Her mother worked in the fields, and during her stay there, the infant girl was left on a piece of cloth under a shady tree. The piece of cloth was only too thin and incapable of obstructing the way of the infective larvae and also too small. The legs below the knee were always touching the soil below. In addition the child always rolled round and round to come down and have direct contact with the moist soil of the field. The mother also had ancylostomiasis. Other children who lived and played in that locality were however, not examined.

Haemoglobin index of the children examined varied from 35-45 percent. According to most workers 75% reading indicates presence of 240 worms. If the intercurrent causes are not taken into consideration, these readings mean that there were on an average 500 to 750 worms in these children. Information of some typical cases are given in the statement below :—

DETAILS OF SOME TYPICAL CASES

Case	Particulars	Parasites
Male Children :		
1. 3 yrs.	Excessive appetite. No abdominal pain, pot-belly. History of dermatitis. Liver and spleen enlarged. Acute gastro-enteritis. Craved for clay and sugar. No history of passing worms	<i>A. duodenale</i> <i>A. lumbricoides</i>

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Case	Particulars	Parasites
2. 3 yrs.	Abdominal pain, pot-belly, food poorly digested, irregular motions. No history of passing worms. Eats earth, charcoal, bricks.	<i>A. duodenale</i>
3. 4 yrs.	No abdominal pain. Low-haemoglobin index (45%), intermittent fever, acute gastro-enteritis for 6 months. Yellow pallor skin, oedema of face. History of thread worms and anal itching in the evening.	<i>A. duodenale</i> <i>E. coli</i> , <i>T. trichiurus</i>
4. 5 yrs.	Pain in the left iliac region. Constipation and diarrhoea alternating. Yellow pallor skin. Always licking the wall plaster, pot-belly. No history of passing worms. No anal itching.	<i>A. duodenale</i>
5. 5½ yrs.	Abdominal pain. Dysentery of 3 months duration. Low haemoglobin index (45)%. Pot-belly. Passing small worms, complains of anal itching.	<i>A. duodenale</i>
6. 6 yrs.	Abdominal pain. Yellow pallor skin. Food poorly digested, no worms passed, no anal itching.	<i>A. duodenale</i> <i>E. nana</i>
7. 8 yrs.	Pain in epigastrium, very anemic (35%) acute gastro-enteritis. Food poorly digested. No history of passing worms.	<i>A. duodenale</i>
8. 8½ yrs.	Abdominal pain. Low haemoglobin index, diarrhoea since 3 months. No history of passing worms. No anal itching.	<i>A. duodenale</i>

Case	Particulars	Parasites
9. 9 yrs,	Pain in epigastrium. Anemic (35%) Food poorly digested, diarrhoea. Small worms in stools. Frequent itching in the anal region.	<i>A. duodenale</i> <i>G. intestinalis</i>
10. 9 yrs.	Pain in epigastrium. Anemic (45%) Diarrhoea for the last 6 months. Small worms in the stools. Oedema of face. Pot-belly.	<i>A. duodenale</i>
11. 9 yrs.	Abdominal pain, palpitation of heart. Acute gastro-enteritis. Diarrhoea of 4 months duration. Fond of sugar. No history of passing small/large worms.	<i>A. duodenale</i> <i>A. lumbricoides</i>
12. 11 yrs.	No abdominal pain. Palpitation of heart. Haemoglobin index 45%. Poor digestion. Constipation/diarrhoea alternating. Oedema of face. Pot-belly.	<i>A. duodenale</i>
13. 11 yrs.	Pain in epigastrium region. Very anemic. Intermittent low grade fever. Palpitation of heart. Food Poorly digested. Diarrhoea alternating with constipation. Oedema of face. No history of passing worms.	<i>A. duodenale</i> <i>E. vermicularis</i>
14. 11 yrs.	Abdominal pain, pot-belly, anemic, food poorly digested. Diarrhoea/dysentery for one year. Oedema of face and legs. History of passing tapeworm segments.	<i>A. duodenale</i> <i>A. lumbricoides</i>

Case	Particulars	Parasites
2. 3 yrs.	Abdominal pain, pot-belly, food poorly digested, irregular motions. No history of passing worms. Eats earth, charcoal, bricks.	<i>A. duodenale</i>
3. 4 yrs.	No abdominal pain. Low-haemoglobin index (45%), intermittent fever, acute gastro-enteritis for 6 months. Yellow pallor skin, oedema of face. History of thread worms and anal itching in the evening.	<i>A. duodenale</i> <i>E. coli</i> , <i>T. trichiurus</i>
4. 5 yrs.	Pain in the left iliac region. Constipation and diarrhoea alternating. Yellow pallor skin. Always licking the wall plaster, pot-belly. No history of passing worms. No anal itching.	<i>A. duodenale</i>
5. 5½ yrs.	Abdominal pain. Dysentery of 3 months duration. Low haemoglobin index (45)%. Pot-belly. Passing small worms, complains of anal itching.	<i>A. duodenale</i>
6. 6 yrs.	Abdominal pain. Yellow pallor skin. Food poorly digested, no worms passed, no anal itching.	<i>A. duodenale</i> <i>E. nana</i>
7. 8 yrs.	Pain in epigastrium, very anemic (35%) acute gastro-enteritis. Food poorly digested. No history of passing worms.	<i>A. duodenale</i>
8. 8½ yrs.	Abdominal pain. Low haemoglobin index, diarrhoea since 3 months. No history of passing worms. No anal itching.	<i>A. duodenale</i>

Case	Particulars	Parasites
9. 9 yrs.	Pain in epigastrium. Anemic (35%) Food poorly digested, diarrhoea. Small worms in stools. Frequent itching in the anal region.	<i>A. duodenale</i> <i>G. intestinalis</i>
10. 9 yrs.	Pain in epigastrium. Anemic (45%) Diarrhoea for the last 6 months. Small worms in the stools. Oedema of face. Pot-belly.	<i>A. duodenale</i>
11. 9 yrs.	Abdominal pain, palpitation of heart. Acute gastro-enteritis. Diarrhoea of 4 months duration. Fond of sugar. No history of passing small/large worms.	<i>A. duodenale</i> <i>A. lumbricoides</i>
12. 11 yrs.	No abdominal pain. Palpitation of heart. Haemoglobin index 45%. Poor digestion. Constipation/diarrhoea alternating. Oedema of face. Pot-belly.	<i>A. duodenale</i>
13. 11 yrs.	Pain in epigastrium region. Very anemic. Intermittent low grade fever. Palpitation of heart. Food Poorly digested. Diarrhoea alternating with constipation. Oedema of face. No history of passing worms.	<i>A. duodenale</i> <i>E. vermicularis</i>
14. 11 yrs.	Abdominal pain, pot-belly, anemic, food poorly digested. Diarrhoea/dysentery for one year. Oedema of face and legs. History of passing tapeworm segments.	<i>A. duodenale</i> <i>A. lumbricoides</i>

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Case	Particulars	Parasites
Female Children :		
15. 10/12 mths.	Intermittent fever. Acute gastro-enteritis, poor digestion. Yellow pallor skin. No history of passing worms.	<i>A. duodenale</i>
16. 6 yrs.	Abdominal pain, pot-belly, very anemic, haemoglobin index 35%. Intermittent fever. Palpitation of heart. Dermatitis. Bad digestion, acute gastro-enteritis. Eats clay. Oedema of face. History of passing roundworms in stool/vomits. Passing small worms. Severe anal itching.	<i>A. duodenale</i> <i>A. lumbricoides</i>
17. 10 yrs.	Pain in epigastrium. Extensive appetite. Palpitation of heart. Digestion bad. Diarrhoea for the last 6 months. Oedema of face. History of passing roundworms. Haemoglobin index 55%.	<i>A. duodenale</i> <i>A. lumbricoides</i>
18. 10 yrs.	Pain in epigastrium. Yellow pallor skin. Pot-belly. Chronic diarrhoea. Oedema of face. No history of passing worms.	<i>A. duodenale</i>
19. 10 yrs.	Abdominal pain. Yellow pallor skin, pot-belly. Digestion very poor. Palpitation of heart. Oedema of face and legs. No history of passing worms. Haemoglobin index 35%.	<i>A. duodenale</i> <i>G. intestinalis</i>
20. 10 yrs.	No abdominal pain. Yellow pallor skin, haemoglobin index 35%. Diarrhoea for several months. No history of passing worms.	<i>A. duodenale</i>

Case	Particulars	Parasites
21. 10 yrs.	Pain in epigastrium region. Yellow pallor skin, haemoglobin index 30%. Diarrhoea and dysentery for the last 6-7 months. No history of passing worms. Anal itching severe.	<i>A. duodenale</i>

4.8. *Enterobius vermicularis* (Linnaeus, 1758) was found in 22 cases. In 17 cases it was the only parasite, while in 5 cases it was found with *A. duodenale* (one case) and *A. lumbricoides* (4 cases).

The seatworm eggs were found in several cases which had no clinical evidence of infection, no history of passing small worms and no complaint of itching or both. On the other hand several children had typical history of enterobiasis but were not found having *Enterobius* eggs in the stools.

The youngest children found harbouring *E. vermicularis* were of 3 and 5 months of age. Cellophane tape-test were performed to detect enterobiasis in several cases giving the history, but it did not give us good results. Only two cellophane anal swabs, obtained from about 50 children giving history of *enterobiasis* were found positive, as against additional 8 found positive after stool examination. It is usual practice to make the child evacuate or vigorously wash the seat if there is trouble of evening itching. This operation gives relief to the child and at the same time removes traces of infection around the anus. For survey work, the mothers have to be instructed that cleaning of the anus and peri anal skin should be avoided before obtaining NIH swabs.

4.9. *Ascaris lumbricoides* (Linnaeus, (1758) is a common roundworm of Lahorites. All persons in some communities, because of lack of personal hygiene, favourable environmental conditions and contaminated sites are obliged to continue having boosting doses of infection in one or all parts of their life. The children, of the uneducated and untrained mothers in particular, usually pick up the infections more frequently from the seeded courtyards and dooryards.

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In this series, it was found both, in those children who gave the history of passing the giant roundworm in the faeces/vomits and also in those who hadn't had ever passed the worms. Most of the children gave the history of passing small worms.

Irregular respiration, resembling asthma, was reported by one female child of 6 years. Abdominal discomfort and pain in the epigastrium region was common complaint. Poor digestion and intermittent diarrhoea and dysentery brought most of them to the hospital. An unfortunate child of 2 years passed 2 fully developed female worms, through the nares after death. Probably she died of suffocation.

In this series, 19 cases had only giant roundworm. In 15 cases, however it was found with *G. intestinalis* (2 cases), *E. coli* (one case), *T. trichiurus* (one case), *A. duodenale* (7 cases) and *E. vermicularis* (4 cases).

The children, who had both *A. lumbricoides* and *A. duodenale* were found to be in very bad state of health. Majority of the children complained of colicky pain in the epigastrium region. The trouble was also associated with poor digestion, diarrhoeas and fever. The stools were tinged red.

4. 10. *Hymenolepis nana* (von Siebold, 1852) is a fairly common intestinal parasite of this country. It is more frequently found in children than adults. Joint family system and huddling together of the family members in small rooms, encourage its spread and result in high incidence. Observations in Latin America, have shown that incidence in children varied from 7—20 per cent as against 0.7—2.3 in adults.

Most of the children, harbouring dwarf tapeworm complained of vague abdominal pain, indigestion and intermittent diarrhoea. It is pertinent to remember that this parasite does not need an intermediate host during its life history. The larvae pass their life in submucosal coat of the intestinal villi. Auto-infection being most common, the ingestion of a solitary egg eventually may give rise to an ever-increasing infection. A generation usually succeeds a generation. Anthelmintic acts on the adults present in the intestines, but the cysticercoids developing in subcutaneous layers of the villi remain unaffected. This necessitates 2 to 3 administrations of Atabrine at fortnightly intervals. For hyperinfective cases, the dose should be given in the morning, on an empty stomach. A saline purgation a night before and a post-treatment purgation 2 hours after, gives

better results. The physicians need to be very patient with persistent types of infections. He should ensure that the Atabrine course is continued, without break for 6 days. The course should be repeated if stool examination after two weeks suggest persistence of infection.

In this series only 11 children were found harbouring dwarf tapeworm. In 8 it was the only intestinal parasite while in 3 it was superimposed with *G. intestinalis*, *T. trichiurus* and *A. duodenale* (one case each). It was found more frequent in male children than the female (2.33 : 1). The youngest male child found harbouring the dwarf tapeworm was of 4 years old as against the female child who was only 2 years old.

4. 11. **Blood Picture :** A study of blood and blood forming tissues is of practical utility in certain morbid conditions. In health, there are 5,000,000 erythrocytes per cumm. of blood. The number however, may be 4,500,000 in women. At birth the average number is about 7,000,000. The adult figure is obtained at about 15 years of age.

Haemoglobin percentage is another important point to be studied. Colour index is much increased in pernicious anemia. Colour index is normally low in childhood from about 6 months to 14 years.

Differential count yields more helpful information. Average distribution of different leukocytes in a normal American were found to be 25—33% lymphocytes, 2—6% monocytes, 60—70% polymorpho—nuclear neutrophils, 1—4% eosinophils and 0.25—0.5% basophils. Age, climatic factors and altitude may exert influence on these figures. As long as the normal figures are not available from a community/country, it is unsafe to conclude from the variation of DLC. Marked relative lymphocytosis may occur in exophthalmic goiter. In simple goiter however, there is no effect on lymphocytes. Pulmonary tuberculosis may also cause increase in lymphocytes. All conditions, which cause leukopenia, pernicious anemia and other debilitating conditions, also moderately increase lymphocytes.

Monocytes constitute 2—6 per cent of the total number of leukocytes. An increase of 15% or above is a feature of typhoid fever. It remains constant in malaria. Chronic amoebic dysentery, trypanosomiasis, Leishmaniasis and rocky-mountain fevers may increase the figures due to proliferation of capillary endothelium.

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Polymorphonuclear Neutrophils generally constitute 60—70 per cent of the leukocytes. In rare instances these figures may be 40—80%. In children below one year 35% and above 10 years 50%. Any marked increase usually increases total leukocyte count (Neutrophilic leukocytosis). The percentage represents the severity of infection (toxic absorption) while the total indicates power of resistance.

Eosinophilic leukocytes comprise 1—4 per cent of leukocytes. An increase is called *eosinophilia*. Marked eosinophilia (above 6—7%) always indicates pathological condition. Eosinophilia may represent an infestation by any of the worms. 10—30% eosinophilia may be in trichiniasis, uncinariasis, filariasis and echinococcosis.

DLC figures may have some meaning in the light of clinical history and general condition of the patient. A study of blood parasites may also be made. The condition of spleen becomes abnormal in long continued infections. Cases marked (*) in Table IV are suggestive of such an observation See Page 30.

5. DISCUSSION

Parasitism and parasitic infestations are universal conditions of life. The communities living under primitive conditions of sanitation usually have a high rate of infection. Lack of personal hygiene also promotes infection with intestinal parasites.

About 80 per cent of our people live in insanitary houses. The children defecate in courtyards and streets. Indiscriminate scattering of human faeces does not only contaminate water supply but also other articles of food. Because of this nasty habit the dust of the kacha streets and courtyards is heavily loaded with faecal matter and slight wind blows it into the houses and on to every thing exposed in the vendors' shop. It is obvious, that children who run about in the contaminated courtyards and play in the filthy streets do not only pick up the infective stages of the intestinal parasites but also make others to eat their faeces.

Time are now gone, when public health activity consisted of doing things to and for people. Now-a-days all the public health activities have to be done with people. It involves top level health education of the masses, so that the people may render full co-operation. In the first phase the community is to be

made fully aware of the problem. The sensitization process has to be elaborated slowly, so that the masses become receptive to the expert advice. A close contact will not only increase their knowledge but also change their old concepts and yield place to newer concepts of healthful living. Community finally is motivated to make practical use of the knowledge imparted to them.

As long as promiscuous, defaecation within the domestic premises is not stopped, the incidence of intestinal parasites in children cannot be brought down. Manures, mostly consisting of human faeces, are cause of much unhappiness and inefficiency. Composting of manures, and provision of proper latrines to the community are some pre-requisites to check the spread of the intestinal parasites.

All of us agree on one point, that the wide spread parasitism is mainly due to the absence of sanitary precautions. Although modern sanitation and hygiene have controlled shigellosis to the point that the cases become either rare or sporadic, yet no amount of sanitation will control the zooparasites if the children continue easing in the courtyard and dooryard. The vicious circle cannot be broken, if the elders are not prevented from finding clump of bushes for defaecation and micturation. Intestinal parasites are fairly commonly associated with intestinal disorders. The larval disorders are directly or indirectly most important cause of invalidating the younger age groups.

Detection of intestinal parasites and specific treatment of each, are of great importance as a practical measure to curb the trouble. Significance of the carrier condition, both to the individuals and for the community, is not yet clearly understood for all the intestinal parasites. For practical purposes however, mild cases should be considered as acute cases. The danger lies in the escape of cases without demonstrable symptoms.

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Public Health workers cannot change the picture of animal parasitosis. A safeguard lies in setting up a campaign programme with the active cooperation of the people. A neglect in this direction means establishing of an endemic area and also providing opportunity to the parasites to become established in new foci. An answer to the question, why there is an incidence of intestinal parasite in elite quarters of the city, is provided by this observation.

The diarrhoeas and dysenteries are problems of the communities living under insanitary conditions. Prevalence of unhygienic conditions means occurrence of more incidence of bowel diseases. Most of the infections are conveyed through the agency of contaminated food and drinking water. Some cases can be traced back to the activities of domestic flies, which pick up the infection from the filth and faeces and transport it to the food reserved for human consumption.

No facilities should be provided to the filth-flies to breed. Sanitary disposal of human faeces and domestic sweepings bring the incidence of domestic flies to the lowest level. Promiscuous defecation should not be tolerated at any stage. Even the stools of the infants are danger spots and should be hurriedly disposed of properly. The manure heaps should be carefully attended to. All efforts should be made to consume good and wholesome water. Hand washing facilities should be available in the schools and should be provided to the food handlers. Fly menace should be exterminated or reduced to minimum by adopting anti-fly measures. It is man himself who provides facilities to the domestic flies to breed comfortably. These "favourable spots" should be attended to properly and hazard must be got reduced to minimum.

Our is a period of dramatic development in the public health field. Health education of the parents has brought exciting changes in other countries. The diarrhoea and dysentery cases become unknown when the mothers are mindful of the factors promoting these troubles. Improvement of living conditions in this country and attending to individual prophylaxis may bring down cases to minimum.

The sanitation of Lahore is improving every year. In some sections of the city however, much still remains to be achieved. Eradication of dysenteries and diarrhoeas cannot be achieved as long as such pockets still exist. Illiteracy and low socio-economic conditions of the masses are the root cause of much trouble. Much persuasion of the masses and proper briefing of common man in the principles of elementary hygiene may probably partially improve conditions.

It is not inadequate financial assistance alone but extreme lethargy and corruption which actually thwart efforts towards the construction of sanitary work. Gangs employed to maintain the sanitary works do not attend to their duties. The sewerage system in Samanabad, for instance, has become a nuisance because the slope provided is incorrect and improper. The cleaning squads do not work because the house-holders do not regularly tip the gutter cleaners. The calverts remain chocked because the house owner in front did not pay him the *bakhs'hish*.

Removal of rubbish heaps is more on papers and less in practice. A city father feels that the Corporation sweeper in his street is to serve him only and in turn the sweeper thinks that for continuity in service he is to please the basic Democrats, Municipal Commissioners and members of the Corporation. He keeps their houses and their premises spick and span and completely neglects other parts of the street. The housewife on the other hand, believes that putting the rubbish and sweepings in front of the neighbouring houses is part of personal cleanliness. She also probably thinks that asking the children to ease in the gutter, drain and dooryard will keep away the filth flies from entering houses. It is "in" and "out" cleanliness which counts. A principle of "total coverage" is the fundamental truth here.

National outlook rotates round everything. As long as the principle is based on persons, the progress in the field of public health will not benefit the masses. Neither this principle helps in reducing the cases of intestinal parasites. In a country,

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where the District Board and Municipal Committees flow facilities to the strong section of the community, the intestinal parasites will continue flourishing unchecked. The amount of money spent on sanitation in Gulberg is far too great than the amount released for looking after Ichhra and Rahmanpura. The result of this step motherly treatment is that the well-looked-after part of the city also cannot dream of living peacefully. The pathogenic organisms will continue moving from man-made hatcheries, till such time that these hatcheries are hit hard and the distributory is sealed or closed.

6. SUMMARY

The diarrhoeas and dysenteries occupy an important place amongst communicable diseases. In aggregate, diarrhoeas and dysenteries probably cause more morbidity and mortality than other diseases in children. Bacillary infections are seriously active while zooparasites are not spectacular in outbreaks. The former disease is characterised by great virulence and rapid course and also accompanied by diarrhoea, tenesmus and fever. In some cases blood and mucus is also passed. The diarrhoeas and dysenteries due to intestinal parasites are chronic and relapsing infections. The evacuations are moderate. The motions may contain mucus and blood.

The incidence of diarrhoeas and dysenteries is closely webbed with the sanitary standard of a community. Provision of latrines, and privies, sanitary disposal of human faeces, prohibition of promiscuous defaecation, supply of protected water and health education of masses are important tools to control these diseases. Let every body know that "high level of personal hygiene nips most of these troubles in the bud".

We examined 321 children complaining of intestinal troubles. 38.01 were found harbouring intestinal parasites.

Giardia intestinalis was found in 7.84 per cent children. This flagellate is known for its ill effects in children,

Entamoeba histolytica cysts were found in 1.25 per cent cases. Classical amoebic dysentery is usually uncommon in children below 5 years. A child of 2½ yrs. had amoebiasis and was found passing trophozoites. Other children were 9—12 years of age.

The non-pathogenic amoebas were incriminated in 13 cases (4.05 per cent). *E. coli*, which is generally a very frequently found commensal, was found in 2.18 per cent cases. *I. butschlii* was also found most uncommon in these series.

The helminthic infections were detected in 33.95 per cent children.

The whipworm eggs (*T. trichiurus*) were present in 0.93 per cent as against 9.03 per cent with hookworm eggs (*A. duodenale*). The seatworm eggs (*E. vermicularis*) were found in 6.85 per cent children. The roundworm infection (*A. lumbricoides*) appeared to predominate in this series. It was found in 13.71 per cent. If an allowance of 10% is allowed for the immature worm and male worm infection, which is not detected by stool examination, the infection rate may work out to be 17 per cent.

The dwarf tapeworm (*H. nana*) eggs were found in 3.43 per cent children only. The corresponding ratios of dwarf tapeworm, seatworm, hookworm, and roundworm in this series was found to be 1 : 2 : 2.64 : 4.

The corresponding ratios of various intestinal parasites are given in Table IV.

TABLE 1 : Incidence of Intestinal Parasites in the Children Examined

	PROTOZOAS						HELMINTHS			
	GI	EH	EC	EN	IB	IT	AD	EV	AL	HN
1. Pure Infections :	18	3	2	2	1	—	15	17	29	8
(a) % of total examined (321)	5.61	0.93	0.63	0.63	0.31	—	4.68	5.29	9.03	2.49
(b) % of total positive (122)	14.75	2.46	1.64	1.64	0.82	—	12.29	13.93	23.77	6.55
(c) % of total with one Parasite (95)	18.94	3.15	2.11	2.11	1.05	—	15.79	17.89	30.52	8.42
(d) % of total with one protozoa (26)/ one helminth (69).	69.23	11.54	7.69	7.69	3.84	—	21.74	24.64	42.03	11.59
2. Double Infections :	3	—	—	—	—	—	3	—	—	—
	2	—	—	—	—	—	—	—	2	—
	1	—	—	—	—	—	—	—	—	1
	—	1	1	—	—	—	—	—	—	—
	—	—	2	2	—	—	—	—	—	—

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—	—	1	—	—	—	—	—	—	1	—
—	—	—	1	—	—	—	1	—	—	—
—	—	—	—	—	—	1	—	—	1	—
—	—	—	—	—	—	1	—	—	—	1
—	—	—	—	—	—	—	1	1	—	—
—	—	—	—	—	—	—	7	—	7	—
—	—	—	—	—	—	—	1	—	—	1
—	—	—	—	—	—	—	—	4	4	—
(a) % of total examined (321)	1.87	0.31	1.24	0.93	—	0.63	4.05	1.56	4.68	0.93
(b) % of total positive (122)	4.92	0.82	3.28	2.46	—	1.64	10.65	4.09	12.29	2.46
(c) % of with parasites (26)	23.07	3.85	15.38	11.59	—	7.69	56.00	19.23	57.69	11.52
3. Triple Infection :	—	—	1	—	—	1	1	—	—	—
GRAND TOTAL	24	4	7	5	1	3	29	22	44	12

Protozoan and Metazoan Parasites of Children

TABLE I : Incidence of Intestinal Parasites in the Children Examined

	PROTOZOAS					HELMINTHS				
	GI	EH	EC	EN	IB	TT	AD	EV	AL	HN
(a) % of total examined (321)	7.48	1.25	2.18	1.56	0.31	0.93	9.03	6.85	13.71	3.43
(b) % of total positive (122)	19.67	3.28	5.74	4.09	0.82	2.46	23.77	18.03	36.06	9.01
(c) % of total with protozoa (38)/with helminths (93)	63.15	10.53	18.43	13.16	2.63	3.23	31.18	23.65	47.31	11.83

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TABLE II ; Distribution of Intestinal Parasites in Different Age-Groups

Intestinal Parasites	Age (yrs) of Male/Female children	Total No. cases	Intestinal Parasite	Age (yrs) of Male/Female children	Total No. cases
GI.	M : 7 (2), 11 $\frac{1}{2}$, 2 (2) 3 (2), 3 $\frac{1}{2}$, 4, 5 (2) 9, 10, F : 4, 10 (2), 12	18	AD+GI.	M : 7, 9, F : 10	3
GI+AD.	M : 7, 9, F : 10	3	AD+EN.	M : 6	1
GI+AL.	M : 1, F : 2	2	AD+EV.	F : 11	1
GI+HN.	M : 4	1	AD+AL.	M : 3, 5, 7, 9, 11, F : 6, 10	7
EH.	M : 2 $\frac{1}{2}$, 3, 9	3	AD+HN.	M : 4/12	1
EH+EC.	F : 12	1	AD+TT+EC.	M : 4	1
EC.	M : 5, 7	2	EV.	M : 5/12, 11 $\frac{1}{2}$, 2, 2 $\frac{1}{2}$, 4, 5, 5 $\frac{1}{2}$, 10, 11, F : 2/12, 3/12, 1, 2, 6, 8 $\frac{1}{2}$, 10, 12.	17
EC+EH.	F : 12	1	EV+AD.	F : 11	1
EC+EN.	M : 4, F : 2	2	EV+AL.	M : 6/12, 5, 8, F : 1 $\frac{1}{2}$. .	4
EC+AL.	M : 4	1	AL.	M : 8/12 (2), 1 (3), 11 $\frac{1}{2}$ (3), 2 (2), 3 (3), 4 (2), 5, 7, 8, 9 (2), 10 (2), 11, F : 6/12, 1, 2, 3, 10 (2)	29
EC+TT+AD.	M : 4	1	AL+GI.	M : 1, F : 2	2
			AL+EC.	M : 4	1

Protozoan and Metazoan Parasites of Children

TABLE II : Distribution of Intestinal Parasites in Different Age-Groups

Intestinal Parasites	Age (yrs) of Male/Female children	Total No. cases	Intestinal Parasite	Age (yrs) of Male/Female children	Total No. cases
EN.	M : 6, F : 7	2	AL+TT.	M : 4	1
EN+EC.	M : 4, F : 2	2	AL+AD.	M : 3, 5, 7, 9, 11, F : 6, 10	7
EN+AD.	M : 6	1	AL+EV.	M : 6/12, 5, 8, F : 1 1/8	4
IB.	M : 6	1	HN.	M : 3, 4, 10, 12, F : 4, 6, 7 (2)	8
TT+AL.	M : 4	1	HN+GL.	M : 4	1
TT+HN.	M : 12	1	HN+TT.	M : 12	1
TT+AD+EC.	M : 4	1	HN+AD.	M : 4/12	1
AD.	M : 3 (2), 4, 5, 5 1/2, 8, 8 1/2, 11 (2), F : 10/12 (2), 6, 10 (3)	15			

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TABLE III : Corresponding Ratios of the various Intestinal Parasites in the Children

	Protozoas					Helminths				
	GI	EH	EC	EN	IB	TT	AD	EV	AL	HN
1. Total ...	24	4	7	5	1	3	29	22	44	11
2. <i>G. intestinalis</i> ...	1	0.17	0.29	0.21	0.04	0.13	1.21	0.92	1.84	0.49
3. <i>E. histolytica</i> ...	6	1	1.75	1.25	0.25	0.75	7.25	5.50	11.0	2.75
4. <i>E. coli</i> ...	3.43	0.57	1	0.72	0.14	0.43	4.14	3.14	6.29	1.57
5. <i>E. nana</i> ...	4.80	0.80	1.40	1	0.20	0.60	5.80	4.40	8.80	2.20
6. <i>I. butschlii</i> ...	24	4	7	5	1	3	29	22	44	11
7. <i>T. trichiurus</i> ...	8	1.33	2.33	1.66	0.33	1	9.66	7.33	14.66	3.66
8. <i>A. duodenale</i> ...	0.83	0.14	0.24	0.17	0.03	0.11	1	0.76	1.52	0.38
9. <i>E. vermicularis</i> ...	1.09	0.19	0.32	0.23	0.05	0.14	1.32	1	2	0.50
10. <i>A. lumbricoides</i> ...	0.54	0.09	0.16	0.12	0.03	0.07	0.66	0.50	1	0.25
11. <i>H. nana</i> ...	2.18	0.36	0.64	0.45	0.09	0.27	2.24	2	4	1

Protozoan and Metazoan Parasites of Children

TABLE IV : Differential Leukocyte Count in some cases examined

With Roundworms					With Hookworms					With both				
Age	L	M	P	E	Age	L	M	P	E	Age	L	M	P	E
3M	13	...	86	1	5½M	41	...	56	3	3M	38	...	61	1
4M	16	...	83	1	6F	44	2	51	3	4M	51	1	47	1
4M	34	9	54	3*	7M	23	3	71	3					
8M	8	...	92	...	9M	22	1	74	3	10M	46	7	44	3*
8F	24	1	70	5*	10F	35	...	65	...	11M	23	...	77	...
10M	47	1	51	1	...	...	...	...	...	...	...	...	...	...
12M	19	2	77	2	...	...	...	...	...	...	...	...	...	...
12M	16	...	81	3	...	...	...	...	...	...	...	...	...	...

*Suggestive.

Legend : Age=years, M= male children, F= female children.

7. PREVIOUS PAPERS

1. Ansari, M.A. Rahman (1964) Intestinal Parasites in cases with definite clinical evidence. *Pak. Jour. Hlth. Lahore*, 14(3) : 156-200.
2. Ansari, M.A. Rahman (1966) Intestinal protozoas and helminths in random samples of boys and girls. *Pak, Jour. Hlth. Lahore*. 16(1) : 8-22.
3. Ansari, M.A. Rahman and Naru, N.A. (1966) The prevalence of intestinal parasites in the Lahore Mental Hospital (Male cases) : *Pak. Jour. Hlth. Lahore*, 16(3) : 146-164.
4. Ansari, M.A. Rahman and Naru N.A. (1966) A note on the incidence of intestinal parasites in the Lahore Mental Hospital for female patients. *Pak. Jour. Hlth. Lahore*, 16(3) ; 165-178.
5. Ansari, M.A. Rahman, and Naru, N:A. (1967) Studies on the epidemiology of intestinal parasites in Lahore Mental Hospital. *Pak. Jour. Hlth. Lahore*.
6. Ansari, M.A. Rahman, Sapru. Z.A. (1963-64) A survey of human intestinal parasites in conservancy staff of the city Corporation Lahore. *Pak. Jour. Hlth. Lahore*, 13(3) : 196-232, 13(4) : 234-300.
7. Ansari, M.A. Rahman, Sapru, Z.A. (1964). Intestinal parasitic infections in children of a primary school of Lahore. *Pak. Jour. Hlth. Lahare*, 14(2) : 86-155.

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8. Ansari, M.A. Rahman, Sapru, Z.A. and Naru, N.A. (1964). A survey of intestinal parasites in a village within city Corporation of Lahore—Incidence in female. *Pak. Jour. Hlth. Lahore*, 14(4) : 239-285.
9. Ansari, M.A. Rahman, Sapru, Z.A. and Naru, N.A. (1965). A survey of intestinal parasites in village Sahowary—Incidence in males. *Pak. Jour. Hlth. Lahore*, 15(1) : 16-39.
10. Ansari, M.A. Rahman, Sapru, Z.A. and Naru, N.A. (1965). Instestopan in the treatment of chronic amoebiasis—Preliminary assessment of trials carried out in village Sahowary (Lahore). *Pak. Jour. Hlth. Lahore*, 15(4) : 40-78.
11. Ansari, M.A. Rahman, Sapru, Z.A. and Naru, N.A. (1966). The occurrence of intestinal parasites in an orphanage is still an outstanding problem. *Pak. Jour. Hlth. Lahore*, 16(1) : 27-43.

INTESTINAL PARASITES OF RANG MAHAL AREA OF LAHORE CITY

By

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Rang Mahal is a slice of original city of Lahore, which stands on the debris of ages. Not long ago, it was also enclosed within rampart. Narrow streets and tortuous lanes are still its characteristic features. Damp and dingy environments contribute to its deplorable sanitation. Epidemiological conditions are as found in most old cities of West Pakistan.

Characteristics of Population. According to a conservative estimation, the total population of the area is 6103. Out of which 51.5 per cent are males as against 48.5 per cent females. The proportion of children may come to 44 per cent of the total population. A break up of child population will show 18.25 per cent below two years of age, 28.5 per cent between 2—5 years and 53.25 per cent between 5—12 years of age.

On an average, 5.74 persons form a family. 65.5 per cent of the families live in a single room accommodation, while 25.2 per cent live in two room accommodation. Three or more room accommodation is available for 9.3 per cent families only. Eight families had half room accommodation. According to an over all estimation, on an average one room is available for 4 persons.

Features. A perusal of the above figures will show that Rang Mahal is a thickly populated area. The houses are mostly old, built back to back with narrow and large lanes in between the rows of houses. Most of the houses have little chance to have sun and fresh air. These environments make houses dark, damp and dirty and give gloomy outlook. The streets are narrow, usually 4—5 feet

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wide. In most sections, a dilapidated opened drain runs either in the centre or on one side of the street. Frequently one may find one or more children defaecating in the drains. These drains also serve the purpose of an open latrine for some adults after dusk and during the night.

There are no dust bins or filth depots for the community to dump the household refuse. The streets are therefore, littered with rubbish and debris of all sorts.

Water Supply. An extensive distributory net work supplies the potable water throughout the area. Most of the supply pipes frequently lie in the open drains. As the water supply is so far intermittent, it is open to contamination.

Privies. Most of the houses are usually 2 or 3 storeyed. Several families live in each house. Each unit has its own privy in the portion in use with the family. These privies are either used in emergencies, or by stay-at-home members of the family or only by the female members. For the children and adult males the dooryard gutter is the convenient privy. The children may use the drains at any time of the day, while the elders take advantage of the lightless lanes during the night.

Occupation. Most of the habitants earn their livelihood from modest business or are engaged in cottage industries and handicrafts. Per capita income is usually low. 30 per cent of the families have an income of less than Rs. 20/- per capita per month, 44.2 per cent have per capita income of Rs. 20—40 per month while 25 per cent may have an income of more than Rs. 40/- per capita per month.

Food Supplies. There are modest arrangements for provisions in all the main streets. Several milk vendors, sweetmeat sellers and fruit and vegetable grocers have established tuck shops here and there in the narrow lanes. The articles of food are usually kept uncovered. This is not only a matter of annoyance but a matter of great concern. The house flies have an easy access to the eatables. Dust raising winds also help in the dispersal of infective material from the filth to the food stuffs. Contamination of food articles with filth is something unavoidable under these circumstances.

Educational Facilities. There is a High School for Girls and two Primary Schools—one each for boys and girls, in the area. In addition there are several other teaching Institutions in the neighbourhood to supply opportunities to those

who are to take an advantage of the facilities. Economic conditions are not favourable and therefore full advantage is usually not enjoyed by the community.

Health Education Facilities. The Red Cross Health Centre is rendering common service to the community. The weekly lectures on various aspect of public health are regularly arranged. It is hoped that these programmes will remove ignorance from the masses in near future. A M.C.H. Centre has also been established in the premises. The Lady Health Visitor incharge of the Centre is very conscientious worker and also holds Health Education Classes. Weekly visits by a Lady Doctor has done tremendous good to the community and will certainly improve the plight of the masses.

STATEMENT : SOME SALIENT INFORMATION

Survey of the Specified Area :

		Percentage
1. Total No. of families	... 1064	...
Total population	... 6103	...
Males	... 3141	51.5%
Females	... 2961	48.5%
Total child population	... 2683	44%
Children below 2 years of age	... 492	18.25%
Children between 2 to 5 years	... 764	28.5%
Children between 5 to 12 years	... 1427	53.25%
Average No. of persons per family is	...	5.74 or say 6.

2. Literacy :

	Men	Women
Literates	... 53.3%	28.2%
Below Matric	... 39.7%	26.5%
Matric and above	... 18.1%	1.7%

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3. Accommodation :

No. of families having one room	...	...	65.5%
No. of families having two rooms	...	...	25.2%
No. of families having three or more rooms	...	...	9.3%

N.B.: Eight families have $\frac{1}{2}$ room accommodation.

Average No. of persons per room = 3.72 (say 4).

Average No. of persons per house = 14.2.

4. Income per Capita P.M.

Families with an income of less than Rs. 20/- per capita p.m.	...	30.8%
Families with an income of Rs. 20/- to Rs. 40/- per capita p.m.	...	44.2%
Families with an income of more than Rs. 40/- p.m. per capita	...	25%

N.B.: Income per capita for Pakistan is Rs. 372/- per annum or Rs. 31/- per month.

OBSERVATIONS

834 persons out of 1064 were examined during a period of 11 months. The incidence of infection was found to be 35.73 per cent (298 out of 1064). The protozoan were found in 12.4 per cent (102) as against 19.42 percent (162) with helminthic parasites. Mixed infection was however found in 4.07 per cent (34) only.

1. *Endamoeba hartmanni*. It was found in three cases (0.35%). A female child of six years in addition also had *G. intestinalis*. In a 12 years old male it was accompanied by *E. coli*, *I. butschlii* and *H. nana* infection. In a three years old male child it was not accompanied by any other parasite.

2. *Endamoeba coli*. 43 persons (5.15%) were found carrying *E. coli*. Out of them, 14 females and 8 males (22 persons) had only colon protozoa. In nine

cases (all males) it was accompanied by *I. butschlii*. In one case (male) it was accompanied by *G. intestinalis*. In four cases (females) it was accompanied by *I. butschlii*, in one out of these four cases it was also accompanied by *H. nana*. In one female it was accompanied by *A. lumbricoides*. In one case this parasite was accompanied by *I. butschlii*, and *A. lumbricoides*. In a case it was found with *I. butschlii* and *H. nana*. In another case both *G. intestinalis* and *A. lumbricoides* occurred with it. In one case *E. hartmanni*, *I. butschlii* while in another it co-existed with *A. lumbricoides*.

3. *Iodamoeba butschlii*. It was detected in 39 cases (4.67%). In 13 cases (6 males, 7 females) it was not accompanied by any other parasite. In 11 cases it was accompanied by *E. coli*. In one case it was found with *G. intestinalis*. In another case it was found with *E. coli* and *E. hartmanni*. It occurred along with *G. intestinalis* and *E. coli* in one case. In seven cases this parasite was found together with *A. lumbricoides*. In a solitary instance it was accompanied by *H. nana* and in another case it was accompanied by *E. coli* and *A. lumbricoides*. *E. coli*, *I. butschlii* and *H. nana* were found together in one case. Its companions were both *A. duodenale* and *H. nana* in one case. In a case of quadruple infection it was with *E. coli*, *A. lumbricoides* and *H. nana*.

4. *G. intestinalis*. It was comparatively most common protozoan parasite of this group. It was found in 79 cases (9.11%). Out of these 52 cases (29 males and 23 females) had only an infection of *G. intestinalis*. In 3 cases it was accompanied by *I. butschlii* and *E. coli*. In one case it was found with *I. butschlii*, in another with *E. coli*, and with *E. hartmanni* once. In five cases this parasite was found with *A. lumbricoides* and nine times with *H. nana*. Two times it was found with *A. lumbricoides* and *H. nana*, once with *E. coli* and *A. lumbricoides* while once with *E. vermicularis*, *A. lumbricoides*.

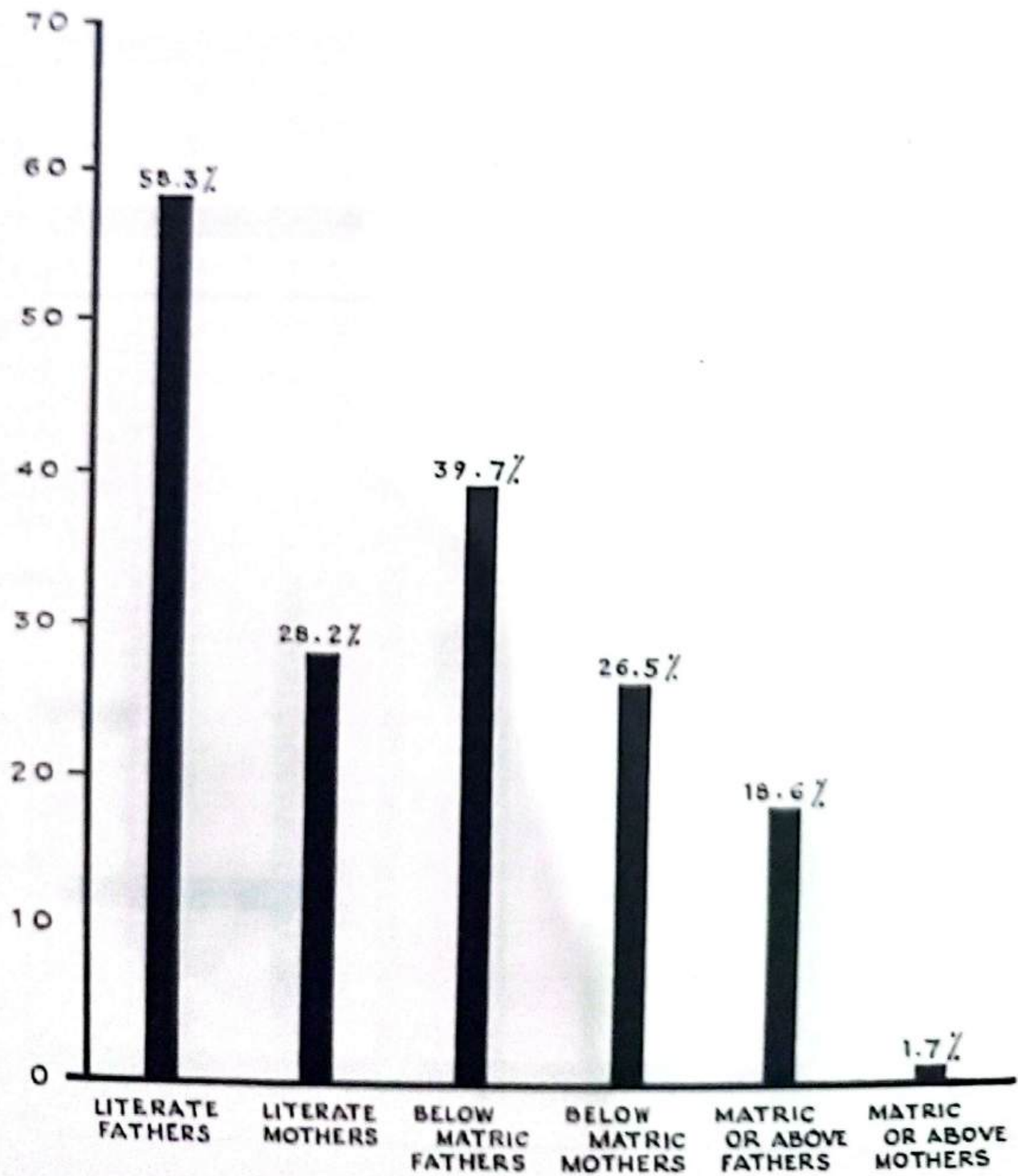
5. *Enterobius vermicularis*. *E. vermicularis* was found in 14 cases (1.91%). In 8 cases (3 males and 5 females) it was unaccompanied by any other parasite. In one case it was found alongwith *G. intestinalis*, *A. lumbricoides* and *H. nana*. In one case (age 10 years : male) it was accompanied by *A. lumbricoides* and *H. nana*. In two cases (a male : 12 years and female 9 years) it was accompanied by *A. lumbricoides* only. In two females, 7 years and 16 years of age, it was accompanied by *H. nana*.

6. *Trichuris trichiura*. This parasite was found in only one case, a boy of 12 years age, alongwith *A. lumbricoides*.

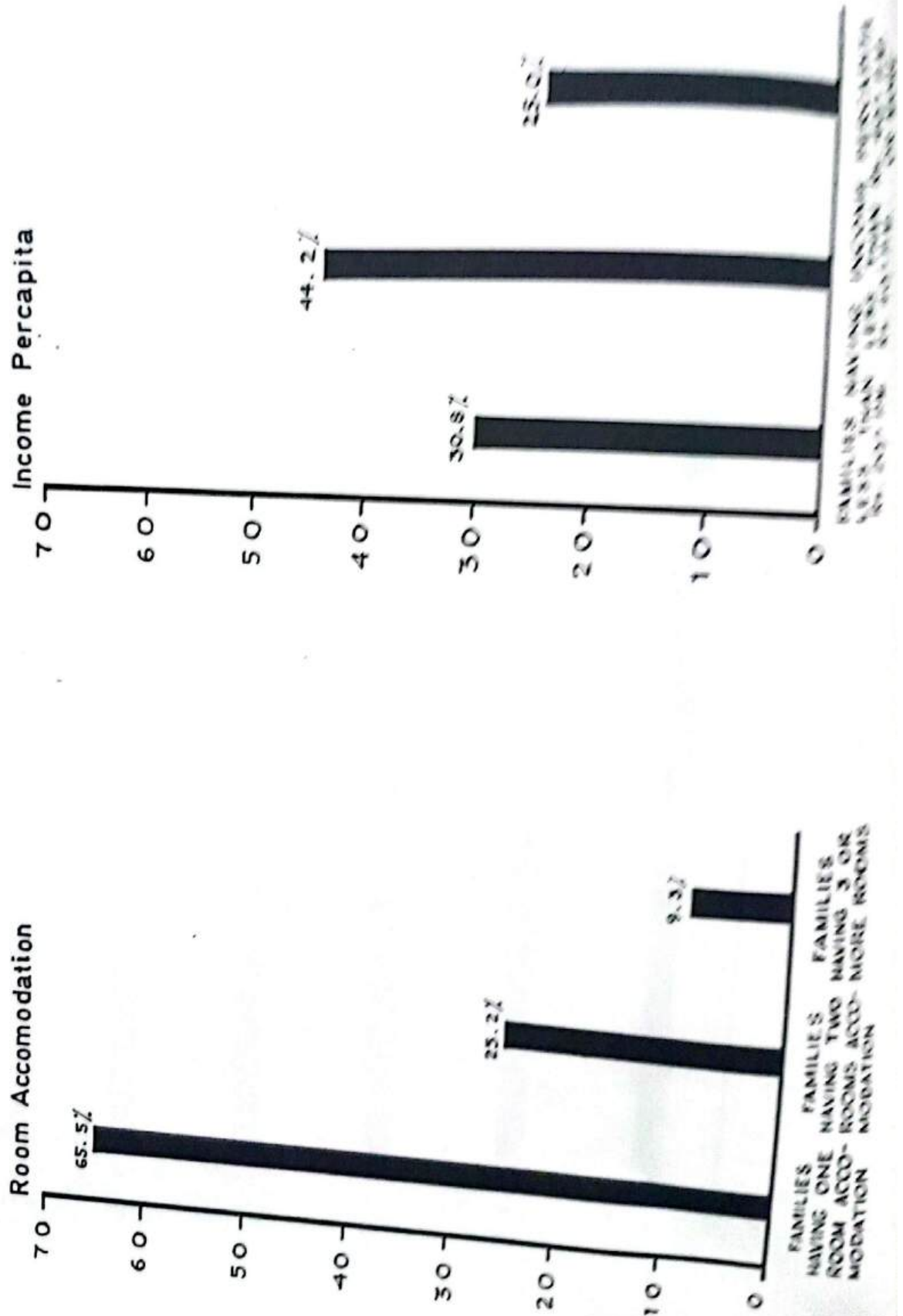
7. *Ascaris lumbricoides*. Roundworm infection was of frequent occurrence in this group. It was detected in 112 persons (13.4%). In 67 cases it was the only parasite found. In 20 cases it was accompanied by *H. nana*. In two cases it was accompanied by *E. vermicularis*. In one case it was found with *T. trichiura* and in three cases with *A. duodenale*. In five cases it was accompanied by *G. intestinalis*. In 7 cases it was found with *I. butschlii*. In two cases it was found with *E. coli*. Twice it was accompanied by *G. intestinalis* and *H. nana*, once with *E. coli* and *I. butschlii*, once with *E. hartmanni*, *E. coli*, *I. butschlii*, once with *G. intestinalis*, *E. vermicularis* and *H. nana* and once with *E. coli* and *G. intestinalis*.

8. *Ankylostoma duodenale*. Hookworm infection was present in eight cases (0.95%). In three (2 males and 1 female) it was the only parasite found. The female was 10 years old, while males were of 8 and 18 years of age. In a 6 years old female, it was accompanied by *I. butschlii* and *H. nana* infection. In three females, aged 2 years, 13 years and 17 years, it was found with *A. lumbricoides*. In one female, 10 years of age, it was accompanied by *H. nana* infection.

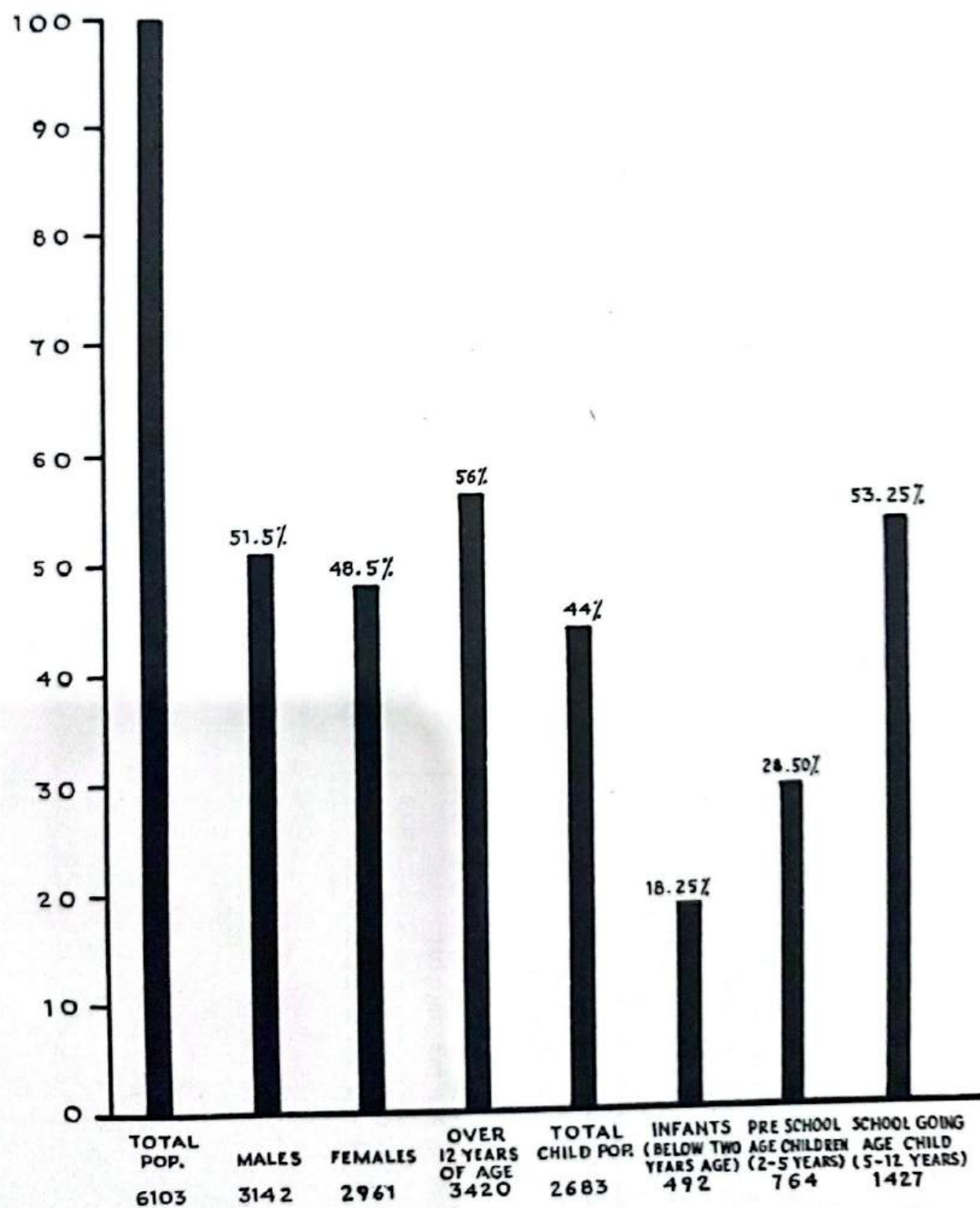
PARENTS EDUCATION IN THE SPECIFIED AREA



ROOM ACCOMODATION & INCOME PERCAPITA OF THE SPECIFIED AREA



POPULATION OF THE SPECIFIED AREA.



MAP SHOWING SPECIFIED AREA TO BE COVERED BY THE DISTRICT MATERNITY
SERVICE & MODEL CHILD WELFARE CENTRE
SHAHALAM MARKET LAHORE

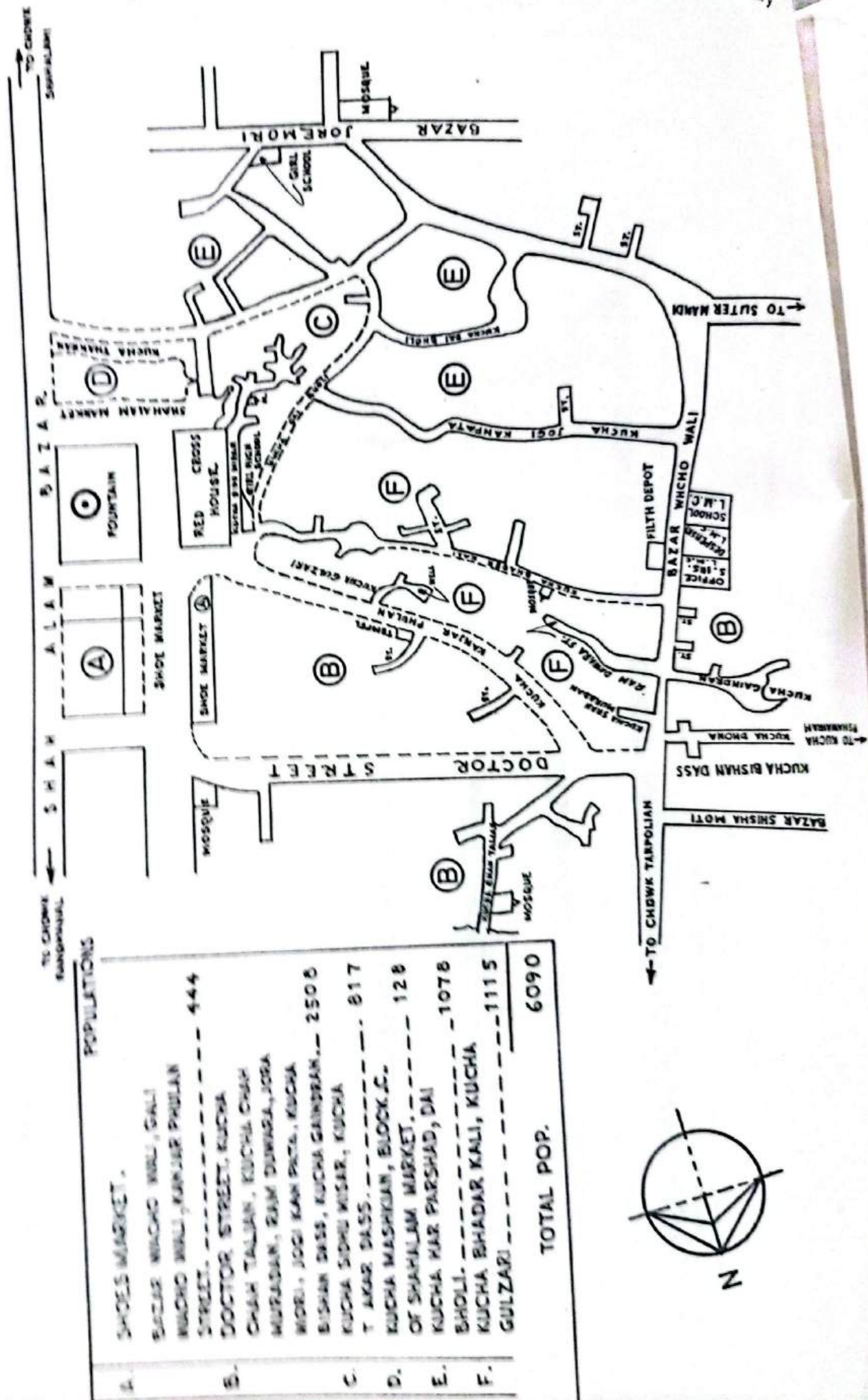


TABLE I
Showing Number of Persons with Single Protozoa/Helminths Infections
(Females in Parenthesis)

Age group	E. H.	E. C.	I. B.	G. I.	E. V.	A. L.	M. W.	M. M.
Below 5 yrs.	1 (-)	4 (3)	- (1)	11 (14)	1 (-)	11 (12)	- (-)	5 (2)
5-10 yrs.	- (1)	3 (5)	1 (3)	12 (6)	- (2)	19 (15)	1 (1)	13 (8)
10-15 yrs.	1 (-)	1 (2)	1 (3)	6 (2)	2 (2)	6 (2)	- (-)	7 (6)
15-20 yrs.	- (-)	- (1)	3 (-)	- (1)	- (-)	- (1)	1 (-)	- (-)
20-30 yrs.	- (-)	- ()	1 (-)	- (-)	- (1)	- (-)	- (-)	- (-)
30 and above	- (-)	(3)	- (-)	- (-)	- (-)	1 (2)	- (-)	1 (-)
Total	2 (1)	8 (14)	6 (7)	29 (23)	3 (5)	28 (39)	2 (1)	26 (35)

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TABLE II

Showing Cases with more than one Helminthic Infection in Males.

Ages.		E. V.	T. T.	A. L.	B. N.
1 yr.	...	-	-	+	+
3 yrs.	...	-	-	+	+
5 yrs.	...	-	-	+	+
5 yrs.	...	-	-	+	+
5 yrs.	...	-	-	+	+
6 yrs.	...	-	+	+	-
6 yrs.	...	-	-	+	+
8 yrs.	...	-	-	+	+
8 yrs.	...	-	-	+	+
8 yrs.	...	-	-	+	+
10 yrs.	...	-	-	+	+
10 yrs.	...	+	-	+	+
12 yrs.	...	+	-	+	+
13 yrs.	...	-	-	+	-
13 yrs.	...	-	-	+	+
14 yrs.	...	-	-	+	+
25 yrs.	...	-	-	+	+
				+	+
17	...	2	1	17	15

TABLE III

Showing Cases with more than one Helminthic Infection in Females.

Age,		E. V.	A. L.	A. D.	H. N.
2 yrs.	...	-	+	-	+
2 yrs.	...	-	+	+	-
4 yrs.	...	-	+	-	+
4 yrs.	...	-	+	-	+
4 yrs.	...	-	+	-	+
7 yrs.	...	+	-	-	+
9 yrs.	...	+	+	-	-
10 yrs.	...	-	-	+	+
10 yrs.	...	-	+	-	+
13 yrs.	...	-	+	+	-
16 yrs.	...	+	-	-	+
17 yrs.	...	-	+	+	-
12		3	9	4	8

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TABLE IV

Showing cases with more than one Protozoa Infection : (Males)

Ages.		E. H.	E. C.	I. B.	G. I.
4 yrs.	...	-	+	+	+
5 yrs.	...	-	+	+	-
5 yrs.	...	-	-	+	+
5 yrs.	...	-	+	+	-
6 yrs.	...	-	+	+	-
12 yrs.	...	-	+	+	-
12 yrs.	...	+	+	+	-
12 yrs.	...	-	+	+	-
14 yrs.	...	-	+	+	-
17 yrs.	...	-	+	+	-
30 yrs.	...	-	+	+	-
			+	-	+
Total (11)		1	10	10	3

TABLE V

Showing Cases with more than one Protozoa Infection (Females).

Ages.		E. H.	E. C.	I. B.	G. I.
6 yrs.	...	+	-	-	+
9 yrs.	...	-	+	+	+
10 yrs.	...	-	+	+	-
30 yrs.	...	-	+	+	+
35 yrs.	...	-	+	+	-
Total (5)	...	1	4	4	3

TABLE VI

Showing Mixed Protozoa and Helminthic Infection in Males (Double Infection)

Ages.		E. C.	I. B.	G. I.	A. L.	H. N.
1 yr.	...	-	-	+	+	-
5 yrs.	...	-	-	+	-	+
5 yrs.	...	-	-	+	-	+
6 yrs.	...	-	-	+	+	-
6 yrs.	...	-	+	-	+	-
8 yrs.	...	-	+	-	+	-
9 yrs.	...	+	-	-	+	-
10 yrs.	...	-	-	+	-	+
10 yrs.	...	-	+	-	+	-
10 yrs.	...	-	-	+	+	-
12 yrs.	...	+	-	-	-	+
12 yrs.	...	-	+	-	+	-
12 yrs.	...	-	+	-	+	-
14 yrs.	...	-	+	-	-	+
14 cases	...	2	6	6	9	5

TABLE VII

Showing Mixed Protozoa and Helminthic Infection in Females
(Double Infection)

Ages		E. C.	I. B.	G. I.	A. L.	H. N.
2 yrs-	...	-	-	+	-	+
3 yrs.	...	-	-	+	+	-
3 yrs.	...	-	-	+	-	+
4 yrs.	...	-	-	+	+	-
4 yrs.	...	+	-	-	+	-
5 yrs.	...	-	-	+	-	+
6 yrs.	...	-	+	-	+	-
7 yrs.	..	-	-	+	-	+
7 yrs.	...	-	+	-	+	-
10 yrs.	...	-	-	+	-	+
14 yrs-	...	-	-	+	-	+
11 cases	...	1	2	8	5	6

TABLE VIII

Showing Mixed Protozoa and Helminthic Infection in Males
(Triple and Quadruple)

Ages		E. H.	E. C.	I. B.	G. I.	E. V.	A.L.	H. N.
Triple Infections :								
5 yrs.	...	-	-	-	+	-	+	+
13 yrs.	...	-	-	-	+	-	+	+
14 yrs.	...	-	+	+	-	-	+	-
3 cases	...	-	1	1	2	-	3	2
Quadruple Infections :								
12 yrs.	...	+	+	+	-	-	+	-
50 yrs.	...	-	-	-	+	+	+	+
2 cases	...	1	1	1	1	1	2	1

TABLE IX

Showing Mixed Protozoa and Helminthic Infection in Females (Triple)

Ages.	E. C.	I. B.	G. I.	A. L.	H. W.	H. N.
9 yrs. ...	+	+	-	-	-	-
20 yrs. ...	-	+	-	-	+	+
30 yrs. ...	+	-	+	+	-	-
3 cases ...	2	2	1	1	1	1

TABLE X

Showing Parasite Burden in some cases Carrying Helminths.

Ova per Gram	E. V.	T. T.	A. L.	H. W.	H. N.
Up to 100 ...	5	1	8	2	14
100 to 500 ..	6	-	24	6	26
500 to 1000 ...	1	-	15	-	10
1000 to 1500 ...	1	-	11	-	4
1500 to 2000 ...	-	-	11	-	9
2000 to 3000 ...	1	-	8	-	6
3000 to 4000 ...	-	-	5	-	2
above 4000 ...	-	-	19	-	90

Hookworm Cases. It is unusual for a strictly urban community to have ankylostomiasis. A study of this group revealed hookworm infection in eight cases and warranted careful recording of detailed history of each case. Main purpose being to ascertain if these cases picked up infection from within the area or from the open fields on the periphery or brought it from their original rural homes. A summary of information obtained after interrogation is given in the following paras.

1. Two of these cases were, a brother aged 8 years and a sister aged 6 years. Both of them were frequently going to their relatives in rural areas to attend social functions. At the time of interrogation it was already a year back, when the two paid a visit to this village. Exact date of their last visit, however, could not be ascertained. Both of these children loiter about bare footed. The courtyard of the apartment is rather spacious and is not brick soled or cemented.

2. An other two cases, a male 18 years old and a female 10 years old, have their relatives in Karachi. Back in Karachi, the house is with large open (Kutchha) courtyard. The two gave a history of going there and it is probable that the infection was picked up from Karachi.

3. A female, aged 17 years, gave a history of going to Sahiwal and Ichhra in Lahore. Both the areas visited are known to be highly contaminated. A bare-footed person have fair chances to pick up infestation after trodding in the fields. In this area promiscuous defaecation and going in the fields is a common practice.

4. A female child of 2 years of age had hookworm but there was no history of her ever leaving the parental house. The house in itself is dark, dirty and without courtyard. The family received guests occasionally from countryside. Picking of infection within is unbelievable and therefore it is probably a case of contamination.

5. Two females aged 17 years and 20 years did not give history of going outside Lahore.

9. *Hymenolepis nana*. *H. nana* was detected in ninety persons (10.91%) in 51 cases (26 males + 25 females) it was the solitary parasite while in others it had companions. In two males it was accompanied by *G. intestinalis* and *A. lumbricoides*. In a female it was found with *I. butschlii* and *E. coli*, while in another with *A. duodenale* and *I. butschlii*. In one case it occurred with *A. lumbricoides*,

E. histolytica and *E. moshkovskii*. In twenty cases it was accompanied by *A. lumbricoides*. In two cases it was found with *E. vermicularis* and in one with *A. duodenalis*. In one case it was with *E. intestinalis*. In one case with *E. coli* and in another with *E. histolytica*.

Discussion When a community does not observe the standard rules of sanitation, and people do not make use of simple judgement while eating and drinking, the in and out movement of the intestinal parasite is virtually facilitated. Epidemiologically the community living in Rang Mahal area are exposed to intestinal parasite infestation. If they cared they could conveniently avoid infestation. Each individual is required to know simple principles of healthful living. The families may also require help in the judicious use of the principles so frequently preached. This community at present suffers more from meagre means and resources. They have the will to cooperate but lack the urge to practice. It is not only ignorance but general lethargy which stands in the way of healthful living. The health education programme in the area therefore needs to be so modified as to convince them of self-help.

Promiscuous defaecation in the dooryard drains and gutters may be an important source of contamination of water supply. The presence of swarms of flies also helps in the dispersal and distribution of intestinal parasites from the filth to the food. Careless handling of foods during preparation, distribution and consumption adds to the trouble several folds. The eating habits more or less commensurate acquisition of parasites. The vendors and the consumers play important role in this regard and increase chances of travels of the intestinal parasites from the carriers to the susceptible population. As long as drastic changes are not brought about in the outlook of the people the incidence of intestinal parasites will continue to be alarming.

E. histolytica. This protozoan parasite of great concern, was not found in the group. An allied non pathogenic form *E. hartmanni* was, however, detected in 3 cases. Active or passive amoebiasis was not reported by the clinician. It is a point of great interest and needs to be confirmed both clinically and parasitologically during the current year.

E. coli and E. histolytica commonly occur in Lahorites. In the group under study the two protozoas were not found predominating.

The presence of *G. intestinalis* in 76 cases was not at all surprising. It was found frequently in all the groups so far studied at the Institute.

High incidence of *A. lumbricoides* suggests that dooryard contamination has provided favourable conditions for this parasite. Promiscuous defaecation in the lanes means the outdoor premises are seeded with the ova of the helminths. Playing, dust raising winds and flies may play significant role in broadcasting the infective eggs.

H. nana is the next common helminth of the community. The environmental condition of the area exerted favourable influence on the distribution of this helminth also.

Presence of 8 cases of ankylostomiasis in this community was a matter of great surprise. Open fields are just conspicuous by their absence. Dooryard play grounds do not exist in the locality. Most of the residences are without a courtyard. If it is there, it is paved. Chances of getting infection within the house are simply remote. All infection probably starts from the contaminated lanes where promiscuous defaecation occurs. But such an assumption would not apply to ankylostomiasis. It is, therefore, presumed that most of these infections are imported. In one case, however, the status could not be ascertained. If this person does not give a history of going out from Lahore, he is suspected to have visited the open fields on the periphery, which are known to be very highly contaminated.

Treatment. The Red Cross Health Centre was advised to administer Antepar and Alcopar to all cases harbouring *Ascaris* and *Ankylostoma* while those carrying *Hymenolepis nana* were advised Yomison.

A clinical treatment will remain palliative measure as long as reinfestation rate continues to be high. Socio-economic development, and general and health education is the crux of the problem. Unless people adopt clean and hygienic habits, make provision for proper disposal of human excreta, arrange safe water supply and control of fly population, the helminthic infestation will continue spreading. Screening of cases, treatment and follow up are essential steps in all deworming operations.

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LITERATURE

1. Ansari, M.A.R. (1954). Intestinal parasites in cases with definite clinical evidence. *Pak. Jour. Hlth., Lahore*, 14(3) 156-200.
2. Ansari, M.A.R. (1966). Intestinal protozoa and helminths in random samples of boys and girls. *Pak. Jour. Hlth., Lahore*, 16(1) : 8-22.
3. Ansari, M.A.R. (1967). Protozoan and metazoan parasites of children suffering from diarrhoea and dysentery. *Pak Jour. Hlth. Lahore*, 17(1).
4. Ansari, M.A.R. (1968). Clinical diagnosis and Laboratory identification of human parasites are prerequisites to radical treatment. *Community Medicine*, 1(1) : 24-34.
5. Ansari, M A.R. and Naru, N.A. (1966). The prevalence of intestinal parasites in the Lahore Mental Hospital (Male cases). *Pak. Jour. Hlth. Lahore*, 16(3) : 146-164.
6. Ansari, M.A.R. and Naru, N.A. (1966) A note on the incidence of intestinal parasites in the Lahore Mental Hospital for female patients. *Pak. Jour. Hlth., Lahore*, 16(3) : 165-176.
7. Ansari, M.A.R. and Naru, N A. (1967). Studies on the epidemiology of intestinal parasites in Lahore Mental Hospital. *Pak. Jour: Hlth. Lahore*, 16(4) : 197- 230.
8. Ansari, M.A.R. and Naru, N.A. (1968). Some incoming intestinal parasites of Lahore. *Pak. Jour. Med. Res.*, 7(2) : 138-154.

“ *Pak. Jour. Hlth.* 1968-69 ”

9. Ansari, M.A.R. and Sapru, Z.A. (1963- 4). A survey of human intestinal parasites in conservancy staff of the City Corporation Lahore. *Pak. Jour. Hlth. Lahore*, 13(3) : 196-233 and 13(4) : 234-306.
10. Ansari, M.A.R. and Sapru, Z.A. (1964). Intestinal parasitic infections in children of a Primary School of Lahore. *Pak. Jour. Hlth. Lahore*, 14(2) : 86-155.
11. Ansari, M.A.R., Sapru, Z.A. and Naru, N.A. (964). A survey of intestinal parasites in a village within City Corporation of Lahore incidence in females: *Pak. Jour. Hlth. Lahore*, 14(4) : 230-285.
12. Ansari, M.A.R., Sapru, Z.A. and Naru, N.A. (1965). A survey of intestinal parasites in village Sahowary : Incidence in males. *Pak. Jour. Hlth. Lahore*, 15(1) : 16-39.
13. Ansari, M.A.R., Sapru, Z A. and Naru: N.A. (1965). Intestopan in the treatment of chronic amoebiasis—Preliminary assessment of trials carried out in village Sahowary : (Lahore). *Pak. Jour. Hlth. Lahore*, 15(4) : 40-78.
13. Faust, E.C. and Russell, P.F. (1957). *Clinical Parasitology*, 6th Ed., Lea and Febiger, Philadelphia, P. 386.

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A PRELIMINARY REPORT ON THE INTESTINAL PARASITES OF LULLIANI, DISTRICT LAHORE.

By

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Lulliani, a small town situated on Lahore-Kasur Road, is about 22 miles due south from Lahore. The town is divided into a number of blocks. The central part of the town is semi-urban while its periphery is typically rural.

A study of intestinal parasites was planned in Block one. A road separates this block from other blocks of the main town. Most of the houses in this area are kacha hutments. The streets and courtyards are mainly dusty. The open fields and farms surround it from all sides. The inhabitants are mostly farmers.

Total population of this block is 718. Out of this 388 are males and 330 females. About 50.7 per cent are under 12 years of age. The total number of infants, toddlers and children is 21,132 and 211 respectively. For each infant there are 5.3 toddlers and 10.05 children upto 12 years.

Total numbers of 188 rooms are in all available in 125 houses. 37 cattle sheds are also situated within these houses.

Water Supply. The tubewell installed in the R. H. Centre extends facilities to the town of protected water. So far only 14 taps have been provided in the block under study. There are 16 hand pumps. Two improved wells also cater the requirements of water supply in the block. Four insanitary wells are also in use.

Excreta Disposal. Most of the people, except 5 families, go out to the fields for defaecation purpose. Open latrines are provided in the houses of five families.

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This however does not preclude their going to the open fields. Menfolk, who go to the fields, generally prefer to go behind the bushes. Removal of the filth from these latrines is affected once a day by the sweepers.

Socio Economic Conditions. This is a group of cultivators, land owners as well as land-less peasants. Four hand looms are also available and 15 persons are working on them.

The income per capita per month is more or less about Rs. 20/-. On interrogation it was found that 350 out of 718 move about barefooted in the agricultural fields.

493 specimens of stool were examined and 256 (51.92%) were found positive for either Helminth or Protozoa or both. Although we tried to examine the stool of every individual in the area yet due to one or the other reason some cases could not be examined.

All the stools were examined by direct microscopy, using both iodine stain as well as single saline preparations. Since only one stool per person was examined, the data presented may be considered to present conservative incidence of intestinal parasitic infection in the area.

OBSERVATIONS

1. *Endamoeba hartmanni* was found in seven persons (1.41%). In three cases (2 males and a female) it was not accompanied by any other parasite. In a solitary case, it occurred alongwith hookworm. Once it occurred with *G. intestinalis* and in another both *E. coli*, and *hookworm* were its companions. In a quadruple infection, it occurred alongwith *E. coli*, *I. butschlii* and *hookworm*.

2. *Endamoeba coli*. 89 (18.05%) persons were found harbouring colon amoeba. Out of these, 9 females and 10 males (19 persons), had this protozoa alone. In 15 cases, it was accompanied by *I. butschlii*. In two cases, it was accompanied by *G. intestinalis*. In 26 cases, it was accompanied by *hookworm*. In 6 cases, it was found with *H. nana*. In 4 cases with *E. vermicularis*. In one case, it occurred together with *G. intestinalis* and *hookworm*. Four times, it was found with *I. butschlii*, and *hookworm*, in six instances with *I. butschlii* and *H. nana*, once with *E. vermicularis* and *hookworm*, once with *E. hartmanni* and *hookworm*, once with *I. butschlii* and *A. lumbricoides*, and once with *I. butschlii* and *E. vermicularis*.

3. *Iodamoeba butschlii* was detected in 51 cases (10.34%). In 6 cases, it was the solitary infection. In 4 cases, it was accompanied by *G. intestinalis*. In 15 cases, it was found with *E. coli*. In one case, it was found with *E. coli* and *G. intestinalis* together. Once it was found with *H. nana*, once with *E. vermicularis*, 5 times with hookworm, and twice with *H. nana*, 6 times with *E. coli* and *H. nana*, 4 times with *E. coli* and hookworm, once with *E. coli* and *A. lumbricoides*, once with *E. coli* and *E. vermicularis* and once with *G. intestinalis* and hookworm. In quadruple infection, it was accompanied by *E. hartmanni*, *E. coli* and hookworm, in one case, in another it was found with *E. coli*, *A. lumbricoides* and hookworm. In one person it was accompanied by *E. coli*, *E. vermicularis* and hookworm.

4. *G. intestinalis* was found in 23 cases (4.66%). Out of these, 7 cases (4 males and 3 females) had only *G. intestinalis*. In 4 cases, it was accompanied by *I. butschlii*. In 2 cases its companion was *E. coli*. In one case, in addition to *E. coli*, it was accompanied by *I. butschlii*, while in one case it was accompanied by *E. hartmanni*. Twice it was found with *H. nana*, once it occurred with *T. saginata*, 4 times with hookworm and once with *I. butschlii* and hookworm together.

5. *E. nana* This parasites was found only in one case together with *I. butschlii*

5. *Enterobius vermicularis* The seat worm was found in 20 cases (4.05%). In 3 cases (2 males and a female) it occurred alone. In 8 cases it was found along with hookworm, in one case with *E. nana*, once it was found with *I. butschlii*, 4 times with *E. coli*. Once with *E. coli* and hookworm and once with *E. coli* and *I. butschlii*. It also occurred once with *E. coli*, *I. butschlii* and hookworm.

7. *Trichuris trichiura* This parasite was found only in one case, and was not accompanied by any other parasites.

8. *Ascaris lumbricoides* ; As is not usual in rural population, only six cases (1.21%) were found harbouring this parasite. Out of these, in 3 cases (a male and two females) it was found alone. In an individual it occurred along with *H. nana*. In one case its companion were *E. coli* and *I. butschlii*, while in another case it was accompanied by three other parasites viz., *E. coli*, *I. butschlii* and hookworm.

9. *Ankylostoma duodenale* This parasite occurred most frequently in this group. It was not unusual in a community walking about barefooted in the fields. A total number of 130 persons (26.38%) were found to be harbouring *hookworm*. 75 persons (50 males and 25 females) were not passing cysts or eggs of any other intestinal parasite in their stools. In 7 cases, it was accompanied by *H. nana*. In other 7 cases it was found with *E. vermicularis*. In 20 cases it was accompanied by *E. coli*. In 5 cases it was detected alongwith *I. butschlii*. In 4 cases its companion was *G. intestinalis*. Once it was found with *E. hartmanni*. In a solitary case its companions were *E. vermicularis* and *H. nana*. Four times it was found along with *E. coli* and *I. butschlii*. Once with *E. coli* and *E. vermicularis*, once with *E. coli* and *E. hartmanni* and once with *I. butschlii* and *G. intestinalis*. It was also found in one case with *E. hartmanni*, *E. coli* and *I. butschlii*. In another it occurred with *E. coli*, *I. butschlii* and *A. lumbricoides* and in one with *E. coli*, *I. butschlii* and *E. vermicularis*.

10. *Hymenolepis nana* Dwarf tapeworm was detected in 62 (12.56%) cases. In 30 cases (16 males and 14 females) it was the solitary infection while in others it was found with companions. In 7 cases, it was accompanied by *hookworm*. In one case with *A. lumbricoides*, while in another case with *E. vermicularis*. Twice it was found with *G. intestinalis*. In 12 cases, its companion was *E. coli*, while twice it occurred with *I. butschlii*. In 6 cases it was accompanied by *E. coli* and *I. butschlii*. In one case it was found with *hookworm* and *E. vermicularis*.

11. *T. saginata*: Beef tapeworm was found in one case only. The victim was a male child of six years. In this case it was found alongwith *G. intestinalis*. In rural population, beef tapeworm infection is usually very rare. The reason being non-availability of meat so frequently. Moreover, once in a blue moon, when beef is available, it is fully cooked before consumption. *Tikka Kababs* and other similar delicacies are not available to the rural community. Even when in the city, most of the villagers cannot afford to eat smoked meat and hence escape tape-room infection with ease. Chances are that the particular child may have picked up the infection from the city, where he chanced to go with elders. However, we could not ascertain the fact, if he ever enjoyed a dish of *Kababs* during his short stay in Lahore.

DISCUSSIONS

A perusal of the above data will show that among the helminthic infestation, *hookworm* predominated, 26.38% of the population being infected. If a little more sophisticated laboratory methods were used the proportion might have been a little more higher. This is not surprising, as *hookworm* is common.

found among the rural population in general. Almost all the people defecate in the fields where the larvae after coming out of the eggs find favourable situation. Most of the villagers go about barefooted in the agricultural fields, and have every chance to pick up the infection from contaminate patches. Male population, particularly male adults, are more prone to infection because they work most of the time on the farms. This is also evident from the present study. 84 males were found harbouring *hookworm* as against 46 females.

H. nana was the next common helminth of the area. The environmental conditions of the area exert favourable influence on the distribution of this helminth also.

Round worm was found in only six persons. This helminth is mainly found in the urban areas. In the villages infection is comparatively scanty.

E. histolytica, a parasite of great interest, was not found in this group. An allied non pathogenic form, *E. hartmanni* was, however, detected in 7 cases.

E. coli and *I. butschlii* were the most frequent protozoa found. These protozoan parasites have been found commonly in other studies carried out at the Institute.

G. intestinalis was present in 23 cases (4.6%). This incidence is much less as compared to the figures obtained in a recent study in the heart of city of Lahore where its incidence was found to be 9.11%.

BLOCK No:- 1
LULLIANI

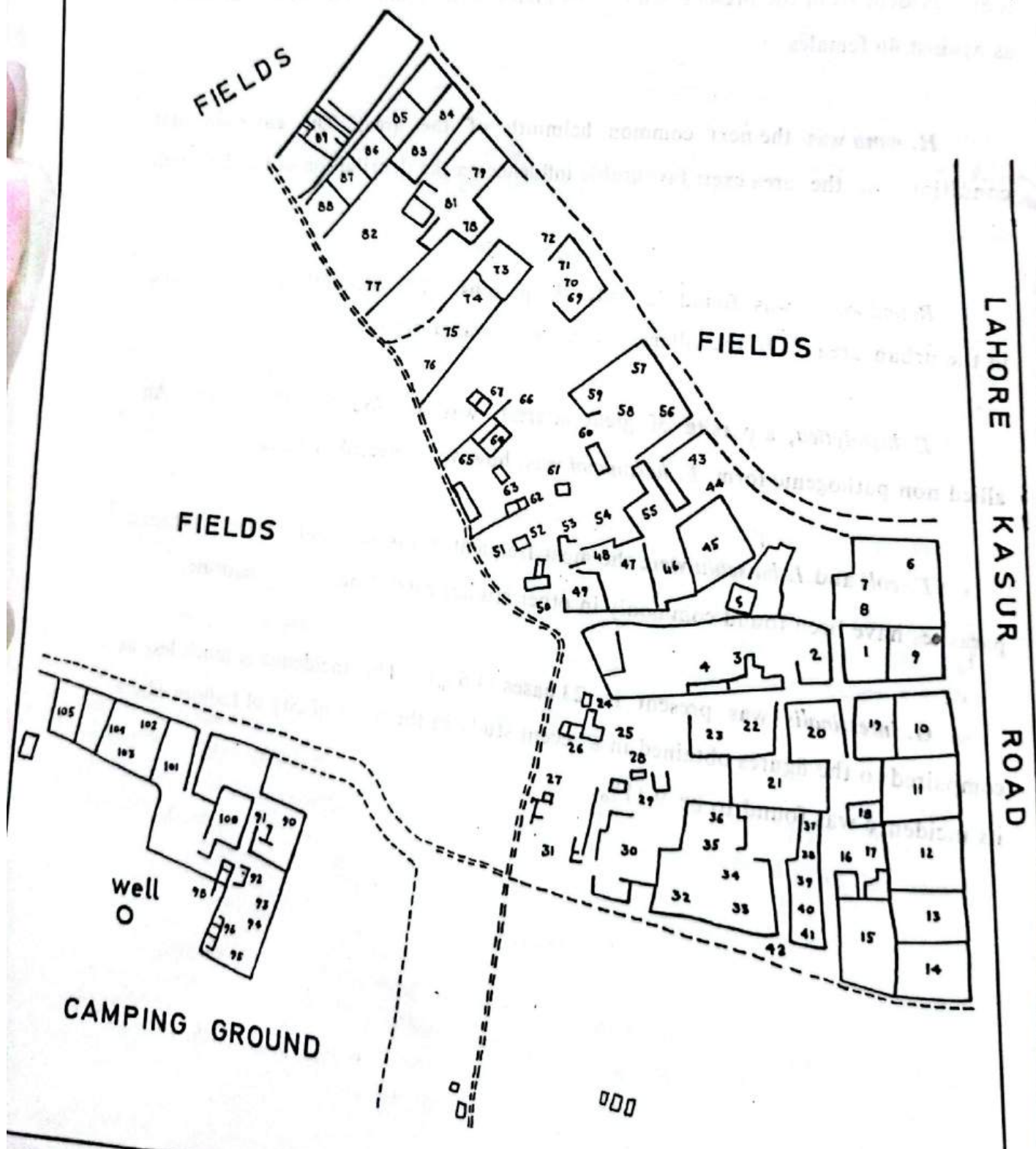


TABLE 1
Showing Number of Persons with Single Protozoa/Helminth Infection (Females in Parenthesis)

Ages	E. H.	E. C.	I. B.	G. I.	E. V.	T. T.	A. L.	H. W.	H. N.
Below 5 yrs.	— (—)	1 (2)	— (—)	1 (1)	(—) —	— (—)	— (2)	2 (4)	3 (5)
5—10 yrs.	1 (—)	2 (3)	1 (—)	1 (—)	1 (—)	— (—)	— (—)	7 (4)	5 (5)
10—15 yrs.	— (—)	2 (1)	1 (1)	1 (—)	— (1)	— (—)	1 (—)	13 (5)	3 (1)
15—20 yrs.	— (—)	— (1)	— (—)	— (1)	— (—)	— (—)	— (—)	3 (—)	2 (1)
20—30 yrs.	— (—)	2 (1)	— (—)	— (—)	— (—)	1 (—)	— (—)	6 (—)	2 (1)
30 and above	1 (1)	3 (1)	1 (2)	1 (1)	1 (—)	— (—)	— (—)	19 (9)	1 (1)
Total	2 (1)	10 (9)	3 (3)	4 (3)	2 (1)	1 (—)	1 (2)	50 (25)	16 (14)

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TABLE II

Showing cases with more than one Helminthic infection in males:

Ages.		E. V.	A. L.	H. W.	H. N.
6 yrs.	...	+	-	+	+
8 yrs.	...	-	-	+	+
14 yrs.	...	-	-	+	+
14 yrs.	...	-	-	+	+
15 yrs.	...	-	-	+	+
16 yrs.	...	-	+	-	+
30 yrs.	...	+	-	+	-
36 yrs.	...	+	-	+	-
45 yrs.	...	+	-	+	-
50 yrs.	...	+	-	+	-
60 yrs.	...	-	-	+	+
11 cases	...	5	1	10	7

TABLE III

Showing cases with more than one Helminthic Infection in Females

Ages.	E. V.	H. W.	H. N.
6 months	-	+	+
8 months	+	+	-
2 yrs.	+	+	-
8 yrs.	-	+	+
35 yrs.	+	-	+
35 yrs.	+	+	-
6 cases	4	5	3

TABLE IV

Showing cases with more than one Protozoan Infection in Males.

Ages.	E. C.	I. B.	G. I.
1 yr.	-	+	+
3 yrs.	+	+	-
8 yrs.	+	+	-
14 yrs.	+	+	-
17 yrs.	+	+	-
25 yrs.	+	+	-
30 yrs.	+	+	-
40 yrs.	+	+	-
60 yrs.	+	+	-
9 cases	8	9	1

TABLE V

+ Showing cases with more than one Protozoan Infection in Females.

Ages	E. H.	E. C.	I. B.	G. I.	I. N.
3 yrs. ...	-	-	+	+	-
5 yrs. ...	-	+	-	+	-
6 yrs. ...	-	+	+	-	-
6 yrs. ...	-	+	+	+	-
10 yrs. ...	-	+	+	-	-
10 yrs. ...	+	+	+	-	-
10 yrs. ...	-	+	+	-	-
12 yrs. ...	-	+	-	+	-
16 yrs. ...	-	-	+	+	-
20 yrs. ...	-	-	+	-	+
25 yrs. ...	-	+	+	-	-
40 yrs. ...	+	-	-	+	-
50 yrs. ...	-	+	+	-	-
50 yrs. ...	-	-	+	+	-
60 yrs. ...	-	+	+	-	-
15 cases ...	1	10	12	7	1

TABLE VI
Showing Mixed Protozoa and Helminthic Infections in Males (Double Infections).

Ages.	E. Hart.	E. C.	I. B.	G. I.	E. V.	T. S.	H. W.	H. N.
9 months	-	+	-	-	+	-	-	-
2 yrs.	-	+	-	-	-	-	+	+
3 yrs.	-	-	-	+	-	-	-	+
3 yrs.	-	+	-	-	-	-	-	+
3 yrs.	-	-	+	-	+	+	-	+
5 yrs.	-	+	-	-	-	-	-	-
5 yrs.	-	+	-	-	+	-	-	-
6 yrs.	-	+	-	-	-	-	-	-
6 yrs.	-	-	-	+	-	+	+	-
6 yrs.	-	+	-	-	-	-	+	-
8 yrs.	-	-	-	+	-	-	-	+
9 yrs.	-	+	-	-	-	-	-	+
9 yrs.	-	+	-	-	-	-	-	+
9 yrs.	-	-	+	-	-	-	+	-

9 yrs.	-	-	-	+	-	-	+	-
10 yrs.	-	+	-	-	-	-	+	-
11 yrs.	-	+	-	-	+	-	-	-
12 yrs.	-	+	-	-	-	-	+	+
12 yrs.	-	+	-	-	-	-	+	-
22 yrs.	+	-	-	-	-	-	+	-
24 yrs.	-	-	-	+	-	+	+	-
25 yrs.	-	+	-	-	-	-	-	+
32 yrs.	-	-	-	+	-	-	+	-
32 yrs.	-	-	+	-	-	-	+	-
35 yrs.	-	+	-	-	-	-	+	-
35 yrs.	-	+	-	-	-	-	+	-
36 yrs.	-	+	-	-	-	-	+	-
40 yrs.	-	+	-	-	-	-	-	+
40 yrs.	-	+	-	-	-	-	+	-
40 yrs.	-	+	-	-	-	-	+	-
60 yrs.	-	+	-	-	-	-	-	+
60 yrs.	-	+	-	-	-	-	+	-
32 cases	1	22	3	6	4	1	17	10

TABLE VII

Showing Mixed Protozoa and Helminthic Infections in Females (Double Infections).

Ages.	E. C.	I. B.	G. I.	E. V.	H. W.	H. N.
6 months ...	+	-	-	-	+	-
2 yrs. ...	+	-	-	-	-	+
4 yrs. ...	-	+	-	-	-	+
7 yrs. ...	+	-	-	-	-	+
7 yrs. ...	+	-	-	-	-	+
8 yrs. ...	-	+	-	-	+	-
12 yrs. ...	+	-	-	-	-	+
13 yrs. ...	+	-	-	-	+	-
20 yrs. ...	+	-	-	-	+	-
20 yrs. ...	+	-	-	-	+	-
25 yrs. ...	+	-	-	-	+	-
35 yrs. ...	+	-	-	-	+	-
35 yrs. ...	-	+	-	-	-	+
35 yrs. ...	+	-	-	+	+	-
35 yrs. ...	+	-	-	+	-	-
35 yrs. ...	-	+	-	-	+	-
35 yrs. ...	-	+	-	-	+	-
48 yrs. ..	-	-	-	-	+	-
50 yrs. ...	+	-	+	-	+	-
60 yrs. ...	+	-	-	-	+	-
20 cases ...	14	5	1	1	13	6

TABLE VIII

**Showing Mixed Protozoa and Helminthic Infection in Males
(Triple Infections)**

Ages.		E. H.	E. C.	I. B.	E. V.	H. W.	H. N.
5 yrs.	...	-	+	+	-	-	+
9 yrs.	...	-	+	+	-	+	-
10 yrs.	...	-	+	-	+	+	-
14 yrs.	...	-	+	+	-	+	-
16 yrs.	...	+	+	-	-	+	-
23 yrs.	...	-	+	+	-	-	+
30 yrs.	...	-	+	+	-	+	-
7 cases	...	1	7	5	1	5	2

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TABLE IX

Showing Mixed Protozoa and Helminthic Infections in Females
(Triple Infections)

Ages		E. C.	I. B.	G. I.	E. V.	A.L.	H. W.	H. N.
3 yrs.	...	+	+	-	-	+	-	-
5 yrs.	...	+	+	-	-	-	-	+
7 yrs.	...	+	+	-	-	-	-	+
9 yrs.	...	+	+	-	-	-	+	-
10 yrs.	...	+	+	-	-	-	-	+
12 yrs.	...	+	+	-	+	-	-	-
20 yrs.	...	+	+	-	-	-	-	+
70 yrs.	...	-	+	+	-	-	+	-
8 cases	...	7	8	1	1	1	2	4

TABLE X

Showing Quadruple Infections (Males and Females)

Ages.		Sex.	E. H.	E. C.	I. B.	E. V.	A. L.	H. W.
50 yrs.	...	Male	+	+	+	-	-	+
30 yrs.	...	Female	-	+	+	-	-	+
6 yrs.	...	Male	-	+	+	+	-	+
3 cases	...		1	3	3	1	1	3

THE INCIDENCE OF INTESTINAL PARASITES IN LAHORE JAIL

By

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and

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1. INTRODUCTION

The prisoners in a jail are akin to the inhabitants of a walled city. They have no option to choose a system of life and no alternative to accept or reject an environment at will either. They are obliged to stay within and can neither avoid a contact with an infection nor evade the exchange of a parasite. In medieval days the incidence of such hazards was extremely high and the plight of the prisoners was simply horrible. What to say of the amenities of life, even the stark necessities of life were refused to them. Liaison with the surrounding community was unknown and a prisoner was unfortunately made to lead a segregated life. In the middle of last century, the prisons were dark, unventilated and over crowded dungeons. Living conditions in these cells were not only appalling but bad enough to be acceptable to the animals. These were strongholds of vice and debauchery and huddling centres to produce future pests of the society. Acute sufferings met with here, instead of reforming the convicts, ruined their moral aptitudes and wrecked their mentalities. Vermins and diseases were orders of the day. Epidemics were common and frequent. Morbidity and mortality rates were sky-high.

Recent changes in the outlook, warranted human treatment to this socially deranged lot. Reforms also helped the prisoners to change their ways of living. Convicts today are sentenced to undergo a sort of reclamation. The punishments are proportionate to the crime and motive. The corrective means have replaced the punitive methods. The retributive punishment has yielded place to human administration. The aim of the prison, as it is now understood, is not to punish but provide facilities which may enable the prisoner to develop healthy relationship with the environments.

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As far as possible each prisoner is now provided decent living environments. To ensure healthful living conditions to the prisoners, each jail has a full time or a part time Medical Officer. Maintenance of the jail and its surroundings in a thoroughly sanitary state and the prisoners in sound and sparkling health, is the immediate responsibility of the benevolent government.

Water Supply. Water supply system in jails now fully confirms with the modern scientific standards. It reaches the prisoners from the tubewells through the overhead reservoirs. Water taps are provided in all the wards. For drinking purposes, however, the prisoners, for their own convenience, store water in gharas/jhajjars. The water is periodically subjected to chemicals/bacteriological analysis as a routine on or about 5th January each year. At other times however, as and when required

There is good arrangements for bathing and ablution in prison barracks. More convenient and refreshing shower baths are also made available in some wards.

Conservancy System. All the wards are provided with modern fly-proof laterines. Cage Laterines are available in barracks for use at night. Regular cleaning of the Laterines is done by a gang of Sweepers. Disinfectants and deoderants are frequently used in the prescribed manner. Water is also available close to the laterines for ablution. All the laterines are made fly-proof as a permanent measure against diseases and epidemics.

Water carriage system has been introduced since 1950 in some barracks. This system suffers from one defect in the jails. The prisoners hailing from rural areas in particular use stones and earth clods in the laterines. This practice more frequently results in the clogging of the "S" shaped traps.

Each day starts with routine sweeping, dusting and cleaning of the wards and barracks. Frequent washing of doors, windows, gratings and shelters is a general practice. Plastering of floors, brushing of walls is also done every now and then.

Kitchen refuse, garbage, garden sweepings are collected in filth buckets and stacked in filth objectors, installed along the main wall. All the bins, filth containers and rubbish receptacles are covered to discourage fly breeding. Ultimately the scavengers remove the rubbish to the trenches, where the manure is properly conditioned before use in the vegetable fields.

Food. Each prisoner is supplied the sanctioned ration. The caloric value of the ration available for A and B-Class prisoners is 3981 as against 2889 for C-Class. All the prisoners, except the sick, are provided three meals a day.

Supplements and special diets are allowed on the recommendation of Medical Officers. All foods are subject to an examination by the Medical Officers before serving. Wholesomeness and accuracy according to scales prescribed are some of the points looked into. All efforts to provide hot and fresh meals are made. Prisoners are also given facilities to supplement their food rations with sweet meats, fresh and dry fruits, ghee and sugar on their own expense. Special dishes however, are made available on ceremonial days. Special precautions are taken, both in the kitchen and food preparation hall, to keep the fly menace at its lowest possible level.

Clothing. Every prisoner, is at all times provided with sufficient clothing and adequate bedding material so that he gets reasonable comfort and maintains good health. Some categories of prisoners are allowed their own clothing. Extra clothing are issued to convalescent men and women. Medical Officer ensures that prisoners maintain scrupulous cleanliness.

Medical Facilities. The medical staff controls diseases at all stages and at all levels. Control of epidemics is a matter of utmost importance. Timely steps and precautions are taken to prevent communication of infectious diseases. The process of prevention begins with medical examination of prisoners on their first entry in the jail. In all emergency cases, the medical officer keeps the newly admitted prisoners in the quarantine ward. The private clothing of the convicts are always boiled before storing. Vaccination is must on arrival, except when Medical Officer finds it unnecessary. In an event of an outbreak of a disease in epidemic form, the sick and suspects are kept in isolated wards while others are immediately immunised against infection. Disinfection and disinfestation are regularly carried out. Anti-fly measures are taken all the year round according to a schedule. Insecticides are also sprayed when required.

In 1953, morbidity per mille was worked out at 21 in Lahore jail while the corresponding mortality per mille was 2.74. Daily average of sick persons was 2.03 per cent. Total dysentery cases in a year were 40.5, out of which 19 were due to protozoal infections as against 366 due to bacillus infections. Purely clinical cases of dysentery were reported to be 120. In addition 144 cases of diarrhoea also occurred during the year. According to the clinical sense, 0.41 per cent prisoners

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were found harbouring helminths viz., *Ascaris lumbricoides* (2), *Ancylostoma duodenale* (6), *Dracunculus medinensis* (8), *Filaria* (1) and others (54). The information regarding intestinal parasites was mostly based on the history and symptoms.

Clinical diagnoses is a tentative identification of pathogenic intestinal parasites. The experience may guide the physician to presumptive treatment. For radical treatment however, the laboratory services are indispensable. With a view to know the intestinal parasites harboured by the prisoners, we arranged a fact finding survey last year. The account given hereafter is based on the observations made on this special slice of our population.

2. OBSERVATIONS

41.3 per cent of the prisoners, residing in the District jail Lahore, harbour intestinal parasites. The pathogenic intestinal parasites were encountered in 19.88 per cent of the total prisoners examined while 47.41 per cent of the positive cases had pathogenic parasites. The protozoan parasites were found in 28.26 per cent prisoners (67.41 per cent positive cases). The helminths were found in 16.46 percent prisoners as against 39.36 per cent in the positive cases. The pathogenic protozoa were found in 7.76 per cent prisoners (18.52 per cent of the positive cases), while 16.46 per cent prisoners (39.26 per cent of the positive cases) harboured helminths.

2.1 *Giardia intestinalis* Lambl cysts were found in 2.17 per cent prisoners. Only 5.18 per cent positive cases harboured the duodenal flagellate. Low level of infection in the adult age group is understandable. The epidemiological situation in the jails does not also suggest that a liberal spread of this parasite is possible. Although giardiasis is considered to be highly contagious infection, yet 7 mild cases in 322 is more or less as found in communities outside the jails.

In 4 cases, *Giardia intestinalis* was the only infection. In one, it occurred with *E. coli* while in two cases, its companions were two other parasites viz., *E. hartmanni* + *A. duodenale* and *E. coli* + *I. butschlii*.

2.2 *Entamoeba histolytica* Schaudinn cysts were found in four stool samples. According to consensus of opinion, a detailed examination may give significantly increased figure. The conservative estimate of 1.24 per cent is however, supported by the incidence of clinical amoebiasis. The jail has protected water supply and hygienic latrines. In addition there is lesser chances of exposure. Moreover it may be attributed to immunity, which may develop after 35 years of age.

In two cases *E. histolytica* occurred alone. In one case it was superimposed with *E. coli* while in another, its companions were *E. coli* and *I. butschlii*.

2.3 *Entamoeba hartmanni* von Prowazek cysts were found in 14 stool samples. The differentiation of these cysts from *E. histolytica* is not an easy affair. Ordinarily the verdict oscillates between the two possibilities. When material for comparison is not available, positive identification is prevented. The morphological characteristics, if very carefully evaluated, will however, make the distinction easy.

E. hartmanni cysts were found alone in four cases. In six cases the infection was involved with another intestinal parasite viz., *E. coli* (2 cases), *I. butschlii* (one case) and *A. duodenale* (3 cases). It was also involved in four triple-infection cases. In the latter combination the other parasites were: *G. intestinalis* + *A. duodenale* (one case), *E. coli* + *I. butschlii* (2 cases) and *E. coli* + *E. vermicularis*.

2.4 *Entamoeba coli* (Grassi) is a common parasite of both healthy and sick individuals. It was found in 17.08 per cent prisoners examined. When the positive cases are taken into consideration, its cysts were present in 40.74 per cent cases. Its proportion was also high when only protozoas are taken into consideration. 21 prisoners had only *E. coli* infection. In 22 it occurred alongwith *G. intestinalis* (one case), *E. histolytica* (one case), *E. hartmanni* (2 cases), *I. butschlii* (14 cases), *A. duodenale* (3 cases) and *E. vermicularis* (one case). Five cases of *E. coli* were involved in triple infection cases, and its partners were *G. intestinalis* + *I. butschlii*, *E. histolytica* + *I. butschlii*, *E. hartmanni* + *I. butschlii* (2 cases) and *E. hartmanni* + *E. vermicularis*.

2.5 *Iodamoeba butschlii* (Von Prowazek) has been found fairly common parasite in West Pakistan. It was slightly less common than *E. coli* but more or less equal to *A. duodenale* in incidence in this series. In 28 prisoners, it was the only infection encountered. In 18 it occurred along with *E. hartmanni* (one case), *E. coli* (14 cases), *A. duodenale* (one case) and *E. vermicularis* (2 cases). In 4 prisoners it occurred along with two other parasites viz., *G. intestinalis* + *E. coli*, *E. histolytica* + *E. coli*, and *E. hartmanni* + *E. coli* (2 cases). On the whole this parasite occurred in 13.35 per cent prisoners as against 31.85 per cent in all positive cases. Amongst the prisoners carrying protozoas, it was found in 47.25 per cent cases.

2.6 *Ancylostoma duodenale* (Dubini) is known to man since 3500 years. Although it was said to be a common parasite of northern India, yet it was not a serious problem of Lahore region. After independence, the migration of infected

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persons from sub mountainous regions and foot-hill areas has introduced it in many areas. It is no wonders that the net work of irrigation system and the habits of the people has helped this parasite to become endemic in many new foci. In the communities coming from urban regions, its incidence is steadily increasing. 13.04 per cent incidence in the prisoners, who usually come from different urban parts of the province, is therefore, not unusual. It was found to be the commonest helminthic infection in this series. 31.12 per cent prisoners harbouring intestinal parasites had hookworm while amongst those having helminths, 78.31% had *A. duodenale*.

34 prisoners had hookworm infection alone. In 7 cases, *A. duodenale* occurred with another parasite viz., *E. hartmanni* (3 cases), *E. coli* (3 cases) and *I. butschlii* (one case). In one case it was involved with *G. intestinalis* and *E. hartmanni*.

Blood picture in Hookworm Infection : The pathological effects of hookworm infection mostly depend on the worm load and the nutritional status of the host. In majority of the cases it has been observed that the latter condition is probably the deciding factor in determining the host's reaction to the infection. In most individuals the moderate worm load usually does not initiate symptoms. It has been reckoned that an infection with less than 100 *Necator americanus* or 20 *A. duodenale* worms causes no clinical symptoms. The symptoms are significantly enough when the worm load exceeds 500 in the former and 100 in the latter. In the presence of food deficiencies however, these figures are comparatively low. It has been found out that there may be no blood changes even in a heavy infection.

According to Stoll (1923) each female *A. duodenale* lays 9000 eggs per diem. The worm load was determined in 19 cases and the ova count per gram of faeces varies from 100-2800. 100 in one case, 200 in four cases, 400 in five cases, 600 in two cases, 800 in two cases, 2200 in two cases, 2700 in two cases and 2800 in one case.

Total leucocyte count. It ranged from 3150-11850 in 34 Hookworm infection cases examined. Mild leucopenia was observed in nine cases. In these cases the count ranged from 3150 to 4000. There was no relative lymphocytosis. Eosinophil count remained throughout within the normal limits. E. S. R. varied from 3-45 which cannot be attributed to Hookworm infection without screening other concomitant infections in the cases concerned.

Haemoglobin. Due to intake of blood by the worm and loss of blood from seepage at abandoned sites of attack, the haemoglobin index of victim gets depressed from the normal.

Out of 19 cases, in which ova per gram of the faeces was estimated, the Hb was found to range between 80%—90% in seven cases. In 3 cases it was 70% with ova/gm in 2 cases 200 and in one case 4000. In two cases the Hb was 80% and the ova were 100 and 200 per gram of the faeces. In two cases Haemoglobin was 90%, whereas the eggs per gram were 400 and 600. In two cases, where ova per gram was 400, the Haemoglobin was 60 and 65%, while in one case with 800 ova per gram the Haemoglobin was estimated to be 60%. In seven cases the Hb was 50% when ova strength per gram was 600 (1 case), 800 (one case), 2200 (2 cases), 2700 (2 cases) and 2800 (one case). In two cases, with concentration of ova as high as 200 and 400 per gram of the faeces, the Haemoglobin was 55% only.

2.7. *Enterobius vermicularis* (Linnaeus) Usually shows a trend of group infection. Its incidence is usually high in asylums, hostels and jails. It may be pointed out that the recovery of its eggs in faeces does not give any indication of infection rate. The real incidence figures however, can be obtained by perineal swabbing methods. The figures available with us therefore may not be taken as representative.

In this series, eggs were found in 1.81 per cent stools examined. When the positive cases are taken into consideration, the seatworm infection was detected in 2.96 per cent cases. In two cases, it was the only infection found. In three cases, it was involved with *E. coli* (one case) and *I. butschlii* (two cases). In another case however, it occurred alongwith *E. hartmanni* and *E. coli*.

2.8. *Ascaris lumbricoides*. Linnaeus is a notorious door yard and household infection. Its incidence is high when soil in the immediate vicinity of the houses is seeded with infective eggs. 1.24 per cent infection rate in this series shows that the jail premises are maintained in proper hygienic condition. A few positive cases detected, were probably not local infections but contacted by prisoners

while free in their original places of residence. Chances are also there of getting rid of the infection in due course of time.

The prisoners harbouring roundworm had no other infection. The blood picture of the four prisoners is given in table I. Homoglobin percentage in ascariasis varied from 50 to 60, while ESR fluctuated from 3 to 7 and eosinophilia did not exceed 2-3 per cent.

From the data available, it may be concluded that in this jail, ascariasis is not a serious problem. Good sanitation and maintenance of high level of personal hygiene will certainly keep the incidence at the lowest ebb.

2.9. *Hymenolepis nana* (von Siebold) is frequently found to be a common human tapeworm. Like seatworm, it is more common in children than adults. It is said to be more common in certain groups than others. Institutions, asylums and congested families have ideal conditions for its distribution and therefore may show higher incidence.

It was found only in one (solitary) prisoner. Chances of cross-infection in the jail are remote. Washing of buttocks, soon after passing stools is probably a part of personal hygiene, which keeps its incidence at a very low level.

3. Discussion

The frequency of various intestinal parasites in a group depends upon the availability of suitability of environments. Most of these intestinal parasites are acquired, when fully embryonated eggs and ripe cysts are ingested. Eating of contaminated food and drinking of polluted water helps in the transmission of some forms of parasites. Soiled hands also play an important role. Other parasites get favourable conditions both for the development and transmission when raw and unconditioned human faeces are used as fertiliser. Vegetables which are usually

consumed raw and unprocessed, when produced on such fields, become source of infection. Walking bare footed on seeded fields also helps the transmission of some forms of infections. Exposure of the unprotected skin to the infective larvae produces intestinal hookworm infection. Moist sandy soils and earth charged with human faeces, containing viable eggs of hookworms are therefore dangerous.

Clear understanding of epidemiology of a parasite is prerequisite to its control and prevention. Health education of the masses is also crux of the problem. Ignorance is responsible for much of the trouble. Health education plan needs to be according to the education level of the group involved. The economic standards of the people, their social problems and religious beliefs are also important considerations. The health education should be so arranged as to be easily acceptable to the masses. No efforts should be made to bring in sudden changes. Ignorance is no excuse and it needs to be eradicated before any public health scheme is started. As long as the masses, irrespective of age, do not have lucid account of the natural history of the intestinal parasites, no direct action from them may be expected. A control programme, developed with the active co-operation of the masses, can work tremendously well. If people know that some of the intestinal parasites develop when the viable cysts and infective eggs get into their mouth they will ensure that such a entry does not occur. When the role of contaminated food, polluted water and soiled hands is known, efforts to minimise would be made. Personal hygiene is always conducive to good health, and a defence to the spread of several intestinal parasites. Sanitary sewage disposal reduces chances of transmission. Population needs to be educated on the use of sanitary laterines. The community is not merely to be discouraged but is also to be made to stop promiscuous defaecation. Poorly nourished individuals have also poor resistance. Wholesome food and balanced diet make man less susceptible to intestinal parasites.

In jails, the incidence of intestinal parasites is directly proportionate to the discipline maintained. Proper conservancy system reduces to and fro movement of intestinal parasites. Adequate sanitary standards, timely removal of human faeces, disposal and storage of household refuse and reduces chances of door yard infection. Absence of promiscuous defaecation and use of well conditioned manures in the fields amounts to a death blow to major intestinal parasites of man. Protected water supply also considerably reduces the chances of transmission of the infective stages from the source to the susceptible host.

The jails do not fulfill the epidemiological requirements of intestinal parasites. The infections detected in the prisoners therefore do not seem to have been picked up from the jail premises. The lean circumstances, under which auto-infection may occur, cannot however be ruled out. Auto-infection normally occurs in seatworm and dwarf tape worm. An open permission of supplementary diets may also do some harm. We are particularly dubious of Sugar, Gur and Shaker. The stools of all the newly admitted prisoners, if examined as a matter of routine and all the positive cases so screened are treated well in time, the incidence figures will drop considerably and further, the procedure will make the jails free of the noxious intestinal parasites.

TABLE I

Incidence of Intestinal Parasites (Together with Blood Picture) in Prisoners.

Incidence of Intestinal Parasites in Lahore Jail

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Age Years	BLOOD PICTURE.						INTESTINAL PARASITES										
	TLC	DLC			E S R	Hb%	PROTOZOAS				HELMINTHS						
		P	L	M			E	GI	EH	ET	EC	IB	AD	EV	AL	HN	
Pure Infections (100 Cases) :																	
40—50	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	—
25—29	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—
35—45	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—
29—55	—	—	—	—	—	—	—	—	—	28	—	—	—	—	—	—	—
21—70	—	—	—	—	—	—	—	—	—	—	21	—	—	—	—	—	—
—29	3900	66	32	2	2	4	—	—	—	—	—	+	—	—	—	—	—
—29	6000	64	32	1	3	5	—	—	—	—	—	+	—	—	—	—	—
—30	3700	66	26	4	4	15	—	—	—	—	—	400	—	—	—	—	—
—30	3900	64	34	2	—	9	—	—	—	—	—	600	—	—	—	—	—
—30	4000	70	27	—	3	4	—	—	—	—	—	+	—	—	—	—	—
—30	5600	66	30	—	4	4	—	—	—	—	—	200	—	—	—	—	—

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TABLE I- (contd.)

Incidence of Intestinal Parasites (Together with Blood Picture) in Prisoners.

Age Years	TLC	BLOOD PICTURE							INTESTINAL PARASITES							
		DLC				E S R	Hb%	PROTOZOAS					HELMINTHS			
		P	L	M	E			GI	EH	ET	EC	IB	AD	EV	AL	HN
Pure Infections (100 Cases) :																
-30	6100	66	30	2	2	4	70	-	-	-	-	-	200	-	-	-
-30	7000	68	30	-	2	5	65	-	-	-	-	-	+	-	-	-
-30	7100	64	28	2	6	5	70	-	-	-	-	-	+	-	-	-
-32	3700	58	38	2	2	32	50	-	-	-	-	-	+	-	-	-
-32	6400	64	30	1	5	4	61	-	-	-	-	-	+	-	-	-
-35	3650	66	30	4	-	45	70	-	-	-	-	-	+	-	-	-
-39	5800	68	30	-	2	7	80	-	-	-	-	-	+	-	-	-
-39	8100	60	37	1	2	4	65	-	-	-	-	-	+	-	-	-
-40	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
-40	3150	58	40	2	-	5	90	-	-	-	-	-	400	-	-	-
-40	3400	66	30	4	-	4	90	-	-	-	-	-	600	-	-	-
-40	5400	58	38	1	3	20	50	-	-	-	-	-	+	-	-	-

-40	5600	68	28	-	4	18	60	-	-	-	-	-	800	-	-	-
-40	5600	60	38	1	1	19	50	-	-	-	-	-	+	-	-	-
-40	6000	64	30	2	4	3	50	-	-	-	-	-	2700	-	-	-
-40	6500	62	30	6	2	10	70	-	-	-	-	-	+	-	-	-
-40	7400	63	35	1	1	4	75	-	-	-	-	-	+	-	-	-
-40	8750	68	28	4	-	15	65	-	-	-	-	-	400	-	-	-
-40	10000	78	20	2	-	22	50	-	-	-	-	-	2200	-	-	-
-40	11850	58	38	4	-	6	80	-	-	-	-	-	100	-	-	-
-45	3750	55	40	4	1	8	55	-	-	-	-	-	200	-	-	-
-45	3900	70	28	2	-	5	55	-	-	-	-	-	400	-	-	-
-45	5800	68	28	-	4	3	50	-	-	-	-	-	2700	-	-	-
-45	7000	76	20	-	4	21	50	-	-	-	-	-	2800	-	-	-
-50	5550	64	32	2	2	4	50	-	-	-	-	-	800	-	-	-
-50	7800	64	30	2	4	7	70	-	-	-	-	-	400	-	-	-
-60	3850	62	34	4	-	6	80	-	-	-	-	-	200	-	-	-
-28	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
-28	4150	66	30	4	-	7	79	-	-	-	-	-	-	+	-	-
-31	3000	64	32	2	2	6	60	-	-	-	-	-	-	-	+	-
-32	4200	68	38	-	2	3	50	-	-	-	-	-	-	-	+	-

Prof. M. A. Rahman Ansari, and Dr. Nazir Alam Nari

Incidence of Intestinal Parasites in Lahore Jail

TABLE I—(contd)

Incidence of Intestinal Parasites (Together with Blood Picture) in Prisoners.

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Incidence of Intestinal Parasites (Together with Blood Picture) in Patients																
Age Years	BLOOD PICTURE							INTESTINAL PARASITES								
	TLC	DLC				E S R	Hb%	PROTOZOAS					HELMINTHS			
		P	L	M	E			GI	EH	ET	EC	IB	AD	EV	AL	HN
Pure Infections (100 Cases)																
—40	7000	68	30	—	2	5	60	—	—	—	—	—	—	—	+	—
—40	5800	60	36	1	3	4	60	—	—	—	—	—	—	—	+	—
—29	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+
Total (100 cases)								4	2	4	28	21	34	2	4	1
Double Infections Cases (29 Cases):																
—40	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—
—30	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—
35—40	—	—	—	—	—	—	—	—	—	2	2	—	—	—	—	—
—40	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—
—50	—	—	—	—	—	—	—	—	—	3	—	—	3	—	—	—
26—60	—	—	—	—	—	—	—	—	—	—	14	14	—	—	—	—

—25	4701	78	18	3	1	6	90	—	—	—	1	—	1	—	—	—
—35	6800	64	34	—	2	5	70	—	—	—	1	—	1	—	—	—
—40	6600	68	27	3	2	27	75	—	—	—	1	—	1	—	—	—
—30	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—
—35	6100	66	30	—	4	4	70	—	—	—	—	1	1	—	—	—
32—40	—	—	—	—	—	—	—	—	—	—	—	2	—	2	—	—
Total (29 cases)								1	1	6	22	18	7	3	—	—
Triple Infection Cases (6 Cases)																
—40	4650	70	28	—	2	6	70	1	—	1	—	—	1	—	—	—
—40	—	—	—	—	—	—	—	1	—	—	1	1	—	—	—	—
—36	—	—	—	—	—	—	—	—	1	—	1	1	—	—	—	—
40—45	—	—	—	—	—	—	—	—	—	2	2	2	—	—	—	—
—30	—	—	—	—	—	—	—	—	—	1	1	—	—	1	—	—
Total (6 Cases)								2	1	4	5	4	1	1	—	—
Grand total (135 cases)								7	4	14	55	43	42	6	4	1

Incidence of Intestinal Parasites in Lahore Jail

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	GI	EH	ET	EC	IB	AD	EV	AL	HN
(a) Percent of the total (322) examined.	2.17,	1.24,	4.35,	17.08,	13.35,	13.04,	1.81,	1.24,	0.31
(b) Percent of the total (135) positive.	5.18,	2.96,	11.11,	40.74,	31.85,	31.12,	4.44,	2.96,	0.74,
(c) Percent of the total (91) with protozoas.	7.69,	4.39,	15.38,	60.44,	47.25,	—	—	—	—
(d) Percent of the total (53) with helminths.	—	—	—	—	—	78.31,	11.32,	7.55,	1.89

TABLE II
Corresponding Ratios of Intestinal Parasites in Prisoners :

	GI	EH	ET	EC	IB	AD	EV	AL	HN
Total ...	7	4	14	55	43	42	6	4	1
1. <i>G. intestinalis</i> ...	1	0.57	2.00	7.86	6.14	6.00	0.86	0.57	0.14
2. <i>E. histolytica</i> ...	1.75	1	3.50	13.75	10.75	10.50	1.50	1	0.25
3. <i>E. hartmanni</i> ...	0.50	0.28	1	3.93	3.07	3.00	0.43	0.28	0.07
4. <i>E. coli</i> ...	0.13	0.07	0.25	1	0.78	0.76	0.11	0.07	0.02
5. <i>I. butschlii</i> ...	0.16	0.09	0.33	1.28	1	0.98	0.14	0.09	0.02
6. <i>A. duodenalis</i> ...	0.17	0.09	0.33	1.31	1.02	1	0.14	0.09	0.02
7. <i>E. vermicularis</i> ...	1.17	0.67	2.33	9.17	7.17	7.00	1	0.67	0.17
8. <i>A. lumbricoides</i> ...	1.75	1	3.50	13.75	10.75	10.50	10.50	1	0.25
9. <i>H. nana</i> ...	7	4	14	55	43	42	6	4	1
10. % of 322 examined...	2.17	1.24	4.35	17.08	13.35	13.04	1.81	1.24	0.31
11. % of 135 positive ...	5.18	2.96	11.11	40.74	31.85	31.12	4.44	2.96	0.74
12. % of 91 with protozoa	7.69	4.39	15.38	60.44	47.25	—	—	—	—
55 with helminths ...	—	—	—	—	—	78.31	44.32	7.55	1.89

LITERATURE

1. Ansari, M. A. Rahman and Naru, N. A. (1966). The prevalence of intestinal parasites in the Lahore Mental Hospital (Male cases) *Pak. Jour. Hlth., Lahore*, 16 (3) : 146—164.
2. Ansari, M. A. Rahman and Naru, N. A. (1966). A note on the incidence of intestinal parasites in the Lahore Mental Hospital for female patients. *Pak. Jour. Hlth., Lahore* 16 (3) : 165—176.
3. Ansari, M. A. Rahman and Naru, N. A. (1967). Some, incoming intestinal parasites of Lahore. *Pak. Jour. Med. Res. Lahore*, 7 (2) : 138—154.
4. Ansari, M. A. Rahman and Sapru, Z. A. (1963). Intestinal parasitic infections in children of a primary school of Lahore. *Pak. Jour. Hlth., Lahore*. 14 (2) : 86—155.
5. Faust, E. C. and Russell, P. F. (1957) *Clinical Parasitology*, VI ed, Lea & Febiger, Philadelphia, P. 386.

A COMPARISON OF INTESTINAL PARASITOSIS IN KARACHI AND OTHER PARTS IN PAKISTAN

By

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And

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The importance of diseases due to intestinal parasitosis is immense, as these are unremittingly corrosive, constituting a steady drain on the vitality of the host. The full seriousness of intestinal parasitic infection should be measured in terms of increased morbidity, mortality prolonged hospitalisation, additional and complicated treatment. The financial cost of sickness due to intestinal parasitosis is also very great. This includes not only the cost of hospital and medical services but also the cost of financial assistance required to be provided by the state to persons unable to earn their own living from diseases and disablement. In an underdeveloped country like Pakistan, the aim must now be directed towards raising the annual per capita income of the population. But this aim cannot be achieved if the heavy loss of productive power of the population from the preventable diseases like the intestinal parasitosis is not controlled. But the prerequisite for the application of any preventable measure is the full knowledge of the problem from survey works based on reliable and standardised quantitative methods and technics.

While the diagnosis of intestinal parasitosis from clinical cases by the routine diagnostic procedures such as saline and iodine smears examination under the microscope is not very difficult, the same cannot be said about the detection of carriers, particularly of the *E. histolytica*. Various authorities (Faust and Russel 1964; Chandler, 1955; Belding, 1952) advocated the usefulness of concentrations, preservations, staining and culture technics in such situations. For Karachi, no such survey reports based on modern methods of diagnosis is available. Moreover recent reports (Haleem *et al* 1965) shows that the parasitic load at Karachi has been increasing from year to year. The percentage of positive cases even with the saline and iodine method is very high as compared to the advanced countries of the world. It was therefore

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presumed that the parasitic load at Karachi might be revealed at a danger level if investigations had been undertaken by applying all modern laboratory technics.

MATERIALS AND METHODS

In all, 425 freshly passed fecal specimens were examined. Out of these only 21 specimens (5.0%) were collected from the staff and the students of Jinnah Post-Graduate Medical Centre, Karachi. The remaining 404 samples (95.0%) were collected at random from various surgical wards of the attached hospital. A proforma for noting down the name, age, sex, address, history of present illness, past illness and treatment was made. Anyone giving a recent history of diarrhoea or dysentery were excluded from the study. In constipated persons, the stool collection was preceded by the administration of saline purgative.

As soon as the fresh stool specimen was brought to the laboratory about 0.25 gm of the material was immediately preserved in a clean screw capped specimen bottle containing 2.35ml of MF stock solution (distilled water 250ml, tincture of merthiolate 200ml, formaldehyde 25ml and glycerol 5ml) to which 0.15ml of Lugol's iodine solution (iodine crystals 5gm, potassium iodide 10gm and distilled water 100ml) was immediately added before addition of the specimen. 100 stool specimens were put to entamoeba medium immediately. In few exceptional cases when immediate examination was not possible, the stool specimens were immediately refrigerated after collection and in no case the examination was delayed for more than 2 hours. After the culture of the stool, from the remaining portion of the stool a portion was then concentrated by the zinc sulfate centrifugal flotation technic and examined under the microscope. The merthiolate iodine formaldehyde concentration technic (MIFC) was performed at leisure hours in all cases of preserved stool and microscopy was done. A portion of the MIFC material was then smeared on a clean slide, allowed to dry and then stained by the iron hematoxyline staining technic with the omission of Schaudinn's fixation and immersion in the 70.0% alcohol iodine solution. Whenever any ova of helminth was diagnosed then the stool was put to Stoll's dilution egg counting technic. In each case 4 slides were examined and the average egg count was noted.

RESULTS AND OBSERVATIONS

This study involved the investigations of fecal specimens from 425 normal individuals, having no present complaints of gastro-intestinal disturbances or recent

history of diarrhoea of dysentery. In all 253 individuals (59.5%) were found to be infected with a variety of parasites either alone or in combinations. Only 74 individuals (17.4%) were found harbouring commensal parasites. While 179 individuals (42.1%) were found infected with pathogenic parasites. The associations of non-pathogens in pathogenic parasitic infected individuals were found to be 25.7%, as compared to the pure pathogenic parasitosis which was 16.4%.

The predominant parasitosis has been presented in Table I. The frequencies of pure infections were as follows: *Ascaris lumbricoides* 3.5%, *E. histolytica* 2.5%, *Giardia lamblia* 2.3 %, hookworm 1.6 %, *T. trichiura* 1.6 % and *Hymenolepis nana* 0.25 %.

The frequencies of single commensal parasitosis were as follows: *E. coli* 6.3%, *T. hominis* 1.9%, *C. mesnili* 1.2% and *E. nana* 0.23%. Double infections were detected in 3.5% cases; tripple infections in 0.94% cases and quadruple infections in 0.23% cases.

The total number of males examined were 219 and females examined were 206. In the male group 60.7% had parasitosis, while in the female group 58.7% had parasitic infections (Bar Diagram 1).

The sex relation of the intestinal parasitosis has been presented in Bar Diagram 2. The male population in general showed higher helminthic infection than the females who in their turn demonstrated higher protozoal infections.

The age relation of the parasitosis demonstrated highest incidence in 1-10 years age group and the lowest incidence of parasitosis in older age group (Graph 1).

The age relation of the individual parasitosis of protozoal infection has been drawn in graph 2; and that of helminthic infections in graph 3. Giardiasis was mostly prevalent in the children. For the difference of age the other protozoa showed remarkable variations in their incidence. In case of the helminths, hookworm was found absent in the children and present in moderate percentage in the other age groups. *H. nana* being present in quite high percentage in the children became non existant in the older individuals. The *Ascaris lumbricoides* was also prevalent in very high percentage (26.6%) in the children and in moderate percentage in the other age groups.

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The monthwise prevalence of the pathogenic parasites in percentage is presented in graph 4. Comparatively lower rates prevailed during September and October, but the rates showed remarkable rise thereafter.

The intensity of the helminthic infections as determined by egg counting has been presented in Table 2. It was observed that most of the *Ascaris* infected individuals had egg count below 5.5 thousands per gram of stool. The hookworm and *trichiuris* infected individuals had egg count below 2000 per gram of stool.

The intensity of the helminthic infections in different age groups of the infected persons has been presented in Graph 5. The highest incidence and intensity prevailed in the children group in *Ascaris*, *Trichiuris* and *H. nana* infections. Hookworm infection being remaining absent in the children the peak intensity was observed in the adolescents.

DISCUSSIONS

In this study positive parasitosis was detected in 59.5% cases. Similar survey reports in various parts of Pakistan the rates of parasitosis as mentioned are as follows :—Multan 77.5% (Farooki, 1964), Lahore village 57.9% (Ansari *et al* 1965B); Dacca students 100% (Kuntz 1960); Dacca patients 75.7% (Muzzam and Ali, 1961).

Out of the 59.5% infected individuals, pure pathogenic parasitic infection was present in 16.4%; pure non-pathogenic parasitosis in 17.4% and the combined pathogenic and non-pathogenic parasitosis in 25.7%. In a similar survey at Multan (Farooki 1964), out of 77.5% parasitosis there was pure pathogens in 6.5%; pure commensals in 51.8%; and mixed pathogens and commensals in 20.4%. By his results, Farooki regarded that there were more chances that one having pathogens have commensals too. Results at Karachi also leads one to the same hypothesis.

The highest pathogenic parasitosis of 19.5% was noted in *E. histolytica*. The incidence of this dangerous parasite in other parts of Pakistan are as follow :—Dacca children 37.0% (Kuntz 1960); Dacca patients 7.4% (Muazzam and Ali 1961); Multan 8.7% and Peshawar 3.5% (Farooki 1964); Lahore males 2.9% and females 2.5% (Ansari *et al* 1965BA); Karachi 11.0% (Haleem *et al* 1965).

The results showed higher incidence of this parasite in the females. According to Belding (1952) sex had little influence over the rates of infection by this parasite although Faust and Russel (1964) observed higher incidence of this parasite in the males irrespective of occupational variations. However, Ansari *et al* (1965AB) in a survey of Lahore village people could not detect any significant difference for sex in the incidence of this parasite. Considerable high incidence of above 20.0% infection prevailed at Karachi upto 40 years of age. Belding (1952) reported of the increased incidence of *E. histolytica* during high humidity and rainfall and that temperature had less influence in its incidence. During this present study there was no rainfall at Karachi and the variation in the humidity also was not marked, but the variation in the temperature was significant. Surprisingly, there was marked variation in the incidence of this parasite for the seasonal variation.

The incidence of *Ascaris lumbricoides* 10.8% was the next highest. Farooki (1964) reported 0.15% infection in Multan, 1.4% infection in Peshawar and 0.3% infection in Bahawalpur. Ansari *et al* (1965A) reported 16.1% infection in Lahore women and 12.1% infection in men. Ansari and Sapru (1964AB) reported 37.6% infection in Lahore Children and 34.6% infection in conservancy staff. For Karachi Saleem (1961) reported 3.5% infection and Haleem *et al* (1965) reported 9.0% infection. In East Pakistan Muazzam (1962) reported 10.8% infection at Rajshahi and 33.9% infection at Dacca and Kuntz (1960) reported 40.83% infection in school children of Dacca.

Ascarts infection was present in highest incidence 26.2% as well as in highest intensity (above 50,000 eggs per gram of stools) in the children population of Karachi. Similar high incidence in the children had been reported by Chandler (1955), Belding (1952) and Faust and Russel (1964). Faust and Russel 1964 considered *Ascariasis* to be essentially a door-yard infection. Belding 1952 reported that no seasonal variation was observed with this infection, but in the present study at Karachi an appreciable increase in the incidence was observed with the advent of winter.

Belding (1952) reported of the higher incidence in the males as compared to the females. In the present study 13.0% infection was observed in the males as compared to the females showing 9.0% infection. The highest incidence and the highest intensity in the children was possibly due to the insanitary habits of the children who gather the infection from the door-yard.

The incidence of *Giardia lamblia* being present in 9.6% individuals was the next highest of the pathogens to be present in Karachi. For Karachi Saleem (1961) and Haleem *et al* (1965) reported 5.6% infection in persons having digestive disturbances. Farooki (1964) reported 13.8% infection at Multan, 4.8% infection at Bahawalpur and 9.8% infection at Peshawar. Muazzam and Ali (1961) reported 20.0% infection by this parasite at Dacca. 11.0% of the males harboured this infection as against 8.2% infection in the females. The higher rates in the males corresponds to similar observation by Belding 1952. As compared to the adults of Karachi, the children suffered about 4 times more infection. The ratio of the incidence of this parasite in the children as compared to the adults as reported by various other workers were 3 : 1 (Belding, 1952) ; 5.5 : 1 (Chandler, 1955) ; and 2 : 1 (Farooki, 1964).

Out of the total 41 persons infected with *G. lamblia* in this study 5 cases had flagellates and cysts in the stool while the rest passed only cysts.

The *Trichuris trichiura* being present in 7.7% of the cases, came next in the rates of incidence. Muazzam and Ali (1961) reported 26.7% infection in the Dacca patients and Kuntz (1960) reported 55-87% infection in the Children of Dacca Saleem (1961) found 6.3% infection by this parasite in the symptomatic persons of Karachi and Haleem *et al* (1965) detected only 0.5% infection there in a similar group of persons. Farooki (1964) also reported very low infection (0.2%) in Peshawar and no infection at Multan and Bahawalpur.

Jung and Beaver 1951 reported heavy infection in the children in the endemic areas. In Karachi only slightly higher incidence was detected in the children. From this observation we can conclude that Karachi is not an endemic area for this parasite. Chandler (1955) reported high incidence of this worm to be always associated with abundance of moisture in the soil from heavy rainfall. Karachi having very little rainfall is therefore not a suitable place for heavy infection.

Jung and Beaver (1951) observed that there was remarkable association between *T. trichiura* and the *E. histolytica* in the infected individuals. Similar high association (24.2%) was noticed in the present study. Another interesting association of this worm was its presence with the *A. lumbricoides* in 27.2% cases.

The incidence of the most notorious worm i.e., hookworm was not high. Only 4.9% harboured this dangerous parasite in their intestine. Saleem (1961) and

Haleem *et al* (1965) found only 1.6% infection by this parasite in symptomatic persons of Karachi. Ahmad (1959) reported 21.6% infection in Lahore village people and 12.9% infection in city people. Ahmad and Shah (1959) reported 22.6% infection in the organised communities of Lahore city. Ansari and Sapru (1964A) detected 18.7% infection in the Lahore children. Ansari *et al* (1965B) found 16.6% infection in the male population of Lahore village people and 9.5% infection in the female population of the same area of Lahore (1965A). Farooki (1964) reported 1.0% infection in Multan, 1.8% infection in Bahawalpur and 5.6% infection in Peshawar. Muazzam and Ali (1961) reported 28.2% infection in the Dacca patients and Kuntz (1960) found 44-52% infection in the Dacca school children.

Chandler (1955) termed rainfall as of fundamental importance in the prevalence of hookworm infection and that heavy infection was never common in localities having less than 40" rainfall in a year. Karachi having little rainfall in a year, therefore was not likely to have heavy infection. The absence of the incidence in the children is perplexing, but this might be explained by the infrequent nature of this infection and that the few infections that has been detected at Karachi might have been imported from other areas of East and West Pakistan.

Faust and Russel (1964) regarded egg count of less than 2100/gm. of stool in the infected persons to be of no clinical significance. In the present study the egg count in the infected persons always remained below this number and therefore the infections were of no clinical significance.

Only 2 cases (0.46%) suffered from *Enterobius vermicularis* infection. Since the application of the special technics e.g. Scotch tape method and the anal swabbing etc. were not undertaken the incidence rates detected in this study does not claim to have revealed all the *enterobius* cases.

H. nana being present in only 3.7% individuals of Karachi showed moderate infection. Farooki (1964) reported 1.1% infection in Bahawalpur; 2.1% infection at Peshawar and 3.4% infection at Multan. Ansari and Sapru (1964 A) reported 11.6% infection in Lahore children also and (1964 B) reported 4.4% infection in the conservancy staff of Lahore. Ansari (1964) found 3.1% infection in Lahore People. At Dacca Muazzam and Ali (1961) found only 0.41% infection in the symptomatic people and Kuntz (1960) detected 1.0% infection in the symptomatic children. At Karachi, Haleem *et al* (1965) reported 1.4% infection in diarrhoeic individuals. Saleem (1961) found 2.9% infection in diarrhoeic individuals.

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Chandler (1955) reported higher incidence in the children in case of *hymenolepiasis*. In the present study 13.0% infection was detected in the children as against 3.0% infection in the next age group (11—20 years) and thereafter the infection failed to occur.

Belding (1952) cited Killer and Leather (1934) having reported of higher incidence of *hymenolepiasis* in the male children as compared to the female children. In this study 17.3% infection of this parasitic infection was detected in the male children as against only 4.0% infection in the female children.

SUMMARY

A survey based on a study of single stool specimen from 425 normal individuals of Karachi having no complaints of gastro-intestinal disturbances or any recent history of diarrhoea or dysentery revealed a high rate of the pathogenic parasites along with the other intestinal fauna. Out of the population surveyed 253 (59.5%) persons were found to have positive parasitosis. The pathogenic parasites either alone or in different combination with the commensals were detected in 42.1% cases. Among the 219 males the parasitosis detected were in 60.7% and in the female group of 206, (53.7%) suffered from parasitosis. The children of both the sexes were found to have the highest parasitosis in case of all of the pathogens except for the hookworm infection which was found altogether absent in the children.

The rates of the pathogenic parasitosis were :— *E. histolytica* 19.5% ; *Ascaris lumbricoides* 10.8% *Giardia lamblia* 9.6% ; hookworm 4.9% ; *Hymenolepis nana* 3.7% and *Enterobius vermicularis* 0.46%.

The commensal parasitosis were : *E. coli* 30.3% ; *Endolimax nana* 13.2% , *Trichomonous hominis* 10.1% ; *Chilomastix mesnili* 9.0% ; *Iodamoeba butschlii* 8.7% . *Enteromonas hominis* 0.46% , *Retortomonas intestinalis* 0.23% and *Iso spora belli* 0.23% .

The different pathogenic parasitosis detected at Karachi has been compared against the different reports of the parasitosis at different areas of parasitosis.

Certain specific characteristics of the pathogens in relation to their incidence in the different sexes of the infected persons and the different ages of the same has been compared with other such informations found in different books and periodicals. Variations in the incidence of the pathogens for meteorological variations as has been reported by various authorities has been compared with the present findings.

TABLE I

Frequency of Intestinal Parasitosis in 425 Asymptomatic Persons of Karachi.

Serial No.	Parasite	Number of infected persons	Percent infected
1	<i>Entamoeba coli</i> ...	129	30.3
2	<i>Entamoeba histolytica</i> ...	83	19.3
3	<i>Endolimax nana</i> ...	56	13.2
4	<i>Ascaris lumbricoides</i> ...	46	10.8
5	<i>Trichomonas hominis</i> ...	43	10.1
6	<i>Giardia lamblia</i> ...	41	9.6
7	<i>Chilomastix mesnili</i> ...	38	8.9
8	<i>Iodamoeba butschlii</i> ...	37	8.7
9	<i>Trichuris trichiura</i> ...	33	7.7
10	<i>Hookworm</i> ...	21	4.9
11	<i>Hymenolepis nana</i> ...	16	3.7

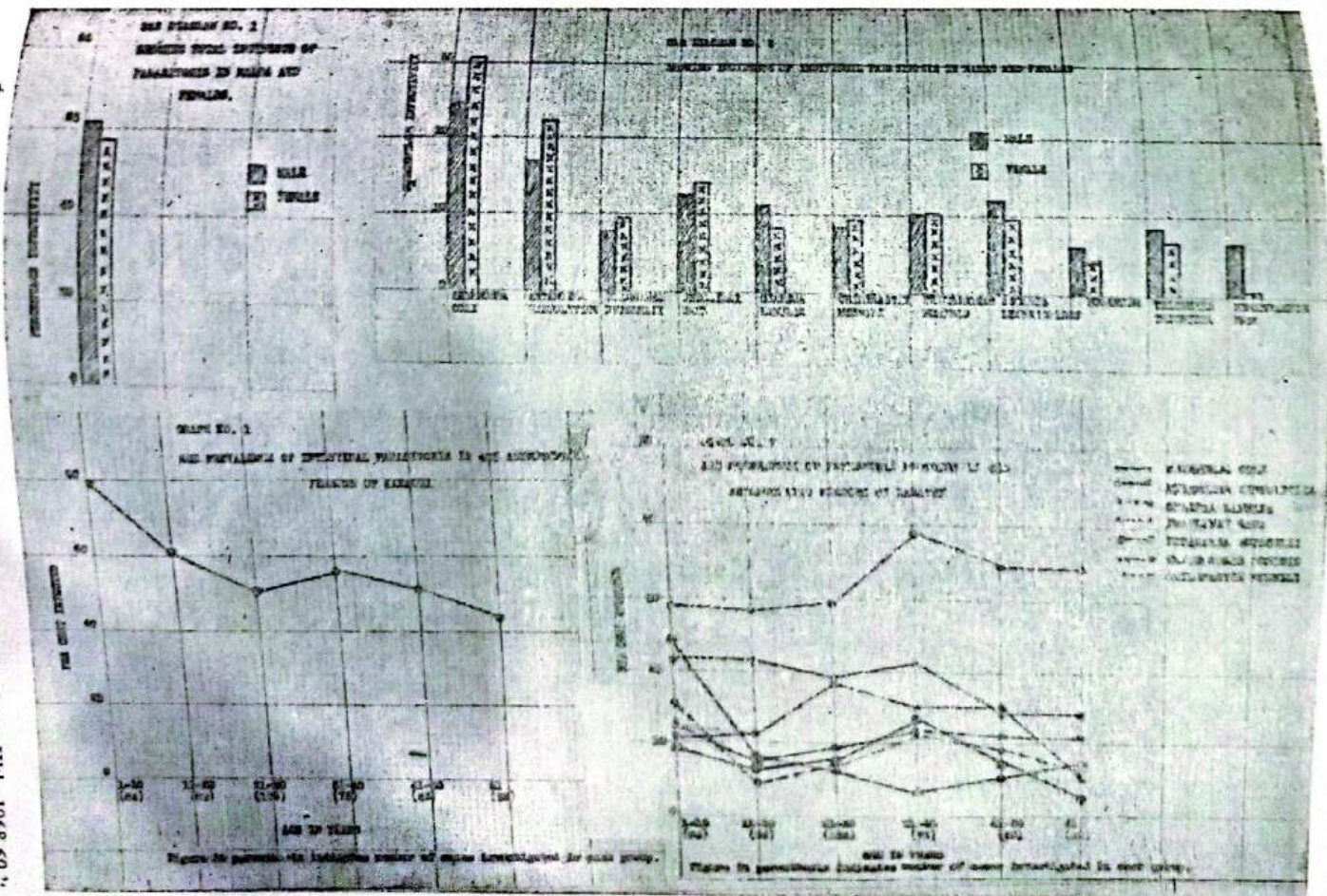
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TABLE II
Intensity of Helminthic Infections (In Percentages)

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Parasite	Number of eggs per gram of stools (In thousands)								
	0.0 to <1.0	1.0 to <2.0	2.0 to <3.0	3.0 to <4.0	4.0 to <5.0	5.0 to <6.0	6.0 to <7.0	7.0 to <8.0	8.0 and above
<i>Ascaris lumbricoides</i> (46 = 100%)	—	—	—	9.2	27.6	33.7	18.2	11.5	—
<i>Trichuris trichiura</i> (33 = 100%)	70.7	29.3	—	—	—	—	—	—	—
<i>Hookworm</i> (21 = 100%)	60.3	39.8	—	—	—	—	—	—	—
<i>Hymenolepis nana</i> (16 = 100%)	47.8	35.2	—	17.0	—	—	—	—	—



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References

1. Ahmad N. (1959) Studies on ankylostomiasis in West Pakistan. *Pakistan J. Med. Res.* 1 : 54—71 (January).
2. Ahmad, N. and Shah, K.S. (1959) Reports on hookworm infection survey of organised communities in Lahore Corporation *Pak. J. Med. Res.* 1 : 35—52.
3. Ansari, M.A. Rahman, (1964) Intestinal parasitic infections in cases with definite clinical evidence. *Pakistan J. Health.* 14 : 156—200.
4. Ansari, M. A. Rahman and Sapru, Z. A., (1964A) Intestinal Parasitic infections in children of a Primary school of Lahore. *Pakistan J. Health.* 14 : 36—155.
5. Ansari, M. A. Rahman, and Sapru, Z. A. (1964B) A survey of human intestinal parasites in the conservancy staff of the City Corporation of Lahore. *Pakistan J. Health.* 13 : 243—306.
6. Ansari, M. A. Rahman, Sapru, Z. A. and Naru, N. A. (1965A) A survey of intestinal parasites in a village within City Corporation of Lahore, incidence in females. *Pakistan J. Health.* 14 : 239—285.
7. Ansari, M. A. Rahman, Sapru, Z. A. and Naru, N. A. (1965 B) A survey of intestinal parasites in village Sahowary, incidence in males. *Pakistan J Health.* 15 : 1—24.
8. Belding, D. L. *Text Book of Clinical Parasitology.* 2nd, ed. New York. Appleton-Century- Croft (1952).
9. Chendler, A. C. *Introduction to Parasitology.* 9th ed. New York, (1955).
10. Farooki M. A. (1964) An investigation of human intestinal parasitism in some areas of West Pakistan. *Pakistan J. Med. Res.* 3 : 113—152.
11. Faust, E. C. and Russal. P. F. (1964) *Craig and Faust's Clinical Parasitology.* 7th. ed., Philadelphia, Lea and Febiger.

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12. Haleem, M. A. Akram, M.A. Akram, S. (1965) Intestinal parasitic infection in Karachi. *J. Pakistan Med. Assn.* 15 : 499—506.
13. Jung, R. C. and Beaver, P. C. (1951) Clinical observation on *Trichocephalus trichiura* (Whipworm) infestation in Children. *Pediatrics.* 8 : 548—557.
14. Kuntz, R. K. (1960) Intestinal protozoa and helminths in school children of Dacca, East Pakistan East Bengal. *Amer. J. Trop. Med.* 9 : 168—172.
15. Muauzam, M. G. (1962) Ascariasis in East Pakistan. *Medicus Karachi* 24 : 160—166.
16. Muazzam, M. G. and Ali M.T. (1961) Intestinal parasites in East Pakistan. *J. Pakistan Med. Assn.* 9 : 181—184.
17. Saleem, A. (1961) Incidence of helminthiasis and dysenteries in Karachi. *J. Pakistan Med. Assn.* 9 : 175—180.

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OBSERVATIONS ON HOUSE FLIES AS NATURAL CARRIER OF THE HELMINTHIC OVA FROM DIFFERENT LOCALITIES OF LAHORE CITY.

By

Dr. Nazir Alam Naru*

INTRODUCTION

Our knowledge of "House flies and their effect on Public Health" is far from complete. It has now been established beyond any shadow of doubt that house flies are potential mechanical transmitters of several human diseases viz., Dysenteries, Diarrhoeas, Inflammatory and vital infections of the eye, Enteric group of fevers and Cholera etc.

There are several species of house flies but the most intimately associated species are *Musca domestica* and *Musca nebulosa*. The flies breed freely in any decaying material including kitchen sweepings, human faeces available near residential areas. The house flies do not only share our houses but also the food. Their habits of visiting filth-faeces-food-face and licking sores and lesions incriminate them as important agents of dispersal of pathogenic organisms. The ready appetite of the house fly for filth and clean foods at one and the same time and its unpleasant habit of moving rapidly back and forth between the two diagonally opposite things makes it a deadly enemy of man.

Upto the recent studies the following facts have been definitely ascertained. The larvae of many species of non-biting flies breed in human and animal excreta or decaying animal and vegetable matter. The adults frequent these substances and often feed upon them. Flies are therefore, an indication of the presence of such insanitary substances in the neighbourhood of the houses in which they occur, may carry both in and on their bodies the putrefactive and faecal bacteria acquired from the substances on which they feed, and, experimentally at least can also carry and distribute many of the disease producing species of bacteria and the ova of parasitic worms. Since these ova and bacteria are present in the faeces of infected persons, flies under suitable conditions, mainly by infecting food substances, may help the spread of the diseases, produced by these organisms.

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OBJECTIVE

Recently the Institute of Hygiene carried out parasitic surveys in different localities of Lahore District. It became evident from these studies that incidence of Helminthic infections amongst Lahorites is in general alarmingly high. In order to investigate the causes of such a high incidence of Parasitic infections, the author tried to probe into the role of house frequenting flies in the dissemination of helminthic infections in 12 different localities of Lahore city. Indeed many other factors regarding insanitary conditions, Literary standards, personal cleanliness etc. all are worth exploring and the author intends to carry out studies on these facts.

PLANNING AND PROCEDURE

Living flies from different localities of Lahore city were collected daily in test tubes.

For this initial experiment the flies were collected at about midday on August 3, 1965 from Nawan Kot (Multan Road). The killed flies were placed in a half ounce bottle containing ether. After brisk shaking, some water was added to wash flies thoroughly. The washings were centrifuged. A very slight deposit so obtained was examined for ova + cysts. It gave negative results.

In another experiment the flies were well washed up in ether and then thoroughly mixed with water. The larger fly fragments, which remained were carried upto the top of the fluid by the ether. The fluid, below the level of the fly fragments, was pipetted off and centrifuged. Washings with fresh water were repeated until enough fluid was obtained to fill the centrifuge tube. The tube was then centrifuged for 2 minutes, the deposit thus obtained was of a deep blackish brown colour and was composed of finer debris from the flies. The deposit was drawn up in a pipette. 50 preparations were made of which only 13 were found with ova. The ova were found to be of

A. duodenale (in 3 preparations),

A. lumbricoides (in 7 preparations),

Trichuris trichiura (in 1 preparation) and

Hymenolepis nana (in 2 preparations).

Obviously from this observation the number of flies charged with ova could not be ascertained. It was therefore decided to make further observations on individual housefly-specimens.

RESULTS

TABLE No. 1

It indicates that the parasitic infection rate was highest i.e., 11.00% in the locality of Bakkarmandi and it was lowest i.e., 2.43% in Wahdat Colony. In other localities the rates were 9.58%, 9.07%, 7.01%, 6.26%, 6.25%, 5.65%, 4.83%, 4.71%, 4% and 3.25% in the localities of Sodhiwal, Baboo Saboo, Nawankot Pakki Thatti, Sanda Khurd, Sanda Kalan, Rajgarh, Krishan Nagar, Samanabad and Sham Nagar respectively.

The number of House flies examined was highest from Nawan Kot locality and the lowest was from Samanabad. It further predicts the parasitic infection present in house flies and it shows that number examined is not significant for parasitic infection. On an average the number of flies examined in these localities in each month varied, from 70 to 192.

TABLE No. II

I. Percentage of Parasitic infections present in the house flies of Nawan Kot locality ranges from 3.57% to 11.00% in the month of March, 1966 to April, 1966. The infection is also very high in the months of August, September, October, November, 1965. It is clear from this table that the infection rate is nearly equal in all the months except in December, 1965 and March, 1966.

II. Out of the 1725 house flies examined, 3.71% were positive for Hookworm, 1.57% for ova of *Ascaris lumbricoides*, 1.28% for eggs of *Trichuris trichiura* 0.11% for ova of *H. nana* and 0.34% were with Mites.

III: Monthwise carrier state of the Parasitic infection in the house flies is found to be as stated below : -

- i. *Ascaris lumbricoides*. The infection rate of this helminthic infection ranges from 0.44% to 3.11% in the months of March, 1966 and October, 1965. It was not found in the month of December, 1965.

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- ii. *Hookworm*. Eggs were found to be more on the house flies during the month of August viz., 7.20% and was least during the months of September and November viz., 2.22%.
- iii. *H. nana* ova were only found in 2 house flies out of 225 examined during the month of September and during the rest of the period this Helminthic infection was not detected.
- iv. *Trichuris trichiura*. *Trichiuris trichura* infection varied from 0.44% in the month of October, 1965 i.e., to 3.00% in the month of April, 1966. The rate of this infection remained constant from September 1965 to March, 1966 except in October, 1965, when the number of house flies infested were 3%.
- v. *Mites*. The mites on the house flies were found only in the month of February 1966, when the number of houseflies infested were 3%.

TABLE III

Percentage of parasitic infection present in the house flies of Pakki Thatti was found to be 6.26% of the total examined. The carrier state ranged 2.66—12.00% in the months of January, 1966 and September, 1965 respectively. 4.04% of the total examined were found to have ova of Hookworm, 1.47% *Ascaris lumbricoides*, 0.13% *Enterobius vermicularis* and 0.26% were with Mites on their body.

- (a) *Ascaris lumbricoides* : Presence of the eggs ranges from 1.0—4 % in the months of Nov. 1965 and Jan. 1966 this infection was not detected. It remained constant during the investigation period except in the month of Aug. Sep. 1965.
- (b) *Hookworm ova* : Monthwise range was from 1—8 % in the months of Nov. 1965 and Jan. 1966 this infection was not detected. It remained constant during the investigation period except in the month of Aug. Sep. 1965.
- (c) *Enterobius vermicularis* : The ova of this Helminth was found only in April, 1966, otherwise this infection was not common in this locality.
- (d) *Mites* : In only 2 months out of the 9 months study period, the flies have been found with the Mite on their body. That was only 1.0%.

in the September and 1.33% in November. During the rest of the months the flies were free of this coarthropod.

TABLE No. IV

Sodhiwal locality house flies were found to be 9.57% positive for the parasitic infections out of 1650 flies totally examined. Percentage of infection varied from 5-33%—16.00% and it was at the lowest range during the month of November 1965 and was highest in the month of August, 1965. Out of the total examined flies, the highest percentage were positive for Hookworm viz., 6.12%, 1.40% for *Ascaris* eggs, 1.21% for ova of *Trichuris trichiura*, 0.42% for the presence of Mite, 0.24% for *Hymenolepis nana* eggs, 0.12% for ova of *Taenia* and in 0.06% the Pin worm ova were detected.

- (a) *Ascaris lumbricoides* : Its eggs were found on 0—2.66% flies during the period of study. The flies were free of these ova during the months of February and April. The peak percentage reached in the month of August.
- (b) *Hookworm* : Eggs of this worm were found to vary from 2.22 to 8.0% during the period of study. The figures remained between 6.05—8% out of 9 months. It touched at 2.22 and 4.00% in the months of November and September respectively.
- (c) *Enterobius vermicularis* : The Pin worm eggs were only found in 0.05% of the total 200 flies examined during the month of September and during rest of the 8 months, the flies were found to be free of these ova.
- (d) *Hymenolepis nana*: The eggs of this dwarf tapeworm were only found during the months of Feb : 1966 and April, 1966 when these ranged from 1—2% and during rest of 7 months period, the flies were found negative for its ova.
- (e) *Trichuris trichura* : Ova presence on flies varied from 0—4.0%. This was 0—0.44% from January to April. The highest rate was obtained in the month of August.

(f) *Taenia ova* : were present in only 1 % of the flies examined during the month of September and the flies remained free of this infection during other months.

(g) *Mites presence* : on flies ranged from 0—2.66%. These were not found in flies in the months of September, November, December and January. The highest percentage was observed in the month of August.

TABLE No. V

1000 house flies of Bakkarmandi were examined. 11.00% were having one or the other parasitic infection. 4.06% were positive for hookworm, 3.07% for ova of *Ascaris*, 1.03% for eggs of *Trichuris trichiura*. 0.07% for *Taenia* eggs and 0.03% was the figure for infections of *Enterobius* and the Mite. 0.01% was the lowest figure observed for the presence of *Hymenolepis nana* eggs in house flies. Monthwise percentage of infection ranged from 8.66—14%. From this it infers that the percentage of Parasitic infection remained quite high in the flies of locality throughout the period of study.

Monthwise split up of the presence of the parasitic infections was found to be as detailed below :—

- (a) *Ascaris lumbricoides ova* : The presence ranged from 0—7.0%. It was nil in months of the Feb : 66 and April, 66 and was highest in the month of October, 1965.
- (b) Hookworm ova presence varied from 2.00-9.00%. The lowest figure have been obtained in the months of August and March and highest observation was in February.
- (c) *Enterobius* eggs were detected only in 2.0% of 150 flies examined in the month of December. The flies examined in the other 8 months were free of these ova.
- (d) *Hymenolepis nana* ova were also found only in 2% of the 50 flies examined in the month of April. 950 flies which were examined during the other 8 months were free of this infection.
- (e) *Trichuris trichiura* : eggs were not detected from the flies examined during the months of October, January, Feb. and April and during the rest

of the months their presence varied from 0.66—4.00% and this was the observation in the months of September and November respectively.

(f) *Taenia* eggs were found to vary from 0.66—2 % in the study of four months and these were not at all detected in rest of the 5 months study.

(g) *Mites* : were not present in the flies examined in the months of September to February and their presence in other three months of study varied from 0.66—2.0% which was in August and April respectively.

TABLE No. VI

0.07% of 1000 flies of Baboo Saboo were found having parasitic infections. The lowest percentage of infection was in the month of September viz., 4.66% and highest was in August viz., 14.00%.

Presence of the Helminthic ova was in this order : Hookworm 6.02%, *Ascaris* 1.07%, *Trichuris* 1.01%, Dwarf Tapeworm 0.05% and *Enterobius* 0.01%. The mite was present in 0.01% of the flies examined.

Monthwise distribution of Helminthic ova/Mites infection in flies was as under :—

(a) *Ascaris lumbricoides* ova were not present in the flies examined in November and January and in rest of 7 months study the percentage of infection ranged from 0.08—5.33 which was in the months of December and August respectively.

(b) *Hookworm* : eggs presence varied from 2.66—7.33%. The ova of this worm remained above 6.00% in all the 8 months of study except in September where it was 2.66%.

(c) Presence of *Enterobius* eggs was negligible and was only found in 0.66% of the 150 flies examined in the month of September. 850 flies examined in other months were free of this infection.

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- (d) *Hymenolepis nana* ova present in 0.66 and 4.00% of the 250 flies examined in the months of August and October respectively. 750 flies examined in other months were free of these ova.
- (e) *Trichuris trichiura* ova were found ranging from 0.08—4.00% which was in months of December and November respectively. The flies examined in the months of August, Feb : and March were free of these ova.
- (f) Mite only one mite out of the 150 flies examined in August was present and 850 flies tested in the rest of the 8 months were free of this parasite.

TABLE No. VII

Sanda Khurd Locality :

6.25% flies were found carrying the parasitic infections out of 800 examined. The percentage of infection ranged from 2.66—9.00% in the flies examined during the period from August, 1965 to April, 1966 and the lowest was in March and highest was in October. Out of the total examined, the order of presence of ova was as under :—

Hookworm 2.62%, Ascaris 2.25%, Dwarf Tapeworm 0.87% and *Trichuris trichiura* 0.05%. No *Taenia* or *enterobius* ova and Mites were found.

Monthwise distribution of various Helminthic ova in flies was as under :—

- (a) *Ascaris* ova : Presence of these ova ranged from 1.33—4.00%. The figure at the lowest end i.e., 1.33% was obtained in the month of November, December, February and April. The highest percentage (4.00%) was observed in October study.
- (b) *Hookworm* ova : These eggs were found in the range of 0—4% which was the highest in the months of September and April, and was found to be nil in March.
- (c) *H. nana* ova : These eggs were found ranging from 0.80—2% and this was in the months of August and October respectively. The percentage remained within the above limits during all the period of study except in the months of December, February and March when it was nil.

- (d) *Ova of Trichuris* were only found in the flies examined in the months of August, October and February and the percentage varied between 1.00–1.60%. The 6 months flies examination results were negative for these eggs.

TABLE No. VIII

Locality Sanda Kalan

5.65 per cent flies were found positive out of the 725 examined. The intensity of infection varied from 2.66–10.0% during the different months examination i.e. lowest was in November and highest was in August. Out of the total examined the helminthic ova pattern was in this order :—

Hookworm 2.62%, *Ascaris* 1.51%, *H. nana* 0.41%, *T. trichiura* 0.41%, *Enterobius* 0.28% and *Taenia* 0.14%. The mites were present on 0.28%.

Monthwise distribution of the helminthic ova/Mites were found to be as given under :—

- (a) *Ascaris* : The eggs were found in the range of 1.01–2.66%. It was lowest in the month of October 1965 and highest in September, 1966. No positive fly was found during the month of November 1965.

- (b) *Hookworm* : Ova of this worm ranged from 1.00–6.66% during the 9 months period of examination and these figures were in the months of December and January respectively.

- (c) *Enterobius ova* were detected from 125 flies examined during the months of February and August. The percentage of infection was 1.33% and 2.00% respectively. 600 flies examined in other months were free of these eggs.

- (d) *H. nana* eggs were present only on 3 occasions in the months of November, January and March with respective percentages of 1.33, 1.33 and 1.00 and the flies were found without these eggs in the rest of 6 months examination.

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- (e) *Trichuris trichiura* ova were also present thrice in the months of November, January and March when the percentage was 1.33, 1.33 and 1.00 in the respective months. In flies examined during the other months, these eggs were not found in any one.
- (f) *Taenia ova* were only found in 1.00% of the flies examined in the month of October during the period of study i.e. August, 1965 to April, 1966.
- (g) *Mites* : were obtained from 1—2% flies examined in the months of October and August respectively. The flies examined during the 7 months period were without Mites.

TABLE IX

Rajgarh Locality

4.83 per cent flies were found with Helminthic ova/mites out of the 725 examined and the range of infection varied from 1.33—10.00% during the period from August, 1965—April, 1966. It was least in April and highest in August. Out of 4.83% infection positive flies, the ova of Roundworm were present in 2.76%, Hookworm 1.10%, *H. nana* 0.55%. The figure was 0.14% in cases of ova of *Enterobius*, *trichuris* and the mite.

Monthwise distribution of helminthic ova/mites in house flies was found to be as under.

- (a) *Ascaris ova* : ranged from 1.33%—6.00% in the months of April and August respectively. 100 flies examined during the month of December were without the ova of this worm.
- (b) *Hookworm ova* were not detected from the flies examined during the months of September, November, February and April. Its range in other 5 months examinations varied from 1.00% (in October) to 4% (in August).
- (c) *Enterobius* eggs were only found in 1.00% of the flies examined in the month of October.
- (d) *Hymenolepis nana* ova were present only from 1—2.66% flies during the months of September, October and November.

- (e) *Trichuris Trichiura* eggs were present only in one housefly (1.33%) out of 75 examined in the month of January. It was not found in rest of the 8 months examinations.
- (f) Mite was also detected only from one fly (1.00%) out of 100 examined in the month of March and the results of 8 months examination were negative for its presence.

TABLE No. X

Krishan Nagar Locality

Only 4.71% of 700 flies examined were found to be positive and range of infection varied from 1.33—10.66% during the period under report. The lowest incidence was in the month of February and the highest in the month of August. The pattern of the parasitic infection was in this order :—

Ascaris ova 3.14%, *Hookworm* 0.86%, *H. nana* 0.43% and Whip worm eggs were 0.28%.

Monthwise distribution of helminthic ova was as under :—

- (a) *Ascaris*. The percentage ranged from 1.33 to 5.33 during the period under report. The highest infection was in the month of September and the lowest was in February.
- (b) *Hookworm ova* were not present in 300 flies examined in the months of December, January, February and April. The results were positive in the rest of 5 months examinations and the percentage varied from 1.00—2.66 i.e., lowest was in October and highest in August.
- (c) *H. nana* ova were not found throughout the period except in the months of August and October when it was 2.66 and 1.00% respectively.
- (d) *Trichuris* eggs were also only seen on two occasions during the months of August and November and figure remained as 1.33% in both the cases,

TABLE No. XI

Shamnagar Locality

Out of 675 houseflies examined, 3.25% were found to have helminthic ova on their body and this percentage varied from 1.33 to 5.33% during the different months. Hookworm ova were present in 1.78% of the flies examined, Roundworm ova were in 1.18% and the lowest figure was of *Trichuris* viz., 0.29%.

Monthwise distribution of Helminthic ova was as under :—

- (a) *Ascaris* ova presence remained at 1.33% in the 5 months examinations. It was 2% in the months of August and October and the eggs were absent in the flies examined during the months of March and April.
- (b) *Hookworm* eggs presence ranged from 1.33 to 4.00% in the different 7 months examinations. The flies were found without these eggs in the months of August and December.
- (c) *Trichura* ova were present only on two occasions in the months of November and April and the percentage in both the months was 1.33.

TABLE No. XII

Samanabad Locality

4.0 % flies were found to be positive for the presence of helminthic ova out of 625 examined. The percentage varied from 1.33—12% during the different months of study. It was least in the months of December and January and was highest in September. The pattern of infection was in this order :—

Ascaris ova, 2.56, *Hookworm* ova 1.28 and *H. nana* 0.16%.

Monthwise distribution of helminthic ova was as under :—

- (a) *Ascaris* ova. The percentage of these eggs present in house flies in different months ranged from 1.33—8%. It was highest in September viz., 8% and lowest from December to March viz., 1.33%.

- (b) *Hookworm* eggs. The flies were without these eggs in the months of October, December and January and in the rest of the 6 months examinations the percentage ranged from 1—4.00%. It was least in November and highest in September.
- (c) *H. nana*. This infection was very nominal in the locality and was found only in one fly during the investigation month of November in which 75 flies were examined.

TABLE No. XIII

Wahdat Colony Locality

Out of the 700 flies examined, 2.42% were found with the Helminthic ova. The percentage of infection varied from 1.33—4.90% during the different months of observations, except in December when the flies were found free of these eggs. Only two types of helminthic ova were found in these observations. Their percentage was 2.00% of *Ascaris* ova and 0.42% *hookworm* eggs.

Monthwise distribution of helminthic ova in the flies was as under :—

- (a) *Ascaris* ova were not in flies examined in the month of December and in other 8 months examinations their percentage ranged from 1.33—4.00%. The minimum figure was in the months of January and March and the highest was in October.
- (b) *Hookworm* eggs were present in only two months examinations, and the percentage of flies with these eggs was 1.00 and 1.60% in the months of November and August respectively. The flies examined in other 7 months were free of these eggs.

TABLE No. XIV

The results of the parasitic infection present among the houseflies of different surveyed localities are quoted below.

- (a) *Ascaris lumbricoides*. The percentage of flies with these ova in different localities of Lahore city ranged from 1.07% to 3.14%. The lowest
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figure was of Baboo Saboo and the highest was of Krishan Nagar. The prevalence of *Ascaris lumbricoides* infection amongst houseflies of Sanda Khurd, Rajgarh, Samanabad and Wahdat Colony was nearly similar and varied from 2.00% to 2.76%. The localities of Bakar-mandi and Krishan Nagar had also the same rates of infection which were 3.07% and 3.14% respectively. In the remaining 6 localities the pattern of this *Helminthic* infection was same and varied from 1.07% to 1.57%.

- (b) *Hookworm ova*. The distribution of this *Helminthic* infection ranged from 0.43%—6.12% i.e. the lowest percentage was in Wahdat Colony and the highest locality effected was Sodhiwal. The behaviour of *hookworm* infection amongst the houseflies categorized the localities Sodhiwal and Baboo Saboo in one group and Nawankot, Pakki Thatti and Bakar Mandi in the second group and Sanda Khurd and Sanda Kalan in third group while the remaining localities were in the other group.
- (c) *Enterohius vermicularis*. Ova were not detected amongst the flies of Nawankot, Sanda Khurd, Krishan Nagar, Sham Nagar Samanabad and Wahdat Colony. Only 6 localities out of 12 had this infection in the flies and in these the rate varied from 0.01—0.28%. The lowest figure represented Baboo Saboo and the highest percentage was of Sanda Kalan.
- (d) *Hymenolepis nana* ova were detected in the flies of nine localities and the flies of rest of the three localities viz., Pakki Thatti, Sham Nagar, Wahdat Colony were free of these eggs. The percentage was highest i.e., 0.87% in Sanda Khurd locality and was lowest i.e., 0.01% in Bakar Mandi. In fact the prevalence of the infection was very nominal,
- (e) *Trichiuris trichura* eggs ranged from 0.05 to 1.28% in the flies of different localities. The lowest percentage was of Sanda Khurd and the highest was of Nawankot. The flies of Pakki Thatti, Samanabad and Wahdat Colony were free of this *Helminth*. The prevalence of *Trichiuris trichiura* infection grouped the localities Nawankot, Sodhiwal, Bakar-mandi and Baboo Saboo in one category and the localities Sanda Khurd, Sanda Kalan, Rajgarh, Krishan Nagar and Shamnagar in the other group.

- (f) *Taenia* eggs were only present in flies of three out of twelve localities, viz., Sodhiwal, Bakkarmandi and Sinda Kalan and the percentage was 0.12, 0.07 and 0.14 % respectively.
- (g) Mites were present in the flies of seven localities and in them the percentage ranged from 0.01 - 0.42. The highest figure represented Sodhiwal and the lowest was of Babon Sabon. The flies of Sinda Khurd, Krishan Nagar, Shamnagar and Wahdat Colony were free of it.

The above interpretation of the table showed that the infection was highest for Hookworm. The second in the series was of *Ascaris lumbricoides*.

TABLE NO. XV

Shows the prevalence of parasitic infections in house flies during the period August 1965 to April, 1966 in the specified localities. The number of flies examined was 1300 for the months of September October Novembre 1965 and March, 1966. In December, 1965, the number of flies examined was 350 but the percentage of the total examined was 12.18% which is highest from all months. The percentage of the positive cases varied from 0.55 to 1.00 % for the months of April, 1966 and October, 1965. The percentage of total positive categorised the month of August September October 1965 in one group and the remaining period in the other group.

SUMMARY

1. The parasitic surveys were carried out in certain localities of Lahore city. From these studies it became evident that the incidence of Helminthic infections is in general alarmingly high.

2. In order to assess the role of house flies in the dissemination of helminthic infections, a house fly survey was carried out from August, 1965 to April, 1966 in 12 localities of Lahore.

3. The analysis of this data has shown that the infection of the helminthic ova in the House flies varies considerably from locality to locality. The over-all Helminthic infection was found to be more from the localities with poor sanitary conditions and to be lesser with improved sanitation.

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4. The total number of flies examined from all the localities was 11075, out of which 756 were positive for the presence of one or the other parasite. Highest number of flies were examined from Nawan Kot i.e. 1725 and the lowest number (625) was examined from Samanabad area.

5. The highest helminthic infection rate was 11.0% in the house flies from the Bakkarmandi area and was lowest i.e. 2.43% in the flies from the Wahdat Colony.

6. Hookworm infection was found in the flies of all the 12 localities. Next in order of prevalence was the infection of *Ascaris lumbricoides*. Infection with other types of helminths was also present but was insignificant.

7. Hookworm infection rate was highest in the flies of Sodhiwal locality i.e. 6.12% and was lowest in the area of Wahdat Colony i.e. 0.42% while the corresponding figures of highest and lowest for the *Ascaris lumbricoides* infection were 3.14% in Krishan Nagar and 1.07% in Baboo Saboo.

8. Study of seasonal distribution of parasitic infections in house flies in different localities has revealed that the incidence of the infection is not influenced by the variability of the season. The helminthic infection ranged between 8.2–14.15% in the months of April, 1966 and August, 1965 respectively.

9. Incidentally it may be mentioned that the house flies from seven localities were found infested with parasitic Mites and in them the percentage varied from 0.01–0.42%. The highest figure represented Sodhiwal and the lowest was of Baboo Saboo. The identification of the Mites was however, not attempted.

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1. Ansari, M. A. Rahman (1966) Intestinal Protozoas and Helminths in Random Sample of Boys and Girls. *Pak. Jour Hlth., Lahore*, 16 (1) : 8—22.
2. Ansari, M.A. Rahman and Naru, N.A. (1966) The Prevalence of intestinal parasites in the Lahore Mental Hospital (Male cases). *Pak. Jour. Hlth., Lahore*, 16 (3) : 146—164.
3. Ansari, M. A. Rahman and Sapru, Z. A. (1963—64). A survey of human intestinal parasites in conservancy staff of City Corporation, Lahore. *Pak. Jour. Hlth. Lahore*, 13 (3) : 196—232, (4) : 234—306.
4. Ansari, M. A. Rahman and Sapru, Z. A. (1964). Intestinal parasitic infections in children of a Primary School of Lahore. *Pak. Jour. Hlth., Lahore*, 14 (2) : 86—155.
5. Ansari, M. A. Rahman, Sapru, Z. A. and Naru, N. A. (1964). A Survey of intestinal parasites in a village within City Corporation of Lahore—Incidence in females. *Pak. Jour. Hlth., Lahore*, 14 (4) : 239—285.
6. Ansari, M. A. Rahman, Sapru, Z. A. and Naru, N. A. (1965). A survey of intestinal parasites in village Sahowary—Incidence in males. *Pak. Jour. Hlth. Lahore*, 15 (1) : 16—39.
7. Ansari, M. A. Rahman Sapru, Z. A. and Naru, N.A. (1966). The occurrence of intestinal parasites in an Orphanage is still an outstanding problem. *Pak. Jour. Hlth., Lahore*, 16 (1) : 27—43.

Distribution of Parasitic Infections Present in the House flies During the Period

Months.	Nawan Kot.		Pakki	Thatti	Sodhiwal	
	Total Exam.	Total +ve.	Total exam.	Total +tive	Total exam.	Total +ve
August 1965 ...	125	13	50	5	75	12
September 1965 ..	225	15	100	12	200	17
October 1965 ...	225	20	100	7	225	25
November 1965...	225	14	69	4	225	12
December 1965...	200	9	100	3	200	23
January 1966 ...	200	14	75	2	200	19
February 1966 ...	200	17	75	5	200	17
March 1966 ...	225	8	75	3	225	22
April 1966 ...	100	11	100	6	100	11
Total ...	1725	121	750	47	1650	158
Percentage of total exam.	...	7.01	...	6.26	...	9.58

No. 1
From August 1965 to April 1966 in Different Localities of Lahore City.

Bakharmandi		Baboo Saboo		Sanda Khurd	
Total exam.	Total +ve	Total exam.	Total +ve	Total exam.	Total +ve
150	15	150	21	125	10
150	13	150	7	100	8
100	14	100	13	100	9
100	12	100	10	75	3
150	16	125	10	75	3
100	12	100	11	100	6
100	10	100	9	75	4
100	12	100	7	75	2
50	6	75	9	75	5
1000	110	1000	97	800	50
...	11.00	...	9.07	...	6.25

Distribution of Parasitic Infections Present in the Houseflies During the Period

Months.	Sanda Kalan		Rajgarh		Krishan Nagar	
	Total exam.	Total +ve	Total exam.	Total +ve	Total exam.	Total +ve
August 1965 ...	50	5	50	5	75	8
September 1965 ..	75	5	75	5	75	5
October 1965 ..	100	5	100	7	100	5
November 1965...	75	2	75	3	75	5
December 1965...	100	4	100	2	75	2
January 1966 ...	75	7	75	4	75	2
February 1966 ...	75	3	75	2	75	1
March 1966 ...	100	7	100	6	75	3
April 1966 ...	75	3	75	1	75	2
Total ...	725	41	725	35	700	33
Percentage of total exam.	...	5.65	...	4.83	...	4.71

Observations on House Flies as Natural Carrier of the Helminths

No. 1 - (Concl.)

125

From August 1965 to April 1966 in Different Localities of Lahore City.

Shamnagar		Samanabad.		Wahdat Colony	
Total exam.	Total +ve	Total exam.	Total +ve.	Total exam.	Total +ve.
50	1	75	6	125	6
75	3	25	3	50	1
100	4	25	1	25	1
75	3	100	5	100	3
75	1	75	1	75	
75	3	75	1	75	1
75	4	75	2	75	2
75	1	75	2	75	1
75	2	100	4	100	2
675	22	625	25	700	17
...	3.25	...	4.00	...	2.43

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TABLE
Percentage of the Parasitic Infection present in the House flies

Months	Total examined	Type of the parasitic					
		*A.L.		H. W.		E. V.	
		Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage
August 1965 ...	125	3	2.40	9	7.20	...	...
September 1965 ...	225	4	1.77	5	2.22	...	...
October 1965 ...	225	7	3.11	12	5.33	...	...
November 1965 ...	225	5	2.22	5	2.22	...	...
December 1965 ...	200	...	...	6	3.00	...	...
January 1966 ...	200	2	1.00	10	5.00	...	...
February 1966 ...	200	2	1.00	7	3.50	...	...
March 1966 ...	225	1	0.44	5	2.25	...	...
April 1966 ...	100	3	3.00	5	5.00	...	...
Total ...	1725	27	1.57	64	3.71	...	...

* A. L. = *Ascaris lumbricoides*. H. W. = Hookworm. E. V. = *Enterobius*
T. T. = *Trichuris trichiura*.

Observations on House Flies as Natural Carrier of the Helminths

127

No. II

of Nawar Kot from August 1965 to April, 1966

H. N.		T. T.		Taenia		Mite		Total No. positive,	Total Per-centage
Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage		
...	...	1	0.80	...	...	...	...	13	10.40
2	0.90	4	1.77	...	...	...	...	15	6.66
...	...	1	0.44	...	...	...	...	20	8.88
...	...	4	1.77	...	...	...	...	14	6.22
...	...	3	1.05	...	...	...	...	9	4.05
...	...	2	1.00	...	...	...	...	14	7.00
...	...	2	1.00	...	...	6	3.00	17	8.50
...	...	2	0.88	...	...	...	...	8	3.57
...	...	3	3.00	...	...	...	...	11	11.00
2	0.11	22	1.28	...	...	6	0.34	121	7.01

vermicularis. H. N = Hymenolepis nana.

" Pak. Jour. Hlth. 1968-69 "

TABLE
Percentage of the Parasitic Infection Present in the House flies of

Months	Total exam- ined.	Type of the parasitic					
		*A. L.		H. W.		E. V.	
		Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage
August 1965	50	2	4.00	3	6.00	...	...
September 1965	100	3	3.00	8	8.00	...	...
October 1965	100	1	1.00	6	6.00	...	...
November 1965	75	...	...	3	4.00	...	...
December 1965	100	2	2.00	1	1.00	...	...
January 1966	75	...	...	2	2.66	...	...
February 1966	75	1	1.33	4	5.33	...	...
March 1966	75	1	1.33	2	2.66	...	...
April 1966	100	1	1.00	4	4.00	1	1.00
Total	750	11	1.47	33	4.04	1	0.13

*A. L. = *Ascaris lumbricoides*. H. W. = Hookworm. E. V. = *Enterobius*
T. T. = *Trichuris trichiura*.

Observations on House Flies as Natural Carrier of the Helminths

129

No. III.

Pakki Thathi from August, 1965 to April, 1966.

infection.

H. N.		T. T.		Taenia		Mite		Total No. positive	Total Per-centage
Posi-tive	Per-centage	Posi-tive	Per-centage	Posi-tive	Per-centage	Posi-tive	Per-centage		
...	...	...	...	...	...	...	...	5	10.00
...	...	...	...	...	...	1	1.00	12	12.00
...	...	...	...	...	...	...	...	7	7.00
...	...	...	...	...	...	1	1.33	4	5.33
...	...	...	...	...	...	...	...	3	3.00
...	...	...	...	...	...	...	...	2	2.66
...	...	...	...	...	...	...	...	5	6.66
...	...	...	...	...	...	...	...	3	4.00
...	...	...	...	...	...	...	...	6	6.00
...	...	...	...	...	...	...	...		
...	...	...	...	...	...	2	0.26	47	6.26

vermiculgris. H. N. = *Hymenolepis nana*.

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TABLE
Percentage of the Parasitic Infection Present in the House flies of

Months.	Total exam- ined	Type of the parasitic					
		*A. L.		H. W.		E. V.	
		Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Pre- centage
August 1965	75	2	2.66	5	6.66	...	...
September 1965	200	4	2.00	8	4.00	1	0.05
October 1965	225	5	2.22	17	7.55	...	...
November 1965	225	3	1.33	5	2.22	...	...
December 1965	200	3	1.05	13	6.50	...	...
January 1966	200	4	2.00	13	6.05	...	...
February 1966	200	...	...	15	7.05	...	...
March 1966	225	2	0.88	17	7.55	...	...
April 1966	100	...	...	8	8.00	...	...
Total	1650	23	1.40	101	6.12	1	0.06

*A.L. = *Ascaris lumbricoides*. H. W = Hookworm. E. V. = *Enterobius*
T. T. = *Trichuris trichiura*.

Observations on House Flies as Natural Carrier of the Helminths

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No. IV

Sodhiwal from August, 1965 to April, 1966.

infection.

H. N.		T. T.		Taenia		Mite		Total No, positive	Total Percentage
Positive	Percentage	Positive	Percentage	Positive	Percentage	Positive	Percentage		
...	...	3	4.00	...	...	2	2.66	12	16.00
...	...	2	1.00	2	1.00	...	...	17	8.05
...	...	2	0.88	...	...	1	0.44	25	11.11
...	...	4	1.77	...	...	...	...	12	5.33
...	...	7	3.05	...	...	...	...	23	11.05
...	...	1	0.05	...	...	1	0.05	19	0.05
2	1.00	...	...	...	...	...	...	17	8.05
...	...	1	0.44	...	...	2	0.88	22	9.77
2	2.00	...	...	...	...	1	1.00	11	11.00
4	0.24	20	1.21	2	0.12	7	0.42	158	9.57

vermiculariv. H.N. = *Hymenolepis nana*.

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TABLE
Percentage of the Parasitic infection present in the house

Months	Total ex- amined	Type of the					
		*A. L.		H. W.		E. V.	
		Posi- tive	Per- centage	Pois- tive	Per- centage	Posi- tive	Per- centage
August 1965	150	7	4.66	3	2.00	...	...
September 1965	150	4	2.66	5	3.33	...	...
October 1965	100	7	7.00	5	5.00	...	...
November 1965	100	2	2.00	6	6.00	...	...
December 1965	150	6	4.00	5	3.33	3	2.00
January 1966	100	5	5.00	7	7.00	...	...
February 1966	100	...	...	9	9.00	...	...
March 1966	100	6	6.00	2	2.00	...	...
April 1966	50	...	...	4	8.00	...	...
Total	1000	37	3.07	46	4.06	3	0.03

*A. L. = *Ascaris lumbricoides*.

T. T. = *Trichuris trichiura*.

H. W. = Hookworm. E. V. = *Enterobius*

Observations on House Flies as Natural Carrier of the Helminths

133

NO. V

flies of Bakharmandi from August, 1965 to April, 1966.

parasitic infection.

H. N.		T. T.		Taenia		Mite		Total No. positive	Total Per-centage
Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage		
...	...	3	2.00	1	0.66	1	0.66	15	10.00
...	...	1	0.66	3	2.00	...	...	13	8.66
...	...	...	...	2	2.00	...	...	14	14.00
...	...	...	...	...	...	...	...	12	12.00
...	...	4	4.00	...	...	...	...	16	10.66
...	...	2	1.33	...	...	...	...	12	12.00
...	...	...	...	...	...	...	...	10	10.00
...	...	...	...	4	1.00	...	...	12	12.00
...	...	3	3.00	...	...	1	1.00	6	12.00
1	2.00	...	...	...	...	1	2.00		
1	0.01	13	1.03	7	0.07	3	0.03	110	11.00

vermicularis. H. N. = *Hymenolepis nana*.

TABLE
Percentage of the Parasitic Infection Present in the House flies of

Months	Total exam- ined	Type of the parasite					
		*A. L.		H. W.		E. V.	
		Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage
August 1965	150	8	5.33	11	7.33	...	...
September 1965	150	1	0.66	4	2.66	1	0.66
October 1965	100	1	1.00	7	7.07	...	...
November 1965	100	...	...	6	6.00	...	...
December 1965	125	1	0.08	8	6.04	...	...
January 1966	100	...	...	8	8.00	...	...
February 1966	100	2	2.00	7	7.00	...	...
March 1966	100	1	1.00	6	6.00	...	...
April 1966	75	3	4.00	5	6.66	...	...
Total	1000	17	1.07	62	6.02	1	0.01

*A. L. = *Ascaris lumbricoides*.

T. T. = *Trichuris trichiura*.

H. W. = Hookworm. E. V. = *Enterobius*

No. VI

Baboo Saboo from August, 1965 to April, 1966

infection								Total No. posi- tive	Total Per- centage centage
H. N.		T. T.		Taenia		Mite			
Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per-		
1	0.66	...	...	...	...	1	0.66	21	14.00
...	...	1	0.66	...	...	...	...	7	4.66
4	4.00	1	1.00	...	...	...	...	13	13.07
...	...	4	4.00	...	...	...	...	10	10.00
...	...	1	0.08	...	...	...	...	10	8.00
...	...	3	3.00	...	...	...	...	11	11.00
...	...	...	...	...	...	...	...	9	9.00
...	...	...	...	...	...	...	...	7	7.00
...	...	4	1.33	...	...	...	...	9	12.00
5	0.05	11	1.01	...	...	1	0.01	97	9.07

vermicularis, H. N. = *Hymenolepis nona*.

TABLE
Percentage of the Parasitic infection present in the house

Months	Total ex- amined	Type of the					
		*A. L.		H. W.		E. V.	
		Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage
August 1965 ...	125	3	2.40	4	3.20	...	...
September 1965 ...	100	3	3.00	4	4.00	...	...
October 1965 ...	100	4	4.00	2	2.00	...	...
November 1965 ...	75	1	1.33	1	1.33	...	...
December 1965 ...	75	1	1.33	2	2.66	...	...
January 1966 ...	100	2	2.00	3	3.00	...	...
February 1966 ...	75	1	1.33	2	2.66	...	...
March 1966 ...	75	2	2.66	...	...	...	...
April 1966 ...	75	1	1.33	3	4.00	...	...
Total ...	800	18	2.25	21	2.62	...	...

*A. L. = *Ascaris lumbricoides*.
T. T. = *Trichuris trichiura*.

H. W. = Hookworm. E. V. = *Enterobius*

No. VII

flies of Sanda Khurd from August 1965 to April 1966.

parasitic infection.

H. N.		T. T.		Taenia		Mite		Total No. posi-	Total Per-centage
Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage		
1	0.80	2	1.60	...	...	...	...	10	8.00
1	1.00	...	...	...	...	...	...	8	8.00
2	2.00	1	1.00	...	...	...	...	9	9.00
1	1.33	...	...	...	...	...	...	3	4.00
...	...	...	...	...	...	...	...	3	4.00
1	1.00	...	...	...	...	...	...	6	6.00
...	...	1	1.33	...	...	...	...	4	5.33
...	...	...	...	...	...	...	...	2	2.66
1	1.33	...	...	...	...	...	...	5	6.66
7	0.87	4	0.05	...	...	...	...	50	6.25

vermicularis. H. N. = *Hymenolepis nana*.

TABLE
Percentage of the Parasitic Infection Present in the House flies of

Months	Total Examined	Type of the parasitic					
		*A. L.		H. W.		E. V.	
		Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage
August 1965 ...	50	1	2.00	2	4.00	1	2.00
September 1965 ...	75	2	2.66	3	4.00	...	...
October 1965 ...	100	1	1.01	2	2.00	...	...
November 1965 ...	75	...	...	1	1.33	...	...
December 1965 ...	100	2	2.00	1	1.00	...	...
January 1966 ...	75	1	1.33	5	6.66	...	...
February 1966 ...	75	1	1.33	1	1.33	1	1.33
March 1966 ...	200	2	2.00	3	3.00	...	...
April 1966 ...	75	1	1.33	1	1.33	...	...
Total ...	725	11	1.51	19	2.62	2	0.28

*A. L. = *Ascaris lumbricoides*. H. W. = Hookworm. E. V. = *Enterobius*
T. T. = *Trichuris trichiura*.

No. VIII

Sanda Kalan from August, 1955 to April, 1966.

parasitic infection.

H. N.		T. T.		Taenia		Mite		Total No. positive	Total Per-centage
Posi-tive	Per-centage	Posi-tive	Per-centage	Posi-tive	Per-centage	Posi-tive	Per-centage		
...	...	...	...	...	...	1	2.00	5	10.00
...	...	...	...	...	...	...	...	5	6.66
...	...	...	...	1	1.00	1	1.00	5	5.00
...	...	1	1.33	...	...	...	...	2	2.66
1	1.00	...	...	...	...	...	...	4	4.00
...	...	1	1.33	...	...	...	...	7	9.33
...	...	...	...	...	...	...	...	3	4.00
1	1.00	1	1.00	...	...	...	...	7	7.00
1	1.33	...	...	...	...	...	...	3	4.00
3	0.41	3	0.41	1	0.14	2	0.28	41	5.65

vermicularis. H. N. = *Hymenolepis nana*.

" Pak. Jour. Hlth, 1968-69 "

TABLE
Percentage of the Parasitic Infection Present in the House flies of

Months	Total exam- ined	Type of the parasitic					
		*A. L.		H. W.		E. V.	
		Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage
August 1965	50	3	6.00	2	4.00	...	...
September 1965	75	3	4.00	...	..	...	...
October 1965	100	4	4.00	1	1.00	1	1.00
November 1965	75	2	2.66	...	...	...	...
December 1965	100	...	...	2	2.00	...	...
January 1966	75	3	2.66	1	1.33	...	...
February 1966	75	2	2.66	...	...	...	...
March 1966	100	3	3.00	2	2.00	...	...
April 1966	75	1	1.33	...	...	...	...
Total	725	20	2.76	8	1.10	1	0.14

* A. L. = *Ascaris lumbricoides*.

T. T. = *Trichuris trichiura*.

H. W. = Hookworm.

E. V = *Enterobius*

No. IX

Rajgarh from August, 1965 to April, 1966

infection								Total No. posi- tive	Total Per- centage
H. N.		T. T.		Taenia		Mite			
posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage		
...	...	...	...	...	...	...	...	5	10.00
2	2.66	...	...	...	...	...	...	5	6.66
1	1.00	...	...	...	...	...	...	7	7.00
1	1.33	...	...	...	...	...	...	3	4.00
...	...	...	...	...	...	...	...	2	2.00
...	...	1	1.33	...	...	...	...	4	5.33
...	...	...	...	...	...	...	...	2	2.66
...	...	...	...	...	...	1	1.00	6	6.00
...	...	...	...	...	...	...	...	1	1.33
4	0.55	1	0.14	...	...	1	0.14	35	4.83

vermicularis. H. N. = *Hymenolepis nana*

TABLE
Percentage of the Parasitic infection present in the house

Months	Total ex- amined	Type of the					
		*A. L.		H. W.		E. V.	
		Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage
August 1965	75	3	4.00	2	2.66	...	...
September 1965	75	4	5.33	1	1.33	...	...
October 1965	100	3	3.00	1	1.00	...	...
November 1965	75	3	4.00	1	1.33	...	...
December 1965	75	2	2.66	...	...	...	...
January 1966	75	2	2.66	...	...	...	...
February 1966	75	1	1.33	...	...	...	...
March 1966	75	2	2.66	1	1.33	...	...
April 1966	75	2	2.66	...	...	...	...
Total	700	22	3.14	6	0.86	...	...

*A. L. = *Ascaris lumbricoides*.

T. T. = *Tricburis trichiura*.

H. W. = Hookworm. E. V. = *Enjerobius*

No. X

flies of Krishan Nagar from August 1965 to April 1966.

parasitic infection.								Total No. posi- tive	Total Per- centage
H. N.		T. T.		Taenia		Mite			
Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage		
2	2.66	1	1.33	...	...	...	...	8	10.66
...	...	...	...	...	...	...	...	5	6.66
1	1 00	...	...	...	...	...	...	5	5.00
...	...	1	1.33	...	...	...	...	5	6.66
...	...	...	...	...	...	...	...	2	2.66
...	...	...	...	...	...	...	...	2	2.66
...	...	...	...	...	...	...	...	1	1.33
...	...	...	...	...	...	...	...	3	4.00
...	...	...	...	...	...	...	...	2	2.66
3	0.43	2	0.28	...	...	...	...	33	4.72

vermiculari H. N. = *Hymenolepis nana*.

TABLE
Percentage of the Parasitic Infection Present in the House flies of

Months	Total exam- ined	Type of the parasitic					
		*A. L.		H. W.		E. V.	
		Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage
August 1965	50	1	2.00	...	...	...	...
September 1965	75	1	1.33	2	2.66	...	...
October 1965	100	2	2.00	2	2.00	...	...
November 1965	75	1	1.33	1	1.33	...	...
December 1965	75	1	1.33	...	...	...	...
January 1966	75	1	1.33	2	2.66	...	...
February 1966	75	1	1.33	3	4.00	...	...
March 1966	75	...	...	1	1.33	...	...
April 1966	75	...	...	1	1.33	...	...
Total	675	8	1.18	12	1.78	...	...

*A. L. = *Ascaris lumbricoides*. H. W. = Hookworm. E. V. = *Enterobius*
T. T. = *Trichuris trichiura*.

No. XI.

Shamnagar from August, 1965 to April, 1966.

infection								Total No. posi- tive	Tot-al Per centage
H. N.		T. T.		Taenia		Mite			
Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage		
...	...	...	...	...	...	...	...	1	2.00
...	...	...	...	...	...	...	...	3	4.00
...	...	...	...	...	...	...	...	4	4.00
...	...	1	1.33	...	...	...	...	3	4.00
...	...	...	...	...	...	...	...	1	1.33
...	...	...	...	...	...	...	...	4	5.33
...	...	...	...	...	...	...	...	4	5.33
...	...	...	...	...	...	...	...	1	1.33
...	...	1	1.33	...	...	...	...	2	2.66
...	...	2	0.29	...	...	...	...	22	3.25

vermicularis. H. N. = *Hymenolepis nana*.

No. XI.

Shamnagar from August, 1965 to April, 1966.

infection								Total No. posi- tive	Tot-al Per centage
H. N.		T. T.		Taenia		Mite			
Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage		
...		...	...		...	...	...	1	2.00
...	...	...	...	...	...	...	...	3	4.00
...	...	...	...	...	...	...	...	4	4.00
...	...	1	1.33	...	...	...	...	3	4.00
...	...	...	...	...	...	...	...	1	1.33
...	...	...	...	...	...	...	...	4	5.33
...	...	...	...	...	...	...	...	4	5.33
...	...	...	...	...	...	...	...	1	1.33
...	...	1	1.33	...	...	...	...	2	2.66
...	...	2	0.29	...	...	...	...	22	3.25

vermicularis. H. N. = *Hymenolepis nana*.

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TABLE
Percentage of the Parasitic Infection Present in the Houseflies of
Type of the parasitic

Months	Total exam- ined	Type of the parasitic					
		A. L.		H. W.		E. V.	
		Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage
August 1965 ...	75	4	5.33	2	2.66	...	...
September 1965 ...	25	2	8.00	1	4.00	...	...
October 1965 ...	25	1	4.00	...	...	...	...
November 1965 ...	100	3	3.00	1	1.00	...	...
December 1965 ...	75	1	1.33	...	...	...	...
January 1966 ...	75	1	1.33	...	...	...	...
February 1966 ...	75	1	1.33	1	1.33	...	...
March 1966 ...	75	1	1.33	1	1.33	...	...
April 1966 ...	100	2	2.00	2	2.00	...	...
Total ...	625	16	2.56	8	1.28	...	...

* A. L. = *Ascaris lumbricoides*.

T. T. = *Trichuria trichiura*.

H. W. Hookworm.

E. V. = *Enerobius*

No. XII

Samanabad From August 1965 to April 1966.

infection.								Total No. Positive	Total Percentage
H. N.		T. T.		Taenia		Mite			
Positive	Percentage	Positive	Percentage	Positive	Percentage	Positive	Percentage		
...	...	...	...	...	...	...	...	6	8.00
...	...	...	...	...	...	...	...	3	12.00
...	...	...	...	...	...	...	...	1	4.00
1	1.00	...	...	...	...	...	...	5	5.00
...	...	...	...	...	...	...	...	1	1.33
...	...	...	...	...	...	...	...	1	1.33
...	...	...	...	...	...	...	...	2	2.66
...	...	...	...	...	...	...	...	2	2.66
...	...	...	...	...	...	...	...	4	4.00
1	0.16	...	...	...	...	...	...	25	4.00

vermicularis. H. N. = *Hymenolepis nana*.

TABLE
Percentage of the Parasitic infection present in the house

Months	Total ex- amined	Type of the					
		*A. L.		H. W.		E. V.	
		Posi- tive	Per- centage	Posi- tive	Per- centage	Posi- tive	Per- centage
August 1965	125	4	3.20	2	1.60	...	...
September 1965	50	1	2.00	..	...	...	...
October 1965	25	1	4.00	...	...	...	...
November 1965	100	2	2.00	1	1.00	...	...
December 1965	75	..	...	...	...	...	...
January 1966	75	1	1.33	...	...	...	...
February 1966	75	2	2.66	...	...	...	...
March 1966	75	1	1.33	...	...	...	...
April 1966	100	2	2.00	...	...	...	...
Tota	700	14	2.00	3	0.42	...	...

*A. L. = *Ascaris lumbricoides*.

T.₃T. = *Trichuris trichiura*.

H. W. = Hookworm. E. V. = *Enterobius*

No. XIII

flies of Wahdat Colony from August 1965 to April, 1966.

parasitic infection

H. N.		T. T.		Taenis		Mite		Total No. positive	Total Percentage
Positive	Percentage	Positive	Percentage	Positive	Percentage	Positive	Percentage		
...	...	...	...	...	...	..	...	6	4.80
...	...	...	...	...	...	...	...	1	2.00
...	...	...	...	...	...	...	...	1	4.00
...	..	...	...	...	...	...	...	3	3.00
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	1	1.33
...	...	...	...	...	...	...	...	2	2.66
...	...	...	...	...	...	...	...	1	1.33
...	...	...	...	...	...	...	...	2	2.00
...	...	...	...	...	...	...	...	17	2.42

vermicularis. H. N. = *Hymenolepis nana*.

TABLE XIV
Percentage Distribution of Parasitic Infections in Different Localities of Lahore City
From August, 1965 to April, 1966

Localities	Type of the Parasitic Infection							
	Examined	A. L. Percentage	H. W. Percentage	E. V. Percentage	H. N. Percentage	T. T. Percentage	Taenia Percentage	Mite Percentage
1. Nawan Kot ...	1725	1.57	3.51	...	0.11	1.28	...	0.34
2. Pakki Thathi ...	750	1.47	4.04	0.13	...	...	...	0.26
3. Sodhiwal ...	1650	1.40	6.12	0.06	0.24	1.21	0.12	0.42
4. Bakar Mandi ...	1000	3.07	4.06	0.03	0.01	1.03	0.07	0.03
5. Baboo Saboo ...	1000	1.07	6.02	0.01	0.05	1.01	...	0.01
6. Sanda Khurd ...	800	2.25	2.62	...	0.87	0.05	...	...
7. Sanda Kalan ...	725	1.51	2.62	0.28	0.41	0.41	0.14	0.28
8. Rajgarh ...	725	2.76	1.10	0.14	0.55	0.14	...	0.14
9. Krishan Nagar ...	700	3.14	0.86	...	0.43	0.28	...	...
10. Sham Nagar ...	675	1.18	1.78	...	...	0.29	...	...
11. Saman Abad ...	625	2.56	1.28	...	0.16	...	...	...
Wahdat Colony ...	700	2.00	0.43	...	...	...	...	...

Dr. Nazir Alam Naria

Observations on House Flies as Natural Carrier of the Helminths

TABLE No. XV

Table showing the prevalence of parasitic infection in house flies during the period August 1965 to April, 1966 in the specified localities.

Month and year.	Examined	Percent of the total examined	+ tive	Percent of the Total Positive	Percent of the Total Positive
August 1965 ...	1100	9.93	107	0.96	14.15
September 1965 ...	1300	11.7	94	0.85	12.43
October 1965 ...	1300	11.73	111	1.00	14.68
November 1965 ...	1300	11.73	76	0.68	10.05
December 1965 ...	350	12.18	74	0.66	9.78
January 1966 ...	1225	11.06	82	0.74	10.84
Februar 1966 ...	1200	10.83	76	0.68	10.05
March 1966 ...	1300	11.73	74	0.66	9.2
April 1966 ...	1000	9.02	62	0.55	8.20
Total ...	11075	...	756	...	...

GASTRIC PLASMACYTOMA WITH INVOLVEMENT OF VIRCHOW'S LYMPH NODE

Case Report and Review of Literature

By

Amanullah Khan, M.B.B.S.*

Extramedullary plasmacytomas are tumors of rare occurrence. Their relationship to multiple myeloma is still controversial (9, 17). However, this entity offers better prognosis than multiple myeloma (2, 17), and deserves separate consideration. Their occurrence has been reported in a wide variety of organs, which include lungs, trachea, larynx, naso-pharynx, conjunctiva, lip, brain, salivary gland, lacrimal glands, lymph nodes, testes, and gastro-intestinal tract (2, 3, 5, 6, 7, 14, 16). About seventy percent of these cases were seen in the respiratory tract.

The plasmacytoma of the gastro-intestinal tract is an exceedingly rare tumor. North (11) reported the first case of plasmacytoma of the gastro-intestinal tract arising from the ileum in 1924. The first plasmacytoma involving the stomach was reported by Vasiliu in 1928 (15). Since then, twenty-eight cases of plasmacytoma of the stomach have appeared in the world literature. The case to be described will be the twenty-ninth (Table I). However, this case is unique in that it is the first one in which Virchow's lymph node was involved and the diagnosis was established by its biopsy.

CASE REPORT

A fifty-seven year old colored female was referred to Wadley Research Institute for evaluation of anemia, progressive weakness and loss of appetite. Previously, she was hospitalized in March 1966 by her family physician with the same complaints. She was found to be severely anemic and suffering from pneumonia. During her stay in the hospital, she received two pints of whole

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blood and was treated subsequently with vitamins and oral iron. Despite this therapy, she kept losing appetite and became progressively weaker, requiring a second admission to the hospital in June 1966, during which she was given five pints of blood.

At the time of her arrival at Wadley Research Institute on August 1, 1966, she gave a history of tarry stools and bleeding from the nose which required packing, three days prior to this visit.

On physical examination her conjunctivae and mucous membranes were found to be extremely pale. The liver was palpable, smooth, firm and tender, seven centimeters below the right subcostal margin. The supraclavicular (Virchow's) lymph node was palpable. It was firm non-tender, and freely mobile, measuring about one and one-half centimeters in diameter. Her hemoglobin was 2.16 grams, red blood cells 640,000, white blood cells 6,300, platelets 5,000, blood glucose 79 mg; per cent, blood urea nitrogen 12 mg; per cent, sodium 142 mg; per cent and potassium 4 mg; per cent. Cephalin flocculation test was negative at twenty-four hours and one plus at forty-eight hours. The serum alkaline phosphatase was 8.1 units and serum transaminase 39 units per ml; serum protein electrophoresis was within normal limits. Bence Jones protein was not detected but, a heavy growth of *E. coli* was obtained from her urine.

A skeletal survey by x-ray revealed prominent trabecular pattern of the bones which was explained on the basis of her anemia. Fluoroscopy and film studies of the gastro-intestinal tract showed a filling defect in the greater curvature of the stomach which was suggestive of an intramural lesion (Figure I). Excretory urography was normal. X-rays of the colon following a barium enema were reported as normal. A sternal marrow smear did not show any increase or abnormality of the plasma cells. A needle biopsy of the liver would have been very desirable but it could not be performed due to low platelet count of the patient. It is very likely that enlargement of the liver is due to its involvement by plasmacytoma. A biopsy of the Virchow's lymph node was performed on August 11, 1966.

PATHOLOGY

On biopsy the specimen consisted of a nodular rubbery structure, measuring 1.5 cm. in length and 1 cm. in width. It had a homogenous glistening surface on section.

HISTOLOGY

Microsections showed portions of the lymph node with an architecture completely replaced by a monotonous sheet of cells. There was no structure formation visible. On high power examination these cells had abundant cytoplasm which was slightly basophilic. The nuclei were hyperchromatic and eccentric, with clumping of the chromatin near the nuclear membrane. A diagnosis of plasmacytoma was thus made. (Figure 2).

TREATMENT

Considering the patient's general condition, extreme anemia and severe thrombocytopenia, it was decided to treat her conservatively. She was given repeated blood transfusions to keep her hemoglobin around 10 grams per cent. She also received platelet concentrates from time to time, because of her low platelet count. She was running fever due to urinary infection which responded to antibiotics. She was treated with melphalan (Alkeran) and prednisolone. The patient received massive dosages of prednisolone as recommended by Hill *et al* (8). There was marked improvement in her appetite, her hematocrit came up to 40 per cent and she was discharged from the hospital on August 23, 1966. She did fairly well until June, 1967, when her hemoglobin and platelet count dropped again. Melphalan was discontinued at this time. A month later massive steroids were instituted again but with only partial success. The patient is still alive, requiring an increasing number of blood transfusions. Her liver has enlarged by another 4 cm. and her spleen has become palpable, 3 centimeters below the left subcostal margin. She has had repeated respiratory infections during this period, which were managed with appropriate antibiotic therapy. She has bled frequently from her nose.

DISCUSSION

Neoplasms arising from plasma cells can be classified as :

- (1) Multiple myeloma
- (2) Solitary myeloma of the bone
- (3) Extramedullary plasmacytoma.

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Extramedullary plasmacytomas are uncommon tumors of the plasma cell origin and those that arise from the stomach are extremely rare. The present one is the twenty-ninth case to be reported in the world literature (Table I). Out of these twenty-nine cases, twelve were women and seventeen were men. Their ages vary from twenty-eight to seventy-eight years. The maximum incidence seems to be between the ages of forty and sixty (Figure 3).

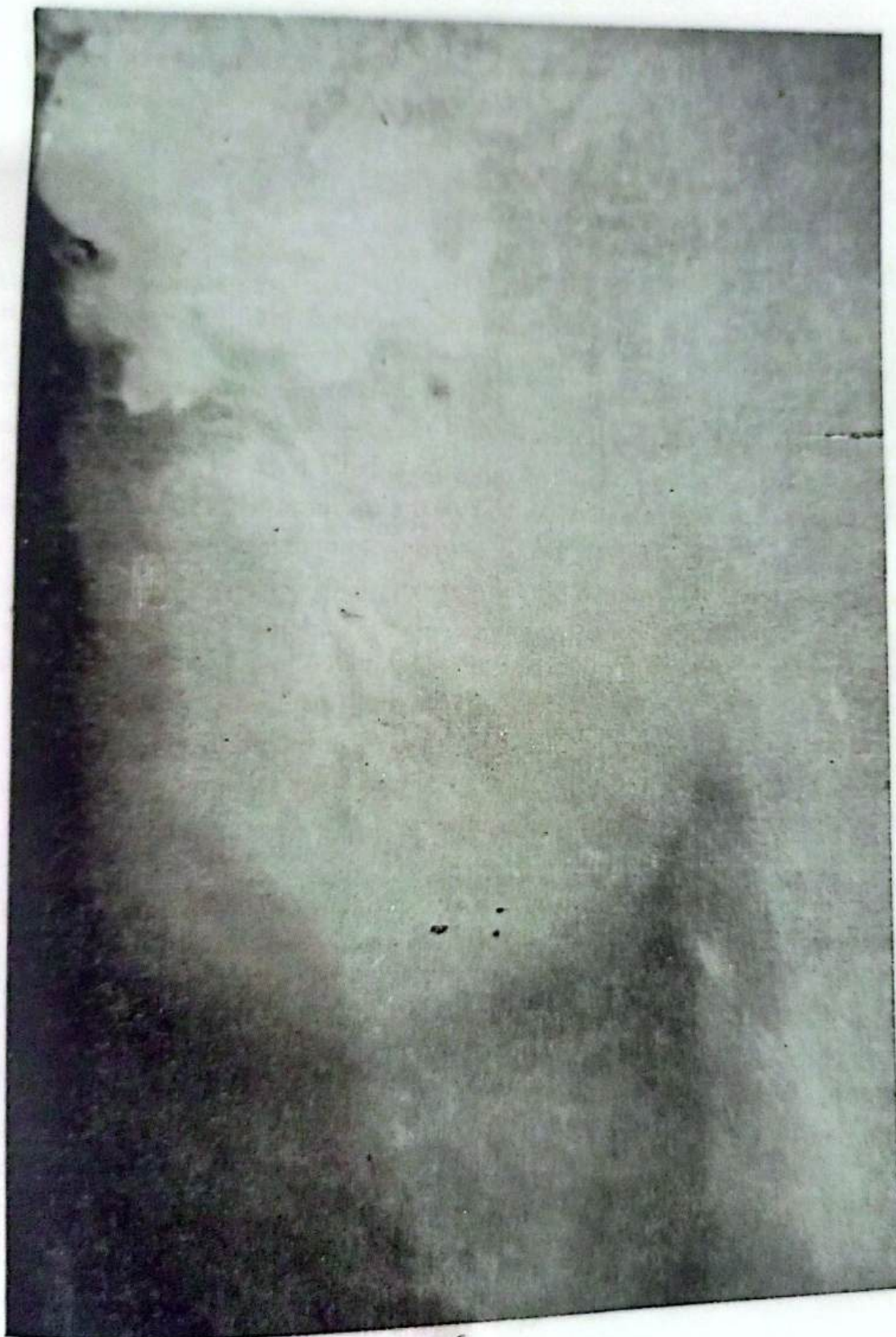
A review of Table I shows that all cases reported in the literature so far were misdiagnosed pre-operatively. This is understandable, considering the predominant symptoms of anorexia, nausea, vomiting, loss of weight and anemia, which are similar to gastric carcinoma. Even radiological examination can not be of much help in differentiating plasmacytoma from carcinoma of the stomach. It was generally held that abnormality of serum globulin and appearance of Bence Jones protein in the urine is not observed in cases with extramedullary plasmacytoma (1, 10, 12). On the contrary, the occurrence of both, a tall M spike in the gamma zone on serum electrophoresis and Bence Jones protein in the urine has been reported recently in a patient with extramedullary plasmacytoma involving lymph nodes, spleen, liver and adrenal glands (4). Therefore, absence of protein abnormalities can no more be considered as a diagnostic evidence in favour of plasmacytoma. The diagnosis is established only on histological examination of the tissues. The presence of an associated multiple myeloma should be excluded by a sternal marrow smear, a radiological survey of the skeleton, and serum calcium and phosphorus determinations.

From the review of past literature, treatment of choice seems to be surgical excision and radiation. Todd has reported sixty percent, five year survival rate following x-ray therapy (13). However, fair results have been obtained in the present case by treating with massive steroids and melphalan.

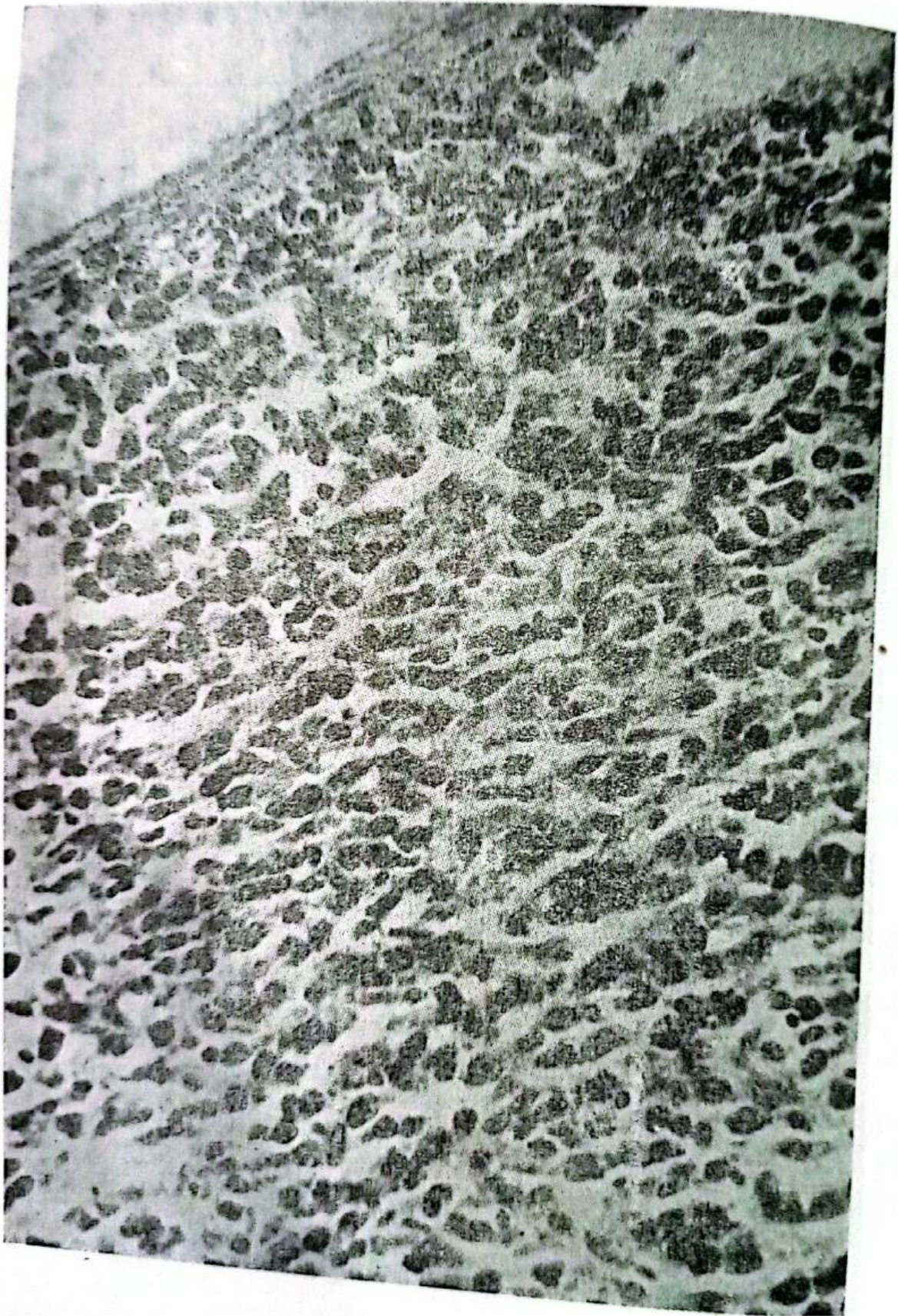
This case emphasizes the point that involvement of Virchow's lymph node associated with a gastric mass which has been considered to be a hallmark of gastric carcinoma, may not very well be so. A biopsy should be performed before making a final diagnosis.

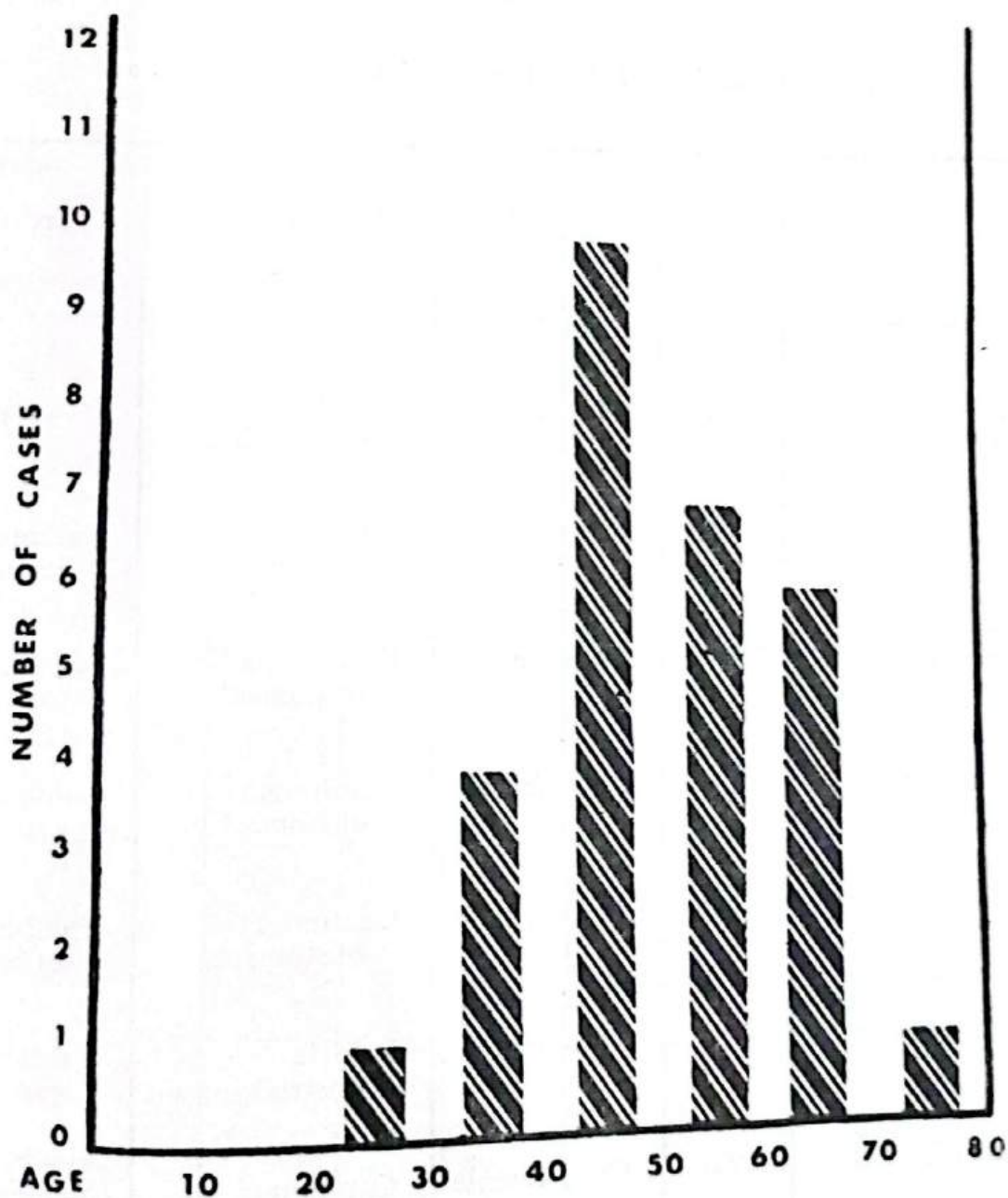
SUMMARY

A case of plasmacytoma of the stomach with involvement of Virchow's lymph node has been described and the literature has been reviewed. The incidence, symptoms, signs, diagnosis, pathology and treatment has been discussed.



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ACKNOWLEDGMENT

I wish to express my gratitude to Dr. Joseph M. Hill, M. D., Director, Wadley Institutes of Molecular Medicine, for his guidance and permission to publish this case.

TABLE I

Literature Review of 29 Cases of Gastric Plasmacytoma

Author	Year	Age	Sex	Initial Diagnosis	Treatment
1. Vasiliu and Popa	1928	32	female	Pyloric obstruction	Not reported
2. Pelagatti ...	1941	65	male	Carcinoma of stomach	Subtotal gastrectomy
3. Pelagatti ...	1941	30	male	Carcinoma of stomach	Subtotal gastrectomy
4. Pelagatti ...	1941	52	female	Carcinoma of stomach	Subtotal gastrectomy
5. Couret ...	1946	48	female	Carcinoma of stomach	Subtotal gastrectomy
6. Schwander et al	1947	42	male	Pyloric obstruction	Subtotal gastrectomy
7. Ravaglia ...	1949	66	female	Carcinoma of stomach	Subtotal gastrectomy
8. Gowron Cohen and	1949	57	male	Carcinoma of stomach	Subtotal gastrectomy

TABLE I—(Contd.)

Literature Review of 29 Cases of Gastric Plasmacytoma

Author	Year	Age	Sex	Initial Diagnosis	Treatment
9. Ende, et al ...	1950	63	male	Carcinoma of stomach	Subtotal gastrectomy and radiotherapy
10. Siegmund ...	1952	45	female	Carcinoma of stomach	Total gastrectomy
11. Schumann ...	1953	53	male	Carcinoma of stomach	Subtotal gastrectomy
12. Ruland ...	1954	47	female	Carcinoma of stomach	Total gastrectomy and radiotherapy
13. Merritt ...	1955	53	male	Carcinoma of stomach	Subtotal gastrectomy
14. Merritt ...	1955	34	female	Pyloric obstruction	Subtotal gastrectomy and jejunal resection
15. Hampton and Gandy.	1957	47	female	Carcinoma of stomach	Radiotherapy, nitrogen mustard and total gastrectomy
16. Parahoniak ...	1958	28	male	Carcinoma of stomach	Subtotal gastrectomy
17. Miselli ...	1958	43	male	Carcinoma of stomach	Subtotal gastrectomy

TABLE I—Conntd.)

Literature Review of 29 Cases of Gastric Plasmacytoma

Author	Year	Age	Sex	Initial Diagnosis	Treatment
18. Annamunthodo and Robertson.	1959	50	male	Pyloric obstruction and duodenal ulcer	Subtotal gastrectomy
19. Robson and Knudson.	1959	48	female	Carcinoma of stomach	Total gastrectomy
20. Ferrand ...	1961	69	female	Antral polyp	Subtotal gastrectomy and radiotherapy
21. Konuralp et al.	1962	57	male	None	Gastric resection
22. Fraser, et al ...	1963	67	female	Leiomyoma of stomach	Subtotal gastrectomy and partial transverse colectomy
23. Astacio and Quezada.	1963	35	male	Carcinoma of ca pancreas	Exploratory laparotomy and biopsy
24. Astacio and Quezada.	1963	45	male	Carcinoma of stomach	Exploratory laparotomy and biopsy
25. Astacio and Quezada.	1963	68	male	Neoplasm of gastrointestinal tract	None
26. Astacio and Quezada.	1963	78	male	Pyloric obstruction	Exploratory laparotomy and biopsy

TABLE 1—(Concl'd.)

Literature Review of 20 Cases of Gastric Plasmacytoma

Author	Year	Age	Sex	Initial Diagnosis	Treatment
27. Konuralp et al...	1963	46	male	Carcinoma of stomach	Gastric resection
28. Brock, et al ...	1965	46	male	Carcinoma of stomach with perforation	Gastric resection
29. Khan ...	1967	57	female	Carcinoma of stomach	Prednisolone and melphalan

REFERENCES

1. Brock, D. P. ; Floyd, C. E. ; and Bliss, B. O. : Gastric plasmacytoma. *The American Surgeon* 31 : 519-524, 1965.
2. Dines, D. E. ; Lillie, J. C. ; Henderson, L. L. ; and Stickney, J. M. : Solitary plasmacytoma of the trachea. *American Review of Respiratory Diseases* 92 : 949-951, 1965.
3. Dolin, S. ; and Dewar, J. P. : Extramedullary plasmacytoma. *American Journal of Pathology* 32 : 83-103, 1956.
4. Edwards, G. A. ; and Zawadzki, Z. A. : Extrasosseous lesions in plasma cell myeloma. *American Journal of Medicine* 43 : 194-205, 1967.
5. Gould, L. ; and Ostrove, R. ; Extramedullary myeloma of the lacrimal gland. *American Journal of Ophthalmology*, 60 : 1125-1126, 1965.
6. Guasch, J. : La forma ganglionar, forma rara del plasmocitoma extramedular. *Sangre (Spanish)* 11 : 249-251, 1966.
7. Hellwig, C. A. : Extramedullary plasma cell tumours as observed in various locations. *Archives Pathology* 36 : 95-111, 1943.
" *Pak. Jour. Hlth.* 1968-69 "

8. Hill J. M. ; Falco, D. J. ; and Speer, R. J. : Massive therapy with various steroids. Proceedings of the 6th Congress, International Society of Hematology, 1956, page 183-195.
9. Innes, J ; and Newall, J. : Myelomatosis. Lancet 1 : 239, 1961.
10. Miselli, L : Gastric localization of extramedullary plasmacytoma. Archivio Italiano delle Malattie dell Apparato Digerente 24 ; 198, 1958.
11. North: J. P. : A case of plasmacytoma of the small intestine. Buffalo General Hospital Bulletin 2 : 81, 1924.
12. Snapper, I ; and Kahn, A. I. : Multiple myeloma. Seminars in Haematology 1 : 87, 1964.
13. Todd, I.D.H. : Treatment of solitary plasmacytoma. Clinical Radiology 16 : 395-399, 1965.
14. Vainio-Mattila, J. : Plasmacytoma of the parotid gland. Archives of Otolaryngology 82 : 635-637, 1965.
15. Vasiliu, T ; and Popa, R. : Forme gastrointestinal des tumeurs dites plasmacytomes. Comptes Rendus des Seances de la Societe de Biologie et de Ses Filiales (French) 98 : 738, 1928.
16. Weiner, L. P. ; Anderson, P. N. ; and Allen, J. C. : Cerebral plasmacytoma with myeloma protein in the cerebrospinal fluid. Neurology 16 : 615-618, 1966.
17. Willis, R. A. : Solitary plasmocytoma of bone. Journal of Pathology and Bacteriology 53 : 77-85, 1941.

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1. Table 1. Literature review of 29 cases of gastric plasmacytoma in a tabular form.
2. Figure 1. X-ray of the stomach following barium showing intar-mural lesion of the greater curvature.
3. Figure 2. Photomicrograph of Virchow's lymph node showing a monotonous sheet of malignant plasma cells. H and E. stain X 1150.
4. Figure 3. A graph showing the age incidence of reported cases of gastric plasmacytoma.

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PARASITOLOGICAL LABORATORY ORGANIZATION OF A ZONE
IN
WEST PAKISTAN MALARIA ERADICATION PROGRAMME
By

Dr. Muhammad Jamil Khan*

The functions of the parasitological laboratory in zones are in principle :—

- (1) To examine efficiently and correctly, the maximum number of blood smears in the shortest possible time.
- (2) To register the results of blood films so examined and to submit the results to the statistical section of Evaluation Branch for consolidation and analysis.
- (3) In addition the laboratory has the responsibilities of cleaning the slides and returning them to field for re-use.

The personal establishment of zonal laboratory for a Million population is :—

Senior Microscopis ... 1.

Microscopists ... 10. (Calculated on the basis of one Microscopist per 100,000 Inhabitants).

Laboratory Attendants... 2. (1 to each 5 Microscopists).

The duties of the above categories may be briefly described as follows :—

*Regional Chief, Southern Region, West Pakistan, Malaria Eradication Programme.

Dr. Muhammad Jamil Khan
SENIOR MICROSCOPISTS

- (1) To organize and distribute the laboratory work amongst all the Microscopists.
- (2) To check the work out-put and the accuracy of the blood slide examination results of each microscopist by daily checking about 10% slides of the slides examined by each Microscopist, and to maintain a record of this checking procedure.
- (3) To keep a detailed record concerning the staining, and the examination of the blood films received from the different localities and of the positive cases found.
- (4) To maintain daily record of the work undertaken and to make weekly and monthly reports on the activities of the laboratory based on this information.
- (5) To procure supplies as required and maintain records of these.

MICROSCOPIST

1. To stain blood films and examine them for malaria parasites and to record the results
2. To take good care of the microscopes and other equipment in his charge.

LABORATORY ATTENDANTS

1. To wash and pack the slides.
2. To stain the blood films under guidance of the Senior Microscopist.
3. To maintain the washing and staining equipment in good condition.

4. For convenience the Laboratory organisation may be described involving the following activities :—

- i. Organization of staining and examination of blood smears.
- ii. Checking of the work of the laboratory.
- iii. Washing of slides.
- iv. Supplies.
- v. Reporting and recording system.

**(i) ORGANIZATION OF STAINING AND
EXAMINATION**

The laboratory organization for staining and examination may, differ in some detail in order to deal with blood smears collected during :

- a. *Active and Passive Case detection operations.*
- b. *Malariometric surveys, Epidemiological contact surveys and mass blood surveys.*

The detailed procedures used by Evaluation Section during these different operations are :—

(a) Active and Passive Case detection Operations :—

The blood smears in packets (individual packets for each days collection) collected in the field during Active Case Detection and Passive Case Detection are received in the Zonal Headquarter by the Senior Clerk (Operations). He records these on the appropriate form, "Laboratory Reference Record" (EVA-M/9—ANNEX II, compiling only the receipt acknowledgment portion of the form. (The staining and examination portions are not to be filled by him). As he fills in the form, he makes a simultaneous analysis of time lag between collection of slides in the field and their receipt in the zone.

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Soon after (usually 1—2 hours) the packets of slides are sent by the Senior Clerk (Operations) to the laboratory alongwith the previously compiled "Laboratory Reference Record" (EVA-M/9), which is then filed in file of "Blood Laboratory Reference Record" (File No. 1) and the slides are sent to the staining room for immediate staining. This is done on the same day or at the latest on the next day. The field forms, *i.e.* Case Detection Record (EVA-M/2) and Fever Case Report (EVA-M/3) accompanying the packets of slides are taken out and are filed in the "Surveys Pending Examination" file (No. 3). The field forms are filed according to the date of collection. (Forms not so filed are frequently lost). Meanwhile a reference slip (shown below) detailing locality code numbers,

	Slides No.	Code No.	<table border="1"> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> </table>				
LOCALITY _____							
DATE COLLECTED _____							
DATE STAINED _____							

date of collection, Numbers of slides, etc. remains with each packet of slides until slides are finally washed. Staining is carried out by the Laboratory attendants under the strict supervision of the senior microscopist deputed by him. However, the buffer water and the staining solution is always prepared by the Senior Microscopist/Microscopist personally. By preference Mashal's method is employed which affords great savings in stain and time. A system of separating slides of two localities in the same staining dish has been evolved which eliminates the chance of mixing up slides from different localities. After staining, the slides are dried and then rolled, alongwith reference slip, in toilet tissue. The staining portion of the "Blood Laboratory Reference Record" (EVA-M/9), which provides the analysis of time lag between collection and staining, is compiled by the Senior Microscopist. Then the packets of slides are placed awaiting examination in pigeon hole rack according to date of collection (slides collected through P.C.D. are immediately examined and are not kept in pigeon holes waiting for their turn); the advantages of keeping the pending slides according to date of collection being two fold. Firstly, the slides collected first are examined first, while slides collected later are examined later. Secondary, by a cursory look at the pigeon holes it can readily be ascertained how the daily progress of examination of slides in the laboratory is proceeding and how much work is pending in the laboratory. This facilitates the taking of prompt action to deal with any back log of work which may occur.

The packets of slides which are to be examined on that day according to work load which the laboratory can undertake, are taken from the pigeon holes in the morning by the senior microscopist, and distributed to the microscopist in the laboratory. The Microscopists then give serial numbers to their packets. The examination of slides is done in the serial way by the microscopists, and after the completion of the examination of one locality, the locality packets are put in relevant hole of checking* rack of the microscopist. Hence packets No. 1, 11 are put in hole No. 1 and packets No. 2, 22 are put in hole No. 2 and so on.

At the end of the day the original field forms with the results of slides recorded are handed over by the Microscopists alongwith the packets of slides to the Senior Microscopist, who immediately enters the positive cases in the "Positive Case Record" Register. The original field forms are arranged according to sector, subsectors and localities by a simple system in which all microscopists participate without delay and any extra effort. The same evening these forms are handed over to the Senior Clerk (Evaluation) by Senior Microscopist and the examination portion of the "Blood Laboratory Reference Record" EVA-M/9 (which also provides an immediate analysis of the time lag between blood collection and examination) is compiled by the Senior Microscopist. Thus it is always ensured that no original field form is kept in the laboratory for more than a day. (This form relates to slides already examined.) This is a simple point but has got a great bearing on the efficiency of the laboratory organization.

(b) Organization in Malariometric surveys, Epidemiological contact surveys and Mass blood surveys :—

The blood smears collected during malariometric surveys, epidemiological contact surveys and mass blood surveys, are directly received by the Senior Microscopist (i.e. these slides are not received by the Senior Clerk—Operations). The Senior Microscopist gets them stained under his direct supervision and gives top priority to their examination. The relevant information is recorded on a separate "Laboratory Reference Record" (EVA-M/9), slides from one village being given to an individual Microscopist for examination. In no case are the slides of one village permitted to be examined by more than one Microscopist as this restricts the responsibility for mistakes. After completing the examination of a slide, the Microscopist puts it in the respective hole of the checking rack which is numbered 1, 2, 3, 4, 5, 6, 7, 8, 9 and 0. Therefore, slide No. 1, 11, 21, 31, 41, 51, and so on, are put in hole No. 1, while slide No. 2, 22, 32, 42, 52 and so on are

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put in hole No. 2. The remaining procedures are the same as those discussed under Active and Passive Case Detection.

(ii) CHECKING AND SUPERVISION OF THE LABORATORY

It is a well known fact that supervision and checking is the secret of success in Laboratory operations and the results of the microscopical laboratory cannot be relied upon until and unless, there is a constant supervision and checking. In the West Pakistan Malaria Eradication Programme two levels of checking have been developed :

(a) Zonal Checking. One of the most important jobs of senior microscopist in the zone is to do the checking of the microscopical examinations of the microscopists.

As described in the previous section of this note each microscopist is provided with a slide checking rack in which the holes are numbered as 1, 2, 3, 4, 5, 6, 7, 8, 9 and 0. After the examination of each slide collected by Malariometric survey, Epidemiological contact survey or Mass blood survey, the Microscopist puts the individual slide in the respective hole of slide checking rack. Similarly the slides of one locality collected through A.C.D. and P.C.D. put as a complete packets into the respective hole of the slide checking rack, according to the serial number given at the starting of the day's work.

At the end of the day the DMEO/Evaluator selects a specific number for checking. Accordingly, all the slides in the pigeon holes bearing this number are collected by the Senior Microscopist from each Microscopist and is made of each slides reference number. These slides are examined next day by the Senior Microscopist and the results are entered in "Zonal Checking Record" Register kept for this purpose. To facilitate checking, the Senior Microscopist has a slide checking rack with fifteen holes, each hole for the slides of one Microscopist.

(b) Regional Checking. The system for selection of slides used for Regional checking is same as a zonal level but instead of daily weekly slides selections are made and sent to RHQ. The selection of the particular day when selection is made is left to the discretion of DMEO/Evaluator. The slides are sent alongwith a form "Checking Record of RHQ" (EVA-M/11) ANNEX IV, which lists the full reference number of each slide sent.

The examined slides of each week are not washed till the results are received back from RHQ. The results are promptly communicated by RHQ to zones.

Checking of positive slides. All the positive slides reported by the microscopists are confirmed by the Senior Microscopist, Evaluator and DMEO. The thin smear of the positive slides is stained immediately and the slide is labelled with Laboratory Reference No. and specie classification. The slide is then sent to the Regional Headquarters for reconfirmation.

(iii) WASHING OF SLIDES

The examined slides of each week are kept pending in special pigeon holes until the confirmation of results by Regional Headquarter is done when this is received washing can be undertaken. Washing is done by Laboratory attendants and the method employed is basically of boiling the slides with detergent.

The washing of slides is so arranged by Senior Microscopist that only those examined slides which can easily be washed on that day are unpacked for washing. Great care is taken not to leave the unpacked slides over night in trays soaking in water.

After washing the serviceable slides are pulled out and packed while the un serviceable slides are discarded. These clean slides are packed in toilet tissue in lots of 25 slides. The actual packing is done by the Laboratory Attendants.

(iv) SUPPLIES

A simple streamlined supply procedure, necessary for the proper functioning of the parasitological laboratories, has been developed. In formulating the procedure, care has been taken to avoid possible loss of equipment, chemical etc., by defining clear cut responsibilities. Also, this system facilitates the advance projection of the supply requirements of the laboratory.

The Senior Microscopist is responsible for the advance procurement from the zonal stores of all the supplies for laboratory. The chemicals and equipment for the laboratory are indented on a special proforma (ANNEX V) from zonal stores and a full record is kept in the supply register of consumable and non-consumable items by the Senior Microscopist.

List of equipment and chemicals authorized to zone laboratory and standard kits for microscopist and Senior Microscopist are given in Annex I.

(v) Reporting and Recording of Laboratory :

A simple efficient, reliable but rapid reporting system forms an important component of the laboratory organisation of the West Pakistan Malaria Eradication Programme.

It was realized, soon after starting of Malaria Eradication Programme in West Pakistan, that a delay in the laboratory adversely effects all the epidemiological activities. Hence great attention was paid to device a reporting and recording system which would facilitate the work of the laboratory and at the same time readily provide all the required information about the activities of the laboratory. This was achieved by eliminating the duplications and non-productive information recorded under the previous system.

The Senior Microscopist records daily work done by each Microscopist with summary of laboratory activities on "Weekly Record of Blood Laboratory" (EVA-M/10), ANNEX III. This forms the basis of monthly report of the laboratory. This is filed in the file of Blood Laboratory Weekly Record (File No. 2).

The files and registers meant for records and reports are given briefly as under. It is the responsibility of the Senior Microscopist to keep all the records upto date. To have uniformity in reporting and recording, to facilitate rapid scrutiny and analysis of records, the files and registers have been given numbers.

V. (i) LIST OF FILES

File No.	Name of file	Form filed in File.	No. of files.	Sections in every file.	REMARKS.
1	Blood Laboratory Reference Record	Blood Laboratory : Reference Record EVA—M/9	1		To be maintained by Senior Microscopist.
2	Blood Laboratory Weekly Record	Weekly Record of Blood Laboratory. EVA—M/10	1		— do —
3	Malaria metric Survey Record Pending blood examination	Malaria metric Survey Record (EVA-M/1) and Case Detection (EVA-M/2).	4	In every file sections according to dates, so each section for one date. Total No. of 31 Sections in four files.	— do —
4	Record of slides checked by RHQ laboratory	Record of slides sent for checking to Region. (EVA-M/11).			— do —

Dr. Muhammad Jamil Khan
V. (ii) LIST OF REGISTERS.

Serial No.	Register No.	Name of Register	No. of Register	REMARKS
1	3	" Supply (Non-consumable) " Record.	1	To be maintained by Senior Microscopist who will record all entries of non-expendable item received from Zonal store and issue if any to Blood Laboratory personnel.
2	4	" Supply Record ", Consumable)	1	To be maintained by Senior Microscopist who will record all entries of expendable items received from zonal stores and issue to Blood Laboratory.
3	5	" Equipment Breakage/Lost Record ".	1	To be maintained by Senior Microscopist who will record all entries of equipment lost or broken with Evaluator's remarks and action taken.
4	6	" Malaria Positive case Record ".	1	To be maintained by Senior Microscopist who will record all related information of the positive case detected during Microscopical examination.
5	7	" Zone Checking Record ".	1	To be maintained by Senior Microscopist who will record all his checking activities of the Microscopist. One register separates for one month. Summary of monthly activities of the Laboratory also be made.

V. (iii) SPECIMEN OF REGISTERS

1. Supply Consumable and non-consumable Record for Parasitology Laboratory of Evaluation Branch.

Name of item _____ Unit _____

Yearly authorized Qnty. _____ Critical Level. _____

Date	Voucher	Received or Supplied to	QUANTITY			Signature of Receipt	Remarks.
			Receipt	Issued	Balance		
1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"

2. Senior Microscopist Checking Record.

Date	Slide No.	Locality Code No.	Result by Senior Micr.	Correct or Worng.	Labeling	Staining.	Smear thick	Smear thin.
1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"

3. Breakage/Lost Record.

Date	Description of article broken/lost.	Broken/Lost by whom with designation.	Signature of person who has broken/Lost.	Evaluator's Comments.	D. M. E. O's Order.	R. C.'s Order.	Action Taken	Remarks.
1"	2-1/2"	1 3/4"	1"	2-3/4"	1-3/4"	1-3/4"	2"	1-1/2"

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(ANNEX—1ST)

List of Equipment Authorized to Parasitological Laboratory.

Serial No.	SPECIFICATION	Unit	Quantity authorised.
1	Band rubber, 2" diam ...	Nos.	500
2	Beaker, Pyrex, 500 ml. with spout ..	Nos.	4
3	Bottle, Immersion Oil/Xylene combined ...	Nos.	1/micr.
4	Bottle, Winchester quarter quart, Polythene/glass with cap or stopper.	Nos.	2
5	Bowl. Plastic, diam 18" z depth 6" approx ...	Nos.	4
6	Box, microscope slide storage, horizontal with 100 slides.	Nos.	36
7	Brush, nail type. Nylon bristle ...	Nos.	12
8	Bucket, plastic or galvanised steel. 4 to 6 gln. caps ...	Nos.	2
9	Blubs, spare microscope lamp ...	Nos.	6/microscope
10	Card board corrugated 75" x 48" ...	Nos.	8
11	Clock, laboratory, 60 minutes. One hand alarm ...	Nos.	1
12	Cloth, cotton, shirting white, Dawood 96000 ...		

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Serial No.	SPECIFICATION	Unit	Quantity authorised
	Pieces 18" × 18" and embroidered " M " ...	Nos.	2/microscope
	Pieces 18" × 18" and embroidered " O " ...	Nos.	2/microscope
13	Comparator, Lovibond/Hellige with 2 spare cells with disc Bromothymol blue P. H. 6.0—7.6.	Nos.	1
14	Cylinder, measuring, glass or polythene mls. 100	Nos.	2
	mls. 500 ..	Nos.	2
15	Dish, staining aluminium, rectangular in pairs ...		
	To take 20 slides back to back ...	Nos.	4
	To take 50 slides back so back ...	Nos.	6
	To take 100 slides back to back to back ...	Nos.	6
16	Funnel, galvanised, steel, 3" ...	Nos.	2
	Funnel, glass or polythene 15 ml. diam ...	Nos.	2
17	Jar, coplin, glass or polythene to take 10 slides back to back.	Nos.	8
18	Labels. microscope slide 1" × 1" plain, not gummed	Nos.	1000
19	Matches, safety. 50's ...	Box	
20	Micr. Compound monocular, inclined tube, triplicate revolving nosepiece, achromatic objectives 10×/0.25, 46×/0.65, 100×/1.30 (Oil immersion) eyepieces 6× and 10×, built in or attachable lamp with blue filter (220V). Mechanical stage with co-axial adjustment, focussing by co-axial fine and coarse adjustment, lens hood, all in tropicalised cabinet with lock and two keys.	Nos.	1 for Sr. microscopist
21	Paper, emery. 18, 5 cms		
22	Paper filter, whatman's No. 1 (100 sheets) ..	Sheets	6
23	Paper, wrapping, brown 30" × 30" approx ...	Box	6
24	Pencil, dermograph/glass red, and blue ...	Sheet	100
	...	Nos.	12 each

Serial No.	SPECIFICATION	Unit	Quantity authorised
25	Pipette, dropping with rubber eat, 2 ml. cap. ...	Nos.	6
26	Pepettes, graduated, in 0.1 ml step ...	Nos.	2
	5 ml. ...	Nos.	2
	10 ml. ...	Nos.	2
27	Racks, slide checking microscopist with 10 compartments 3"×3"×1".	Nos.	1 Microscopist.
28	Rack, wooden microscope slides ...	Nos.	1 Microscopist.
29	Racks, slide checking Sr. Mic. with 15 compartments 3"×3"×1".		
30	Rod, Glass, 4 mm diam, 1 foot ...	Nos.	6
	2 feet. ...	Nos.	3
31	Scissors, general purpose, heavy duty ...	Nos.	1
32	String, jute, parcel quality ...	Bounds	10
33	Stove, oil primus pressure type, heavy duty with welded steel reservoir and iron stand.	Nos.	1
84	Tissue, toilet, absorbent ...	Rools	50
35	Vessels, aluminium Dixie type with lid 18" diam×10".depth. ...	Nos.	3

REAGENTS AND CHEMICALS

1	Acetic acid 5 % by volume ...	Mis.	500
2	Bromothymol blue, Indicator ...	Mls.	100
3	Detergent, Surf or Teapol ...	lbs.	3
4	Giemsa stain stock solution ...	Litres	2
5	Immersion oil cedarwood or substitute ...	Litres	7
6	Kerosene oil ...	gals	4

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Serial No.	SPECIFICATION	Unit	Quantity authorised
7	Lithium carborate or substitute 5 % by volume ...	Mls.	500
8	Methanol (methyl alcohol acetone free) ...	Litres	1
9	Oil, Lubricating (Singer) ...	Cans.	1
10	Soap, toilet ...	bars.	6
11	Xylol (Xylene sulphur (free) ...	Litres	1
STANDARD KITS			
1. Microscopist Kit.			
1	Microscopist table	...	1
2	Microscopist stool	...	1
3	Microscopist monocular complete	...	1
4	Microscopist table lamp with bulbs	...	1
5	Slides echecking rack for Microscopist	...	1
6	Cedarwood oil in a small bottle	...	1
7	Xylene in a bottle	...	1
8	Pencil lead	...	1
9	Pencil Red and Blue	...	1
10	Cotton handkerchief, one embroidered 'o' the other 'M'	...	1
11	Form EVA M/4	...	2
		...	2
			As needed

Serial No.	SPECIFICATION	Unit	Quantity authorised
2. Senior Microscopist Kit.			
1	Microscopist table	...	1
2	stool	...	1
3	Microscope Monocular complete	...	1
4	Microscope table lamp with bulb	...	1
5	Slide checking rack for Senior Microscopist	...	1
6	Cedarwood oil in small bottle	...	1
7	Xylene in a bottle	...	1
8	Pencil lead	...	1
9	Pencil Red and White blue	...	1
10	Pencil Wax	...	1
11	Cotton handkerchief, one embroidered 'O' the other	...	2 'M'
1	Haver Sack	...	1
2	Clip board	...	1
3	Sharp pricking needle (Hagerdorn needle)	...	1
4	Clean Microscope slides (in packet of 25 wrapped in tissue paper).		According to scale

Serial No.	SPECIFICATION	Unit	Quantity Authorised
5	Methylated spirit in bottle 3 oz. flat side with screw cap	...	1 bottle
6	Field slide box for 100 slides/10 slides	...	1
7	Surgical cotton in small roll pocket	...	According to scale
8	Soft lead pencil	...	1
9	Pen	...	1
10	Forms	...	1
11	Drugs	...	1
12	Corrugated card board for packing (T-Shaped cut for this purpose)	...	According to scale.
13	Specimen tube with cork (for prickling, needle)	...	2

Code No.
cript.

<u>PROGRAM</u>	<u>REFERENCE NO.</u>	<u>Date of Receipt.</u>
BLOOD LABORATORIA	No Slides with time interval (in days)	
	No Slides collected &	

[illegible]

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(EVA—M/10)

Code No.

(ANNEX III)

WEST PAKISTAN
MALARIA ERADICATION PROGRAMME

District

WEEKLY RECORD OF
BLOOD LABORATORY

Zone

Week from 196 . to .

SLIDES EXAMINED

Day of Week	MONDAY	TUESDAY	WEDNES-	THURSDAY	FRIDAY	SATURDAY	Av. Vid. Mic. day
Date of Week							
Figure Selected for Checking							
Name of Microscopist	No. Ex. +	No. No. Chk Ex. +	No. No. Chk Ex. +	No. No. Chk Ex. +	No. No. Chk Ex. +	No. No. Chk Ex. +	No. No. Chk Ex. +
1.							
Total							

Record of Slides for week :—

1. No. Pending at beginning of week
2. No. received during week
3. No. examined during week
4. No. pending at the end of week
5. No. checked by Senior Microscopist.
6. No. Sent to RHO for checking.
7. No. Re-Examined by Microscopist.

Remarks.

8. No Examined for other zones.
9. Total working days in week.
10. Days spent on leave.
11. Days spent on Microscopy.
12. Days spent on staining.
13. Days spent on Paper work.
14. Days spent on Field.
15. Days spent on Miscellaneous.

Seen

Seen

D M E O

Evaluator

Signature of Senior Microscopist

(ANNEX V).

SUPPLIES REQUISITION FORM (For Office Record)

Date : _____

Voucher No. _____

S. No.	Particulars	QUANTITY			
		Required	In hand	Last supp. with Date	Remarks
1					
2					

Indentor _____

SUPPLIES REQUISITION FORM (For Supply Section/Stores)

Date : _____

Voucher No. _____

S. No.	Particulars	QUANTITY			
		Required	In hand	Last supp. with Date	Remarks
1					
2					

Order of Sanction Authority _____

Indentor _____

Supplied by _____

Above supplies

Dated _____

received by _____

Date _____

SUPPLIES REQUISITION FORM (Return with Supplies)

Date : _____

Voucher No. _____

S. No.	Particulars	Quantity Supplied	REMARKS
1			
2			

Supplied by _____

Date _____

Received the above supplies and have entered them in register/Ledger

A LESSON IN MOSQUITO CONTROL "BAYTEX" (A NEW ORGANOPHOSPHORUS INSECTICIDE) ON TEST*

By

Ahmad Swaleh Nasir, M.P.H. (Columbia)*

And

Muhammad Latif**

INTRODUCTION

Throughout West Pakistan the most man menacing mosquito is *Culex fatigans* (*pipiens*). A notorious vector of filaria in India and South East Asia, *Culex fatigans* has not as yet been incriminated as a vector of human disease in West Pakistan. Its abundance, avidity for human blood and vicious bites deprive man of rest and sleep. These predatory night brigands, with their incessant rampage make life miserable, a perpetual nuisance present most part of a year. Mosquitoes are perhaps the most hated creatures in the insect world, therefore.

In West Pakistan the problem of *Culex fatigans* is chiefly urban and less rural. It breeds in close vicinity of its host and is well adapted to develop and flourish in sewage, foul water pits, pools and puddles, which it can always find near any human habitation. In our cities *Culex fatigans* problem is rather man made, an ideal breeding place a suitable shelter and plenty of food around is all that it needs.

Mosquito problem can perhaps be dealt with more effectively through improved Engineering and sanitation works, but since these methods involve huge financial resources, such developments can be achieved only over a length of time. Mosquito menace, therefore, is to continue indefinitely and insecticidal method have to be resorted to deal with them.

In the rural areas the situation with regard to this species of mosquito is different. Breeding grounds suiting its taste are fewer in the rural areas due to

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**Sanitary Patrol, Field Epidemiological Unit.

less compact population. It is for this reason that *Culex fatigans* population is smaller in the villages, compared to its abundance in the cities.

In the city of Lahore an organized mosquito abatement programme was started in 1951, designated as Malaria Control. In reality this programme was meant to control *Culex fatigans* menace in the city. The mosquito problem was mainly tackled by insecticidal methods. Mosquito breedings were destroyed by the application of oils (furnace oil) while DDT and BHC were used against imagines in areas of heavy mosquito infestations. Due to several fold increase of work after rains the anti larval oiling has frequently been supplemented with DDT and BHC mixed in oil. It is now for over fifteen years that the local mosquito population has had DDT and BHC onslaughts both as larvae and adults. *Culex fatigans* which in the beginning of this programme had at one time reached a point of annihilation has long since returned with enormous population.

Leaving aside the meadow or garden mosquito (*Aedes species*) which remain restricted within a short distance of its domain and hardly if ever enter houses and dwellings, in number the second dominant mosquito of the cities and first dominant in the rural areas is from the anophelines, namely *Anopheles subpictus*. As far as human maladies are concerned this mosquito is considered harmless. It has little taste for human blood and prefers to feed on cattle. In the cities *Anopheles subpictus* competes in all biological aspects with *Culex fatigans* but for its food preference and seasonal prevalence.

When *A. subpictus* shows up in August *Culex fatigans* population declines. In the city the two species of mosquitoes balance each other, so much so, that when in late October *A. subpictus* population shows remission, *Culex fatigans* density shoots up immediately. It is however, not so in the rural areas. *Anopheles subpictus* can breed in sewage and foul water pools as well as in much clearer waters than those preferred by *Culex fatigans*. Quite often *Culex fatigans* and *Anopheles subpictus* thrive together in the same breeding place in the cities but in the rural areas this company is occasional.

In 1958, high densities of *Anopheles subpictus* in the villages sprayed with DDT and BHC over a number of years were noticed. This aroused suspicions of a high degree of tolerance in this mosquito against DDT which was subsequently confirmed by susceptibility tests carried out in the field (Maldonado and Nasir 1958). In 1966 susceptibility level of this species against chlorinated hydro-

carbons was again studies. Results of susceptibility tests carried out against *A. subpictus* and *Culex fatigans* at different times are summed up in Table I.

From the criteria of resistance in mosquitoes with tests using WHO adult mosquito kits. (HOSKINS 1963), conclusions are, that in Lahore both *Culex fatigans* and *Anopheles subpictus*, are resistant to DDT and Dieldrin. It appears the tolerance level in *A. subpictus* against DDT has been further strengthened since the earlier 158 tests.

In spite of the high resistance against DDT and BHC in the two species, namely *Culex fatigans* and *Anopheles subpictus*, Malaria Eradication Programme based on DDT spraying has been launched throughout Pakistan since 1960. The choice of the insecticide was consequent to the evidence that the malaria vectors in the country are susceptible to this insecticide. The programme is in progress and malaria has already reached extinction point in the zones under the third year of attack phase or little after.

The appearance of resistance in mosquitoes has had some advantages, as well, in its wake. The concept of Malaria Eradication was born when the confidence in the chlorinated hydrocarbons was shaken by the defying vector mosquitoes. Further research and advancement in tactics of combating these vermins who every time have appeared as much virulent and more vigorous, after negating human efforts to annihilate them is owed to resistance. Baytex is yet another insecticide in this series of endeavours, progress and discoveries which claims better control, lesser mammalian toxicity, long residual activity and stability against weather odds. With limited resources it was not possible to test, the entire set of claims with regard to Baytex. We, therefore, limited our study on Baytex to the following basic questions:—

(a) Insecticidal activity against DDT Dieldrin resistant mosquitoes both larvae and adults.

(b) Duration of its residual action.

Material:—The test were carried out in the laboratory. Material used were the two Baytex formulations namely Baytex granular 2% and Baytex Emulsion Concentrate 50%. Mosquito larvae used in these tests were obtained from the field and not from the colonies we are maintaining for over 2 years now. Due

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to variability in the vitality of different strains in the field there was a possibility of vast divergence in the day to day test results, making it difficult to interpret. However, not such occasion arose in our larval experiments. It will not be unreasonable to assure that the results arrived at, represent field conditions and fairly accurately apply to the actual situation encountered.

Method :—In a partially shaded varandah were placed unglazed, round, baked clay troughs of 30" diameter and a capacity to hold about 40 liters of water. Each trough was filled with water measuring exactly 20,000 cc. The depth of the water was thus, uniformly 12 cm. A calculated dosage of insecticide was then introduced in the water. On each day 50 mosquito larvae of the species under test against the insecticide were introduced in the trough at a fixed time. In addition 5 c.c. of a protozoal culture maintained in hay water was added initially and subsequently every alternate day with a pinch of mice food which is used for feeding mosquito larvae in the insectory. This was done in order to obviate death amongst the mosquito larvae due to starvation. Twenty four hours after the mosquito larvae had been in contact with the insecticide in the trough, the larvae were retrieved one by one and the number of dead and alive larvae was recorded. Immediately after the recovery of the larvae the loss of water in the earthen troughs due to evaporation, percolation and leakage was made up to the level mark and fresh larvae introduced. The loss of water on each day in each trough ranged between 1000 to 3000 c. c. of water, average being 1800 c. c. The tests in each trough were continued as long as the mortality amongst the larve did not fell below 70% for three consecutive days. In a duration of about 12 days the quantity of water replenished in each trough amounted to the original quantity of 20 liters without any addition of insecticide. This condition is very much akin to the city breeding grounds. Number of tests ranged from 1—3 for each formulation and concentration.

Invariably with each set of tests a control was kept to take into account the extent of natural death amongst the mosquito larvae under conditions of the experiment. Fortunately there has been only negligible, rather, no death amongst the controls throughout the period of experiments. The larvae of either species used in tests were late third instar or early fourth instar. Any larva which pupated during the 24 hours of their contact with insecticide were excluded from the total. The dosage of insecticide used in these experiments was the recommended standard dose (0.1 PPM), its half and one quarter. Higher concentrations were not put on trial. The results arrived at in the experiments on larvae are given in Table II.

INTERPRETATION OF RESULTS AND DISCUSSION

Brooks et al (1965) have tried relatively higher dosage of insecticides in their trials against certain newer compounds and have arrived at very encouraging results with proportionate increase in insecticidal concentrations. This we avoided deliberately for the following reasons

(1) During Rainy season (Monsoons), outburst of heavy rains, cause complete overthrow of the contents in the breeding ground frequently. As a result more frequent application of insecticides is essential for control of mosquito breeding.

(2) A large number of small breeding grounds are created which vanish shortly after the rainy season has ended. A lesser dosage in such circumstances is both economical and advantageous.

(3) The milch animals (buffalows), spend their time resting in water collections and drink water from pools and puddles. Avoidance of mammalian toxicity with lesser dosage of insecticide, and no loss of efficacy against the insect larvae was considered highly desirable under existing circumstances and therefore, in the experiment.

Baytex granular 2%.—The dosage of 0.025 PPM (active material) of this formulation was effective against *Culex fatigans* larvae for 10 days (mortality 70% and over). Double this dosage i.e., 0.05 PPM, the duration of residual effect did not increase and remained 10 days, but at 0.1 PPM the residual effect lasted 15 days. Against the larvae of *Anopheles subpictus* 0.05 PPM was effective for only 5 days but 0.1 PPM was effective for 11 days. It may be inferred that 0.1 PPM Baytex as granular 2% gives effective control of *Culex fatigans* for 2 weeks and is less effective against *Anopheles subpictus* larvae.

Baytex Emulsion Concentrate 50%.—This product was tested against the two mosquitoes using same technique and same dosage as for granular. Against *Culex fatigans* larvae it was effective, for 4 days, seven days and nineteen days for 0.025 PPM, 0.05 PPM, and 0.1 PPM respectively. In dosage of 0.05 and 0.1 PPM it having ceased to show effectiveness (70% or above mortality) against *Culex fatigans*, was found effective against *Anopheles subpictus* larvae for two additional days in each concentration.

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Against *Anopheles subpictus* larvae 0.025 PPM was effective for 9 days, 0.050 PPM for 12 days and 0.1 PPM for 25 days. After the solutions ceased effectiveness against *Anopheles subpictus*, for 3 consecutive days, *Culex fatigans* larvae were introduced in the same troughs but to no effect, contrary to the effect seen when *Culex fatigans* larvae were first introduced.

In another experiment 25 *Anopheles subpictus* and 25 *Culex fatigans* larvae were introduced in 0.1 PPM of Baytex liquid. The 70% or above mortality amongst *Anopheles subpictus* continued upto 21 days while for *Culex fatigans* it was 2 days less i.e., 19 days. It may also be mentioned here that on all occasions the decline in the mortality of the test larvae of either species has been abrupt and not gradual. A 100% mortality continues for several days which may touch the levels of 70% at the point of depletion of its effectiveness for a couple of days and then mortality suddenly falls to a much lower level, the residual effect of the insecticide having terminated.

From the above experiments it is inferred that Baytex Emulsion concentrate is superior to Baytex granular for the control of both DDT-Dieldrin resistant *Culex fatigans* and *Anopheles subpictus*. Also that Baytex liquid concentrate has a greater duration of residual effect against *Anopheles subpictus* compared to *Culex fatigans*. In lesser concentration Baytex granular is superior to liquid in controlling *Culex fatigans* larvae alone. The optimum dosage is 0.1 PPM but this dosage may be reduced to half for the treatment of breeding grounds which may appear to last only a duration.

BAYTEX AS ADULTICIDE

Baytex 40% W.D. powder was on trial for testing its efficacy as adulticide. The tests were carried out strictly under field conditions in 2 villages, about a mile and a half apart, 20 miles from Lahore on Sheikhupura Road. The conditions in these villages were rural, a true representation of our rural areas in general and of the villages around the Lahore city. The population of each village was about 200 persons of all ages, about 50 houses, and equal number of cattle sheds and about 100 heads of cattle in each village. The area is canal irrigated and partially water logged. Mosquito density is usually very high although *Culex fatigans* is normally low on account of fewer breeding grounds peculiar to this species.

These villages have had treatment with DDT constantly for the last five years under the National Malaria Eradication Programme. The spraying campaign con-

cluded in 1965 and no DDT spraying was done during 1966. These villages are at present under consolidation phase and no case of malaria has been reported for the last four years, though mosquito density is high. For the first time this year (1966), the vector of malaria *Anopheles culicifacies*, which had nearly vanished, has reappeared but in small number. Its population showed an increasing trend all over in the areas where DDT treatment has been stopped. These two villages are connected with Lahore by rail and this facility was considered important in choosing these villages for experiment. In the absence of any other mode of transport, the safe arrival of mosquitoes from the field to the laboratory early in the morning was possible only by rail. From the Lahore Railway Station to the laboratory the collection was transported on bicycles.

In each village 3 groups of 2 rooms each, (one cattle shed, the other a residential room) were chosen for the purpose of this experiment. Each group of two rooms was at least 200 yards away from the other two groups.

A fortnight before the commencement of the treatment with insecticide daily mosquito catching was done for one hour in each group to obtain information on mosquito densities and their population composition. This data seems to be of no importance and is omitted therefore. Mosquito densities greatly vary with seasonal fluctuation.

In each of the villages one set of rooms was kept as control, the other set treated with DDT wettable powder in a dosage of 2 gm./m² and the third group treated with Baytex W. P. 40% dosage being 1 gm./m² (active material). After a lapse of three days mosquito catching was done in each room under experiment for half hour. In the beginning the mosquito catching was done alternately in the morning and in afternoon but subsequently only afternoon catching were done twice every week. The collection from each group was kept separately in paper containers and transported to the laboratory next morning, when mortality in each species was counted 24 hours after the capture and recorded. Despite best care, high day temperature, inadequate transport facilities and long journey from the village to laboratory was in several instances responsible for very high mortality amongst the mosquitoes brought to the Laboratory. For the purpose of this study, therefore, only those days on which the mortality amongst the control group was less than 22%, have been taken into account. The study was continued in village Chak Sethian and in village Chichoki Mallian upto 116 days and 107 days respectively and discontinued after the mortality of total mosquito catch in Baytex treated rooms fell below 59% for three consecutive days.

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RESULTS AND DISCUSSION

The results of this study have been enumerated in Table III and IV.

Table III. From the results for both the villages, given in Table III, it is evident that the over all mortality in female mosquitoes captured from the rooms sprayed with Baytex is higher than the other two sets of rooms, namely DDT and Control.

In village Chak Sethian the mortality amongst mosquitoes collected between 5-30 and 6-30 a.m. was 92% upto 16 days. The results were better for village Chicho Ki Mallian were, in the collection made on the morning of 26th day (after treatment with Baytex), the mortality was still 91 percent. This was despite the fact that these mosquitoes had a very short contact with the surface treated with insecticides. These catchings were done within one hour from the sun rise, which means that the contact of mosquitoes with insecticide was of a duration of less than an hour. Under our conditions where cent-per-cent people sleep outdoors during the summer season, all mosquitoes are outdoors throughout the night and start entering rooms only for day resting at dawn.

In this Table (Table III), on the occasion the mortality is 63.6% in Chak Sethian and 75% in village Chicho Ki Mallian, ten and fifteen days respectively after the treatment with Baytex. For this we find no explanation except that mosquitoes captured from behind the food storage vessels, bags and trunks hanging apparel rolled beddings, decoration pieces etc., are not likely to have had sufficient contact with the insecticide.

In this connection another interesting feature which needs mention is that with the increase in the atmospheric temperature and fall in relative humidity, the indoor resting mosquitoes start descending on the walls lower and lower reaching ultimately the floor level in search of a spot with a suitable microclimate. As already mentioned the area is water-logged and as a result there is a continuous falling out of the plaster from the mud walls, near the floor and a few inches above. Thus every day a new mud surface is exposed for the resting of the mosquitoes, with no insecticide sticking to it. Perhaps a little contact at the time of entry before a proper unsprayed resting place was sought by the mosquito, was enough to provide the lethal dose of the insecticide which resulted in the comparatively greater mortality in the Baytex sprayed rooms of the two villages. In the months of June and July not one single mosquito was captured from any surface 12 inches above the floor, in the afternoon collections.

Mosquitoes were collected from the rooms regardless of the surface where they were resting. This was done in order to avoid any bias in the selection of the mosquitoes. The results from mosquitoes captured only from the sprayed walls would have proved prejudicial to the study. The situation would have been that of bioassay tests where the contact of the mosquitoes with the insecticide is forced. Such results may well denote the potency of the insecticide against any test insects but will not determine whether or not the insecticide is actually serving the purpose for which it has been applied.

Table IV: In this Table the total catch in each set of rooms has been summed up by species by month together with the average per man hour catch for (a) total mosquitoes : (b) total females after deducting males from the total catch.

In the Baytex treated rooms there appears no appreciable decline in the number of mosquitoes captured alive compared to other rooms. This denotes that Baytex does not exert repellance on the mosquitoes generally. Nevertheless, from the specific analysis of the catch, the decrease in the number of *Culex fatigans* in the Baytex sprayed rooms is conspicuous.

GENERAL DISCUSSION AND CONCLUSION

The objective in this trial was to assess from Entomological view point as to how far Baytex can bring a relief from DDT, Dieldrin fast city mosquitoes, both as a larvicide and adulticide.

As a larvicide the results of Baytex have been highly satisfactory as borne out in the experiment. Nevertheless, it must be admitted that the experiment has not been sufficiently productive in revealing conclusively the effect of Baytex against adult mosquitoes. The data is insufficient and any hasty conclusions drawn from meagre data will be erroneous. More decrease in the number of a particular species in the room sprayed with the test insecticide is not enough proof of the efficiency of an insecticide. The gonotrophic condition and age composition of each species caught alive from the room sprayed with trial insecticide and in control is of great significance in assessing insecticidal activity. Since this has not been done in this experiment, drawing of conclusion is held in reserve. Till such time that the experiment is comprehensive enough to uncover the specific questions precisely there is no justification in making recommendations based upon mere speculations.

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We have had a lesson from the extensive use of DDT and BHC particularly in Lahore City. Though still effective against disease vector *Anopheles* in the rural areas, in Lahore city these chlorinated hydrocarbon insecticides, have long since lost effectiveness.

In cities the best method of mosquito control is through anti-larval measures since the surface area for adult mosquito resting is usually several fold compared to the area of breeding grounds. It is for this reason both economic and feasible to deal with the city mosquito problem by inflicting upon their preimaginal stages. Baytex may be used with for anti-larval measures especially in cities where the local mosquitoes are no longer amenable to chlorinated hydrocarbons both as larvae and adults. Mere oiling of the breeding grounds with Malariol or furnace oil has many limitations and drawbacks, which may be overcome by the application of newer synthetic insecticides.

SUMMARY

Baytex a new organophosphorus insecticide was put on trial in an experiment designed to measure its effectiveness against the city mosquitoes. The term effectiveness signifies insecticidal activity against DDT, Dieldrin resistant mosquitoes (larvae and adults), duration of residual action of the insecticide both as larvicide and adulticide and the dosages of the insecticide which would suit local conditions with regard to mosquito problem.

As a larvicide Baytex undoubtedly fully meets all requirements in connection with the control of city mosquitoes. Baytex may be used even in a dosage of 0.05 PPM for control of pre-imaginal *Culex fatigans* and *Anopheles subpictus*. The dosage would however, depend upon the local circumstances and breeding situations.

Baytex as an adulticide has a long residual action against DDT, Dieldrin, fast mosquitoes and does not seem to exert repellent effect on any species. The dosage of 1 gm/2m is effective for about 90 days. This experiment has however not been conclusive and further experiments and observations are necessary.

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REFERENCES

1. Brooks, G.D., Schoof, H.F., and Smith, E.A. Effectiveness of various insecticides against *Aedes aegypti* infestations in water storage drums in U. S. Virgin Island. Mosquito News: Vol. 25(4): 423—427 (1965).
2. Hoskins, W. M. Criteria and meanings of tests with the W. H. O. Adult mosquito kits. WHO/Vector Control/29 : 1963.
3. Maldonado—Capriles, J. and Nasir, A. S. DDT resistant adults of *Anopheles subpictus* in Lahore District of West Pakistan. Mosquito News: Vol. 20(1): 52—54.

TABLE 1

Showing Susceptibility Resistance Level *Culex fatigans* and *Anopheles subpictus* Percent dead after 24 Hours in the Tests Carried out from time to time with the W. H. O. Susceptibility Kit at Lahore

Insecticide %	Exposure time to Insecticide					
	One Hour		Two Hours		Four Hours	
	<i>C. fatigans</i>	<i>A. subictus</i>	<i>C. fatigans</i>	<i>A. subpictus</i>	<i>C. fatigans</i>	<i>A. subpictus</i>
(A) DDT 4%						
1. July 1958	...	10.9	...	49.8	...	53.8
2. Aug. 1966	54.7	13.8	58.8	15.0	...	43.5
(B) Dielurin 4%						
1. Jan. 1964	73.1	...	...	...	...	...
2. Aug. 1966	84.9	26.3	...	23.87	...	47:1

TABLE II
Days of Effective, Control More than 70% Mortality with 2 Baytex (Formulations Against Larvae of *Culex fatigans* and *Anopheles subpictus*)

Compound	A		Y		T		E		X
	B								
Active Material	0.025 ppm				0.05 ppm			0.1 ppm	
Formulation	Granular 2%	E. con 50%	Granular 2%	E. con 50%	Granular 2%	E. con 50%	Granular 2%	E. con 50%	
Larvae species	Days	Days	Days	Days	Days	Days	Days	Days	
1. <i>Culex fatigans</i>	10(50)	4(50)	10(50)	7(50) 2(50)A	15(50)	19(50) 2(50)A			
2. <i>Anopheles subpictus</i>	...	6(50)	5(50)	12(50)	11(50)	25(50)			
3. <i>A. subpictus</i> and <i>C. fatigans</i> 25 each tested simultaneously	...	...	...	...	...	21(25)A/ 19(25)C			

1. Number of larvae used on each day in the test are in parenthesis.
2. Additional days the insecticide was effective against *Anopheles* larvae after it ceased to be effective against *C. fatigans* is shown by mark.
3. A = *Anopheles, subpictus* C = *Culex fatigans*, tested simultaneously. More than 70% mortality amongst *C. fatigans* for 19 days but against *Anopheles subpictus* for additional 2 days the solution remained effective i. e. days.

TABLE

Mortality Percent all Mosquitoes (Females only) 24 Hours after Capture in mortality was less than 22.0%)

VILLAGE CHAK SETHIAN : DATE OF SPRAYING 8th May 1966

Date of catching	Days after treatment	Baytex-40-1 gm/m ²	DDT 50% Wdp 2 gm/m ²	Control
11th May 1966*	3	100%	25	5.8
15th May 1966*	7	63.6	28.5	15.3
24th May 1966*	16	91.8	5.8	18.9
26th May 1966	18	87.5	40.0	4.5
31st May 1966	23	81.2	25.0	12.5
19th June 1966	42	60.0	5.5	12.5
30th June 1966	53	71.4	0.0	0.0
4th July 1966	57	90.9	35.2	8.3
25th July 1966	78	100.0	61.1	0.0
1st August 1966	85	100.0	21.3	11.7
5th August 1966	89	80.9	0.0	12.5
12th August 1966	96	90.1	3.2	8.3
15th August 1966	99	82.1	0.0	22.0
26th August 1966	110	72.2	33.3	10.3
29th August 1966	113	61.7	26.6	8.5
1st September	116	57.8	42.8	11.7

*Catching hours :—5-30 to 6-30 a.m.
Others :—1-30 to 2-30 p.m.

III

the rooms under experiment in the two villages (days on which control

VILLAGE CHICHOKI MALLIAN : DATE OF SPRAYING 22nd May 1966

Date of catching	Days after treatment	Baytex-40-1 gm/m ²	Dot 50% Wdp 2 gm/m ²	Control
25th May 1966*	3	100	0.0	20.0
27th May 1966	5	100	30.0	17.0
30th May 1966*	8	100	11.1	22.0
6th June 1966	15	75	0.0	20.0
13th June 1966*	22	100	50	17.0
17th June 1966*	26	91.2	9.5	2.6
24th June 1966	33	80.0	20.0	10.7
29th June 1966	38	100.0	22.7	20.00
14th July 1966	53	89.0	5.5	...
31st July 1966	70	66.6	0.0	21.0
7th August 1966	77	100.0	33.3	3.4
14th August 1966	84	88.8	11.1	8.0
18th August 1966	88	64.2	38.0	2.0
25th August 1966	95	92.8	44.4	9.6
6th September 1966	107	57.1	46.1	8.7

—, container loss in transit.

TABLE

Showing the Composition of Mosquito Fauna : Total Mosquitoes Captured
(all days)

Month	Catching station		No. of man hours	Female of each				
VILLAGE CHAK SETHIAN				<i>C. fat.</i>	<i>C. tri.</i>	<i>C. theil</i>	<i>Aedes sp.</i>	<i>A pul.</i>
Date of Spraying 8th May 1966								
May	1. Control	...	11	213	57	1	...	7
	2. DDT	...	11	78	108	2	1	4
	3. Baytex	...	11	34	169	2	...	56
June	1. Control	...	13	53	155	6	...	3
	2. DDT	...	13	106	463	...	1	...
	3. Baytex	...	13	8	209	5	...	18
July	1. Control	...	13	19	89	...	...	...
	2. DDT	...	13	2	83	...	...	1
	3. Baytex	...	13	1	85	...	...	9
August	1. Control	...	14	...	7	...	...	9
	2. DDT	...	14	1	7	...	...	1
	3. Baytex	...	14	...	10	...	...	3
September	1. Control	...	2	...	...	...	...	...
	2. DDT	...	3	...	...	...	...	...
	3. Baytex	...	3	...	...	...	...	...

IV

during the entire Period of Experiment in two Villages from the 3 Sets of Rooms, inclusive)

species caught								
<i>A. an.</i>	<i>A. cul.</i>	<i>A. sub.</i>	<i>A. step.</i>	<i>A. nlge</i>	Total	Total females per man hour.	Total males (all species)	Total mosquitoes per man hour.
4	...	...	...	...	282	25.6	303	53.0
3	...	...	...	3	197	18.0	125	29.2
10	...	...	...	...	259	23.5	73	30.1
2	2	...	...	...	221	17	109	25.3
...	8	...	2	...	580	44.6	263	64.8
5	1	...	...	...	246	19.0	33	21.4
...	27	96	5	...	242	18.6	127	28.3
...	12	15	...	...	113	8.3	34	11.3
2	16	105	...	...	218	16.7	42	20.0
...	13	375	...	...	385	27.5	169	39.5
...	18	209	...	...	236	16.8	67	21.6
...	8	747	...	...	768	54.8	213	70.0
...	...	142	...	...	142	71.0	48	95.0
...	1	111	...	...	112	37.3	44	52.0
...	2	91	...	...	93	31.0	55	49.3

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TABLE

Showing the Composition of Mosquito Fauna : Total Mosquitoes Captured
(all days)

Month	Catching station		No. of man hours.	Female of each				
VILLAGE CHICHOKI MALLIAN				<i>C. fat.</i>	<i>C. tri.</i>	<i>C. theil</i>	<i>Aedes sp.</i>	<i>A. pnl.</i>
Date of spraying : 22nd May 1966								
May	1. Control	...	3	70	47	...	...	6
	2. DDT	...	3	51	1	...	1	...
	3. Baytex	...	3	31	18	1	...	4
June	1. Control	...	13	147	558	...	...	39
	2. DDT	...	13	66	108	...	...	3
	3. Baytex	...	13	11	127	...	...	9
July	1. Control	...	12	4	254	...	...	22
	2. DDT	...	12	12	40	...	...	...
	3. Baytex	...	12	4	61	...	...	4
August	1. Control	...	13	3	112	...	...	12
	2. DDT	...	13	...	25	...	...	1
	3. Baytex	...	13	8	55	...	...	1
September	1. Control	...	2	...	...	...	...	...
	2. DDT	...	2	...	...	...	...	...
	3. Baytex	...	2	...	...	...	...	...
ABBREVIATION				...	...	...	...	...

ABBREVIATION

Culex fatigan, *Culex tritaeniorhynchus*, *Culex theileri*, *Aedes species*,
Anopheles pulcherrimus

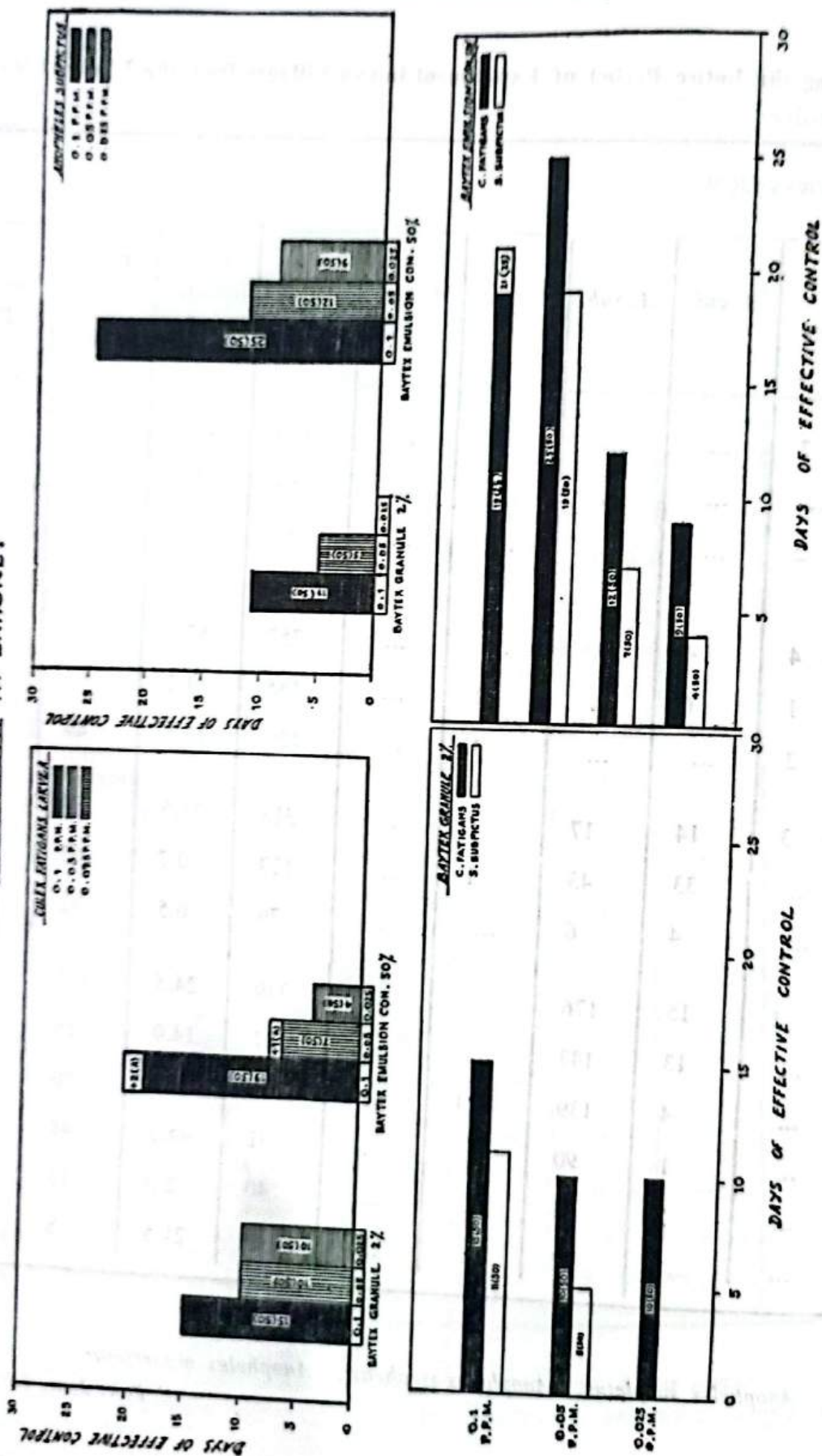
IV
during the Entire Period of Experiment in two Villages from the 3 Sets of Rooms,
inclusive)

species caught

<i>A. an.</i>	<i>A. cul.</i>	<i>A. sub.</i>	<i>A. step.</i>	<i>A. nig.</i>	Total	Total females per man hour.	Total males (all species)	Total mosquitoes per man hour.
7	...	...	...	...	130	43.3	80	70.0
...	...	...	...	...	53	17.6	30	27.6
2	...	...	...	...	56	18.6	26	27.3
4	4	...	...	...	752	57.8	382	87.2
1	6	...	1	...	185	14.2	64	19.1
2	...	...	1	...	150	11.5	49	15.3
3	14	17	4	...	318	26.5	87	33.7
...	33	43	1	...	129	10.7	63	16.0
...	4	6	...	...	79	0.5	32	9.2
1	15	176	...	...	319	24.5	103	32.4
...	13	143	...	...	182	14.0	88	20.7
...	4	139	1	...	208	16.0	70	21.3
...	1	90	...	...	91	45.5	46	68.5
...	2	38	...	...	40	2.0	13	26.5
...	...	43	...	...	43	21.5	8	25.5

Anopheles subpictus. *Anopheles stephensi,* *Anopheles nigarrimus*
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GRAPHS SHOWING DAYS OF EFFECTIVE CONTROL (70% & ABOVE MORTALITY) WITH THE TWO FORMULATIONS OF BAYTEX USED IN VARIOUS STRENGTHS, AS A LARVICIDE AGAINST CULEX FATIGANS AND ANOPHELES SUBPICIUS LARVAE IN THE LABORATORY AT LAHORE.



A NOTE ON EVALUATION OF TWO FORMULATIONS OF ABATE AGAINST CULEX FATIGANS AND ANOPHELES SUBPICTUS LARVAE, IN LAHORE*

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And

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Mosquito nuisance in our cities is essentially a *Culex fatigans* show. No other mosquitoes bother city dwellers as much as does mosquito species, always thirsty for human blood. The other prevalent city mosquito is *Anopheles subpictus* which hardly if ever bites man but attacks treacherously cattle, a close companion of man both in the rural and urban areas of West Pakistan.

Culex fatigans breeds every where in close proximity of its patent host the man, generally in waters polluted to the extent no other species of mosquito would consider respectable to lower its belly for laying eggs. (*A. subpictus* is an exception). The size of a *Culex fatigans* breeding place is highly variable. It may be a single hoof mark, a broken vessel containing some water or a vast expanse of water of any dimension.

Dealing with this species of mosquito has always been a problem and still is. Given an insecticidal pressure, it resists. A short while later D. D. T. and B. H. C. are ineffective, as has been observed through susceptibility tests being carried out by us from time to time. Anti-larval oiling is good but is not as practicable as it sounds. Because of the number of breeding places and repetition of oiling required, oiling for destroying mosquito breeding does not suit to our condition.

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Two formulations of an organophosphate insecticide formerly known as E. I. (52160) mosquito larvicide, and now named "ABATE" developed by American Cyanamid Co. were received for laboratory and field trials against city mosquitoes.

Laboratory trials simulated to field conditions were carried out against *Culex fatigans* and *Anopheles subpictus* larvae using the following technique:—

The test containers were unglazed baked clay troughs of 30' diameter and depth of 12 cm. in the centre when filled with 20,000 cc. (20 litres) of tap water. To each trough was added a precisely calculated and accurately drawn quantity of insecticide of either formulation so that the resulting strength of the insecticide (active material) in the water of the troughs was as follow.

	<i>Abate granular</i>	<i>Abate E.C.</i>
0.025 P.P.M.	2 Troughs	2 Troughs
0.050 P.P.M.	2 Troughs	2 Troughs
0.10 P.P.M.	2 Troughs	2 Troughs.

One trough to which no insecticide was added was kept as control to take into account the extent of natural death amongst mosquito larvae under conditions of the experiment.

In order to study the comparative effect of the 2 formulations of Abate for the 2 species of mosquitoes against whom tested, 50 mosquitoes larvae (late 3rd instar or 4th instar) collected from the field were introduced in each trough every morning and removed alive or dead 24 hours after, next morning. The mortality percent of each species of mosquito larvae in each trough was recorded separately. Any larvae that pupated during the test were excluded from the total when calculating mortality percent. After making up the loss of water due to leakage, evaporation etc. the test was repeated. The amount of water lost due to evaporation or leakage and made up was between 1000 and 2000 cc. every day. Without addition of any fresh insecticide the tests were continued till such time that the

mortality of the test larvae fell below 70% for 3 consecutive days, in any trough. On the termination of the test for any trough, its contents were discarded, the trough emptied and dried in the sun for one full day. On the next day a fresh test was started by the addition of fresh water and fresh insecticide (same dosage as before) as replicates.

RESULTS

Abate granular 1%. The dosage of 0.025 P.P.M. of this formulation was effective (mortality 70% or above) against *Culex fatigans* larvae for 16 days. The 0.05 dosage for 22 days and 0.10 for 29 days. Against the larvae of *Anopheles subpictus*, the effectiveness of Abate granular in 0.025, 0.05 and 0.10 P.P.M. has been for 10 days, 15 days and 18 days respectively.

Abate E. C. 50%. Against *Culex fatigans* larvae the formulation was effective for 17, 17 and 36 days in the dosage of 0.025, 0.05 and 0.10 P.P.M. respectively. Against *Anopheles subpictus* Abate E. C. 50% in the dosage of 0.025, 0.05 and 0.10 P.P.M. was effective for 11, 16 and 32 days respectively.

DISCUSSION

As seen in Table I, Abate granular 1% appears to be highly effective against *Culex fatigans* larvae in the dosage of 0.10 P.P.M. though relatively less effective against *Anopheles subpictus* in the identical dosages as for *Culex fatigans*. This by no means implies Abate granular to be specific for *Culex fatigans* alone. The results against *Anopheles subpictus* are also highly encouraging. Though the dosages of 0.025 P.P.M. and 0.05 P.P.M. (Active Material) of both formulations appear sufficiently potent in eliminating mosquito breeding from the breeding grounds, the dosage of application for both formulations should in our opinion be not less than 0.1 P.P.M. in any case.

From the results arrived at (Table I) Abate E.C. 50% seems almost equally effective against *Anopheles subpictus* and *Culex fatigans*. Apparently the observation is in line with the findings of "Pak. Jour. Hlth. 1968-69"

tions show better results for its action as a residual larvicide against *Culex fatigans* the difference, however, is not significant. Comparing Abate E. C. with Abate Granular, the former appears superior for its residual action against both species of mosquito larvae tested. Abate granular may however be used as a larvicide of choice, for ease in its transportation and application when control of only the *Culex fatigans* mosquitoes be desired.

During these experiments seasonal fluctuations and temperature variations seemed to influence the duration of residual activity of Abate. Further experiments are being carried out to study temperature variation affects on the duration of the residual activity of this larvicide. It will also be highly desirable to conduct experiments on similar lines using higher PPM concentration of active material in order to observe maximum duration of residual activity at safe levels. The higher dosage levels for practical usage will however depend also on the type of breeding ground to be treated, the type of water contained and the time of the year when applied. Yet to play safe the higher dosage may not be tried in the breeding places which might serve as a source of drinking water for men and animal, for culturing fish or for domestic purposes. The safety level of this insecticide to mammals is sufficiently high. The information available indicates that the L. D. 50 values of corn oil suspension administered to young male albino rats are greater than 1000 mg/kg. and the single dermal L. D. 50 value is 1370 mg/kg. (1024—1782 mg/kg. range).

SUMMARY AND CONCLUSIONS

As stated already, in the urban areas of West Pakistan the main mosquito problem is due to *Culex fatigans*. The waters, in which these mosquitoes breed are usually highly polluted, and are numerous specially after the rainy season (Monsoons). Application of oils as larvicide has been the usual method of larval control, but this method bears little fruit on account of several handicaps and disadvantages, e.g. transportation, supervision, too frequent repeat applications etc., etc. D. D. T. and B. H. C. mixed in oil are no more effective due to high degree

of tolerance in these mosquitoes. To overcome these set-backs a potent, and easy to handle larvicide has long since been in demand. This in view, tests were carried out against 2 common mosquito species found in Lahore city using Abate granular and Emulsion concentrate. The results arrived at with both formulations against the two species of mosquitoes are highly encouraging. Abate Emulsion concentrate is relatively superior to granular in residual action, but the granular preparation has its own advantages of convenience in transportation and application. The dosage of 0.1 P.P.M. (Active material) is considered minimum, safe, and moderate for use as larvicide under our conditions. For breeding grounds likely to be formed after rains and to exist only for short duration (Temporary breeding grounds), one application of Abate may be sufficient to deal with mosquito problem arising from such breeding grounds.

ACKNOWLEDGEMENT.

We are thankful for keen interest and the guidance given to us by Prof. M. A. Rahman Ansari Dean, Institute of Hygiene and Preventive Medicine for conducting this experiment. Our thanks are also due to M/s. Cyanamid International who supplied us material information enabling us to carry out this study.

(TABLE I)

Average days of Effective Larval Control (at Least 70% or above daily Mortality in the Dieldrin—D. D. T. Resistant *Culex fatigans* and *Anopheles subpictus* of Lahore) with the 2 Formulations of A. C. 52160, (Abate). A Comparative Study (Period of Study April—December 1967)

FORMULATION	CULEX FATIGANS			ANOPHELES SUBPICTUS	
	Dosage in P. P. M.	No. of tests	Effective control (days).	No. of tests.	Effective control (days)
AC. 52160	0.025	8	16	5	10
	0.05	10	22	7	15
	0.10	7	29	6	18
Abate E. C. 50% ...	0.025	10	17	10	11
	0.05	11	17	8	16
	0.10	19	36	3	32

" ENVIRONMENTAL SANITATION TRENDS IN THE WORLD OF TOMORROW "

By

Professor Muhammad Abdur Rahman Malik.*

Environmental Sanitation means the control or elimination of the communicable diseases by controlling the Environmental factors such as water supply, sewerage, housing, air-conditioning and food hygiene. Further more ; the ultimate aim of every human being, rather every being in the world is to live a happy life. Therefore, the future planning of all the activities is designed to conform with the attainment of the happy surroundings. All are aware that the world's population is increasing tremendously and the environmental sanitation is increasingly being polluted as cities grow and the industry develops - — creating great hazards for human beings. This has to be kept in view while imagining the future trends in environmental sanitation.

2. The environments further can be categorized as :—

(a) PHYSICAL-ENVIRONMENTS

This includes temperature, soil and humidity. The future trends in this field seem to have maximum control of these environments in order to achieve the maximum happiness. For example, every person would like to live in an air-conditioned place, may be his working place or place of residence. The air-conditioning will definitely pay in terms of efficiency as well as increase the longevity of one's life. Similarly the control of humidity, the control of soil behaviour and the control of other physical environmental factors will be the demand of the future.

(b) BIOLOGICAL ENVIRONMENTS

It may be said that with the increase in population of mankind there is also increase of animals and plants which determine certain disease incidences. On the other hand certain plants and animals are used as source of nutrition and for industrial purposes. The future trend of mankind in this field is to

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increase the growth of plants. Therefore there will be a tremendous pressure to produce a proper balance to control these biological environments.

(c) SOCIO - CULTURAL ENVIRONMENTS

Socio-cultural environments arise through association of human beings among themselves. The world is shrinking day by day, due to fast means of travel and communications. The human beings will be having more chances to intermingling the economic conditions, standard of medical care facilities than before. This may produce chances of spread of communicable diseases. Ultimately there will be more demand of raising environmental sanitation standards on scientific lines, to safe guard against these dangers.

3. There are quite a few environmental factors such as water, sewage, food hygiene, housing and drainage, which form components of environmental sanitation. But, here only one factor *i.e.*, water is touched which could serve as an example.

In early ages, there were times when the people used to drink water directly from the rivers and wells, without any proper purification. The passages of the times, with increase in population and with the increase of the demands of the human beings, have introduced various methods of sanitation of water such as sedimentation, filtration, coagulation and chlorination. Now the time has come that it is not only the quality but also the quantity for which man has to make search, research and efforts to produce enough potable water. For one person in America 150 (One hundred and fifty) gallons of water is required per day. It varies in other countries but it is not less than 35 (Thirty five) gallons per person per day at an average. Then, there are countries where neither the surface nor the underground water is available in sufficient quantity. Therefore the necessity of treating sea water has become a must. For this nuclear energy is being tried. At present this system of purification is a little more expensive. But, in times to come this energy may be cheaper or some other method of purification may have to be evolved.

4. Similarly the future trend of sewage disposal would be to treat it in such a manner that the sewage of today can be termed as breakfast of tomorrow. Also in the field of housing, the future generation would require cheapest and best homes, having all the modern facilities of sanitation.

5. To conclude it may be said that the future trend in environmental sanitation will be to produce maximum facilities in shortest possible time involving the use of modern sciences and Technology. The slogan will be to have the BEST, CHEAPEST and QUICKEST.

BOOK REVIEWS

1. EMERGENCIES IN MEDICAL PRACTICE by Birch, C.A., M.D., FRCP, DPH. 8th Ed. 1967 (PP. xvi + 852, 60s). Edinburgh and London E. and S. Livingstone Ltd.

The author has thoroughly revised and brought it up-to-date. It provides essential knowledge for the general practitioners to deal with an acutely ill patient. It presents a comprehensive, practical and reliable information about the various problems encountered by a clinician in an emergency. Strongly recommended to the medical students, physicians and general practitioners.

2. ATLAS OF MEDICAL HELMINTHOLOGY AND PROTOZOOLOGY by Jeffery, H.C., MBCHB, MRCPE, M.C. Path, DTM & H. and Leach, R.M., B.E.M. (Pp. 132, 75s), 1966. Edinburgh and London: E. and S. Livingstone Ltd.

A well designed and illustrated Atlas showing the main morphological features and life cycles of the helminths and protozoa parasitizing man. It contains 121 plates and has been divided into three parts. The first deals with commoner helminths of medical importance, the second with protozoa and the last with somewhat detailed accounts of helminths and notes on less common varieties. It is an excellent book for quick reference near the examination. It would be of much use to the undergraduate and postgraduate students.

3. TROPICAL HEALTH SCIENCE. Edited by Hughs, D.T.D., M.A., EMBCH, B.Sc., MRCP, and Marshal, P. T., M.A. (Pp. 144) 1967. London: Cambridge University Press.

This book presents elementary knowledge of Physiology, Medicine and Public Health in the tropics. It is divided into four parts. The first deals with the

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nature of living things, plant and animal and structure of animal cell. The second part describes the man as a mammal, Physiology and function of body. The third section concerns the nature of disease and how it can be prevented. The last part deals with the establishment of individual community health organizations. Each chapter is appended by examination questions.

The book is based on the syllabus of the Cambridge Local Examinations Syndicate in Health Services. It would be a useful guide for Lady Health Visitors, Sanitary Inspectors and Medical Social Welfare Workers.

4. STRUCTURE AND FUNCTIONS OF HUMAN BODY by MacGregor, G. S., M A., DM, LRCP, MD. 1956 (Pp. xxi + 632, 50s). London : Oxford University Press.

This book describes the body 'as a community of living individual'. It presents the structures and functions of the living body. Some of these have been explained in terms of engineers and automatic machines. It provides interesting knowledge for those concerned with the problems of Health and disease especially paramedical personnel,

5. HANDBOOK OF BACTERIOLOGICAL TECHNIQUE by Baker, F. J., FIMST, FRMS and Breach, M. R., FIMLT, 2nd Ed. 1967 (Pp. ix + 482, 75s). London : Butterworth and Co., Ltd.

This book has been completely revised and brought up-to-date. The technical methods used in bacteriological laboratories have been described in detail. It is based on the syllabus of the Institute of Medical Laboratory Technology examinations. It is strongly recommended for those who want to be efficient laboratory technicians.

6. AN INTRODUCTION TO DERMATOLOGY by Percival, G. H., MD, PhD, FRCP, DPH. 13th Ed. 1957. (Pp. vii + 396, 75s). Edinburgh and London E. and S. Livingstone Ltd.

It has been revised and brought up-to-date. It contains sufficient information as regards the diagnosis and treatment of diseases of the skin. It is well illustrated. It would be of much value to the medical students and general practitioners.

7. THE HAEMOLYTIC ANAEMIAS CONGENITAL AND ACQUIRED PART 4 by Dacie, J. V., MD, FRCP, FRS. 2nd Ed. 1967. (Pp. vii + 360, 65s). London J. and A. Churchill Ltd.

This is the final volume of the second edition of Haemolytic Anaemias. It contains three chapters dealing with haemolytic anaemias due to drugs, chemicals, venoms, lack of glucose-6-phosphate dehydrogenase, paroxysmal nocturnal haemoglobinuria and haemolytic disease of the new born. This is a well written, adequately documented treatise by an Authority on the subject. Highly commendable work of great value to the Haematologist, Physician and Pathologist.

8. AN ATLAS OF BONE MARROW PATHOLOGY by Israels, M. C. G., MD, MSc., FRCP. 3rd Ed. (Pp. xii + 84, 50s). London : William Heinemann Medical Books Ltd. 1966.

It has been revised and brought up-to-date. The book is divided into two sections. The first deals with the techniques and identification of cells. Methods of smear preparations and biopsy for histological sections have been described. The second part deals with the changes in the marrow picture in different diseases and their interpretations. Tables for differential diagnosis are also included. The illustrations are excellent. It is recommended as a useful companion for the clinical pathologists.

9. DIAGNOSTIC METHODS IN CLINICAL VIROLOGY by Grist, N. R. BSc, MB, ChB, FRCP, MC Path.; Ross, C. A. C. MD, MC Path., Bell, E. J. BSc., PhD and Stott, E. J., B.A. (Pp. x + 129, 25s). Oxford : Blackwell Scientific Publications, 1966.

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This book describes the methods of diagnostic routine clinical virology. The techniques are based on methods found satisfactory in the Regional Virus Laboratory, Glasgow. General organisation of a virological laboratory is discussed. This book would be a useful guide to Clinical pathologist and laboratory workers who wish to employ virological techniques for diagnostic and epidemiological purposes.

10. CONTRACEPTIVE TECHNIQUES by Helena Wright, M.B.B.S. 3rd Ed, (Pp. viii + 96, 10s). J. and A. Churchill Ltd., London, 1968.

This well illustrated book has been revised and brought up-to-date. Tremendous increase in population of under developed countries is one of the major problems confronting the Governments. Planned parenthood is of utmost importance to improve their standard of living. The book provides details of contraceptive methods : oral and mechanical etc. It is recommended as a guide to doctors and paramedical personnel working in family planning associations, Lady Health Visitors, Nurses and Midwives etc.

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