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Vol. XVI

OCTOBER, 1966

No. 3

A QUARTERLY
DEVOTED TO HYGIENE, PREVENTIVE MEDICINE,
MEDICAL SCIENCE AND ALLIED SUBJECTS



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The Institute of Hygiene & Preventive Medicine
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INFORMATION

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"Pak. Jour. Hlth., 16 (3)"

Tropical Pulmonary Eosinophilia

Recent work suggests that tropical eosinophilia is linked with infection by a filarial worm. Probably, during the active phase of the disease, microfilariae are liberated by adult female worms in the pulmonary lymphatic bed, and become trapped in the tissues where they die and provoke a characteristic eosinophilic reaction. Demonstrable microfilariae are, however, consistently absent during the illness, it is therefore necessary to postulate that after release into the blood-stream, the microfilariae are trapped and destroyed in the first set of capillaries through which they pass.

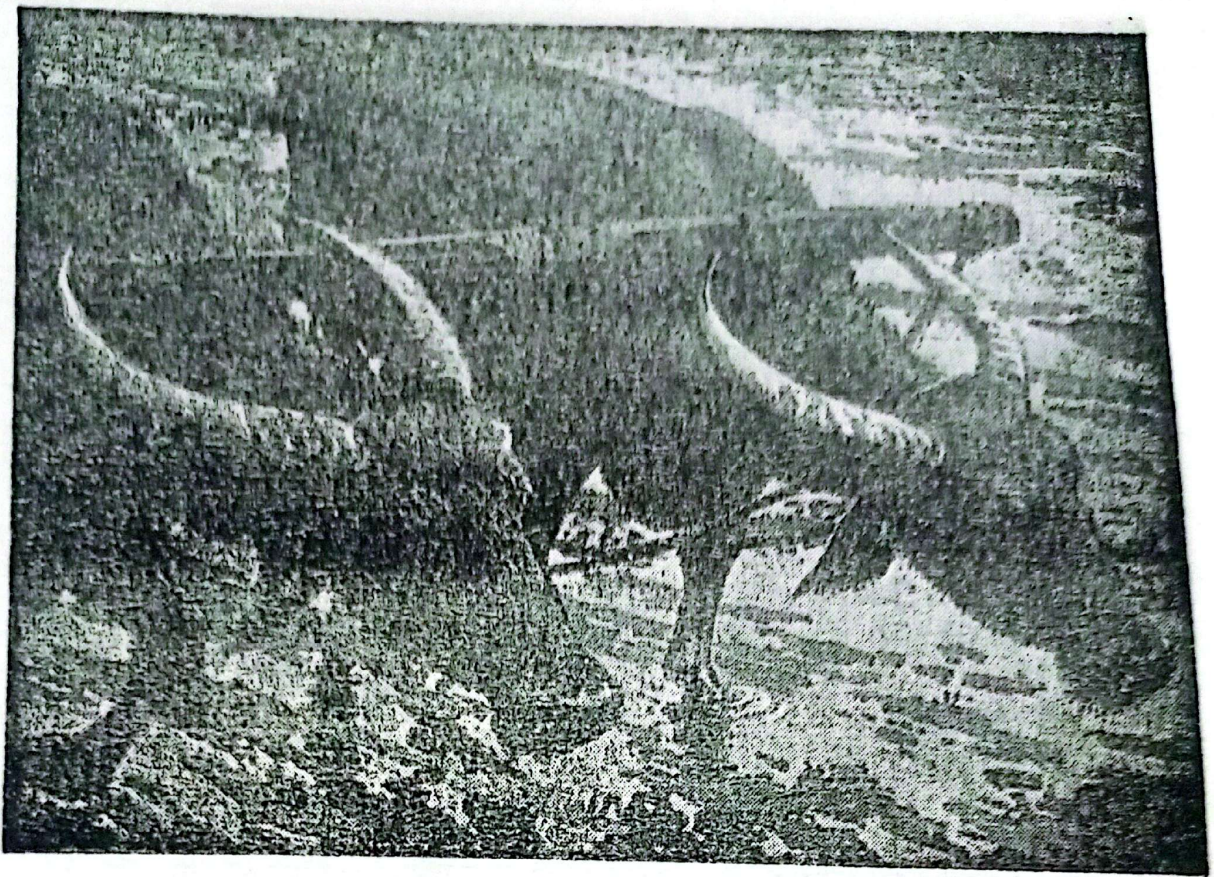
So far, the filaria believed to be responsible has not been identified. Microfilariae morphologically indistinguishable from *Wuchereria bancrofti* have been demonstrated in eosinophilic nodules. Nevertheless, on the analogy of other findings, the infecting worm is probably of animal and not human origin and the disease itself a zoonosis. The possibility exists that the larval forms of other nematode worms may be involved in some instances.

The syndrome consists of intractable respiratory symptoms developing over

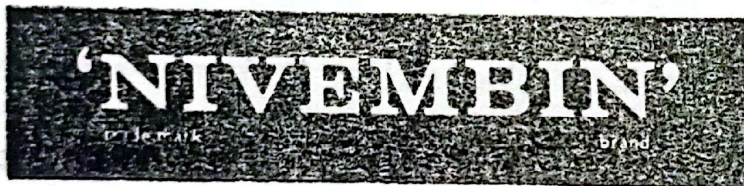
a period of several months and is usually restricted to adults between 20 and 40 years old. Cough predominates from the onset, the sputum is mucoid and sometimes flecked with blood, sleep is profoundly disturbed and there may be dyspnoea and sweating. Radiologically, the lung fields show fine branching striations with basal and bilateral mottling, but these changes are often slight to moderate and out of all proportion to the severity of the symptoms. The absolute number of circulating eosinophils is greatly increased, producing a leucocytosis of up to 45,000 per cubic mm. The disease may last for years, but is rarely fatal.

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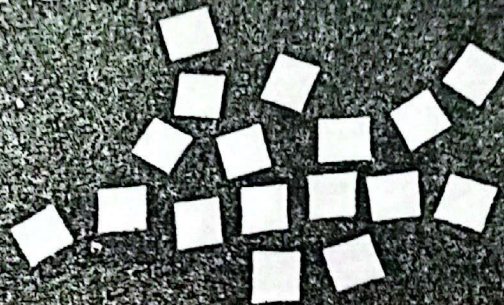
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ESSENTIAL FATTY ACIDS

By

PROF. DR. AHSANUL HAQ R. RANA, *Professor of Nutrition and Dietetics, Institute of Hygiene and Preventive Medicine, Lahore.*

Although opinions differ in respect of the essential nature of Essential Fatty Acids (EFA) as nutrients, yet their role in cholesterol transport and lowering blood cholesterol level, along with the resulting atheromatous and coronary heart diseases in their absence, cannot be ignored. Work already done on the importance of EFA in edible fats during growth and development of fetus, infants and children, and pregnant and lactating women also needs careful consideration. It is, therefore, desirable that population be not exposed to any risk and it be presumed that deficiency of EFA can result by use of saturated fats such as banaspati obtained by hydrogenation of vegetable oils.

Bur and Bur¹ in 1929 first showed that certain unsaturated fatty acids were necessary in the diet for the health and survival of rats. These were called essential fatty acids and are either not synthesized or not synthesized rapidly enough in the animal body to permit their omission from the diet. The exact function of the unsaturated essential fatty acids is not fully known, but it has been suggested that they are needed as actual structural materials. These essential fatty acids (EFA) are Linoleic acid (with two double bonds), linolenic acid (with three double bonds) and arachidonic acid (with four double bonds). They are present in such food as soybean, whole wheat, unhydrogenated cottonseed oil, corn oil, peanut, linseed and olive oils, and in egg yolk, and, to a lesser extent, in lard. Fats, other than these essential fatty acids, can be synthesized in the body from protein, carbohydrates, and other fatty acids. Further work suggests that concept of need for all the three EFA may change. There is indication that linoleic may serve as a precursor of the other two.

Linoleic acid is found in both plant and animal fats; arachidonic acid is synthesized from linoleic acid by animals and is found only in animal tissues. Linolenic acid which was at first classed as one of the essential fatty acids, is not active against dermatitis and, therefore, should not be classed as essential. When growth of rats is used as a criterion, linolenic acid and several other unsaturated fatty acids show activity, but this finding is not sufficient to classify them as essential. Since linoleic acid is the most important and most widely distributed, it is often the only one listed in tables of food values.

The results of Bur and Bur have been fully confirmed and a great deal is now known about the pathological consequences of the deficiency of the EFA in the rat. When young rats are put on a fat free diet immediately after weaning, they continue to grow normally.

Essential Fatty Acids

for two or three weeks. The rate of growth then declines and usually stops within 8 to 10 weeks. During this period an eczematous scalliness of the skin develops. This is most marked over the tail, but the paws are also severely affected and no part of the skin is altogether spared. This can be prevented by giving cottonseed oil or any one of the three EFA. Rats cannot synthesize these acids, but they can convert one into another. Arachidonic acid is probably the physiologically active form, but both linoleic or linolenic acids are readily converted to it in the body so that either can alone prevent the signs of deficiency. Vitamin B₆ (Pyridoxine) is probably needed for the conversion. If hydrogenated coconut oil is added to the diet, the eczema develops sooner and growth ceases earlier. The need for EFA may thus be inversely related to the amount of saturated fatty acids in the diet. The male rat needs about four or five times as much as the female for rapid growth.

Evidence of this deficiency, similar to that found in rats has been produced in mice and dogs. Calves, pigs and poultry have also been reported to be susceptible to the deficiency, although in these species it is not so readily produced. A variety of insects have been shown to require EFA. There is thus good reason to suppose that they are needed by all animal tissues.

However, there is no clear cut clinical evidence that EFA are necessary nutrients for man. Certainly, they are likely to be needed for the nutrition of the individual cell, but it is possible that the human body can make for itself all the arachidonic acid it needs, or derive it from the products of bacterial metabolism in the gut. It is now nearly 40 years since Bur and Bur first announced their discovery; in that time clinicians have searched the whole gamut of clinical medicine for the human counterpart of scaly tails in rats. Not surprisingly, some of them thought that they had found it in certain forms of infantile eczema. For a while these luckless infants were treated with large doses of unsaturated fats by mouth. But, according to Davidson, et. al.², experienced paediatricians no longer prescribe them.

Davidson, et. al.² are of the view that although there is now a massive body of literature in support of the belief that EFA are necessary nutrients for man, they know of no satisfactory scientific proof that this is indeed the case. One human volunteer³ remained for six months on a fat-free diet without developing any skin disorder. This fits in with the experience among Hos in India.

Mitra⁴ has made an interesting study of the dietary habits of the Hos, an aboriginal tribe in the Bihar Province of India. He investigated 250 families and found that 200 made no use of any kind of fat in their cooking. This was not due to poverty for many of the Hos had acquired some money by collecting forest products and they visited bazars nearby towns where they could have purchased fats had they so wished. They did not do because they were ignorant of the use of fats and oils in cooking; their culinary practices are limited to boiling and very occasionally baking. The Hos possess cattle but use them only as beasts of burden; they collect no milk and eat no meat. The total daily fat intake of different families was estimated as varying from 2.4 to 3.8 g. per head per day, which

“*Pak. Jour. Health*, 16 (3)”

would provide at most 2 per cent of the total calories. Although the health and nutrition of these aborigines were by no means ideal, they presented no signs or symptoms which could be attributed to fat deficiency, their general level of nutrition and physique was no worse than that of neighbouring villagers who regularly consumed vegetable oils.

Cooper, et. al⁵, are of the view that demonstration of an essential fatty acid deficiency in animals requires the rigid exclusion of fat from the diet. Therefore, it is not surprising that evidence of essential fatty acid deficiencies in adult humans has not been recognised. However, Wiese and Associates⁶ have demonstrated a fatty acid deficiency in infants, which proves beyond a doubt that essential fatty acid (EFA) are required by humans. Moreover, infants seem to grow better and require fewer calories for growth when there is an adequate supply of EFA. The human requirement for EFA is not known but it is thought to be satisfied if 1 to 4 per cent of the total calories are supplied as linoleic acid. The exact function of EFA in the body is not understood. It is now recognized that polyunsaturated fatty acids tend to lower blood cholesterol, but, again the mechanism of action is not known.

The question has been raised as to whether or not changes in the food pattern and the use of hydrogenated plant oils for culinary purposes have lowered the amount of unsaturated or essential fatty acids in the average diet enough to become a health hazard.

The type of fat in the diet is thought to be a factor in causing Atherosclerosis. Animal fats, such as butter, meat fats and egg fat, and some hydrogenated vegetable fats, all of which contain a large proportion of saturated fatty acids, increase the blood levels of cholesterol and lipoproteins. On the other hand, the vegetable oils such as corn, cottonseed, safflower and soybean oils, which contain a high percentage of poly-unsaturated fatty acids, particularly linoleic acid, tend to lower the levels of cholesterol and lipoprotein in the blood when given in fairly large amounts⁷. Olive oil, containing largely the monounsaturated oleic acid, and coconut oil, which contains mostly saturated fatty acids, do not have this effects.

That it is not linoleic acid but, rather, the degree of unsaturation of the fat which lowers blood lipids was shown by Ahrens⁸, who obtained significant decreases in blood lipids by the feeding of fish oils which contained little linoleic acid but had a high content of other unsaturated fatty acids.

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DIAGNOSIS OF PREGNANCY WITH "PREGNOSTICON"

By

ASGHARI K. AWAN* M.B., B.S., M.P.H. (HARVARD).

SINCE the dawn of civilization, man has taken interest in the early diagnosis of pregnancy. The Egyptians discovered that certain flowers bloomed more rapidly when watered with the urine of a pregnant woman (Hon, 1961). We now associate these changes with the presence of hormones in the urine of pregnant women. Numerous tests have been devised for early detection of pregnancy. A majority of these tests are based on the detection of hormones produced by the developing placenta, e.g., gonadotrophic hormones similar to those produced by anterior pituitary gland & steroid hormones similar to those of ovary and adrenal gland. Though Aschheim and Zondek had demonstrated the presence of gonadotrophic substances in the urine of pregnant women in 1928, it was not until 1938 that the hormone, chorionic gonadotrophin was isolated from placental cells growing in tissue cultures (Baird, 1957).

A majority of current pregnancy tests are based upon the assay of placental hormones, the chief being chorionic gonadotrophin which is found normally in the body fluids during pregnancy only. It is secreted as early as 24th day after the last menstruation and maximum concentration is reached between 50—90 days but decreases after this period to a lower level which is maintained throughout pregnancy. It can also be found in non-pregnant females as well as males when hormone producing tumours are present. Qualitative detection of these hormones has long been used for the diagnosis of pregnancy. Quantitative determination of chorionic gonadotrophin is of value in the diagnosis of disturbed pregnancy and certain pathological conditions such as hydatidiform mole or choriocarcinoma (Hon, 1961).

Organon Laboratories have put up 'PREGNOSTICON' for early diagnosis of pregnancy. By means of this reagent, which is based on immunological principles, it has been claimed that it is possible to detect pregnancy from about 8th day after the absence of menstruation. No test-animals are used nor any prolonged waiting is required as is the case in biological tests. The test is carried out *in vitro* using a small quantity of filtered urine of the woman suspected of pregnancy. The importance of this test lies in the fact that it can make early diagnosis possible and thus can help in the study of pregnancy during early months. It is believed that proportionately greater foetal loss occurs during early weeks of gestation. If pregnancy is diagnosed as early as 4—6 weeks of gestation and kept under observation, the extent of foetal loss as a problem can be studied and aetiological factors affecting this period can be better understood. Moreover, early antenatal care can be commenced which may lead to lower wastage during pregnancy and better preparation for motherhood.

*Produced from Pakistan Journal of Medical Research, 5(4) : 285—293 (October 1966) with the kind permission of the author.

MATERIAL AND METHOD

The composition of the reagent is as follows:—

- (a) Antiserum of rabbits immunised against human chorionic gonadotrophin, freeze-dried in ampoules which also serve as "reaction test tubes".
- (b) Erythrocytes, sensitised against human chorionic gonadotrophin, freeze-dried in vials.
- (c) Suspension liquid for the freeze-dried erythrocytes.
- (d) Control samples of urine (positive and negative) preserved by freeze-drying.

Specially treated erythrocytes serve as antigen carriers. In *pregnosticon* the antigen is human chorionic gonadotrophin. Addition of the corresponding antiserum causes a variation in the sedimentation pattern of the red blood corpuscles due to the occurrence of haemagglutination. This is prevented if free antigen is added at the same time. If the urine of a pregnant woman, which contains chorionic gonadotrophin (antigen), is added to the antiserum the antibody gets fixed. So, when suspension of the sensitised erythrocytes is added, erythrocytes remain unaffected and gradually settle down giving a clearly defined ring. However, if the urine does not contain the antigen, the antibodies in the serum will remain free and unattached and would be able to act on the sensitised erythrocytes, producing haemagglutination which leads to variation of the sedimentation process. A diffuse brown sedimentation then develops. A mirror placed under the "reaction test tubes" facilitates reading of the result.

Organon Laboratories have recommended the following procedure for the conduction of this test:—

1. Filter a small quantity of urine obtained from the suspected woman.
2. Add 4 ml. suspension liquid (c) to the vial of freeze-dried erythrocytes (b) and shake until a homogenous suspension is obtained.
3. Open the ampoule of freeze-dried antiserum (a) and place it in test rack.
4. Using a pipette add 0.1 ml. filtered urine to this ampoule.
5. Add immediately to the above solution 0.4 ml. of homogenous suspension of erythrocytes.
6. Shake the whole rack for about one minute.
7. Leave the test rack holding the ampoules to stand for two hours without changing its position or moving it in any other way.

The presence of a large or small clearly defined ring indicates that urine tested is from a pregnant woman.

METHODOLOGY

The Department of Maternal and Child Health of the Institute of Hygiene and
"Pak. Jour. Health, 16 (3)"

Preventive Medicine, Lahore was conducting a Research Project in order to study foetal loss. Diagnosis of pregnancy in early weeks assumed great importance. Therefore, the need of a test which could easily be carried out in a Maternal and Child Health Centre was greatly felt. It was decided to try out the reliability of 'Pregnosticon' as a test for early pregnancy.

Through the courtesy of Organon Laboratories the reagent was specially sent over to Lahore. The Maternity and Child Welfare Association of Pakistan, a voluntary organization, permitted the utilization of Fatima Jinnah Community Health Centre which it operates, and offered full co-operation. The West Pakistan Maternity and Child Welfare Association agreed to take the full financial responsibility for employing staff required and for meeting the contingent expenditure.

The Research Team consisted of three medical officers, five interviewers, ten assistant interviewers, one laboratory technician and two *ayahs*. One interviewer was a Public Health Nurse and the rest had Master's Degree in Social Sciences. The assistant interviewers were health visitors. The writer acted as the Director of the project.

Saddar Area of Lahore Cantonment in which Fatima Jinnah Community Health Centre is located and which it exclusively serves, was divided into five sectors labelled as 'A', 'B', 'C', 'D', and 'E'. Each sector was placed under one interviewer. It was further divided into two, each part being the responsibility of one assistant interviewer. The assistant interviewers conducted a house-to-house survey of the population and detected married women 10—50 years of age, exposed to pregnancy and were thus likely to be pregnant, or who already had amenorrhoea. Case-finding programme continued during a 6-month period. Two additional surveys were carried out and occurrence of amenorrhoea was detected. The interviewers took over the women who were reported to have, amenorrhoea and filled in the research schedules. These women were repeatedly examined till presence or absence of pregnancy was confirmed by a doctor. A pregnant woman was kept under observation till the termination either in a live-birth or a foetal loss. If the termination of pregnancy resulted in a foetal loss attempt was made to examine the product of conception as well as the mother as soon as possible. Survey work in Saddar Area was started in December, 1963 but 'Pregnosticon' testing was commenced at the end of the month of April, 1964.

Mostly, civilians reside in the Saddar Area of Lahore Cantonment. Total population of this area was found to be composed of 29,489 persons. There were 14,100 females and out of these 4,582 were married women aged between 10—50 years. Amongst the married women, 151 were not exposed to the occurrence of pregnancy because they were widows (120), divorced (6) or had been separated from their husbands for a period of one year or more (25). Only 4,431 married women between 10—50 years were exposed to pregnancy and were watched for amenorrhoea. Amongst these, a total of 2,238 actually had amenorrhoea and were, therefore, registered by the assistant interviewers as suspect pregnancies. All women so registered were found to belong to the age-group 15—49 years and none was found to be below 15 years or above 49 years. Those women who had

more than 19 weeks amenorrhoea or were found to be definitely pregnant on physical examination as well as those who refused co-operation were rejected for pregnancy test. Urine specimens were tested with 'Pregnosticon' according to the technique laid down by the Organon Laboratories. During preliminary testing it was found that the best results at the prevailing room temperature were obtained after one and a half hour, and not after two hours, *as recommended by the Organon Laboratories. When we waited for two hours, the test lost its accuracy because the ring got disintegrated. Therefore, reading of the test in this work was done after one and a half hour.

RESULTS AND DISCUSSION

A total of 506 women were tested. 424 were subsequently found to be non-pregnant (83.8%) and 82 were confirmed as pregnant (16.2%). Table I gives the distribution of these 506 women according to the month of the year during which their urine was tested.

It will be observed that a majority of tests were performed during the months of May, June and July, 1964, i.e. in the peak of the hot weather in Lahore when the temperature may go up to 115°F.

TABLE I

Distribution of 506 married women, suffering from amenorrhoea, according to the calendar month when their urine was tested with 'Pregnosticon'

Month (1964) when tested	NUMBER OF MARRIED WOMEN:					
	PREGNANT		NON-PREGNANT		TOTAL	
	Positive	Negative	Positive	Negative	Positive	Negative
April	0	1	0	2	0	3
May	26	3	0	36	26	39
June	41	4	8	280	40	284
July	5	1	1	76	6	77
August	1	0	0	21	1	21
Total	73	9	9	415	82	424

Note - Reagent was received during the last week of April, 1964.

*Rapid multiplication of bacteria in urine at high temperatures may be responsible for this change.

"*Pub. Jour. Health*, 16 (3)"

Percentage results of 'Pregnosticon' test in pregnant and non-pregnant married females, who had amenorrhoea, are given in Table II. Perusal of Table II shows that amongst 82 pregnant women this test was positive in 73 (89.02%) and gave false negative in 10.98%. This means that the reliability of a positive test in pregnant women in our sample was 89.02%. Amongst the 424 non-pregnant women the test was negative in

TABLE II

Percentage Results of Pregnosticon test amongst 506 married women.

Type of women	NUMBER OF WOMEN TESTED					
	POSITIVE RESULT		NEGATIVE RESULT		TOTAL	
	No.	%	No.	%	No.	%
Pregnant	73	89.02	9	10.98	82	100%
Non-Pregnant	9	2.12	415	97.88	424	100%
Total	82	..	424	..	506	..

97.88% and false positive in 2.12%. Difference between the findings in pregnant and non-pregnant women is statistically highly significant.

Venning (1965) studied 517 women with normal early pregnancy. Pregnosticon test was applied to 302, and positive test was obtained in 99.5% of the cases. During the same study 306 non-pregnant women who had amenorrhoea of varying duration, were tested with pregnosticon. The test was negative in 98% of the cases. Venning attributed false positive reactions to ovarian cysts and endometritis.

Mayo and Thompson (1965) compared one biologic and four immunologic pregnancy tests. They found pregnosticon to be the most accurate test. They concluded that the number of false negatives (10%) was significantly lower in the pregnosticon test than in the immunologic tests (immunoplate, U.C.G., Gravindex). They obtained false positive results in 4% of the cases.

TABLE III

Pregnosticon test in 82 pregnant women as related to their age groups.

Result of the test	NUMBER OF PREGNANT WOMEN BY AGE-GROUPS			
	15-29 YEARS	30 YEARS AND MORE-BOTH GROUPS		
	No.	No.	No.	
+ IVE	No.	45	28	73
	%	88.24	90.3	89.02
-IVE	No.	6	3	9
	%	11.76	9.7	10.98
Total	No.	51	31	82
	%	100%	100%	100%

Perusal of Table III shows that amongst pregnant women below the age of 30, forty-five were positive (88.24%) and six false negative (11.76%). Amongst women of 30 years and above, twenty-eight (90.3%) showed positive result and three (9.7%), gave false negative. There is statistically no significant difference between the two positive rates as the difference can be attributed to chance distribution. Hence, age has no bearing on the reliability of the pregnosticon test.

"Pak, Jour. Health, 16 (3)"

TABLE IV
Pregnosticon test in 82 pregnant females as related to the gravidity of women

Result of the test	NUMBER OF PREGNANT WOMEN ACCORDING TO GRAVIDITY		
	1—5th Gravida	6—14th Gravida	Total
+ IVE.	No. 42	31	73
	% 87.05	91.18	89.02
- IVE	No. 6	3	9
	% 12.5	8.82	10.98
Total	No. 48	34	82
	% 100%	100%	100%

Persual of Table IV shows that reliability of the test did not show any significant variation due to gravidity.

TABLE V
Pregnosticon test in pregnant women as related to pregnancy outcome

Result of the test	NUMBER OF PREGNANT WOMEN ACCORDING TO ULTIMATE PREGNANCY OUTCOME		
	Live births	Foetal loss	Total
+ IVE	No. 55	18	73
	% 90.2	81.08	88.00
- IVE	No. 6	4	10
	% 9.8	18.2	12.00
Total	No. 61	22	83
	% 100%	100%	100%

Note—One respondent had a twin birth. One baby was born alive and other dead. Hence this case has been counted as two respondents.

Perusal of Table V shows that amongst live-birth cases, 90.2% gave a positive test as compared to 81.8% amongst respondents who experienced foetal loss. There is no significant difference in the reliability of the test in women who ultimately have live births or foetal loss, because the difference between the two observed rates can be attributed to chance in this sample.

TABLE VI

Pregnoslicon test in 82 pregnant women as related to income per capita per month

NUMBER OF PREGNANT WOMEN BY INCOME GROUP				
Result of the test	Rs. 0-19	Rs. 20 and more	Total	
+IVE	No.	39	34	73
	%	88.6	89.5	89.02
-IVE	No.	5	4	9
	%	11.4	10.5	10.98
Total	No.	44	38	82
	%	100%	100%	100%

Perusal of Table VI above reveals that no statistically significant variation in the reliability of the test occurs in women belonging to various income groups.

TABLE VII

Pregnosticon test in pregnant women as related to the period of pregnancy during which the test was conducted

NUMBER OF PREGNANT WOMEN ACCORDING TO WEEKS OF THEIR PREGNANCY WHEN TEST APPLIED.										
Result of the test	4-5 wks.	5-6 wks.	6-7 wks.	7-8 wks.	8-9 wks.	4-9 wks.	9-14 wks.	14-18 wks.	Total	
+IVE	No.	2	3	7	6	4	22	39	12	73
	%	..	..	..	..	..	84.6	92.9	85.7	89.02
-IVE.	No.	0	0	2	1	1	4	3	2	9
	%	..	..	..	..	..	15.4	7.1	14.03	10.98
Total	No.	2	3	9	7	5	26	42	14	82
	%	..	..	..	..	..	100 %	100 %	100%	100%

Perusal of Table VII reveals that in two cases tests were done during 4-5th week (actually on the 6th day after the date of expected menses). In both the cases positive results were obtained. Further, reliability of the test does not get significantly, altered by testing during various periods of early pregnancy.

TABLE VIII

Result of Pregnosticon test in 424 non-pregnant married females residing in Saddar Area of Lahore Cantonment, as related to the type of amenorrhoea

Type of amenorrhoe	RESULT OF PREGNOSTICON TESTS	
	True Negative	False Positive
1. Lactational amenorrhoea	405	9
2. Pathological amenorrhoea	5	0
3. Menopausal amenorrhoea	3	0
4. Primary amenorrhoea	1	0
5. Post-abortion amenorrhoea	1	0
Total	415	9

Perusal of Table VIII shows that the most predominant cause of amenorrhoea was lactational amenorrhoea, 97.6% cases being attributable to this cause.

Further, all cases giving false positive results were those who had lactational amenorrhoea.

TABLE IX

Occurrence of true negative and false positive results on Pregnosticon testing amongst 424 non-pregnant married females residing in Sadar Area of Lahore Cantonment as related to the age of the women

Age in years	RESULTS OF PREGNOSTICON TEST			
	TRUE NEGATIVE		FALSE POSITIVE	
	Number	Incidence rate %	Number	Incidence rate %
15—34	324	97.6	8	2.4
35—49	91	98.92	1	1.08
Total	415	97.88	9	2.12

Perusal of Table IX shows that though false positive test was recorded in 2.4% of the cases in age-group 15—34 and 1.08% in age-group 35-49, there was statistically no significant difference in the two groups. Hence, in this series no evidence has been found for the higher frequency of false positive results in older age-group.

SUMMARY AND CONCLUSIONS

1. 506 married women who had amenorrhoea were selected for pregnosticon test of their urine specimens. Women with amenorrhoea up to 19 weeks were included.
2. They were kept under medical supervision till a definite diagnosis of presence or otherwise of pregnancy was made.
3. 82 of these women were finally found to be pregnant at the time when the test was carried out.
4. Results were read after one and-a half hour as against a two-hour period recommended by Organon Laboratories, the manufacturers of pregnosticon. It was noted that clearly defined rings were discernable at the end of one and a half hour but started disintegrating after two hours. This observation could be attributed to higher temperatures which prevail in Lahore in the summer months which are likely to hasten bacterial growth and thus cause disintegration of red cells.

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5. Test was positive in 89.02% of the pregnant women. It was found positive as early as six days after the date on which menstruation was due. False negative was found in 10.98% of the urine samples.

6. False positive was observed in 2.12% of the urine samples.

7. Reliability of pregnosticon test was not found to alter with age, gravidity, period of pregnancy (upto 19 weeks) and ultimate outcome of pregnancy. No relationship was found with income per capita of the women.

8. Lactational amenorrhoea was the most frequent cause of amenorrhoea in this series.

9. All cases showing false positive were those who had lactational amenorrhoea.

10. In this series, no higher prevalence of false positives has been found in the age-group 35—49 as compared to the age-group 15—34 years.

11. Usefulness of pregnosticon test for early diagnosis of pregnancy is confirmed but cannot be exclusively relied upon specially when research is being conducted because of false positive and false negative results.

12. It is considered that the test will be of great value in clinical M.C.H. practice as it will enable the physicians to put women under antenatal care at an early stage.

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ECHINOCOCCOSIS IN MAN

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'Hydatid disease,' one of the important helminthic zoonoses of man, is caused by the larval stages of tape worms belonging to the genus *Echinococcus* which contains two species infective to man: *granulosus* and *multilocularis*. 'Hydatid disease is an inappropriate term as the spread of taenia embryos does not always lead to development of cysts. The correct nomenclature, therefore, is Echinococcosis. It is a price which man pays for the comradeship of the dog. Hippocrates, Aretaeus and Galen were familiar clinically with it. The Talmud (the 'Bible' of the Jews) referred to this condition in sacrificial animals. The term 'Hydatid' was used for any swelling of a cystic character. The animal origin of Hydatid cyst was suspected in the latter half of the seventeenth century by Redi (1684), Hartmann (1685) and Tyson (1691). Pallas in 1766 for the first time noticed its similarity both in man and animal. Goeze in 1782 was the first to study the heads developing from the cyst wall. Hartmann in 1895 noted the presence of an adult worm in the intestines of dog; and this was confirmed later on by Rudolphis in 1808. Von Siebold in 1852, and later several others, fed scolices of cysts from domestic animals to dogs and recovered in three weeks several tiny tape worms from the intestinal Villi. Naunyn in Germany (1863), Krabbe and Finsen in Iceland (1863) and Thomas in Australia (1885) bred adult worms in dogs from scolices of human origin.

Geographical distribution—Hydatidosis is world wide in distribution but is more commonly found in those countries where sheep and cattle raising constitutes an important industry. The two species, *E. granulosus* and *E. multilocularis*, occur in quite different areas. *E. granulosus* occurs chiefly in Iceland, North Germany, Southern Australia, Newzealand, South America, Arabia, Algeria, Tunis and United Arab Republic. *E. multilocularis* is restricted to smaller area and is found in Southern Germany, Tyrol, Southern Wurttemberg, Italy, Switzerland, Ukraine, Moscow district and neighbourhood of Volga, Leningrad, Alaska and islands of Japan. There has been a general impression that this disease was rare in Indo-Pak sub-continent. The provincial annual reports of hospitals and dispensaries showed no separate heading for the hydatid disease which was included under tumours. Attempts have been made at different times to arrive at an estimate of the real prevalence of Echinococcosis in this part of the world. Pease in 1902- (quoted by Maqsood, 1966) found 24% of the stray dogs in Lahore infested with *E. granulosus*. Sondhi (1923) planned to study the morphology of adult worms in Lahore but could not pursue the matter further. Maplestone (1933) in Calcutta found only two of

of one hundred pariah dogs infested with the adult worm but suggested that incidence was much higher in the country than in cities. Sami (1938). In Ranjanpur, District Dera Ghazi Khan, noticed 28.8% (48 out of 156) of the stray dogs infested with *E. D. granulosus*. He also found that over 89% (150 out of 168) of the cattle and 1% of the sheep examined in slaughter house harboured hydatids. He noted about 40 cases of hydatidosis in man amongst a population of 200,000. In Lahore, Maqsood (1946) found 66.1% of the cattle and 68.8% of the buffaloes harbouring larval stage. In Quetta he found 40% of the cattle to be infected during 1965. Naru and Salim (1966) found 25% of the stray dogs in Lahore harbouring the adult worm and thus confirmed Pease findings. In Mayo Hospital, Lahore 140 cases of hydatidosis were operated upon during 1947-65 while 33 cases were operated in Nishtar Hospital, Multan during the period from October, 1953 to January, 1959. So, serious helminthic diseases are far commoner in Pakistan than the published records show and the incidence of Echinococcosis seems to be much higher than what is generally believed to be.

Biology of the Parasite—The two species differ in their host relationship, morphologic characteristics and type of larval development. The canine animals (dog, wolf, fox, etc) are the most important definitive hosts of both the species. Herbivores constitute the main intermediate host group for *E. granulosus*, while rodents, field mice and tundra voles are principle intermediate hosts of *E. multilocularis*. Man is parasitised by the larval stages of both species. *E. multilocularis* causes alveolar hydatid disease which was first observed by Ruysch in 1721 and was believed to be colloid cancer. Virchow in 1856 showed that it had its origin in a worm. Larva of *E. granulosus* causes a single or multiple expanding cysts which are unilocular in character. Life span of the adult worm in canine host is short, about six months. Life span of the larval form is considerable and it may continue to develop for many years.

***E. granulosus*:** Adult worm (Fig. 1) is small, 3-6 mm in length and has about four segments. The scolex or head is pyriform in shape, not more than 300 μ in its transverse diameter. The anterior end is armed with a double crown of 30-40 hooklets. There are four ovoidal suckers. The neck is attenuated. The first segment is immature. The second is mature, is nearly twice as long the preceeding one and contains a complete set of reproductive organs. The terminal or gravid segment may be 2 mm in length and consists principally of uterus with lateral evaginations. The genital pore is near the posterior end of the segment. Testes are located both anterior and posterior to the genital pore and range from 45 to 65. The ova are about 800 in number and resemble those of other Taeniae. These have thick brown shells which surround six hooked oncosphere. The maximum diameter of the ovum is 30-38 μ .

E. multilocularis—The adult worm is smaller than *E. granulosus* measuring 1.2 to 3.7 mm in length. Strobila consists of a scolex, neck, single immature, mature and

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gravid segments. There are usually no lateral branches of the uterus. The genital pore of the gravid segment is near the middle. Testes are distributed from the level of the genital pore to the posterior end of the segment. The number of testes varies from 17 to 26, average is 22.

The dogs are infected by ingesting viscera of animals containing innumerable scolices inside the hydatid cysts. From these adults develop and eggs are passed out in the faeces in about 40 days. The cattle, sheep and pig, etc., become infected by taking contaminated fodder or grazing on contaminated areas. Man is infected by a close association with dogs, handling infected dogs or drinking water or ingesting green vegetables polluted by faeces of infected dogs. Eggs can be disseminated by house-fly. Susceptibility is general, no immunity follows infection. Clinical observations have shown that children are more apt to acquire this disease than are adults because like young animals they are better ground for the development of larvae. If an ovum gets into a man instead of a sheep, life cycle of the parasite will ultimately be broken, because the entrails of man are not eaten by dogs.

The shell of the ovum is digested away in alkaline medium of the first part of small intestines. The embryo with the help of its hooklets invades the mucosa of intestinal wall, penetrates through it and reaches a capillary or a venule. It is then carried passively by the blood stream until it is held by some capillary filter. Meanwhile, the hooklets have been lost. The embryo is soon invaded by mononuclear leucocytes which probably destroy large number of invaders. The surviving embryos increase rapidly in size, so that by the fourth day they measure 40 μ and begin to vacuolate. In about 3 to 10 days a miniature

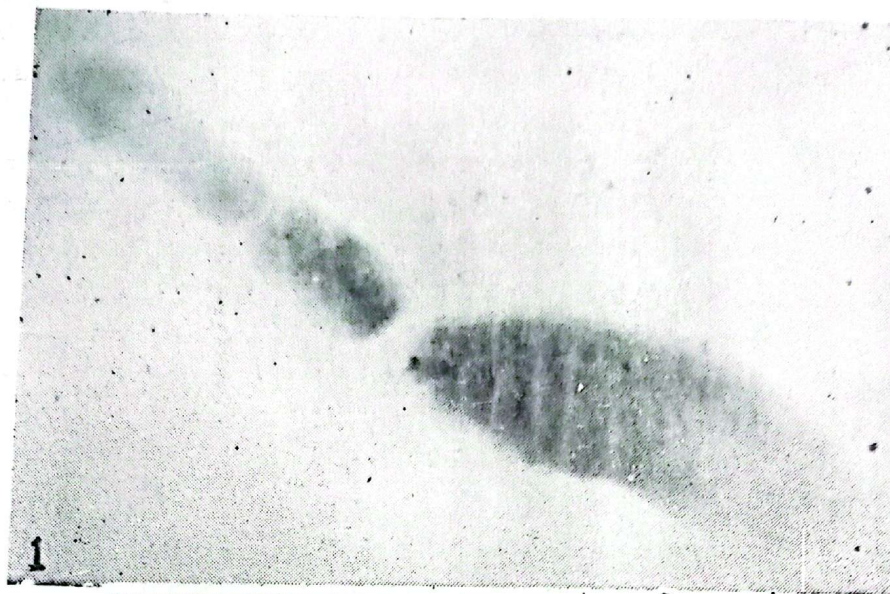


Fig. 1

Adult worm
of *E. granu-*
losus

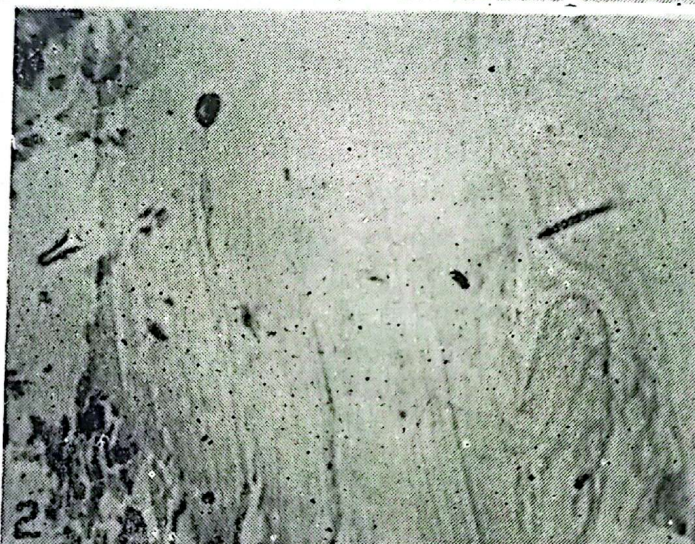


Fig. 2 : Microphotograph of hydatid cyst wall showing laminated cuticular layer.

Fig. 3 : Microphotograph showing nucleated, cellular, internal germinal layer.

Fig. 6

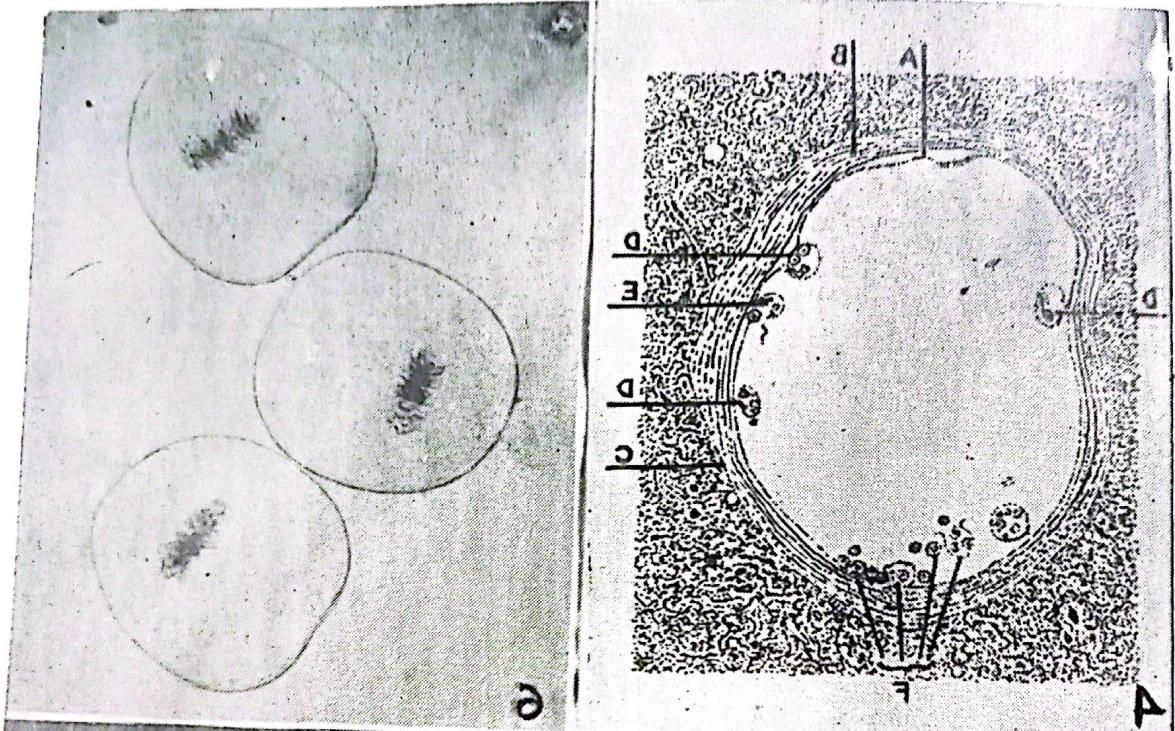


Fig.

Fig. 9

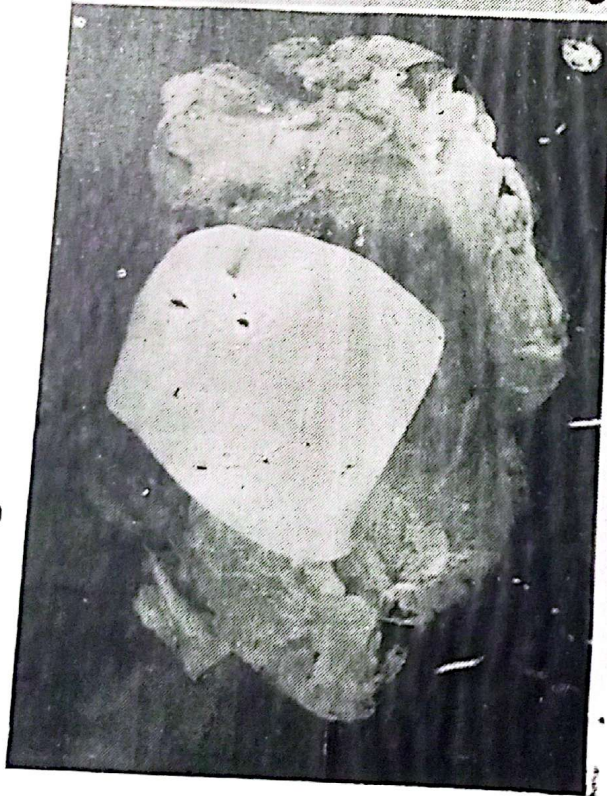
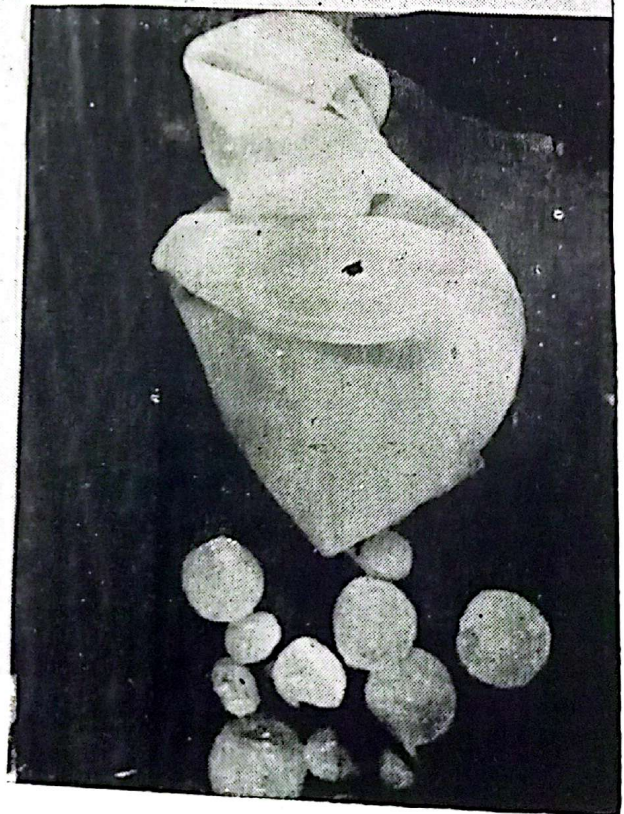


Fig. 4: Development of brood capsules and scolices in a unilocular cyst. (A) germinal layer, (B) cuticular layer, (C) advenitia, (D) proliferative vesicle, (E) scolices and (F) 'hydatid sand.'

Fig. 8: A specimen of unilocular cyst with a number of daughter cysts.



Fig

Fig. 6: Invaginated scolices.

Fig. 9: Hydatid cyst in lung of female aged 25 years.

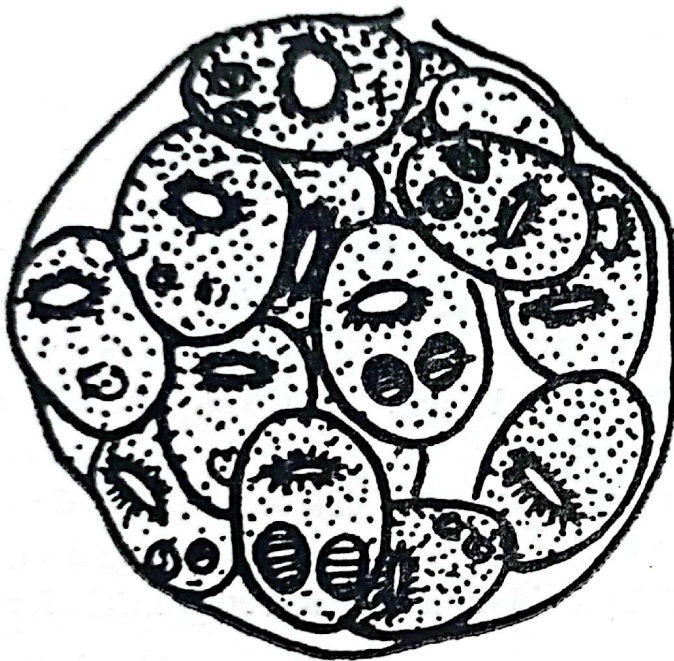


Fig. 5

Fig. 5: A brood capsule composed of a number of scolices enclosed in a thin membrane.

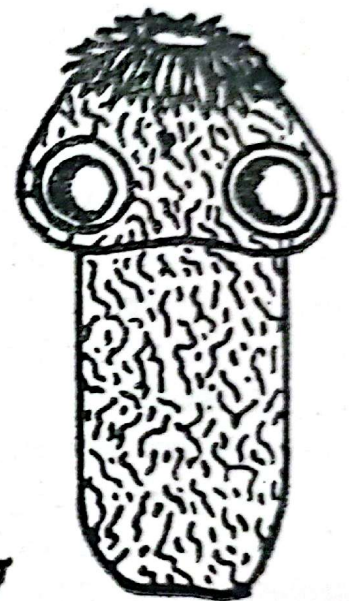


Fig. 7

Fig. 7: An evaginated scolex.

hydatid is formed with an inner nucleated germinal layer and an outer hyaline layer. By the 21st day the larva assumes a size of 250u and the tissue cells of the host begin to show a reaction to parasite. The inflammatory and fibrous reactions of host tend to limit the cyst and its contents. The tissue surrounding the hydatid cyst shows radial arrangement of epithelial cells and infiltration by eosinophil leucocytes and foreign body giant cells. Fibrous tissue surrounding this zone grades off into normal tissue which may show pressure atrophy due to steady increase in size of the larva. The cyst attains a size of 1 cm diameter by the fifth month. The outer most layer is the adventitia formed by the host tissues, then is the outer cuticular layer of the larva, ectocyst (Fig. 2). It is laminated, elastic, devoid of nuclei, resembles white of a hard boiled egg and is everted when cut. The internal germinal layer; endodyst (Fig. 3) is cellular, consists of a number of nuclei embedded in a protoplasmic mass and resembles a tissue paper. The endocyst is ready to produce brood capsules. In a fully developed cyst the cuticular layer may be 2 to 3mm. thick and germinal layer 10 to 25 u. Brood capsules arise from a proliferation of masses of nucleated cells of the germinal layer (Fig. 4). These grow and become vacuolated thus forming minute one layered vesicles which ultimately become stalked. Brood capsule (Fig. 5) measures up to 1.5 mm. in diameter. Such brood capsules or vesicles develop at many points on the germinal layer. Due to injury, brood capsules frequently become separated from their mother cyst-wall and lie in the fluid of the cystic cavity. Usually these brood capsules develop internal buds, which produce an internal cuticular layer. The cyst wall thus, forms an invagination in which scolex continues its development, becomes stalked and develops suckers and hooklets. Meanwhile the scolex has invaginated into its own body to protect its hooklets from injury (Fig. 6). A scolex on an average measures 160u $\times$ 120u. The detached brood capsules slowly disintegrate and scolices lie free in cyst. These scolices and disintegrated brood capsules settle to form a sediment 'hydatid sand' which is responsible for the hydatid thrill described by the clinicians.

Hydatid fluid is generally clear, colourless but may be opalescent or pale yellow in colour. Its specific gravity is low, 1.004 to 1.010. The reaction is slightly acidic, pH 6.7. It contains albumin and a protein allied to casein, sodium chloride, sodium sulphate, sodium phosphate, sodium and calcium salts of succinic acid (a Fehling reducing substance). It is highly toxic, may give rise to anaphylactic shock when absorbed. It is antigenic and is used for immunologic tests. A granular deposit may settle down at the bottom and is composed of liberated brood capsules, free scolices and loose hooklets. A cyst of two quart capacity may produce more than two million scolices.

Sometimes brood capsules or scolices are not developed and such a cyst is biologically sterile and is termed as acephalocyst.

The hydatid cyst grows slowly and in time the cyst capsule may become calcified looking like a thin shell of an egg. Most of the cysts in man are acquired in childhood. Frequently unilocular cyst may grow for 5 to 20 years before it is diagnosed. It may almost be as old as its host. The larva's growth causes ischaemic necrosis through pressure and obliteration of adventitia's capillaries and other small vessels. But when a large vein is affected this process of thrombotic obliterans may not take place; instead, when vein's wall comes into contact with the hydatid vesicle, a communication appears between the two by a process of corrosion. The scolices may reach main blood stream arriving first in the lungs and later in any organ of the body. This spread may cause emboli capable of developing into new hydatid cysts—it is secondary metastatic echinococcosis.

The larva of *E. multilocularis* causes alveolar or multilocular type of cysts which are solid, sponge like tumours that metastasize and resemble malignant neoplasms. Its outline is reticulate and not definitely delimited from the host tissue. The cyst consists of multiple hydatid vesicles not larger than a pear, frequently sterile (there are no scolices) or undergoing degeneration or calcification, embedded in a fibrous stroma. There is never free fluid, merely a jelly like matrix. The organ most frequently involved is liver.

Anatomical distribution of primary unilocular cysts—In man most of the primary cysts are found in the liver which is the first capillary filter but sometimes parasites pass through hepatic capillaries and enter the pulmonary circulation, therefore, the lungs are the next common site. The right lung is affected more often than the left. Once the larvae gain access to the general circulation they can lodge anywhere in the body. Multiple infections are commoner in man than is usually realised, more than one cyst being present in at least 60 per cent of the cases. As the liver is the first filter, any patient who harbours a peripherally placed cyst should be suspected of also having a hepatic cyst.

According to Neisser's statistics of 900 cases the distribution in man was as given in Table 1—

TABLE 1

Distribution of Hydatid cysts in human subject:—
Neisser's 900 cases.

<i>Organ affected</i>					<i>Number of cases</i>
Liver	..	..	..	..	451
Lungs	..	..	..	..	67
Spleen	..	..	..	..	28
Pleura	..	..	..	..	17
Heart and vessels	..	..	..	..	29
Cranial cavity	..	..	..	..	68
Spinal cavity	..	..	..	..	13
Kidney	..	..	..	..	80
Pelvis	..	..	..	..	36
Female genital and breast	..	..	..	..	44
Bones	..	..	..	..	28
Face, orbit, mouth	..	..	..	..	21
Other parts	..	..	..	..	18
Total					900

In contrast to the above figures the distribution in 200 cases operated in Lahore, Rajanpur and Multan was as shown in Table 2—

TABLE 2

Distribution of Hydatid cysts in 200 cases of West Pakistan.

<i>Organ affected</i>					<i>Number of cases</i>
Liver	..	..	..	..	84
Lung	..	..	..	..	52
Peritonium	..	..	..	..	24
Spleen	..	..	..	..	11
Heart and vessels	..	..	..	..	1
Kidney	..	..	..	..	1
Ovary	..	..	..	..	3
Caecum and colon	..	..	..	..	6
Urinary bladder	..	..	..	..	2
Pancrease	..	..	..	..	1
Muscles	..	..	..	..	1
Breast	..	..	..	..	8
Eye	..	..	..	..	4
Bone	..	..	..	..	2
	..	..	..	..	1
Total					200

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Hydatidosis occurs at any age but is more so in children. In a series of 33 cases in Multan, the youngest was a male child of two years and the oldest a male of 70 years. There was no significant difference in sex incidence: 16 were males as compared to 17 females.

Prevention of Echinococcosis in man—The onset of disease is insidious, it usually takes years to develop, to exercise a continued and steady drain on the health of the population and it never attracts attention by an epidemic outburst, so that its serious character is not appreciated by the general public and no demand is made that such an important menace to health be prevented. The number of unwanted dogs should be reduced. They should be prevented from eating infected viscera of animals so that they are not of any danger to man. Health education of the general public be undertaken so that personal hygiene is improved. Hands should be washed before taking food. Periodic deworming of infested dogs in endemic areas be done at regular intervals. Three doses of arecaline hydrobromide, each 4 mgm per 10 lbs. body weight, would exterminate the taenia from the canine host.

LABORATORY DIAGNOSIS OF ECHINOCOCCOSIS IN MAN

1. *Casoni's intradermal-allergic reaction*—0.2 ml of a fresh sterile hydatid fluid is injected intradermally. A wheel of about 5 cm. diameter with pseudopodia appears within half an hour in 80—90 per cent of the positive cases. There may be a marked secondary reaction 8 hours later. Hyatid fluid from human cases (removed at operation) or from animals (obtained from slaughter houses) may be used.
2. *Blood examination*—Differential leucocytic count reveals an eosinophilia of about 5—15 per cent in 20—25 per cent of the cases.
3. *Complement fixation test*—Is positive in 80—90 per cent of the cases. False positive may occur in cases of haemangioma and primary carcinoma of liver.
4. *Precipitin tests*: equal parts of patient's serum and hydatid fluid are incubated at 37° C for one hour and then at room temperature for further 36 hours. A precipitate forms in positive cases.
5. *Haemagglutination test*—Using fresh or formalinised sheep red cells sensitised with tannic acid and coated with Echinococcus antigen. This test is highly specific.
6. *Flocculation tests*: using bentonite particles or polystyrene latex particles coated with hydatid fluid as an antigen.
7. *Exploratory puncture*: of the hydatid cyst is not advocated due to the concomitant danger of anaphylactic shock in case the fluid is absorbed.

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RAW VEGETABLES AND THEIR RELATION TO MAN'S HEALTH*

by

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I. *Importance and significance of raw vegetables in our diet*—As may be known to you all, the ultimate source of all of our dietary needs is the plant kingdom, because the major ingredients of our food, viz., carbohydrates, fats, proteins and vitamins are synthesized in the plant kingdom. In other words man lives a parasitic life on the vegetable world. Furthermore plants carry important mineral salts which comprise twenty per cent of man's body weight.

Heat and energy to our body which is mainly derived from carbohydrates is derived from vegetable food. They also furnish non-essential proteins and fats. Vegetable oils which are expressed from various seeds like coconut, cotton seeds, til, toria and lin-seed etc., vary widely in composition from that of animal fats. These oils are the most concentrated of all non-nitrogenous materials made by plants. Green vegetables or leaves also come under the category of food. They are especially rich in just those elements in which the cereal is the poorest, viz. calcium, phosphorus, sodium and chlorine. Leaf is the synthetic laboratory of the plants. It builds up the proteins, starch and fats. The surface cells of the leaf contain all the chemical complexes which are necessary for the nutrition of the animal cells and are qualitatively complete foods. Leaves are exceptionally rich in minerals, especially calcium. They form salts, which maintain the proper alkalinity for blood by balancing the acid producing tendencies of meat and cereals. Green vegetables contain a good deal of indigestible carbohydrates called cellulose, which stimulates peristalsis of intestines, which prevents constipation. Thus green vegetables form an essential factor of a balanced diet necessary for man's health, vigour and characteristics of youth and their use in our daily diet cannot be overstressed.

During the past few years intensive studies by the authors and many other workers on the incidence of worm infections in man has been carried out in this country. Ahmad and Shah in 1958, during hookworm survey of organised communities in Lahore Corporation observed the infection rate ranged from 7.7 per cent to 35.5 per cent. Miral and Bawa in 1933 during their survey of human intestinal parasites in the Col

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poration staff of Lahore found the incidence of round worms to be 40 per cent. Zaman (1963) carried out a survey of children of a primary school and found that the infection rate due to round worms and other helminths amongst these children was 80.6 per cent. The investigators in their studies have also observed a high infection rate due to other helminths, and the sanitarians undoubtedly regard it an important public health problem. The eggs of these worms are found in the faeces and the infection is usually transmitted through infected food, fingers, faeces and flies.

2. *Role of Raw Vegetables in the Transmission of worm infection*—Since raw vegetables are consumed in plentiful by common man with little precaution in their cleaning, an investigation was carried out to determine the role of green leafy vegetables and other vegetables, which are eaten without cooking, in the transmission of worm infections in Lahore. It may not be out of place to mention here that 80 per cent of the vegetables sold in Lahore are grown on sewage farms and the same is probably true of Karachi. The following account gives the material and methods used and the results of our observations.

3. *Material and Methods*—Raw vegetables of different kinds were procured from the grocer's shop without previous selection and one or two pieces of each were put in wide mouth glass jars of eight ounces capacity and a couple of ounces of tap water was poured on them, in which they remained immersed for about five to ten minutes. Without centrifuging the washings the vegetables were pushed to one side, a few drops of the washings were drawn from the bottom of the jar by means of an ordinary dropper, about half a c.c. was placed on a clean glass slide and without putting the cover slip, the slide was examined under the low or high power of the microscope.

The vegetables under investigation comprised tomato, radish, turnips, beetroot, cucumber, ginger, carrots, spinach, maithi, potato, arbi and waterlilly root. The results of our observations are given in the table below:—

4. Observations:

Name of vegetable		Number of examinations	Number found negative	Number found positive	Larvae of hook. worm	Other parasites or their ova
1. Turnip	..	24	9	15	15	—
2. Spinach	..	9	8	1	1	—
3. Tomato	..	11	9	2	2	+ Adult worm of <i>E. vermicularis</i> once.
4. Ginger	..	5	3	2	2	—
5. Radish	..	11	10	1	1	—
6. Maithi	..	3	2	1	1	—
7. Beetroot	..	35	21	14	14	—
8. Arbi	..	15	3	12	12	+1. Ova of <i>T. trichura</i> 3 times. 2. Ova of <i>E. vermicularis</i> once 3. Ova of <i>A. lumbricoides</i> once.
9. Bhein waterlily roots	..	1	..	1	1	—
10. Potato	..	3	1	2	2	—
11. Cucumber	..	3	0	3	3	+ Ova of <i>E. vermicularis</i> once.
12. Carrots	1	2	2	0	0	
Total 12 Vegetables		122	68	54	54	1. Adult worm of <i>E. vermicularis</i> . 2. Ova of <i>E. vermicularis</i> . 3. Ova of <i>A. lumbricoides</i> . 4. Ova of <i>T. trichura</i> .

A perusal of the above table will show that out of 122 samples of different types of vegetables examined from time to time, 68 were found negative, 54 positive and all the 54 positive specimens revealed the presence of hookworm larvae. The larvae seen were both rhabditiform and filariform. Other worm infections found were ova of *A. lumbricoides*, *T. trichura* and *E. vermicularis*. Out of the various vegetables, the highest infection was found in "Arbi", beetroot, turnip. Other culprits were tomatoes, spinach, ginger, radish, 'maithi', 'bhein', potato and cucumber.

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Since tomatoes, beetroot, radish, carrots, etc., are relishly consumed in the form of 'chaat' we took a few samples of these raw vegetables from the 'chaat' vendors which also showed infection, particularly of hookworm larvae.

5. *Conclusion*—Investigations by a number of workers indicated a very high incidence of infestation by worms amongst school children and adults in this country and the present investigation clearly shows that the mode of transmission through eating and handling raw vegetables definitely plays a significant role and is a matter of great public health importance.

6. *Prevention*—The precautions usually taken by well to do people for their protection is to wash (those fruits and vegetables which are eaten raw) in potassium permanganate solution commonly called 'Pinky' but unfortunately in the strength that 'Pinky' is used it has no effect on the eggs or larvae of worms. If high concentration of 'Pinky' were used it would spoil the taste of the vegetables. The safest method observed by us is to thoroughly wash the vegetables in running water four or five times. It is better not to depend upon servants as they do not appreciate the importance of the process.

7. *Summary*—Raw vegetables are undoubtedly an essential part of nutrition in this country and for the poorer section of the community it is the only source of Vit. A, as they can ill-afford milk and eggs but its consumption without proper precautions is not free from danger. When they are eaten raw, our safety lies in their thorough washing in clean running tap water.

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A majority of symptoms, attributable to parasitosis are not diagnostic. The manifestations of parasitic infections may frequently commensurate with pathogenic changes. In a number of cases however, manifestations are exaggerated. In most helminths, intoxication and sensitization constitute important segments of the total clinical picture. Sensitization to the presence of both the worms and their metabolites are known to set in systemic evidence of allergies or neuralgical symptoms.

Although it is given in most text books, that the intestinal parasites may cause neuralgical symptoms yet no student of parasitology has positively accused intestinal parasites to be responsible directly for any serious mental derangement. The psychotic conditions, suggesting a protozoal or helminthic infection, are subjective and not objective in nature. However, it has been observed that the disturbed mental balance may be a predisposing factor for parasitosis. We are of the opinion that in most cases it is the neglect of personal hygiene which may increase the incidence of intestinal parasitosis in the mental cases rather than the parasitosis which may increase mental imbalance.

Inflammatory diseases of the nervous system may occur in the course of any infectious diseases. Finding of a protozoa and parasitic worms in an inflammatory diseases of nervous system is not an unknown condition. Most of the parasites found in the brain are primarily intestinal parasites and according to the consensus of opinion the extra intestinal lesions due to these parasites are invariably secondary to colonisation of the parasites in the intestines. Extra intestinal infections for the most part, remain clinically undiagnosed until necropsy.

3.1. *Amoebiasis* may be occasionally complicated by brain abscess. Clinically, the diagnosis may be suspected when cerebral symptoms develop in the presence of known amoebic dysentery. At autopsy, there may be slight low-grade meningitis. The amoebic lesions tend to be localised as discrete abscesses and one or more such abscesses may be present. Various workers have reported lassitude, general malaise, neurasthenia, mental apathy and brain abscess due to *E. histolytica*.

The brain abscess in this case, is perivascular, generally single and of small size. In exceptional cases, it involves cerebrum. It is fulminating and proves fatal but is not diagnosed until necropsy. However, from intestinal and hepatic amoebiasis, one may suspect amoebic abscess of the brain also.

3.2. *I. butschlii* has also been incriminated from brain abscess. This protozoa generally causes multiple lesions. Diagnosis can be confirmed after necroscopy.

3.3. *Trichinosis* is a parasitic disease. The larvae may be carried to myocardium, brain substance, cerebro-spinal fluid and cause inflammation. The migrating larvae may cause encephalitis or meningitis.

3.4. *T. trichiurus* infection may also cause headache, uneasiness, abnormal wakefulness, sympathetic neuroses, marked nervousness, abnormal reflexes, epilepsy and vertigo. These disturbances are both of traumatic and toxic origin. The parasite has not so far been found invading brain.

3.5 Hook-worm infection predisposes the host to headache, uneasiness and lassitude, depression, melancholia, apathy, mental dullness, idiocy, tremor and vertigo. The migrating larvae, may be occasionally filtered out in brain and provide mild or serious symptoms.

3.6. *E. vermicularis* may cause restlessness, insomnia, convulsions and nightmares. The children infected with seat-worms are of irritable temperament and of unstable emotions. Auto-infection is very common method of transmission in this case. In mental cases, chances of anus-mouth cycle is more probable. The brain is never involved directly. The incessant irritation, however, does more harm and in severe cases may provoke nervous symptoms.

3.7. Like hook-worm larvae, the migrating larvae of *Ascaris*, in rare instances, may also be carried to the brain and provoke mild or serious symptoms. Ascariasis of the brain may cause meningismus, epilepsy, idiocy. The intestinal infection, however, may cause twitching, restlessness, insomnia, convulsions, angio-neurotic oedema and nightmares.

3.8. *Paragonimus westermani* lives encapsulated in pockets of the lungs. The eggs however, are either voided in sputum or are passed in the stools. In rare instances its cysts may also be found in the brain.

Likewise, the eggs of *Schistosoma japonicum* are occasionally reported from central nervous system and stimulating granulomatous local response to a foreign body.

Other flukes have been known to cause encephalitis. The reaction may be either diffuse, with a perivascular exudate, almost exclusively composed of plasma cells while local reaction to the parasite or its eggs is granulomatous.

3.9. In severe cases of headache, convulsions, epileptic fits, dizziness accompanied by nausea and vomiting and systemic intoxication, a clinician may suspect *H. nana* infection. Severe nervous manifestations generally occur in children living multiple infections. This parasite has not so far been found lodged in the brain.

3.10. In severe pernicious anemia, due to fish tape-worm infection, the patient may complain of very profound nervous symptoms. Vitamin B6 deficiency may be one of its causes. The nervous symptoms may show degenerative changes.

3.11. *Cysticercus* may either give no symptoms or very vague and general ones. Cysticercaria, when regurgitated into the stomach from the duodenum, may invade blood stream and ultimately appear in the brain. Where they may grow and stimulate local neurosis. Cyst formation may give rise to tumour formation in the brain or basilar meningitis. *Cysticercus* may be found in the ventricles, meninges and blood vessels and also within brain substance. *Cysticercus* of the IV ventricle is asymptomatic but may result in death. Although the parasite ultimately dies, yet

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tissue reactions round it may cause headache, vertigo, vomiting and ataxia. Cerebral cysticercosis may initiate disordered behaviour, transient paresis, dysequilibrium, meningo-encephalitis and intermittent obstructive hydrocephalus.

T. saginata is usually cause of neuropathies like choria, epilepsy and systemic intoxication of varied type and intensity. Its cysticerci do not occur in man, therefore brain infection can not even be suspected as in *T. solium*. The various nervous symptoms are due to absorption of its metabolites.

3.12. The hydated cysts may be found in any part of the body. The cysts when lodged in the brain, may soon interfere with its normal functions. Its unilocular cysts, institute usual inflammatory conditions around the site and soon produce dangerous obstructions, resembling tumours. Symptoms of hydrocephalus and convulsions are common.

4. OBSERVATIONS

Stools of 536 mental cases, lodged in the male wards of the Lahore Mental Hospital, were examined. 426 were found passing either cysts or eggs or both of the intestinal parasites. 116 mental cases were found harbouring protozoan parasites as against 387 with helminths. Pure infection was detected in 172 cases. Out of which, 28 had a protozoa and 144 a helminth. 254 mental cases harboured two or more intestinal parasites.

4.1. *G. intestinalis* was found in 9 cases. It occupied 8th position in a series of 10 parasites. Despite good opportunities of transmission, the low rate of its incidence in this group is not clearly understood. Probably lack of contact of the infected with uninfected individuals has kept its incidence so low.

The duodenal flagellate was found alone in 2 cases only. In four cases it was with another protozoan or helminth parasite viz., *E. coli* (one case), *I. butschlii* (one case) and *A. duodenale* (2 cases). In three cases it had three other companions viz., *E. coli* + *A. duodenale* + *T. trichiurus* (one case) and *A. duodenale* + *A. lumbricoides* + *T. trichiurus* (2 cases).

4.2. *E. hartmanni* was found in 11 cases. It was alone in 3. In 2 it was either with another protozoa (*I. butschlii*) or a helminth (*H. nana*). In triple infection cases, it was repeated in four cases. In one case its companions were two other protozoas (*E. coli* + *I. butschlii*) and in three cases it was involved with two helminths (*A. duodenale* + *A. lumbricoides*: one case, and *A. duodenale* + *T. trichiurus*: 2 cases). In two cases its partners were three other parasites viz., *I. butschlii* + *A. duodenale* + *H. nana* and *A. duodenale* + *A. lumbricoides* + *T. trichiurus*.

4.3. *E. coli* was detected in 52 cases. In 1.31 per cent (7 cases) it was the only parasite detected. In 3.92 per cent (21 cases) it occurred with a protozoa or a helminth i.e. *I. butschlii* (9 cases), *G. intestinalis* (1 case), *A. duodenale* (6 cases), *A. lumbricoides* (2 cases) and *T. trichiurus* (3 cases).

E. coli was also involved in 12 cases with triple infections. Its other part.

ners were either two protozoas: *E. hartmanni*+*I. butschlii* (one case) or one protozoa and a helminth: *I. butschlii*+*A. duodenale* (4 cases), *I. butschlii*+*A. lumbricoides* (one case), *I. butschlii*+*T. trichiurus* (one case), *I. butschlii*+*H. nana* (one case) or two helminths *A. duodenale*+*T. trichiurus* (one case) and *A. lumbricoides*+*T. trichiurus* (3 cases).

In 11 cases, *E. coli*, had three other companion parasites viz., *I. butschlii*+*A. duodenale*+*H. nana* (one case) *I. butschlii*+*A. duodenale*+*T. trichiurus* (7 cases), *I. butschlii*+*A. lumbricoides*+*T. trichiurus* (one case), *G. intestinalis*+*A. duodenale*+*T. trichiurus* (one case), and *A. duodenale*+*A. lumbricoides*+*T. trichiurus* (one case).

There was a solitary case harbouring four parasites. Other parasites involved in the combination were *I. butschlii*, *A. duodenale*+*A. lumbricoides* and *T. trichiurus*.

4.4. *E. nana* is most uncommon intestinal protozoa. It was found in only one case harbouring three parasites. The other partners were *A. duodenale*+*T. trichiurus*.

4.5. *I. butschlii* was found to be most common protozoa and was detected in 14.21 per cent cases examined. Elsewhere it has always been found much less common than *E. coli*. Probably faecal contamination of food and drinks in the Mental Hospital is more common. Because of promiscuous defaecation, most of the objects in the wards may be contaminated and may give fair chances to the infection to travel to and fro.

In 16 cases it was found to be alone while in 60 it was involved with other parasites.

In 22 cases it was either with another protozoa viz., *E. hartmanni* (one case), *E. coli* (9 cases) and *G. intestinalis* (one case) or a helminth viz., *A. duodenale* (7 cases), *A. lumbricoides* (one case), *T. trichiurus* (2 cases) and *H. nana* (one case).

In another group of 22 cases, it was involved with two other parasites. In one case, it was involved with *E. hartmanni*+*E. coli*. In 7 cases its companions were another protozoa (*E. coli*) and a helminth viz., *A. duodenale* (4 cases), *A. lumbricoides* (one case), *T. trichiurus* (one case) and *H. nana* (one case). In 14 cases, it was involved with two other helminths i.e., *A. duodenale* and *T. trichiurus* (9 cases), *A. duodenale*+*A. lumbricoides* (3 cases) and *A. lumbricoides*+*T. trichiurus* (2 cases).

In 15 cases its companions were three other parasites viz., one protozoa and two helminths: *E. hartmanni*+*A. duodenale*+*H. nana* (one case), *E. coli*+*A. duodenale*+*H. nana* (one case), *E. coli*+*A. duodenale*+*T. trichiurus* (7 cases), *E. coli*+*A. lumbricoides*+*T. trichiurus* (one case) and 3 helminths: *A. duodenale*+*A. lumbricoides*+*T. trichiurus* (5 cases).

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I. butschlii was involved in one case harbouring five per cent parasites viz., *E. coli*, *A. duodenale* + *A. lumbricoides* + *T. trichiurus*.

4.6. *T. trichiurus* is another best known parasite from the Lahore Medical Hospital. In the series under review, it was second to *A. duodenale* alone. Its incidence in 42.99 percent cases examined, was alarming when compared with the data collected from the normal native population. For extrinsic development, the eggs of whipworm need warm, moist and shady soil. When compared with the eggs of the round-worm, eggs are more delicate and incapable to stand drought and heat. Direct sun light most detrimental to its developing eggs and intense cold may kill them. Viability of eggs is very much interfered with, when on soils which do not hold moisture for very long time. Chemicals and putrefaction is also bad for whipworm eggs. In mental hospital, one may find congenial environments and suitable ecology for spread of trichiuriasis.

In 8.97 per cent persons it occurred alone. In 17.76 per cent cases it occurred along with another parasite. In 3 cases it was found with *E. coli*, in 2 cases with *I. butschlii*, in 55 with *A. duodenale*, in 33 with *A. lumbricoides* while in one case each with *E. vermicularis* and *H. nana*.

In 12.33 per cent cases it had two other companions. In highest number of cases it was found with *A. duodenale* and *A. lumbricoides* (43 cases). In other 23 cases it was associated with *I. butschlii* + *A. duodenale* (9 cases), *E. coli* + *A. lumbricoides* (3 cases), *A. duodenale* + *E. vermicularis* (3 cases), *E. hartmanni* + *A. duodenale* (2 cases), *I. butschlii* + *A. lumbricoides* (2 cases), *E. coli* + *I. butschlii* (one case), *E. nana* + *A. duodenale* (one case), *E. coli* + *A. duodenale* (one case) and *A. duodenale* + *H. nana* (one case).

In 20 cases it was involved with 3 other parasites viz., *E. coli* + *I. butschlii* + *A. duodenale* (7 cases), *E. coli* + *I. butschlii* + *A. lumbricoides* (one case), *E. coli* + *intestinalis* + *A. duodenale* (one case), *E. histolytica* + *A. duodenale* + *A. lumbricoides* (one case), *E. coli* + *A. duodenale* + *A. lumbricoides* (one case), *I. butschlii* + *A. duodenale* + *A. lumbricoides* (5 cases), *G. intestinalis* + *A. duodenale* + *A. lumbricoides* (2 cases), *A. duodenale* + *A. lumbricoides* + *H. nana* (one case) and *A. duodenale* + *A. lumbricoides* + *vermicularis* (one case).

Whipworm was also involved in a five parasites case of infection. Its companions were *E. coli* + *I. butschlii* + *A. duodenale* + *A. lumbricoides*.

From a perusal of the above data, it will be noticed that out of 95 cases of double parasite infection, it occurred with *A. duodenale* and *A. lumbricoides* in 55 and 33 cases respectively. Out of 86 triple parasite infection cases, it was found together with *A. duodenale* and *A. lumbricoides* in 60 and 48 cases, respectively while in 20 four parasite cases it was involved 19 times with *A. duodenale* and 12 times with *A. lumbricoides*. In one four parasite case both, *A. duodenale* and *A. lumbricoides* occurred with it.

4.7. *A. duodenale* was detected in 45.98 per cent cases examined. The highest incidence with this parasite indicates that there is adequate source of infection in the Mental Hospital. Promiscuous defaecation is one of the common habits of most mental cases. Seeding of the parasite in the grassy plots, flower beds and vegetable gardens may therefore occur continuously and incessantly. Proper watering scheme of the fields and plots provides optimum conditions of temperature and humidity for the development of the free living stages. The vagrants, moving about bare footed in the fields, basking in the grassy plots or weeding and hoeing the flower beds, provide favourable conditions to the parasitic phase of the parasite to establish and re-establish in their body. This high rate of infection in this group is not unusual when looked upon from the environmental point of view.

Hook-worm infection was found alone in 11.05 per cent cases examined. In 17.76 per cent cases it was present together with another parasite, viz., *E. coli* (6 cases), *I. butschlii* (7 cases), *G. intestinalis* (2 cases), *A. lumbricoides* (25 cases) and *T. trichiurus* (55 cases).

In 13.08 per cent cases, it was involved with two other parasites. *E. coli*+*I. butschlii* (4 cases), *E. hartmanni*+*A. lumbricoides* (one case), *E. hartmanni*+*T. trichiurus* (2 cases), *E. nana*+*T. trichiurus* (one case), *E. coli*+*T. trichiurus* (one case), *I. butschlii*+*T. trichiurus* (9 cases), *I. butschlii*+*A. lumbricoides* (3 cases), *A. lumbricoides*+*T. trichiurus* (43 cases), *E. vermicularis*+*T. trichiurus* (3 cases), *T. trichiurus*+*H. nana* (one case), *A. lumbricoides*+*E. vermicularis* (2 cases). In the two parasite infections, *A. lumbricoides* and *T. trichiurus* were involved with hookworm in 49 and 60 cases, respectively.

In 3 parasite infections, the hook-worms were detected in 3.92 per cent cases examined. In 10 cases it was involved with protozoas and a helminth, viz., *E. hartmanni*+*I. butschlii*; *H. nana* (one case), *E. coli*+*I. butschlii*+*H. nana* (one case), *E. coli*+*I. butschlii*+*T. trichiurus* (7 cases) and *E. coli*+*G. intestinalis*+*T. trichiurus* (one case). In 9 cases it was involved with a protozoa and two helminths, viz., *E. hartmanni*+*A. lumbricoides*+*T. trichiurus* (one case), *E. coli*+*A. lumbricoides*+*T. trichiurus* (one case), *I. butschlii*+*A. lumbricoides*+*T. trichiurus* (5 cases) and *G. intestinalis*+*A. lumbricoides*+*T. trichiurus* (2 cases). In cases its companions were three other helminths, viz., *A. lumbricoides*+*T. trichiurus*+*H. nana* and *A. lumbricoides*+*T. trichiurus*+*E. vermicularis*. Out of 22 cases harbouring four parasites, 21 had *A. duodenale*. The round-worms and whipworms were involved in 11 and 19 cases, respectively.

Hook-worm was also involved in one-five parasite case. The other parasites were *E. coli*, *I. butschlii*, *A. lumbricoides* and *T. trichiurus*.

From the above account, it is found that in 187 mixed infections, hook-worm was involved with *A. lumbricoides* and *T. trichiurus* in 86 and 135 cases respectively.

4.8. *E. vermicularis* is said to be a group infection. Mental Hospitals, jails and asylums are therefore generally presumed to have very high incidence when compared with the general population. ("Pak. Jour. Hlth.", 16(3))

pared with the population in general. Although stool examination does not usually give exact or even approximate glimpse of enterobiasis in a group, yet 1.49 per cent infection rate by this method in this series seems to be far too low. It was found alone in one solitary case. In one case it occurred with *T. trichiurus*. In three cases its associates were *A. duodenale* and *T. trichiurus* while in two others it existed with *A. duodenale* and *T. trichiurus*. In one case hook-worms, round-worms, and whip-worms were found with seat-worms. It would be worthwhile to study, if the most pathogenic helminths, specially those responsible for disturbed digestion and diarrhoea, are recessive to enterobiasis.

4.9. *A. lumbricoides* occurs more frequently in places where the door-yards and courtyards get contaminated. In the mental hospital, the soil immediately around the wards seems to be profusely seeded with the eggs of the round-worm. Promiscuous defaecation pollutes the environment and unclean habits of the mental cases increase chances of propagation of this parasite better than known from a normal community.

In 5.79 per cent cases examined, it was the only intestinal parasite. In 11.41 per cent cases, it was found with another parasite, viz., *E. coli* (2 cases), *I. butschlii* (one case), *A. duodenale* (25 cases) and *T. trichiurus* (33 cases).

In 10.28 per cent cases, it was involved with two other parasites, viz., *E. coli* + *I. butschlii* (one case), *E. hartmanni* + *A. duodenale* (one case), *E. coli* + *T. trichiurus* (3 cases), *I. butschlii* + *T. trichiurus* (2 cases), *I. butschlii* + *A. duodenale* (3 cases), *A. duodenale* + *T. trichiurus* (43 cases) and *A. duodenale* + *E. vermicularis*.

In 2.24 per cent cases, it occurred alongwith three other parasites, viz., *E. coli* + *I. butschlii* + *T. trichiurus* (one case), *E. hartmanni* + *A. duodenale* + *T. trichiurus* (one case), *E. coli* + *A. duodenale* + *T. trichiurus* (one case), *I. butschlii* + *A. duodenale* + *T. trichiurus* (5 cases), *G. intestinalis* + *A. duodenale* + *T. trichiurus* (2 cases), *A. duodenale* + *T. trichiurus* + *H. nana* (one case) and *A. duodenale* + *E. vermicularis* + *T. trichiurus* (one case).

A. lumbricoides was also present in one-five parasite case and its partners were *E. coli* + *I. butschlii* + *A. duodenale* + *T. trichiurus*.

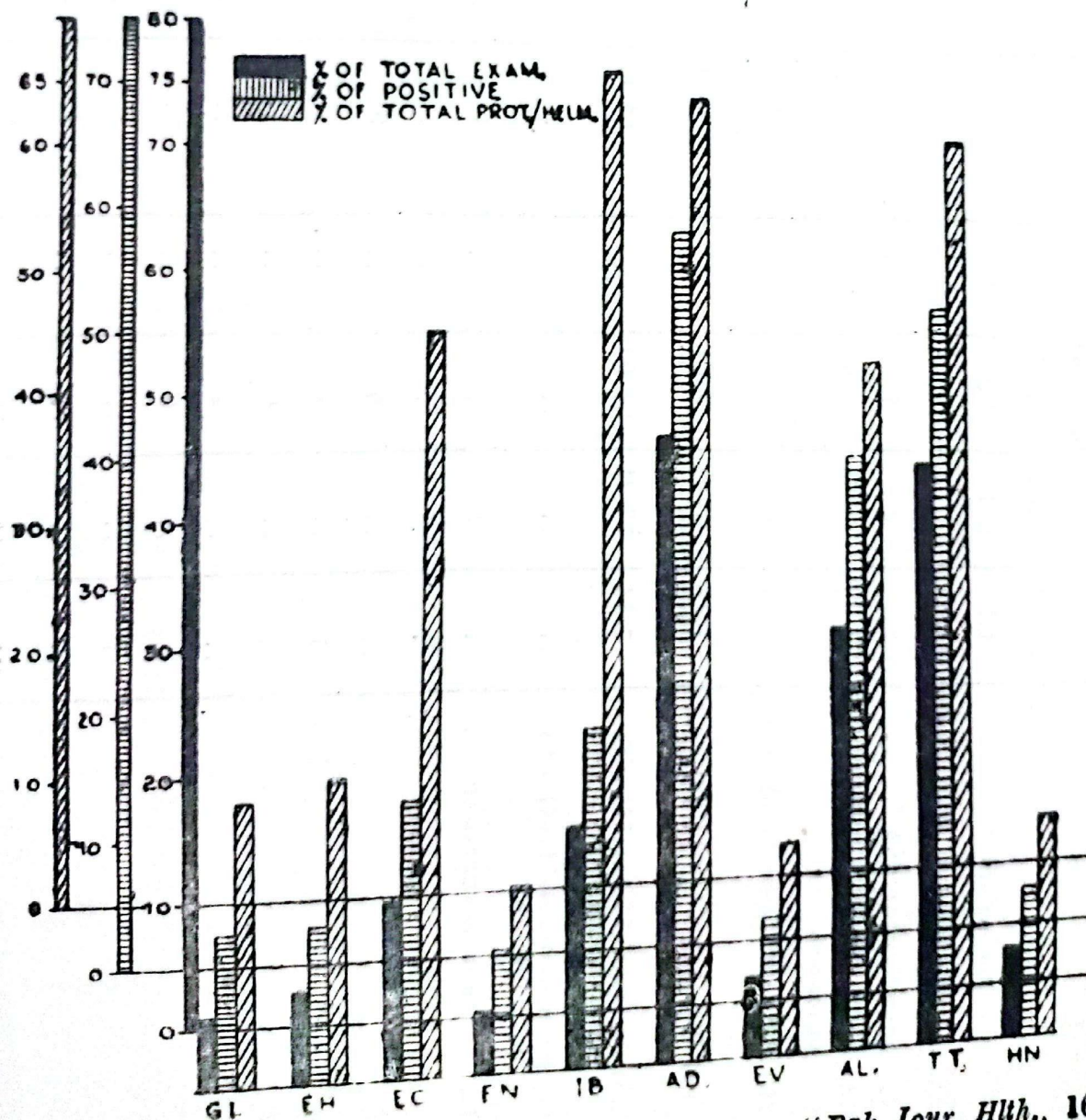
From the above data one may find that the round-worm was found alongwith *A. duodenale* and *T. trichiurus* in 86 and 95 cases, respectively.

4.10. *H. nana* is a specific parasite of man. It is the only tape-worm of man which needs no intermediate host. It is known to be more common in children than in adults. The incidence is also found high in institutional groups. It may be well compared with *E. vermicularis* in this regard. Its incidence was found to vary from 3.14 to 8.48 per cent in a population as a whole. In children, however the incidence may fluctuate from 3.2 to 14.7 per cent. Incidence in children below 12 years is usually 13.3—14.7 per cent as against cases above 12 years, when it steadily drops down to 3.2

to 4.8 per cent. Incidence in the mental hospital was 2.42 per cent. This figure is far below the above figures. It may mean that environments and ecology in Mental Hospital are not suitable for the transmission of this parasite or else in the presence of hook-worms, round-worms and whip-worms, this parasite fails to establish itself well.

The dwarf tapeworm was found alone in 5 mental cases. In 3 cases it occurred either alongwith *E. hartmanni* or *I. butschlii* or *T. trichiurus*. In two cases it was found with *E. coli*+*I. butschlii* or *A. duodenale*+*T. trichiurus*. In four parasite infection cases it was found in 3 instances. In addition to *A. duodenale*, which was present in all the three cases, *A. lumbricoides*+*T. trichiurus*, *E. hartmanni*+*I. butschlii* and *E. coli*+*I. butschlii* were its other partners in this group.

BAR DIAGRAM SHOWING INCIDENCE OF INTESTINAL PARASITES IN MENTAL HOSPITAL (MALE CASES)



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TABLE I

SHOWING INCIDENCE OF INTESTINAL PARASITES IN THE LAHORE MENTAL HOSPITAL (MALE PATIENTS)

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HELMINTHS

PROTOZOAS

Particulars

Particulars	PROTOZOAS					HELMINTHS				
	GI	EH	EC	EN	IB	AD	EV	AL	TT	HN
I. PURE INFECTIONS ..	2	3	7	..	16	59	1	31	48	5
(i) Per cent of total (535) examined.	0.37	0.56	1.31	..	2.99	11.05	0.18	5.79	8.93	0.93
(ii) Per cent of total (426) positive.	0.47	0.70	1.64	..	3.75	13.85	0.23	7.23	11.27	1.17
(iii) Per cent of total (172) with one parasite.	1.16	1.74	4.07	..	9.31	34.31	0.59	13.02	27.91	2.91
(iv) Per cent of total (28) with one protozoa.	7.14	10.71	25.00	..	57.14	..	..	..	..	..
(v) Per cent of total (144) with one helminth.	..	..	..	..	..	40.97	0.69	21.53	33.33	3.47
II. DOUBLE INFECTIONS ..	..	1	..	..	1	..	..	..	..	..
	..	1	..	..	..	..	..	..	..	1
	..	..	9	..	9	..	..	..	..	..
	1	..	1	..	..	6	..	..	..	..
	..	..	6	..	..	..	..	..	..	..
	..	..	2	..	..	..	..	2	..	..
	..	..	3	..	..	..	..	..	..	..
	1	..	..	..	1	1	..	..	..	..
	..	..	..	..	1	1	..	..	..	..
	..	..	..	..	1	..	..	..	..	..

M.A.R. Ansari & N.A. Naru

TABLE I (contd.)

SHOWING INCIDENCE OF INTESTINAL PARASITES IN THE LAHORE MENTAL HOSPITAL (MALE PATIENTS)

PROTOZOAS

HELMINTHS

Particulars

Particulars	PROTOZOAS					HELMINTHS				
	GI	EH	C	EN	IB	AD	EV	AL	TT	HN
..	..	..	..	..	2	..	..	..	2	..
..	..	..	..	..	1	..	..	..	..	1
2	..	..	..	..	2	..	..	..	..	..
..	..	..	..	..	..	25	..	25	..	..
..	..	..	..	..	..	55	..	..	55	..
..	..	..	..	..	..	33	..	..	32	..
..	..	..	..	..	..	..	1	..	1	1
..	..	..	..	..	..	..	..	..	1	..
Total ..	4	2	21	..	22	95	1	61	95	3
(i) Per cent of total (535) examined.	0.75	0.37	1.92	..	4.11	17.76	0.18	11.41	17.76	0.66
(ii) Per cent of total (426) positive.	0.94	0.47	4.93	..	5.16	22.31	0.23	14.32	22.31	0.70
(iii) Per cent of total (152) with 2 parasites.	2.63	1.31	13.81	..	14.61	63.50	0.65	40.13	62.50	1.97
III. TRIPLE INFECTIONS ..	..	1	1	..	1	..	..	..	..	..
	..	..	4	..	4	4	..	..	..	..
	..	..	1	..	1	..	..	..	..	..

Intestinal parasites in mental cases

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PARASITES IN THE LAHORE MENTAL HOSPITAL (MALE PATIENTS)

Particulars	PROTOZOAS				HELMINTHS					
	GI	EH	EC	EN	IB	AD	EV	AL	TT	HN
..	..	..	1	..	1	..	..	..	1	..
..	..	1	1	..	1	1	..	..	..	1
..	..	2	..	1	..	2	..	..	2	..
..	..	..	1	..	..	1	..	..	1	..
..	..	..	3	..	..	..	..	3	3	..
..	..	..	..	..	9	9	..	..	9	..
..	..	..	..	..	2	..	..	2	2	..
..	..	..	..	..	3	3	..	3	..	..
..	..	..	..	..	..	43	..	43	43	..
..	..	..	..	..	..	3	3	..	3	..
..	..	..	..	..	..	1	..	..	1	1
..	..	..	..	..	..	2	2	2	..	..
Total	..	4	12	1	22	70	5	55	66	2

TABLE I (contd.)

SHOWING INCIDENCE OF INTESTINAL PARASITES IN THE LAHORE MENTAL HOSPITAL (MALE PATIENTS)

Particulars	PROTOZOAS				HELMINTHS					
	GI	EH	EC	EN	IB	AD	EV	AL	TT	HN
(i) Per cent of total (535) examined.	..	6.75	2.24	0.18	4.11	13.08	0.93	10.28	12.33	0.37
(ii) Per cent of total (427) positive.	..	0.94	2.82	0.23	5.16	16.43	1.17	12.91	15.49	0.47
(iii) Per cent of total (79) with 3 parasites.	..	5.06	15.18	1.26	27.85	88.61	6.33	69.62	63.54	2.52
IV. QUADRUPLE INFECTIONS										
..	..	1	..	..	1	1	..	..	..	1
..	..	..	1	..	1	1	..	..	..	1
..	..	..	7	..	7	7	..	..	7	..
..	..	..	1	..	1	..	..	1	1	..
1	1	1	1	..	..	1	..	1	1	..
..	..	..	1	..	..	1	..	1	1	..
..	..	..	..	..	..	5	..	5	5	..
..	..	..	..	..	..	2	..	2	2	..
2	2	..	..	..	..	1	..	1	1	1
..	..	..	..	..	..	1	1	1	1	..
Total	..	2	11	..	15	21	1	21	20	3

Intestinal parasites in mental cases

5. RESUME

5.1. A perusal of the above data will show that in this series the incidence of *I. butschlii* was the highest amongst 'protozoan infections'. *E. coli*, which is usually the commonest commensal of man, occupied second position. It may mean that the environmental conditions in the Mental Hospital are probably more favourable for the transmission of *I. butschlii* than *E. coli*. It has been observed that the number of nuclei in *I. butschlii* cysts does not usually increase after leaving the host. In rare instances the ripe cysts may contain only two nuclei. This suggests that the cysts in *I. butschlii* may probably be infective immediately after leaving the body of the host or the development outside the body does not require more than 1-2 days. The mental patients who observe primitive hygiene and sanitation, therefore, are more liable to *I. butschlii* infection than to *E. coli* which requires 7-8 days to ripe.

5.2. On the basis of this data, it may also be concluded that all the three nematodes, viz., *A. duodenale*, *T. trichiurus* and *A. lumbricoides* are the major health problems in the Lahore Mental Hospital. The grassy plots, in front of the barracks and wards, are contaminated with the faecal matter. The plots being grassy, are frequently watered and well-manured. The transmission of all the three nematodes in this series is probably occurring from the door-yard.

5.3. As a rule, the incidence of hook-worm in Lahore is higher in areas where vegetables and fodder crops are grown and there are open fields on the periphery tempting promiscuous defaecation. This worm is mainly associated with fertilization of fields with human night soil. In the Mental Hospital, the moist and manured grassy plots provide optimum conditions for the uninterrupted development of free stages of the worm. The promiscuous defaecation is also responsible for the higher incidence of this nematode. For every one case of hook-worm, there were 0.93 cases of whip-worm and 0.65 cases of round-worm. Spontaneous recovery in ancylostomiasis is known to occur in 70 per cent cases within one year. In some cases the parasite may persist for over 9 years. High incidence may mean that reinfection is of common occurrence. It also indicates that the soil is highly polluted and the transmission is occurring most frequently.

5.4. The incidence and intensity of whip-worm is more in this series probably because warmth and moisture in the soil of the Mental Hospital offer suitable conditions for the survival of its eggs. The eggs of *T. trichiurus* become infective after about 21 days. Temporary drought and heat are detrimental to the developing eggs. Direct sun, hard soil and sand decrease chances of survival. Viability is also hampered with in putrifying media and strong chemicals. Warm, shady and moist soils offer optimum conditions for the extrinsic development of whip-worm eggs. The premises of the Lahore Mental Hospital have all the favourable conditions for the development and

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transmission of whip-worm. For each one infection of whip-worm there were 1.69 infections of hook-worms as against 0.69 with round-worms.

5.5. The round-worm eggs flourish in warm and moist climate, provided the community observes low grade personal hygiene and favour frequent seeding. Environmental conditions encourage embryonation of the eggs in the soil. Unfortunately the Lahore Mental Hospital fulfills all the optimum conditions for the development and transmission, of the common round-worm.

The transmission of round-worms and whip-worms is more or less of similar pattern. Infection of the round-worm is however, acquired more rapidly. The extrinsic development in the egg may be completed in 9—13 days, if the environmental conditions are favourable. Under unfavourable conditions of environments, the extrinsic development may be considerably delayed and the eggs, under exceptional cases, may be found viable for many months. The infection once established in the host, does not last for very long. Disturbed digestion agitates the worms, with the result that they may either pass spontaneously through anus or are vomitted or are passed through the nares. For every one infection of round-worm there were 1.54 and 1.44 cases of hook worms and whip-worms respectively.

5.6. The mental patients constitute a primitive community. The fields facing the wards are moist, shady and warm. To keep the grass fresh and luxuriant, watering is given frequently. Manure is added occasionally when required.

The promiscuous defaecation by the mental patients helps frequent seeding of these plots with the eggs of the hook-worm. The abundant supply of food in the sc helps the larvae to complete the extrinsic growth period with success. Moving about bare footed in the soft, velvety and pleasant plots helps the infective stages in re-establishing parasitic phase successfully. Most of the mental cases are geophagous and observe low level of personal hygiene.

5.7. We propose to carry out a soil survey of the mental hospital in near future and know the prevalence and intensity of soil pollution.

The data of the egg counts is also available and will be presented in a later note.

We were not able to find out the full history sheets of the cases presented in this report. A knowledge of the home-town, socio-economic status, duration of stay in the hospital and behaviouristic pattern of each patient may give more insight of the incidence figures. However, we intend to collect this information whenever possible in our future studies.

TABLE II

SHOWING CORRESPONDING RATIOS OF THE INTESTINAL PARASITES IN THE LAHORE MENTAL HOSPITAL (MALE PATIENTS).

Intestinal Parasites	PROTOZOAS					HELMINTHS				
	GI	EH	EC	EN	IB	TT	AD	EV	AL	HN
Total ..	9	11	52	1	76	230	246	8	160	13
1. <i>G. intestinalis</i> ..	1	1.22	5.77	0.11	8.44	25.55	27.33	0.88	17.77	1.44
2. <i>E. Histolytica</i> ..	0.82	1	4.73	0.09	6.91	20.91	22.36	0.72	14.55	1.18
3. <i>E. coli</i> ..	0.17	0.21	1	0.02	1.46	4.42	4.73	0.15	3.08	0.25
4. <i>E. nana</i> ..	9.0	11.0	52.0	1	76.0	230.0	246.0	8.0	160.0	13.0
5. <i>I. butschlii</i> ..	0.12	0.14	0.68	0.01	1	3.03	3.23	0.11	2.11	0.17
6. <i>T. trichiurus</i> ..	0.04	0.05	0.23	0.01	0.33	1	1.07	0.03	0.69	0.06
7. <i>A. duodenale</i> ..	0.04	0.05	0.21	0.01	0.31	0.93	1	0.03	0.65	0.05
8. <i>E. vermicularis</i> ..	1.13	1.38	6.50	0.12	9.50	28.75	30.75	1	20.00	1.63
9. <i>A. lumbricoides</i> ..	0.06	0.07	0.32	0.01	0.47	1.44	1.54	0.05	1	0.08
10. <i>H. nana</i> ..	0.68	0.85	4.00	0.07	5.85	17.61	18.92	0.62	12.31	1

6. ACKNOWLEDGEMENTS

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A NOTE ON THE INCIDENCE OF INTESTINAL PARASITES IN THE
LAHORE MENTAL HOSPITAL FOR FEMALE PATIENTS

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I. INTRODUCTION

Mental illness is a serious break in an inter-personal relationship. It is therefore, mainly a social mental problem. Its pathogenesis ranges from genetics to mental traumas and therefore, it is multi-dimensional in manifestations.

The intestinal parasites may sometimes be involved in a temporary terror. The roundworm larvae, when present in the brain and spinal cord, may cause lot of disturbances. Mental retardation has also been reported in hookworm anaemia. Some patients harbouring beef-tape-worms may experience nausea, dizziness, insomnia and occasionally convulsions or epileptic fits. Convulsions and epileptic attacks in children may also occur in severe cases of *H. nana* infection and enterobiasis.

The parasitic infections, as far as we know, may be responsible in aggravating nervous instability but cannot be considered primary cause of any neurasthenic symptoms. On the contrary, the mental patients because of lack of hygienic and psychic adaptation are much more likely to ingest infective cysts and embryonated eggs of intestinal parasites. Dirt eating, rolling in dust and wallowing in mud are common in mentally deranged persons. It does not mean accidentally picking up parasites from polluted soil. On the other hand it means habitually eating faeces, contaminating ones own food and drink with ones own hands and picking up infective larvae by getting into their favourite haunts. Most of the mental cases are wormy because of depressed mental vigour.

II. OBSERVATIONS

Stools of 1235 female mental cases, lodged in Mental Hospital, Lahore were examined last summer, from March 3 to August 3, 1966. The protozoan cysts or helminthic ova or both were found in 720 patients. In 86, only protozoan parasites were found as against 584, who had only helminthic ova. In 50 cases, both protozoan and helminthic parasites were detected.

One parasite infections were found in 308 cases, out of which 75 had a protozoa while 323 had a helminth.

Two parasite infections were detected in 223 patients; out of which 10 had protozoas, 183 had helminths and 30 had mixed infections.

93 cases had three parasite infections; out of which only one case had protozoas, 76 had helminths and 16 had mixed infections. One protozoa and two helminths were involved in 13 cases as against 3 cases which had two protozoas and a helminth.

Four parasite infection was traced in 6 cases only, out of which two cases had helminthic parasites as against others who had both protozoas and helminths. In 3 cases a protozoa and three helminths were detected as against only one case, who had, two protozoas and two helminths.

2.1. *G. intestinalis* cysts were found in 22 patients. It occupied sixth position in a series of 10 parasites, while it was third when compared with the intestinal protozoas involved.

It was found alone in 13 cases. In 6 cases it was found involved with another parasite viz., *I. butschlii* (one case), *T. trichiurus* (2 cases), and *A. duodenale* (3 cases). Twice it was found with two other parasites i.e. *E. coli* and *I. butschlii* (one case) and *T. trichiurus* and *A. duodenale* (one case). In one case *T. trichiurus*, *A. duodenale* and *A. lumbricoides* were found with *G. intestinalis*.

Although there are more visible chances for the transmission of duodenal flagellates, yet its incidence remained very low in this group. The infection rate of 1.78 per cent again sets one to find reasons for the low grade of infection.

2.2. *E. hartmanni* was found in 3 cases. It was found to be the only parasite in one case. In one case it was involved with two other parasites viz., *E. coli* and *I. butschlii*. In another case its companions were three helminths viz., *T. trichiurus*, *A. duodenale* and *A. lumbricoides*.

This intestinal protozoa is very rarely reported by the laboratory workers in this country and therefore, may not be accepted with ease. It is a cosmopolitan parasite of the large intestines. Since it closely resembles *E. histolytica* both in the trophozoite and cystic stages it causes much diagnostic difficulties. Invariably our microscopists identify it as an innocent race of the pathogenic form, which is far-fetched guess, specially for those cases who do not give a history of having suffered of amoebic dysentery in the past and have not have a visible or invisible manifestation of dysentery at the time of examination. Safest procedure in all such cases is to examine repeatedly and self criticise the finding before passing a verdict. The results reported in this report are based on self-criticism and a summary debate.

2.3. *E. coli* cysts were found present in 58 cases. It was alone in 28 cases. In 19 cases it was involved with another intestinal parasite viz., *I. butschlii* (9 cases) *T. trichiurus* (3 cases), *A. duodenale* (4 cases) and *A. lumbricoides* (3 cases). In three parasite infection cases, *E. coli* occurred alongwith *G. intestinalis* and *I. butschlii* (one

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0359), *I. butschlii* and *T. trichiurus* (one case), *I. butschlii* and *A. duodenale* (one case), *I. butschlii* and *A. lumbricoides* (one case), *T. trichiurus* and *A. lumbricoides* (4 cases) and *A. duodenale* and *A. lumbricoides* (2 cases). In one case it was found with three helminths viz., *T. trichiurus*, *A. duodenale* and *A. lumbricoides*.

Although, due to the activities of mental cases, the sanitation and personal hygiene in the mental hospital is reduced to minimum, yet the incidence of *E. coli* re-ministration, inspite of the difficulties, has successfully lowered chances of faecal contamination.

2.4. *I. butschlii* was found to be comparatively frequent than other intestinal protozoas in this series. It was found in 69 cases. It is interesting to find it more common than *E. coli* in mental cases. One may suspect that its cysts are probably fully mature when voided in the stools and therefore set in infection even when ingested with food and drink contaminated with fresh stools as against *E. coli* which after leaving the body takes some time to ripe before becoming infective.

I. butschlii was found alone in 33 (2.67 per cent) cases. It was involved with an other protozoan or helminthic parasite in 25 cases. The protozoan partners were *G. intestinalis* (one case) and *E. coli* (9 cases). In 15 cases it occurred alongwith a helminth viz., *T. trichiurus* (4 cases), *A. duodenale* (7 cases) and *A. lumbricoides* (4 cases).

In 9 cases it had two other companions viz., *G. intestinalis* and *E. coli* (one case), *E. coli* and a helminth (3 cases) and *T. trichiurus* and another helminth (5 cases). In these combinations, *T. trichiurus* was involved in 6 cases, while *A. duodenale* and *A. lumbricoides* were the partners in 3 and 4 cases respectively. In 2 cases, *I. butschlii* occurred with three other parasites viz., *T. trichiurus* (2 cases), *A. lumbricoides* (2 cases) *A. duodenale* (one case) and *E. hartmanni* (one case).

From the perusal of the above data, it will be found that in 36 mixed infection cases, *I. butschlii* was involved with *T. trichiurus* (12), *A. duodenale* (11) and *A. lumbricoides* (10) in 23 cases (69.44 per cent).

2.5. *T. trichiurus* is one of the best known parasites from the mental hospital. It was encountered in 344 (27.85 per cent) cases. In this series it was second to none in frequency. Its presence in 47.78 per cent positive cases invites ones attention to the favourable conditions of transmission in our mental hospital. The whipworm is known to be more prevalent in areas of high rainfall. Areas, providing warm, shady and moist soil to the eggs undergoing development, usually have highest incidence. Although the eggs are less resistant to drought and heat and the direct sun rays and intense cold kills them yet the whipworm is said to co-exist with roundworms, which are better equipped to stand the vagaries of the weather. In Lahore, its incidence is almost negligible but its incidence in the mental hospital is comparatively very high, warranting one to call this pouch of institution as hyperendemic within a comparatively negligible whole.

The whipworm infection was found alone in 97 cases. It was one fourth less than the hook-worm infection but almost equal to the roundworm infection.

It was found more frequent in cases with two parasite infections. Out of 153 cases, *A. duodenale* and *A. lumbricoides* were involved in 57 and 85 cases respectively. In other cases it occurred along with *G. intestinalis* (2 cases), *E. coli* (3 cases), *I. butschlii* (4 cases), *E. vermicularis* (one case) and *H. nana* (one case).

In 88 cases, the whipworm eggs were found along with two other parasites. In one case two protozoas viz., *E. coli* and *I. butschlii* were involved. In 11 cases a protozoa and a helminth viz., *G. intestinalis* and *A. duodenale* (one case), *E. hartmanni* and *E. vermicularis* (one case), *E. coli* and *A. lumbricoides* (4 cases), *I. butschlii* and *A. duodenale* (2 cases) and *I. butschlii* and *A. lumbricoides* (3 cases). In 76 cases two helminths viz., *A. duodenale* and *A. lumbricoides* (75 cases) and *E. vermicularis* and *A. lumbricoides* (one case) were involved. From a perusal of this data, it may be concluded that whipworms co-exist more frequently with *A. lumbricoides* (83 cases) and *A. duodenale* (68 cases).

In 6 four-parasite cases, the whipworm remained constantly present. In 3 cases the combination was of a protozoa and two helminths viz., *G. intestinalis*, *A. duodenale* and *A. lumbricoides* (one case), *E. coli*, *A. duodenale* and *A. lumbricoides* (one case) and *I. butschlii*, *A. duodenale* and *A. lumbricoides* (one case). Two protozoas and a helminth were found in one solitary case. In this case the combination was between *E. hartmanni*, *I. butschlii* and *A. lumbricoides*. In two cases it occurred along with three other helminths viz., *A. duodenale*, *E. vermicularis* and *A. lumbricoides* and *A. duodenale*, *A. lumbricoides* and *H. nana*. A perusal of this group will show that it occurred more frequently along with *A. lumbricoides* (in all the six cases) than with *A. duodenale* (in 5 cases).

To sum up, the whipworm in this series occurred 163 times with *A. lumbricoides* as against 134 with *A. duodenale*. The presence of other intestinal parasites with it was more or less sporadic in nature. *E. hartmanni* (2 cases), *H. nana* (2 cases), *E. vermicularis* (3 cases), *G. intestinalis* (4 cases), *E. coli* (9 cases) and *I. butschlii* (10 cases).

2.6. *A. duodenale* was found to be second commonest intestinal parasite in this series. Out of 322 cases, 127 had only hookworm infection while in others (195 cases) it occurred along with other intestinal parasites.

In two parasites infection group, hookworm eggs were detected in 109 cases. In 14 cases it combined with protozoas, viz., *G. intestinalis* (3 cases), *E. coli* (4 cases) and *I. butschlii* (7 cases) while in 95 cases it was found either with *T. trichiurus* (57 cases) or *A. lumbricoides* (38 cases). In this group it showed better inclination towards whipworm.

In three-parasites infection group, hookworm eggs were found in 81 cases as against 86 and 88 cases of *A. lumbricoides* and *T. trichiurus*. In this group it was found most

commonly with *A. lumbricoides* and *T. trichiurus* (75 cases). In 5 cases, its companions were a protozoa and a helminth viz., *G. intestinalis* and *T. trichiurus*, (one case), *E. coli*, *A. lumbricoides* (2 cases) and *I. butschlii* and *T. trichiurus* (2 cases). In one case it was involved with two protozoa viz., *E. coli* and *I. butschlii*. It occurred alongwith *A. lumbricoides* and *T. trichiurus* in 77 and 78 cases respectively.

In four-parasites infection group, *A. duodenale* occurred in 5 out of 6 cases. *T. trichiurus* and *A. lumbricoides* were present in all the 5 cases. However, *G. intestinalis*, *E. coli*, *I. butschlii*, *E. vermicularis* and *H. nana* were detected in one case each.

From the above information it is found that out of 195 mixed infections, *A. duodenale* occurred alongwith *T. trichiurus* in 140 cases as against 120 with *A. lumbricoides*.

2.7. *E. vermicularis* is supposed to be most common in Institutions. An incidence of 0.65 per cent is apparently very low figure even when obtained from stool examinations.

The seat-worm was the solitary parasite in 3 cases. In one case each it was found with *T. trichiurus* or *A. lumbricoides*.

It occurred twice in three-parasites cases. *T. trichiurus* was found in both. *E. hartmanni* and *A. lumbricoides* were found in one case each.

E. vermicularis was also involved in a four-parasites case. Its other companions were *T. trichiurus*, *A. duodenale* and *A. lumbricoides*.

From the above account it is found that out of 5 mixed infection cases, seat-worm was involved with *T. trichiurus*, *A. lumbricoides* and *A. duodenale* in 4, 3 and one case respectively.

2.8. *A. lumbricoides* was another frequently found intestinal parasite in this series. It was present in 317 cases as against 344 cases and 322 cases with *T. trichiurus* and *A. lumbricoides* respectively.

In 94 cases, it was the only parasite detected. The incidence in this group was more or less the same as of *T. trichiurus* (97 cases), but was decidedly low than *A. duodenale* (127 cases).

The roundworm was involved in 131, two parasite infection cases. It was found more frequently with *T. trichiurus* (85) than with *A. duodenale* (38 cases). In 8 cases, it occurred either with a protozoa (7 cases) or with a helminth (1 case). Its protozoan companions were *E. coli* (3 cases) and *I. butschlii* (4 cases). In one case it occurred alongwith *E. vermicularis*.

In 86 cases, it had two other partners. It was found more frequently with *T. trichiurus* (83 cases) and *A. duodenale* (77 cases). In other cases it was involved with *E. coli* (7 cases). *I. butschlii* (4 cases) and *E. vermicularis* (one case).

In 6, four-parasites cases, the roundworm was found in all the cases. *T. trichiurus* was its constant companion and in five however, *A. duodenale* was also involved. In two cases *I. butschlii* was found, while in one case each its companions were *G. intestinalis*, *E. hartmanni*, *E. coli*, *E. vermicularis* and *H. nana*.

From the data given above it is found that *A. lumbricoides* most frequently occurred alongwith *T. trichiurus* (174 cases). It was also of common occurrence with *A. duodenale* (120 cases). Other intestinal parasites alongwith roundworms however, were found rarely. *E. coli* (11 cases), *I. butschlii* (10 cases), *E. vermicularis* (3 cases) and *E. hartmanni*, *G. intestinalis* and *H. nana* (one case each).

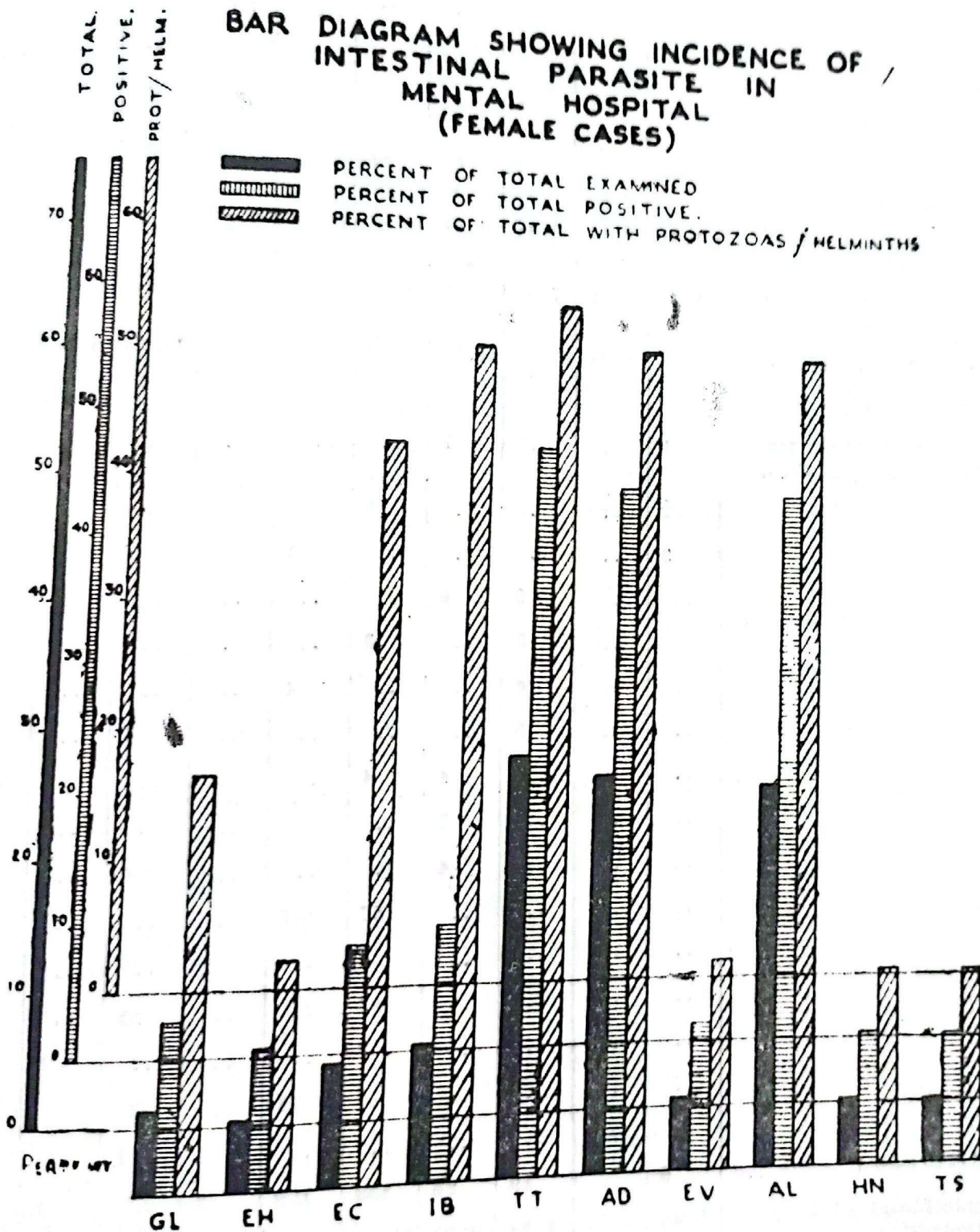
2.9. *H. nana* was found to be of rare occurrence in this series. It was detected in 3 cases only. It was the only intestinal parasite in one case. In one case, it occurred along with *T. trichiurus*. In another case harbouring four parasites, its companions were *T. trichiurus*, *A. duodenale* and *A. lumbricoides*.

According to the consensus of opinion, the dwarf tapeworm is a common parasite of children. Its incidence is also comparatively high in orphanages, asylums, hostels and other institutions. A perusal of our data does not support this view. Its incidence was 3.14 to 8.48 per cent in adults as against 13.3-14.7 per cent in children in Lahore. In the male ward of the mental hospital, however, the dwarf tape worm eggs were detected in 2.42 per cent cases as against 0.24 per cent in female ward.

2.10. *T. saginata* has not so far been found a common parasite in Lahore. However, in a selective group, fond of eating half-cooked beef, beefsteak, tikka kababs, seekh kababs, pickled meat, salted and processed beef, one may find higher incidence.

In this series, only one case was found harbouring *T. saginata*. This female hadn't had any other intestinal parasite. This parasite hasn't had any chance of transmission in the mental hospital and therefore, it is presumed that she brought this infection from her place of origin. Further information about this patient could not be collected.

BAR DIAGRAM SHOWING INCIDENCE OF INTESTINAL PARASITE IN MENTAL HOSPITAL (FEMALE CASES)



Intestinal Parasites in Female Cases
TABLE I SHOWING INCIDENCE OF INTESTINAL PARASITES IN THE LAHORE MENTAL HOSPITAL (FEMALE PATIENTS)

TABLE I SHOWING INCIDENCE OF PARASITIC INFECTIONS IN THE HOSPITAL (1935)											
	Protozoan				HELMINTHIC						
	GI	EH	EC	IB	TT	AD	EV	AL	HN	TS	
I. PURE INFECTIONS (388 cases).	13	1	28	33	97	127	3	94	1	1	
(a) Percent of total (1235) examined.	1.03	0.08	2.27	2.67	7.85	10.28	0.24	7.61	0.08	0.08	
(b) Percent of total (720) positive.	1.81	0.14	3.88	4.58	13.47	17.64	0.42	13.05	0.14	0.14	
(c) Percent of total (388) with one parasite.	3.27	0.25	7.03	8.20	24.37	31.91	0.76	23.62	0.25	0.25	
(d) Percent of total with one protozoa (73) one helminth (323).	17.53	1.53	37.23	44.00	30.33	39.32	0.93	29.11	0.31	0.31	
II. TWO PARASITE INFECTIONS (223 CASES)	1	..	..	1	..	..	..	..	..	..	
	2	..	..	..	8	..	..	..	..	..	
	3	..	..	..	..	8	..	..	..	..	
	..	..	9	9	..	..	..	..	..	..	
	..	..	3	..	8	..	..	..	..	..	
	..	..	4	..	..	4	..	..	..	..	
	..	..	8	..	..	..	..	8	..	..	
	..	..	..	4	4	..	..	..	..	..	
	..	..	..	7	..	7	..	..	..	..	
	..	..	..	4	..	..	..	4	..	..	
	..	..	..	..	57	57	..	..	..	..	
	..	..	..	..	1	..	1	..	..	..	
	..	..	..	..	85	..	..	85	..	..	
	..	..	..	..	1	..	..	..	1	..	
	..	..	..	..	..	38	..	38	..	..	
	..	..	..	..	..	..	1	1	..	..	
(a) Total (223 cases)	6	..	19	25	153	109	2	131	1	..	
(b) Percent of total (1235) examined.	0.48	..	1.54	2.03	12.38	8.83	0.16	10.61	0.08	..	
(c) Percent of total (720) positive.	p.84	..	2.65	3.47	21.25	15.14	0.28	18.19	0.14	..	

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	PROTOZOAS				HELMINTHS					
	GI	EH	EC	IB	TT	AD	EV	AL	HN	TS
(d) Percent of total (223) with two parasites.	2.69	..	8.52	11.21	68.61	48.43	0.89	58.74	0.45	..
III. THREE PARASITE INFECTIONS (93 cases).	1	..	1	1	..	..	..	..	..	..
	1	..	..	..	1	1	..	..	..	..
	..	1	..	..	1	..	1	..	..	..
	..	..	1	1	1	..	..	..	..	..
	..	..	1	1	..	1	..	..	..	..
	..	..	4	..	4	..	..	4	..	..
	..	..	2	..	..	2	..	2	..	..
	..	..	..	2	2	2	..	..	..	..
	..	..	..	3	3	..	..	3	..	..
	..	..	..	..	75	75	..	75	..	..
	..	..	..	..	1	..	1	1	..	..
(a) Total (93 cases)	..	2	1	10	9	88	81	2	86	..
(b) Percent of the total (1235) examined.	0.16	0.08	0.81	0.73	7.12	6.55	0.16	6.96	..	..
(c) Percent of the total (720) positive.	0.28	0.14	1.42	1.25	12.22	11.25	0.28	11.94	..	..
(d) Percent of the total (93) with three parasites.	2.15	1.08	10.75	9.67	94.62	87.09	2.15	92.47	..	..
V. FOUR PARASITE INFECTIONS (6 cases).	1	..	..	..	..	1	1	..	1	..
	..	1	..	..	1	1	..	..	1	..
	..	..	1	..	..	1	1	..	1	..
	..	..	..	1	1	1	1	..	1	..
	..	..	..	..	1	1	1	1	1	..
	..	..	..	..	..	1	1	..	1	..
(a) Total (6 cases)	..	1	1	1	2	6	5	1	6	..
(b) Percent of the total (1235) examined.	0.08	0.08	0.08	0.16	0.48	0.41	0.08	0.48	..	..

	PROTOZOAS				HELMINTHS					
	GI	EH	EC	IB	TT	AD	EV	AL	HN	TS
(c) Percent of the total (720) positive.	0.14	0.14	0.14	0.28	0.84	0.71	0.14	0.84	0.14	..
(d) Percent of the total (6) with four parasites.	15.83	15.83	15.83	33.33	100.00	83.33	15.83	100.00	15.83	..
V. GRAND TOTAL (720 cases).	22	3	58	69	344	322	8	317	3	1
(a) Percent of the total (1235) examined.	1.78	0.24	4.69	5.58	27.85	26.07	0.65	25.67	0.24	0.08
(b) Percent of the total (720) positive.	3.06	0.42	8.06	9.58	47.78	44.72	1.11	44.03	0.42	0.14
(c) Percent of the total with protozoas (136)/with helminths (634).	16.17	2.21	12.65	50.74	54.26	50.79	1.26	50.00	2.21	0.74

TABLE II SHOWING CORRESPONDING RATIOS OF THE VARIOUS INTESTINAL PARASITES IN THE LAHORE MENTAL HOSPITAL (FEMALE PATIENTS)

INTSTINAL PARASITES	PROTOZOAN				HELMINTHS					
	GI	EH	EC	IB	TT	AD	EV	AL	HN	TS
Total	22	3	58	69	344	322	8	317	2	1
<i>E. intestinalis</i>	1	0.14	2.64	3.14	15.64	14.64	3.64	14.41	9.09	4.54
<i>E. hartmanni</i>	7.33	1	19.33	23.00	114.66	107.33	2.66	105.66	0.66	0.33
<i>E. coli</i>	0.38	0.05	1	1.19	5.93	5.55	0.14	5.46	0.03	0.02
<i>I. butschlii</i>	0.32	0.04	0.74	1	4.98	4.66	0.12	4.59	0.03	0.01
<i>T. trichiurus</i>	0.06	0.01	0.17	0.21	1	0.94	0.02	0.92	0.01	0.01
<i>A. duodenale</i>	0.07	0.01	0.18	0.21	1.07	1	0.03	0.98	0.01	0.01
<i>E. vermicularis</i>	2.75	0.37	7.25	8.63	43.00	40.25	1	39.63	0.25	0.12
<i>A. lumbricoides</i>	0.07	0.01	0.18	0.22	1.08	1.02	0.03	1	0.01	0.01
<i>H. nana</i>	11	1.50	29.50	34.50	172.00	161.00	400	158.50	1	0.50
<i>T. Saginata</i>	22.00	3.00	58.00	69.00	344.00	322.00	8.00	317.00	2.00	1

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TABLE III SHOWING THE NUMBER OF TIMES A PARASITE WAS FOUND EITHER ALONE OR SUPERIMPOSED BY OTHER PARASITES IN THIS 612 111

INTESTINAL PARASITE INVOLVED	PROTOZOAS				HELMINTHS					
	GI	EH	EC	IB	TT	AD	EV	AL	HN	TS
i. <i>G. intestinalis</i>	..	13	..	1	2	4	5	..	1	..
2. <i>E. hartmanni</i>	..	..	1	..	1	2	..	1	1	..
3. <i>E. coli</i>	..	1	..	28	13	9	8	..	11	..
4. <i>I. butschlii</i>	..	2	1	13	33	10	10	..	8	..
5. <i>T. trichiurus</i>	..	4	2	9	10	97	134	3	163	2
6. <i>A. duodenale</i>	..	5	..	8	10	134	127	..	38	..
7. <i>E. vermicularis</i>	..	..	1	..	..	3	..	3	1	..
8. <i>A. lumbricoides</i>	..	1	1	11	8	163	38	1	94	..
9. <i>H. nana</i>	..	..	..	..	..	2	..	..	..	1
10. <i>T. Saginata</i>	..	..	..	..	..	..	..	..	..	1
(i) Pure Infections	..	13	1	28	33	97	127	3	94	1
(ii) Double infections	..	6	..	19	25	153	109	2	131	1
(iii) Triple infections	..	2	1	10	9	88	81	2	86	..
(iv) Quadruple infection	..	1	1	1	2	6	5	1	6	1
(v) Total infections	..	22	3	58	69	344	322	3	217	3

III RESUME

It is not one solitary factor but combination of factors, which determine the frequencies of various intestinal parasites in a community or different population groups. We always presume that the incidence of intestinal parasites commensurates with the degree of personal as well as with community sanitation. In warm countries and developing parts of the world, low level of sanitation and low threshold of resistance to the invading parasites are always held jointly responsible for most of the amoebiasis, giardiasis, hook worm disease, ascariasis, enterobiasis and trichuriasis.

In the Mental Hospital Lahore, the sanitation maintained is probably of high level. However, personal hygiene may be said to represent something below primitive level. Mental hospital population cannot be educated to use a sanitary latrine.

continue defecating in and around their wards. Their indiscriminate habits suit transmission of embryonated eggs from the meadows to the mouth. The door yards, the court yards and the grassy plots are all profusely seeded with intestinal parasites contained in the faeces of the mental patients and therefore, they are exposed to infections and reinfections. Although there is safe water supply yet nothing can be done to stop contamination in between the tap and the tumbler. The sources and victims of infection are sharing same conveniences. Here, it is not the absence of sanitary conditions but abuse of facilities which are playing important role in transmission and maintenance of intestinal parasites.

Out of 1235 female patient examined, 59.3 per cent were found harbouring intestinal parasites. 146 cases were passing protozoal cysts as against 634, who were passing the eggs of the helminths. In 86 only protozoan cysts were incriminated as against 584 who had helminthic ova. Both, the cysts and the ova were, however, found in 50 cases.

Out of 720 positive cases, 398 had only one parasite. 75 were harbouring one or other protozoa while 323 had a helminthic infection.

223 female patients had two parasite infections and were passing either cysts or ova or both. The helminthic infections predominated. Only 10 patients were passing cysts of two different protozoas as against 183 who were passing ova of two species of helminths. 30 cases, however, were found passing a cyst and a helminth.

Three parasite infections were detected in 93 cases. In this group also, the helminthic infections were most conspicuous. 76 patients had three helminth infection as against one case who had three protozoas. Two helminths and a protozoa were found in 13 cases as against 3 cases who had a helminth and two protozoas.

Quadruple infection were detected in 6 cases. All had helminth as against 4 who had a protozoan parasite also. In 3 cases one protozoa super-imposed these helminths as against one case in which two protozoas co-existed alongwith two helminthic parasites.

From the above data, it may be concluded that helminthic parasites predominate over protozoan parasites in a group which is unmindful of personal hygiene. On the basis of this data, it may also be said that the whipworms, hookworms and round worms have more chances of transmission in a mental case.

Agricultural, vegetable and fodder crops, which are grown on the periphery of a city, usually become a source of infection if and when human excreta is used as manure. Such fields also encourage promiscuous defaecation and helminthic parasites viz., *T. trichiurus*, *A. duodenale* and *A. lumbricoides* usually become common intestinal infections of the community. Probably, similar conditions are prevalent in the mental hospital.

Highest number of positive cases were found harbouring *T. trichiurus* (344 cases)

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and it was followed by *A. duodenale* (322 cases) and *A. lumbricoides* (317 cases). If we take out the pure infection cases (*T. trichiurus* 97, *A. duodenale* 127, and *A. lumbricoides* 94), we find that in most cases the three parasites try to remain closely associated. *T. trichiurus* and *A. duodenale* were found together in 140 cases while it occurred with *A. lumbricoides* in 174 cases as against 97 cases when it occurred alone. The hookworm infection was super-imposed in 120 cases by *A. lumbricoides*. In 81 of the above cases, the three were found together. For every two infections of *T. trichiurus* there were 1.88 and 1.84 infections of *A. duodenale* and *A. lumbricoides* respectively.

From the common occurrence of the three helminths in this series, it may be concluded that promiscuous defaecation, frequently seed the grassy plots with the eggs. The warm and moist environments help embryonation and extrinsic development of the intestinal parasites. The primitive habits of the mental cases play an important role in the transmission of infective stages to the host. Low level of personal hygiene, moving about bare-footed on the grassy plots, shifting of soil are, all parts of the vicious circle.

Helminthic infection of the intestinal tract is decidedly a major health problem of the mental hospital. Although the prognosis is possible yet reasonable line of management in a group which has gone beyond the frontiers of world of normality is so far most difficult but not impracticable. Helminthiasis is decidedly a terror of primitiveness. If a mental case can be given back the personality, much can be achieved. The presence of some of these parasites must be adding fuel to the fire. An emotional tension when super-imposed with another anxiety may certainly aggravate symptoms.

The incidence of other intestinal parasites does not offer any special features. *I. butschlii* was found comparatively frequently as against other protozoan parasites. The commensal amoeba (*E. coli*) was found in 58 cases as against 69 of *I. butschlii*. The duodenal flagellate (*G. intestinalis*) probably was not able to compete with the three helminthic parasites discussed above. It was found in 22 cases only. The infections of *E. hartmanni* and *H. nana* were more or less sporadic infections in this series. A solitary case of beef-tape-worm, however, does not prove that it has any good environments to establish in a mental hospital where only well cooked beef is served.

IV—ACKNOWLEDGEMENTS

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COMPARATIVE STUDY OF DIRECT MICROSCOPY AND X-RAY IN CASE FINDING.*

By

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1. Introduction—Case finding by bacteriological examination of sputum of symptomatic cases is now being advocated as minimal control programme for the developing countries. It is suggested that since X-ray machines are very expensive and cannot be available within the easy reach of the general public throughout the country, more and more use of microscope should be made, it is cheap, effective and easy to handle.

From epidemiological point of view a case of pulmonary tuberculosis is defined as a person suffering from bacteriologically confirmed disease. All others are considered suspects till such time they are bacteriologically proved. The confirmed cases only required treatment to break the chain of infection and make them non-infectious.

The Tuberculosis Experts Committee of World Health Organisation is of the opinion that the prevalence of pulmonary tuberculosis proved bacteriologically by microscopy of single sputum is best available index of the size of infectious pool in the community.

In order to find out how efficient is microscopy in detecting the cases of pulmonary tuberculosis as defined above, a small survey was conducted during the course of mass case finding programme which was in progress in thickly populated urban area of Rawalpindi City.

2. Method and Material—The routine of the mass case finding programme is first to prepare the detail map of the area under survey. Then the census party carries out house to house census of each household, recording name, age, sex, educational level, occupation, etc., and gives appointment card showing the date and place where the household members are asked to come for Mantoux Test and X-ray examination. After the examination, the X-ray films are read by two independent readers. The radiological definition of case is where both the readers have independently declare the X-ray to have shadow suggesting tuberculosis while for suspects at least one of them has declared. All persons with definite or suspect shadows are asked to give sputum. The sputum specimen is collected and examined by direct microscopy and culture method.

* (Read at Annual TB Conference of Layallpur, held in 1966).

During the routine procedure the census clerks were instructed that during the census they should also record the history of cough with duration in months. Cough of less than one month's duration was not recorded.

All the persons who had cough were as routine examined by X-Ray but sputum specimen of all the persons with cough whether they showed any shadow on X-Ray or not were examined by both direct microscopy and culture.

The total population covered was 6739. Out of which 135 cases with chronic cough were registered by the census clerk. The sputum was collected from 85 persons and 2 were found to be positive by direct microscopy and five by culture method.

The X-Ray of 104 persons were taken in this group and 34 were detected with lung pathology, 21 were definite and 13 suspected cases.

3. *Results—Prevalence rate of Chronic Cough*—Among the total population covered 135 persons of all age groups or nearly 2 per cent were found to be suffering from cough of more than one month duration. The age and sex specific distribution of persons with chronic cough and its prevalence rates are given in Table I.

TABLE I

Showing the age and sex Specific Distribution of the whole Population and persons with chronic cough and its prevalence rate

SEX		0—9	10—19	20—29	30—39	40—49	50—59	60—	Total
Total population	Male ..	1008	894	553	440	350	168	170	3,583
	Female ..	920	826	502	419	234	113	142	3,156
	Total ..	1,928	1,720	1,005	859	584	281	312	6739
No. with chronic cough.	Male ..	15	12	9	7	13	7	8	71
	Female ..	6	9	12	12	14	5	6	64
	Total ..	21	21	21	19	27	12	14	135
Prevalence of chronic cough.	Male ..	1.49	1.34	1.63	1.59	3.71	4.17	4.71	1.98
	Female ..	0.65	1.09	2.39	2.86	5.98	4.42	3.23	2.03
	Total ..	1.09	1.22	2.09	2.21	4.62	4.27	4.49	2.00

There is no significant difference in sex distribution except in the age group of 40—49 years. The female in this group comprised nearly 6 per cent while the male 3.71 per cent. No special reason could be attributed to higher incidence of cough among the female in this age group. Similarly in both sexes the percentage of chronic cough cases gradually increased from nearly 1 per cent in youngest age group to nearly 4.50 per cent in age group above 60 years.

Duration of Cough—The table II shows the break up of chronic cough cases according to the duration of cough in months. 31 cases were excluded from this group as they could not complete the routine examinations.

TABLE II

Showing Persons with chronic cough According to the Duration of cough in months

Population with cough	DURATION OF COUGH IN MONTHS					Total
	1—3	4—6	7—12	13—24	25+	
No. ..	24	15	16	9	40	104
Percentage ..	23.08	14.42	15.38	6.65	38.46	99.99

Of all the persons with chronic cough majority of them, 40 or 38.46 per cent had cough of more than 2 years duration. The second highest group of 23 per cent was among 1—3 months duration.

Sputum Positivity Rate—The sputum was collected from 85 out of 135 persons with chronic cough and only 2 cases were found positive by direct microscopy. All the sputum specimen were also cultured and 5 were positive. The two specimen were positive by both methods or three more cases were confirmed by culture. The sputum specimen of all persons who showed definite or doubtful shadows on X-Ray among the persons without cough were also examined by both direct microscopy and culture. 307 specimens were examined. The Table III shows the comparison of positive results between the two groups by both microscopy and culture:—

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TABLE III

Showing the Bacteriological results in chronic cough and without cough group by Microscopy and culture Method separately

Group	Total No. Examined	MICROSCOPY		CULTURE	
		Number	Percentage	Number	Percentage
Chronic cough	85	2	2.35	5	6
Without cough	307	3	0.98	12	3.91

The infectious rates among the chronic cough group were 2.35 and 6 by microscopy and culture respectively against 0.98 and 3.91 in without cough group. Though the figures are too small for statistical inference yet the difference is quite marked. It is expected that among the chronic cough cases the positivity rate will be higher than the group without cough. All the five cases detected bacteriologically had cough of more than two years duration.

Pulmonary Pathology Prevalence Rate—104 persons with chronic cough from the group of 135 were X-Rayed by mass case finding unit on 70 m.m. rolf film. The children of 0.4 years who were inelligible were excluded. Similarly 4 480 persons without cough were X-Rayed. The number of cases with definite and suspected lung pathology as seen on x-ray films is given in Table IV.

TABLE IV

Showing the Prevalence rate of Definite and Suspected cases of Pulmonary Pathology in chronic cough and without cough Group

	DEFINITE		SUSPECTED		TOTAL	
	Number	Percentage	Number	Percentage	Number	Percentage
With cough 104 ..	21	20.19	13	12.50	34	32.69
Without cough 4480	136	3.04	233	5.20	369	8.24

The overall prevalence rate among coughing population is 32.69 or 4 times more than, in the non-coughing population, (8.24 per cent). The difference in these two rates is highly significant, (5.2 times the standard error).

The prevalence rate of definite cases among the chronic cough group is 20.19 per cent and when compared with 3.04 per cent of group without cough is 6.6 times more.

When comparing the prevalence of definite and suspected cases in the two group separately quite naturally the rate of definite cases is higher than suspected cases in chronic cough group while in without cough group it is reverse. In other words in symptomatic group more definite cases are detected while in healthy groups more suspected cases are detected by radiology. All the bacteriologically confirmed cases had definite pulmonary pathology in both the groups.

Pulmonary Pathology and Duration of Chronic Cough—104 persons with chronic cough who were x-rayed were further analysed according to the duration of cough. The Table V shows the break up of pulmonary pathology cases both definite and suspects according to the duration of cough.

TABLE—V

Showing Prevalence rate of Pulmonary Pathology According to the Duration of Chronic cough

	HISTORY OF COUGH IN DURATION					Total
	1—6	7—12	1—12	13—24	25+	
Population with cough X-Rayed.	39	16	55	9	40	104
Pulmonary pathology detected No.	6	2	8	4	22	34
Percentage ..	15.38	12.50	14.54	44.44	55.00	32.69

There were 34 cases with definite or suspected lung pathology among 104 persons. The prevalence rate increased as the duration of cough increased from 14.54 in 1—12 months duration to 44.44 per cent in cough with 13—24 months and 55.00 per cent among cough of over 2 years duration. In other words, we expect one case out of every seven persons with cough of 1—12 months, three cases out of every seven with cough of 12—24 months and 4 cases out of every seven with cough of two years or more duration.

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Prevalence of infectious rate among pulmonary Pathology Cases—24 cases with definite or suspected lung pathology were detected in chronic cough group and out of them sputum specimen of 28 were examined by both direct microscopy and culture. Similarly among the population without cough the sputum specimen of 307 persons with definite or suspected lung pathology were examined by both methods. The Table VI gives the comparison of results in both groups:—

TABLE VI

Showing the infectious rate among the pulmonary pathology cases in chronic cough and without cough groups

X-Ray positive	SPUTUM RESULT					
	Positive		Negative		Total	
	No.	Per-centage	No.	Per-centage	No.	Per-centage
Chronic cough ..	5	17.86	23	82.14	28	100.00
Without cough ..	12	3.91	294	96.09	307	100.00

The prevalence rate of infectious cases detected by any method of examination in X-Ray positive case with cough is 17.86 against 3.91 in cases without cough. In other words number of persons with chronic cough having definite or suspected lung pathology are likely to be 4.5 times more infectious than number of persons with lung pathology are without cough.

Among the chronic cough group the figures of 5 positives out of 28 specimen tested is too small for making statistical inference but the difference of 13.63 in the rate is close to significance being 1.86 times the standard error. (For significant difference it should be 1.96 times the standard error at 5 per cent level).

4. *Discussion*—Cough is one of the important symptoms of pulmonary tuberculosis. In majority of cases it is accompanied by expectoration which facilitates detection of bacteriologically confirmed cases. The cases of pulmonary tuberculosis with cough are the usual source of infection to others in the community. Mainly for these reasons, this symptom was selected for this study.

It is natural to expect higher prevalence rate of cases by bacteriology as well as by radiology in chronic cough group. The rate is almost four to five times more than in WITHOUT COUGH group.

Radiologically 33 per cent of cases of pulmonary pathology were diagnosed in chronic cough group. The definite cases formed nearly 20 per cent. This compares favourably with the cases diagnosed in Tuberculosis Centre, where 25 to 30 per cent of symptomatic cases are diagnosed with lung pathology. The infection rate among the pulmonary pathology cases in chronic cough group was 18 per cent which again is very close to the result obtained among the pulmonary pathology cases diagnosed in TB Centre.

The number of bacteriologically confirmed cases and radiological cases with definite and suspected lung pathology missed among the population under survey and specially among the chronic cough cases is summarised in Table VII.

TABLE—VII

	BACTERIOLOGICALLY POSITIVE			X-RAY POSITIVE		
	Misc.	Culture	Total	Definite	Suspected	Total
Chronic cough 135 ..	2	5	5	21	13	34
Without cough 6604 ..	3	12	12	136	233	369
Total ..	5	17	17	157	246	403

(Note—Specimen positive by microscopy were positive by culture also).

In chronic cough group two cases were bacteriological positive by both methods and three exclusively by culture alone. This means by direct microscopy examination 60 per cent cases were missed. In the other group three were positive by both methods and nine by culture method alone or 75 per cent of cases were missed by examining the sputum specimen by direct microscopy alone.

Similarly there were five cases positive by direct microscopy in the whole population and 3 or 60 per cent in without cough group would be missed when sputum specimen of chronic cough persons are examined only.

The total number of cases detected in both groups combinedly or in entire population by bacteriological examination is 17 (5 positives by microscopy are common) and out of this 15 or 98 per cent cases are missed if sputum specimen of chronic

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Economic loss due to malaria It is evident from the table that prevalent in all the divisions of West Pakistan. It is agriculturally and economically important divisions of West Pakistan are more malarious than other divisions. The epidemics of malaria are expected to occur if in some years there are floods or heavy rains or other favourable climatological factors. It has been observed that transmission of the disease does not occur above an altitude of 4,000 feet. But people living there also suffers from malaria as they come down in valleys where they contract the disease. (Some worker has said that there is transmission of disease at 10,000 feet or even at more height).

On examination of Table I spleen rates (which shows the endemicity of the disease) in different divisions shows that status of Malaria has gradually changed during past years and is now meso-endemic. The parasite rate has ranged from 2.4% in Bahawalpur to 17.2% in Lahore Divisions in the pre-eradication surveys of 1960. This was the most extensive survey ever undertaken in West Pakistan for Malaria and the purpose was only to delimit the area for inclusion in the Malaria Eradication Programme. The low parasite rate may not be considered as the exact incidence of the disease in that year.

TABLE II
Percentage of Persons Examined for parasite and spleen surveys 1960 by Divisions of West Pakistan

Divisions	Districts covered	Tehsils covered	Villages covered	Percentage examined 1960
Lahore ..	2 (2)	8 (4)	1013 (121)	0.6 (.1)
Sargodha ..	2 (2)	7 (7)	88 (102)	.05 (.09)
Rawalpindi ..	2 (2)	7 (7)	38 (45)	.03 (.06)
Multan ..	3 (3)	11 (11)	87 (107)	.06 (.07)
Bahawalpur ..	3 (3)	11 (11)	80 (91)	.01 (.01)
Hyderabad ..	5 (5)	20 (20)	61 (62)	.08 (.01)
Khairpur ..	5 (4)	20 (16)	53 (49)	.07 (.07)
Quetta ..	3 (3)	11 (11)	23 (31)	.01 (.02)
Kalat ..	1 (1)	3 (3)	3 (7)	.01 (.04)
Peshawar ..	4 (4)	10 (10)	104 (104)	.08 (.16)
D. I. Khan ..	2 (2)	5 (5)	26 (26)	.09 (.1)
Total ..	32 (31)	113 (105)	1102 (745)	0.13 (0.09)

Note—(The figures without brackets are for parasite rates and in brackets are for spleen rates).

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Table II shows that the number of districts, tehsils and villages covered with percentage of persons examined by divisions during pre-eradication survey of 1960. From the Table II it is evident that the spleen and parasite rate would have been much more than observed if selection of sample would have been purely statistical with some pre-fixed high probability of its being true.

Malaria is a problem of high magnitude in rural areas of West Pakistan where more than 77% of population lives and suffers from it because of vector in West Pakistan.

TABLE III

Rural and urban population of West Pakistan 1960

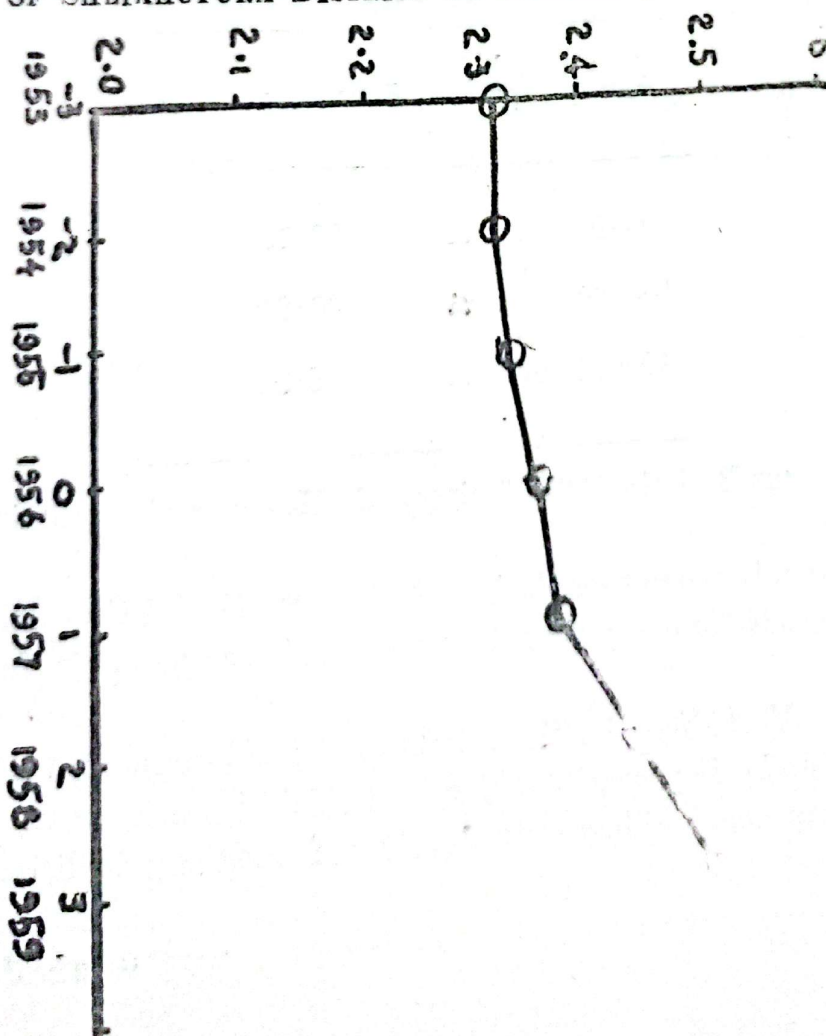
		Urban	Rural
All ages	..	9,654,572	33,225,806
Percentages	..	22.5%	77.5%

(Source:—Census Bulletin 1961, Ministry of Home and Kashmir Affairs, Government of Pakistan).

breeds on clean slowly running water. Such type of breeding places are found in plenty in rural areas and on the out skirts of towns. In West Pakistan the high incidence of Malaria coincides with harvesting and sowing of the main crop in spring and autumn. Average malaria morbidity figures from 1950—1960 of Sheikhpura district have been plotted on the Graph I., which shows that the maximum incidence of the disease is in

GRAPH I

AVERAGE NO. OF CASES REGISTERED IN VARIOUS HOSPITALS AND DISPENSARIES OF SHEIKHUPURA DISTRICT BY MONTHS (1950—1960).



the month of October and it declines rapidly during the month of November and December. Again a small rise is noticed starting in April with maximum in May. This pattern of the incidence in spring and autumn is the model of West Pakistan. The onset may sometimes be two weeks earlier or later than normal depending on the climatological conditions. It will hence be evident that at a time when the rural population should be behind the plough they are down with fever and are unable to attend to their work. This greatly retards the output of the agricultural produce through loss of working hours and consequently affects the economy not only of the individual but of the nation as a whole. Effect of malaria in hindering and retarding the progress of agricultural development in different parts of Pakistan is clear from the fact that the agriculturally important districts are highly malarious as they have become water-logged due to not work of irrigation channels. The official and otherwise duties of persons and childrens are effected by making them to stay away from field factories, offices and schools for a few days. It involves a lot of cost for medical attendance (Hakim's Doctor's, Hospital, Medicines, etc.) If malaria is persistent in an area, there is difficulty or impossibility of utilizing to full extent the land for cultivation of different crops.

From the 1961 Census it is noticed that 32.78% of the population fall in the 0-9 age group.

TABLE IV

PERCENTAGE OF VARIOUS AGE GROUPS IN WEST PAKISTAN 1961

Age groups	Percentage
0—9 ..	32.78
10—59 ..	60.29
60 and over ..	6.93

(Source—Census Bulletin 1961 Ministry of Home and Kashmir Affairs, Government of Pakistan).

This age group is prone to malaria and if once affected they will be incapacitated physically and mentally for many years to come. This age group is future labour force of the country.

2. *Malaria Morbidity*—In West Pakistan on average 2.5 million people who attended hospitals and dispensaries suffer from Malaria each year. This figure is far from actual because many villages are devoid of medical facilities and this do not include—

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TABLE V

Patients Treated for Malaria in Hospitals and Dispensaries of West Pakistan, 1953-59

Year	Actual No of patients (in million)
1953	2.44
1954	2.31
1955	2.14
1956	2.64
1957	2.41
1958	2.44
1959	2.51

(Source—West Pakistan Health Secretariat Statistical Section).

- (i) the persons who receive treatment from private medical practitioners (qualified and unqualified),
- (ii) the persons who don't get any treatment,
- (iii) the malaria fever cases which are registered in hospitals under the heading of non-specified fevers.

GRAPH 2

ACTUAL NUMBER OF PATIENTS TREATED IN VARIOUS HOSPITALS AND DISPENSARIES OF WEST PAKISTAN 1953-1959 WITH TREND OF MALARIA.



A second degree parabola $Y = 1 + 5x + 3x^2$ has been fitted to the observation. The fitted parabola is $Y = 2.33 + 0.03x + 0.006x^2$. The estimated values have been plotted on the graph 2 along with the original observations. This shows that the trend of Malaria is on the increase from year to year and it will continue to increase if the conditions remain the same and favourable for transmission of the disease.

N. Ahmed (1960) has estimated that 8 per 1000 deaths due to direct and indirect causes of malaria occur in West Pakistan. Therefore we have 0.24 million deaths on the average per year in West Pakistan. The case mortality rate comes to 13.76%.

3. *Estimation of loss due to Malaria*—About 2.5 million persons in West Pakistan are registered in hospitals and dispensaries. This is too low figure than the actual incidence. The estimation of under registration has been made on Sheikhupura and Lyallpur districts. The parasite rate for these districts 15.4% and 10% in year 1960 respectively (Pre-Eradication Survey). On this basis the total incidence should have been 133,305 and 225,859 whereas the malaria cases registered for the year 1960 in these districts were 50,991 and 70,768. The under registration has been estimated to be 68% in both districts. This under registration may be taken for entire province though medical facilities etc., are still less in many districts. Assuming this extent of under registration the total number of estimated patients in West Pakistan comes to 4.2 millions. Out of this is 60.29% are working force, giving thereby 2.5 millions working person who actually suffer from malaria in West Pakistan.

The per capita income of West Pakistan is Rs. 250.00. Since the total national income is earned by 25 million persons of working age group. Per capita income calculated on the basis of working age group comes to Rs. 425.00. It will further show that as average income per working man per day will be Rs. 1.30. Hence by considering Rs. 1.30 average earning which may be lost due to illness, we may be able to calculate total loss. The total loss due to 2.5 million malaria cases of working age group is Rs. 3.25 million. Since 10 days on the average are normally lost due to illness therefore Rs. 32.5 millions are annually wasted. Normally a patient spends Rs. 2.50 per man on the average of 10 days on medicine, doctors etc., etc. This comes to 10.5 millions of rupees. If we consider that an attendant also losses one day per patient in whole of sickness of 10 days 4.2 million person also lose their one day income. This gives to 5.46 millions. In addition to these losses, a patient losses vigor and vitality for efficient working which for the entire year has been calculated approximately at 10 days per year. This amount lost due to the 10 days for 2.5 millions sick working force will be Rs. 32.5 millions. The total amount comes to 80.96 millions rupees per year.

The total amount to be spent on West Pakistan Malaria Eradication Programme for 15 years is Rs. 250 millions which comes to Rs. 16.7 million per year, whereas the economic recurrent loss due to malaria is estimated to be Rs. 80.96 millions per year.

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year. This may increase tremendously during the epidemic years. In the opinion of the author the total monetary loss estimated seems quite humble;

4. *Conclusions*—Through an improvement in malaria situations, agricultural industrial production may logically be expected to increase. Actually there will be general rise of economy of the country as vigorous and healthy nation will be built up.

There will be reduced incidence of other diseases, as malaria decreases the resistance of persons and they become easily victims of other diseases.

There will be increased public understanding and co-operation in welfare and public health programme of the government. At the end of programme, valuable army of disciplined skilled public health workers; well trained to carry out any social health or welfare programmes will be available.

It is clear that the cost of preventable diseases imposes a heavy burden on the nation's economy. It is true that health programmes add to the number of months to be lived but they also add the hands and brains which can produce the necessities of better living. With the eradication of malaria sound healthy population becomes available which can be a real asset to our nation. We may expect that the eradication of the disease from West Pakistan will set about 4.2 million people free from attack and enable them to contribute their share to economic prosperity of the country.

There is sufficient proof to believe that sickness and poverty form a vicious circle. As *Winlew* has remarked "Man and Women were sick because they were poor, they became poorer because they were sick and sicker because they were poorer". *Gebalden* (1953) said, "With no malaria, our countries have enlarged their territories without determine to our neighbours".

In India considerable gains in rehabilitating malarious territories have taken place. *Marshani Rao and Bhombone* (1956) in a Socio-economic Survey in Mysore state (India) found that the area cultivated increased by 15 per cent and there was 30 per cent increase in yield of paddy. This excess yield of rice was worth Rs. 23 millions as against Rs. 27,000 spent against the disease producing 87 folds increase in agricultural value.

1. *Clinical Pharmacology*. By Lawrence, D.R., M.D., F.R.C.P., Third Edition, 1966. (Pp. X+378; 32s 6d.) London: J. & A. Churchill Ltd.

The convergence of its three editions in a short period reflects upon the popularity this interesting book has with the Medical Profession. It has been thoroughly revised and enlarged. Some more general topic, such as pharmacology of smoking, hazards of newer drugs have been added. Lists of useful references have been appended at the end of each chapter. This book provides pharmacological knowledge that is interesting and useful to the clinical student, physician and the general practitioner. It is an excellent text book, most strongly recommended to those who prescribe drugs. It would help in the correct, ethical and efficient use of drugs in view of the concomitant dangers of drugs such as foetal deformities.

2. *Bedside Diagnosis*. By Steward, C., M.D., F.R.C.P. (E.) 7th Edition, 1965. (Pp. XX+568; 35s.) Edinburgh and London: E. & S. Livingstone Ltd.

The Author has revised and rewritten this edition. It gives an excellent concise, readable but enormous amount of medical knowledge. It approaches the diagnosis by an analysis of the causes of symptoms and signs observed in a particular case. Subjects of electrophoresis and medical use of Radio-isotopes have been dealt with briefly. Useful normal values have been given in the last chapter. It would be of great help to the medical student and general practitioner.

3. *A Synopsis of Fever and their Treatment*. By Lawson, J. H., M.D., D.P.H., 11th Edition, 1965. (Pp. viii+224; 15s.) London: Lloyd-Luke (Medical Books) Ltd.

This edition has been revised and brought up-to-date. It gives a reasonable concise information on modern practice in infectious fevers. Sections on use of newer penicillins vaccination against poliomyelitis, measles and antiviral chemotherapeutic agents are given. It would be a useful companion to the busy practitioner.

4. *A Laboratory Guide to Clinical Diagnosis*. By Eastham, R. D., B.A., M.D., D.C.P., Dip. Path., M. C. Path. and Pollard, B. R., M.A., M.B., B. Chir, M. C. Path., 1964. (Pp. viii+250; 18s. 6d.) Bristol: John Wright & Sons, Ltd.

This book beautifully describes the value of laboratory investigations used in diagnosis and assessment of the progress during treatment of various diseases. It will be of much help to medical specialists, general practitioners and pathologists.

5. *Prices Text-Book of Medicine*. Edited by Sir Ronald Bodley Scott, K.C.V.O., M.A., D.M., F.R.C.P., London: Oxford University Press, 10th Edition, 1966. (Pp. xiv+1259, 90s.)

Sir Ronald Bodley Scott with the help of 23 other contributors, each one a master of his own field, has thoroughly revised and brought up-to-date well-known Price's Medicine. It has now appeared in a new format. The two column lay-out has made the

presentation more attractive. This monumental work presents a comprehensive account of medicine practised according to the British School. It is a must for the Clinical Teacher, Physician and medical student as a reference book. The book is divided into eighteen sections. The first section gives informative descriptions of different anti-microbial agents. Lists of important references have been appended at the end of each section. This work is highly commendable and would be of immense value to those who practice medicine.

6. *Medical Microbiology*. By Jawetz, E., Ph.D., M.D., Melnick, J. L., Ph.D., and Alderberg, E. A., Ph.D. Maruzen Asian Edition 1964. Tokyo: Large Medical Publications. Maruzen Company Limited. (Pp. 453, Rs. 15.00).

This book presents a concise, up-to-date account of medical microbiology. It gives an excellent material covering major developments in microbial genetics, metabolism antimicrobial chemotherapy and virology. It is well illustrated. Strongly recommended to the medical student, House Officer and practising physician.

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