Indian Journal

OF

PUBLIC HEALTH

Quarterly Journal of the Indian Public Health Association

JULY 1960

VOLUME IV NUMBER 3

EDITOR :

DR. B. C. DASGUPTA, B.SC., M.B., M.R.C.P., D.P.H., D.T.M., & H.

ANNUAL SUBSCRIPTION Rs. 8/- (INLAND) SINGLE COPY Rs. 2/8 (INLAND)

INDIAN JOURNAL OF PUBLIC HEALTH

Official Quarterly Journal of the Indian Public Health Association

VOLUME IV JULY 1960 NUMBER 3

CONTENTS

PAGE

LEADING ARTICLES:

1. Small-pox Eradication Pilot Project in Andhra Pradesh—C. R. Naidu ... 127
2. A comparative study of medical and health care in a rural area (Nasibpur Union) in West Bengal—A. K. Roy *et al* 134
3. Filaria Survey in Basti (U.P.)—A. P. Sinha 146
4. Prevalence of some tooth and gum diseases among the school children in Chetla area—P. M. Roy *et al* 152

EDITORIAL:

Control of Leprosy 178

NOTES & NEWS 181

ABSTRACTS 184

BOOK REVIEW 186

ASSOCIATION NEWS 186

INDIAN JOURNAL OF PUBLIC HEALTH

Official Quarterly Publication of the Indian Public Health Association

VOLUME IV JULY 1960 NUMBER 3

SMALL-POX ERADICATION PILOT PROJECT IN ANDHRA PRADESH

By

DR. C. R. NAIDU, M.B.B.S. (BOM.), M.R.C.S. (ENG.), L.R.C.P. (LOND.), D.P.H. (LOND.),

Director of Public Health Andhra Pradesh, Hyderabad (Dn.)

INTRODUCTION

By way of implementing the recommendations of the Expert Committee on the control of Small-pox and Cholera, 12 Pilot Projects, in various Districts of Andhra Pradesh, were taken up and implemented in the year 1959 from April to November.

OBJECTS OF THE PILOT PROJECTS

The main objects of the Pilot Projects were

(i) to assess the man-power requirements for a State-wise Small-pox Eradication Programme that is going to be implemented in the very near future.

(ii) to study various practical difficulties that would arise in the implementation of such an eradication programme.

(iii) to work out a basis for Lymph requirements for the entire programme.

(iv) to assess the financial implications of such a state-wide programme.

PLANNING THE PILOT PROJECTS

The first Pilot Project was planned with meticulous care in a compact block forming part of Vijayawada Municipality and containing about 60,000 population. There was full co-operation of its Chairman, the Commissioner and the elected body with the local health personnel. Subsequently eleven more Pilot Projects each covering a population of more or less 60,000 were planned in other areas Viz., Panchayats, Community Development, Non-Community Development Blocks with the best possible care and insight. As soon as the first phase in Vijayawada Municipality was nearing completion, the Chairman and Member in Vijayawada Municipality, agreed to extend the vaccination programme to the rest of the population in the entire town. Thus the Second block (B) of Vijayawada, comprising a population of about 2,00,000 was also taken into the Pilot Project area.

The whole planning, execution and assessment of results etc., was done in close consultation with the Regional Assistant Director of Public Health concerned, District Health Officer, Municipal Health Officer or Commissioner and Collector of the District where each particular project was selected. Co-operation of Non-officials like Chairmen of the Municipalities, Panchayat Presidents, District Boards and members of the State Legislature etc., was solicited and they had co-operated with the work even from the planning stage.

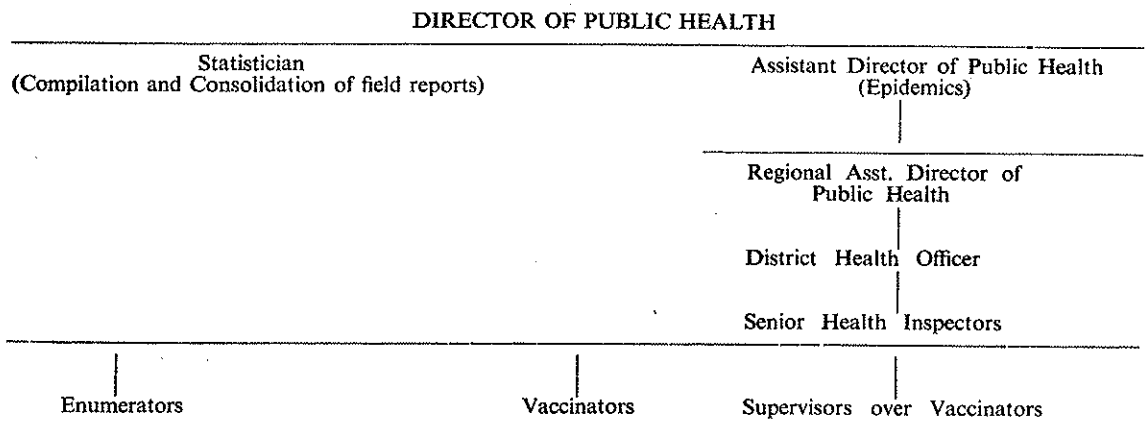
SELECTION OF PROJECT AREAS

In selecting areas for conducting the Pilot Projects careful consideration was given to the various strata of social, economic and geographical features in different parts of the State such that the areas selected reflect a fairly representative cross-section and reveal these factors in different levels and degrees and in varying permutations and combinations. Thus the project areas range from the most backward area like Parvitipuram in Srikakulam District closely adjacent to the Agency (Tribal) tract at the extreme North-Eastern portion of Andhra Pradesh and close to the State of Orissa, to the most highly urbanised communities like Vijayawada, Masulipatnam and Visakhapatnam Municipalities in the State. The following table shows the 12 Pilot areas selected and their classifications according to the nature of the terrain, people and degree of development of the area.

Name of the area	Rural or Urban	Description (Municipality /Panchayat C.D. Block/Non-Block)
ANDHRA		
1. Vijayawada (Krishna District) Blocks—A & B	Urban	Municipality
2. Ponnur and Nidubrolu Panchayat and rural areas (Guntur District)	Rural	Non C.D. Block
3. Masulipatnam (Krishna District)	Urban	Municipality
4. Visakhapatnam (Visakhapatnam District)	Urban	Municipality
5. Parvathipuram (Srikakulam District)	Semi-Urban	Panchayat
6. Armoor (Nizamabad District)	Urban	Municipality
7. Nakrekap (Nalgonda District)	Rural	C. D. Block
TELENGANA		
1. Medichal (Hyderabad District)	Rural	C. D. Block and Panchayat
2. Wyra (Khammam District)	Rural	C. D. Block
3. Kalwakurty (Mahabubnagar District)	Rural	C. D. Block
4. Ramayampet (Medak District)	Rural	Non C. D. Block
5. Karimnagar (Karimnagar District)	Urban	Municipality

ORGANISATIONAL DETAILS OF THE PROJECTS AND THEIR IMPLEMENTATION

The details and distribution of staff engaged in the Pilot Project were as follows:



Each member of the staff engaged in the Pilot Project was assigned definite duties and strict supervision at all levels was enforced. There was strict supervision of their Project by the Director of Public Health; the Statistician attached to Directorate was in-charge of compilation of Field Reports etc.

The Regional Assistant Directors of Public Health were responsible at the regional level, while the District Health Officer and the Senior Health Inspector were the men on the spot, to direct and supervise the work in the Field.

STUDY OF PRACTICAL DIFFICULTIES ARISING AND ASSESSMENT OF REQUIREMENTS

(1) *Man-power requirements*

(a) *Enumerators:* It is found from experience in these Pilot Projects that it would be highly desirable to have in advance a team of enumerators to record a census, that is to say, to enumerate inmates of the houses by noting down their names, age, and sex, in a Pilot Project area by a door-to-door visit and thus cover the whole area of the Pilot Project in a week or ten days' time. It is felt that there should be 3 sets of field workers namely (a) Enumerators (b) Vaccinators and (c) Verifiers or Scrutinisers i.e., those who verify the results of the vaccinations. One can thus ensure a correct and uptodate count of population and an independent verification of vaccination results. In this Pilot Project study, areas such as Vijayawada Municipality Block A in Krishna District which employed the said 3 sets of Field workers gave very encouraging results with a fairly high coverage of population Viz., 82% and having work-load to the tune of 104 vaccinations per day per head, whereas other areas like Medak (a rural area) in which all these three functions were combined in one set of field workers, the results were comparatively lower with coverage of

60% of population and work-load of 80 vaccinations per day per head.

(b) *Vaccinators:* The requirement of Vaccinating personnel for conducting the projects was assessed on the presumption that a work-load of 100 vaccinations per head per day is possible.

(c) *Supervisors:* In almost all the Project study areas temporary staff was supplemented by drafting permanent staff of the Department Viz., Sanitary Inspectors and Health Inspectors for inspection work as Supervisors and for verification work wherever possible. In a large scale mass vaccination programme, adequate supervisory staff at all levels must be provided to ensure effective pyramidal supervision.

2. *Training*

In Vijayawada Municipality and in the bigger Panchayats like Ponnuru and Nidubrolu and in some district boards like Nizamabad, temporary staff was recruited and preliminary intensive training was given in vaccination work to the newly recruited staff.

3. *Financial Implications of the Pilot Project*

No extra expenditure as such was sanctioned by the Government for conducting the Pilot Projects. The various local bodies like District Boards, Municipalities, Panchayats etc., had come forward to implement the Projects in these areas with their own finances. This could be achieved by personal approach of the Departmental Head with the various Non-Officials, Official bodies or organisations.

The per capita vaccination cost as worked out in these Pilot Projects came to, on an average, 0.18 nP. which compares very favourably with those of the other areas in India as well as with some foreign centres, as illustrated below—Per capita cost: (exclusive of the cost of Lymph).

(i) Andhra (India)		0.18 nP.
S. American Centres		
(ii) Peru	(0.12 U.S. cents)	0.57 nP.
(iii) Mexico	(0.15 cents)	0.71 nP.
(iv) Venezuela	(0.14 cents)	0.62.5 nP.

The cost of Lymph which usually works upto about 6 to 12 nP. per dose has been excluded from calculating the per capita cost, as indicated above.

4. *Lymph Supplies*

Before the commencement of the Pilot Project, the Director of Public Health had a discussion with the Director, Institute of Preventive Medicine Hyderabad, and apprised him of the estimate of Lymph requirements for the Pilot Projects. Though the Director, Institute of Preventive Medicine, has tried his level best to cope up, with the result that some projects like Parvatipuram Panchayat, Armoor rural area in Nizamabad District, Kalvakurthi Community Development Block area had to be temporarily interrupted till regular supplies flowed in and only after this the Pilot Project campaign could be completed. Thus it is absolutely essential to augment the production of Lymph before a main programme is launched and to take care that there is no interruption of supplies during the course of the campaign.

5. *Storage and Distribution of Lymph*

All the District Health Officers and the Major Municipalities were supplied with refrigerators to store lymph before distribution. In some projects special messengers were engaged to bring the lymph from Hyderabad so as to avoid delay in transport and also for distribution to the vaccinators in the field to maintain regular and systematic receipt of lymph in the field. It is also felt that supply of thermos flasks (with ice inside them) as is done in the case of Mass B.C.G. Vaccination Campaign will go a long way in preserving the potency of lymph in the field. This is absolutely essential in a tropical country like India, and particularly when mass vaccination programme is embarked on a national scale throughout the year, which necessarily includes summer months. It would not be out of place to mention that in some districts of Andhra the weather throughout the year excepting for two months or three, maintains invariably a summer temperature.

6. *Potency of Lymph Supplies*

The Potency of lymph supplied was quite good and in fact reports received from all the Pilot Project areas indicated that in almost all the study areas wherever verification was done, the reactions after vaccination were of a severe nature. It would be desirable to have periodic tests of lymph carried out regularly to ensure uniform and optimum standards of potency.

7. *Transport*

No special vehicular transport was assigned to the Projects for the actual vaccination

work. Some District Health Officers had used their normal District Epidemic Jeeps for transporting vaccinators and lymph from place to place and this additional cost by way of petrol charges only was taken into consideration while computing the cost per vaccination and not the cost of the vehicle, and the services of the driver.

However, it is felt that if Bicycles are provided to the vaccinators a reasonable amount of time taken in reaching places by walking could be minimised and work-load improved. Considering the communications available in the State, Bicycles are best suited for the actual field workers, excepting in some districts where there is no other alternative but to go over the region on foot after reaching the nearest point by Road Transport Bus.

At times other difficulties were noticed that even cycles could not be transported by Road Transport Buses and thus the vaccinators had to cover the distance by foot from the nearest Road Transport Bus Stop to the Villages. If facilities were provided for the transport of the Bicycles to some far off places by vehicles such as Jeep or trucks the period of travel could be curtailed and the work-load increased.

8. *Timing of the Vaccination Work*

Timing of the vaccination work to suit the local occupation of the people will go a long way in ensuring adequate coverage of the population. In the implementation of the Pilot Project, some difficulty was experienced especially in the major panchayats of Ponnuru, Nidubrolu and the adjacent rural areas in Guntur District where the main vaccination period coincided with rainy season and in some other study areas it coincided with agricultural operations namely Transplantation or harvesting. Yet in other areas, due to heavy rains and muddy and slushy village communications, movements of the vaccinators within such areas had become extremely difficult. Thus, the proper timing of vaccination campaign will determine to a large extent the success of the Small-pox Eradication Programme. If Small-pox Eradication Programme is to be embarked on a National Scale throughout the country in one year these factors will have to be borne in mind. During the agricultural seasons viz., transplantation and harvesting, the work-load gets a severe set-back and absence of certain adult members of the population is inevitable, who have to be tackled separately by organising special mopping-up operations as in the case of Malaria Eradication Programme after keeping a special record of these temporary absentees.

9. *Equipment Used for Vaccination Work*

Since most of the vaccinators in Andhra Pradesh were accustomed to the use of the rotary lancet the same was used in the Pilot Project study.

10. *Verification of the Results of the Vaccination*

The verification work was mostly done by the permanent Health Staff of the area. Verification was usually done after 8 days of the primary vaccination. The total number of primary vaccinations conducted in all these Pilot Projects varied from 10% to 25% of the total vaccinations, the rest being re-vaccinations. Verification results available showed proportion of successful vaccination to be 89% in case of primary vaccinations and 30% in case of re-vaccinations. The manpower requirements and financial implications would have been much more if two visits by the verifiers had been insisted upon, one after the 3rd day for re-vaccinations and after 8th day for primary vaccinations.

11. *Coverage of Total Population and Absenteeism*

The average coverage of population in these Pilot Projects came to nearly 70% of the population. In one Unit viz., Parvatipuram Panchayat which was a compact and small area, 87% of population was covered. In Vijayawada Municipality Block-A, as also in Nakrekal Community Development Block 82% of population could be covered, with the help of intensive Health Education and follow-up.

The main reason for the escape of 30% of the population is (a) sickness, (b) being out of station, (c) away from their houses for days in their fields either for transplantation or harvesting and (d) refusals. Sickness and being out of station accounted for barely 8%. Most of the remaining 22% of the population that escaped was due to the non-availability of the village population for vaccination work in a specified time. It has to be pointed out that during the Pilot Projects studies a time limit of 2 to 3 days, is to be allocated for covering the villages. Although the vaccination programme was carried out invariably very late in the evening and at times

in the early hours of the morning, nearly 15% of the village population could not be contacted during the transplantation and harvesting seasons since they used to be away or absent from their houses continuously for a week or even more at a stretch at their respective fields and at times away from their village, or gone to other villages for job work for a longer period. This is a very important point for consideration during the National Small-pox Eradication Programme to be covered within a period of one year. One must bear in mind the mass seasonal migration of labour population from place to place in search of livelihood during agricultural operations such as transplantation and harvesting.

Thus if sufficient care was taken to see that these temporary absentees from their houses on their respective jobs were also vaccinated by some suitable and appropriate mechanism, the overall coverage of the population might go, to 80% or even more. This temporary absenteeism could be taken care of if more than one visit could be arranged to the same house, though this would involve additional staff and expenditure for the programme. In other words a scheme of mopping-up operation as is done in Malaria Eradication Programme will have to be arranged. This mopping operation will have to be organised soon after transplantation and harvesting seasons, after mainly maintaining special records, in respect of such persons in every village who escaped, vaccinations.

12. *Health Education and Propaganda as the Basis for Successful Vaccination*

As observed in Block (B) of Vijayawada Pilot Project and also some other urban or Semi-Urban Projects the extent of coverage of population in a mass vaccination programme in the case of fairly large tracts is likely to fall below the optimum level, viz., 80% unless special precautions are undertaken. Not only a drive for thorough follow-up for tackling the individuals who escaped the vaccination in the initial round is necessary but intensive Health Education just before the inauguration of mass vaccination in the area is essential in order to raise the level of knowledge among the masses about the usefulness of vaccination. Numerous cases of conscientious objections based upon belief in homeopathy etc., were met with. Such objections even in adults and enlightened sections of the population are strange abnormally, considering the fact that compulsory vaccination has been in force for a number of years in Andhra Pradesh. This is a good example revealing that it is not possible to enforce health measures merely by force of law and that Health Education is absolutely essential.

The Advance Health Education Programme will have to be organised with up-to-date techniques suited to the local customs and conditions so as to counteract the general resistance to the vaccination and to eliminate most of the causes of absenteeism.

13. *Field Forms and Reports*

With a view to bringing uniformity in the implementation of the Pilot Projects and in collecting and compiling the data, all the field forms were standardised from the Directorate and issued to all Projects. The Statistician attached to the Directorate was in-charge of receiving the reports, scrutiny and consolidation of the data from the field.

14. *Non-official Co-operation*

Due to frequent personal visits of the Head of the Department of Public Health to the Project areas, co-operation from such non-officials as Chairman of Municipalities, Panchayat Presidents, District Board Presidents, was encouraging. The excellent co-operation extended by all these non-officials is being appreciated with deep gratitude.

15. *Creation of Non-official Vaccination Committees in Groups of Villages*

With the advent of Panchayat Samithis and Ziila Parishads in the State of Andhra Pradesh, there is now wide scope for the formation of Samithi Vaccination Committees in each block which will be of immense help in securing public co-operation with the Health Department's endeavours in carrying out a National Small-pox Eradication programme. While constituting the vaccination committees one should not rest complacent by enrolling the members of the Panchayat Samithis as members of these committees. Care must be taken to see that only those local leaders who enjoy the confidence of the rural folk and are liked by the local public are enrolled irrespective of their political leanings.

EXPENDITURE INCURRED IN SMALLPOX ERADICATION PILOT PROJECT, ANDHRA PRADESH: 1959

Expenditure	Vijaya-wada (a) (1)	Vijaya-wada (b) (2)	Ponnur and Nidubrolu (3)	Masuli-patnam (4)	Visakha-patnam (5)	Parvathi-puram (6)	Medi-chal (7)	Wyra (8)	Kalwa-kurty (9)	Rama-yampet (10)	Karim-nagar (11)	Armoor (12)	Nakare-kal (13)
1. Cost of petrol, Oil etc	—	—	500.00	70.00	—	—	155.00	—	681.00	190.00	406.00	—	392.00
2. Pay and allowance including T.A. to vaccinating and supervising staff, drivers, cleaners, peons etc	3,716.00	13,204.00	6,260.00	1,341.00	—	930.00	8,405.00	—	6,795.00	6,210.00	4,781.00	1,645.00	10,071.00
3. Contingencies soap, rectified spirit towels etc	200.00	108.00	685.00	660.00	—	200.00	845.00	—	86.00	60.00	512.00	100.00	210.00
4. Stationery	—	990.00	1,000.00	600.00	—	—	—	—	78.00	—	154.00	—	22.00
5. Propaganda Materials	93.00	—	—	—	—	—	—	—	—	—	484.00	—	—
Total: Rs.	4,009.00	14,212.00	8,644.00	2,671.00	—	1,130.00	9,305.00	—	7,640.00	6,460.00	6,357.00	1,745.00	10,695.00
Average cost for one vaccination (excluding cost of vaccine lymph)	0.13	0.13	0.13	0.10	0.10	0.18	0.11	0.15	0.18	0.17	0.15	0.10	0.17

Detailed for columns 5 'and' 8 are not received.

PARTICULARS OF SMALLPOX ERADICATION PILOT PROJECT UNITS ANDHRA PRADESH : 1959

Details		Vijaya-wada (a)	Vijaya-wada (b)	Ponnur and Nidu-brolu	Masuli-patnam	Visakha-patnam	Par-vatih-puram	Medi-chal	Wyra	Kalwa-kurthi	Rama-yanpet	Karim-nagar	Arm-oor	Nakre-kal
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1. Population		56,929	1,60,831	69,676	38,000	60,000	19,279	60,202	57,909	62,464	62,201	64,000	74,782	66,046
2. No. of villages		Gover-norpet	rest of the city	41	Part	2 Wards	6	76	61	57	62	37	1 ton & 63 Vges	42
3. No. of days worked		48	89	62	83	—	39	134	—	90	88	85	152	158
4. Staff on duty		36	30	26	28	22	12	19	20	16	15	11	11	13
5. Total No. of vaccinations done	PV	1,338	1,276	3,392	1,199	—	639	8,525	7,979	14,204	5,895	18,040	11,000	8,165
	RV	45,582	74,420	43,032	18,454	—	18,468	32,124	32,574	29,900	31,848	23,530	44,793	47,754
6. Average No. of vaccinations per head per day		104	150	50	52	—	50	101	—	87	80	80	80	80
6. Successrate	PV	98	85	89	10	—	—	70	90	78	83	66	74.5	98
Percent	RV	53	51	23	23	—	—	22	32	26	31	52	39	24
7. Percentage of population protected		82	54	67	50	—	87	67½	70	70.6	60.7	65	71	82
8. Vaccinated absentees percent ..		—	—	—	—	—	—	17	—	14.5	17.2	—	13	15
Sick		4	9	—	—	—	—	3	—	2.2	2.3	2	1	18
Refusal		5	18	—	—	—	—	2	—	3.4	10.2	19	2	1
Out of station		9	19	—	—	—	—	10	—	9.3	9.6	14	36	2

Blanks in Columns 5, 12 and others—Details are not yet available.

A COMPARATIVE STUDY OF MEDICAL AND HEALTH CARE IN A RURAL AREA (NASIBPUR UNION) IN WEST BENGAL

DR. A. K. ROY, M.B.B.S., D.P.H.,
DR. K. S. VISWANATHAN,
B.A., M.B.B.S., B.S.SC., M.P.H. (Harvard),
DR. S. K. BOSE,
M.B.B.S., D.T.M., D.P.H.,
and
DR. S. K. MONDAL,
M.B.B.S., D.P.H.,
Section of Public Health Administration
All-India Institute of Hygiene and Public Health, Calcutta.

INTRODUCTION

Health indicators are useful in the Measurement of Levels of Health of a community, in guiding public health action and for international comparability. The World Health Organization has recognised, amongst others, as health indicators those factors concerned with health services and activities directed to the improvement of health conditions. The W.H.O. Study Group on Measurement of Levels of Health (W.H.O. Tech. Rep. Ser., 1957, 137) considers that a high priority should be given to the "study of the actual use of health services in relation to the services available in an area".

Accordingly, as a part of administrative research conducted in the rural practice field of the All-India Institute of Hygiene and Public Health, Calcutta, the present study was undertaken in Nasibpur union under the Rural Health Unit & Training Centre, Singur. Integrated health service is provided to the people of Nasibpur union by Government of India through the Union Health Centre in Nasibpur union. Besides this service obtainable free of cost, the area is also conveniently situated so that the people could be served by other agencies like private practitioners, neighbouring health centres of Government of West Bengal, Sub-divisional hospitals of Chandernagar and Serampore. The union therefore has the advantage of receiving health and medical care from quite a number of agencies. In this perspective it was thought desirable to assess the nature and extent of integrated health service provided by Government of India to the local people as well as to make a comparative study of other agencies which have some part to play in the field of medical relief.

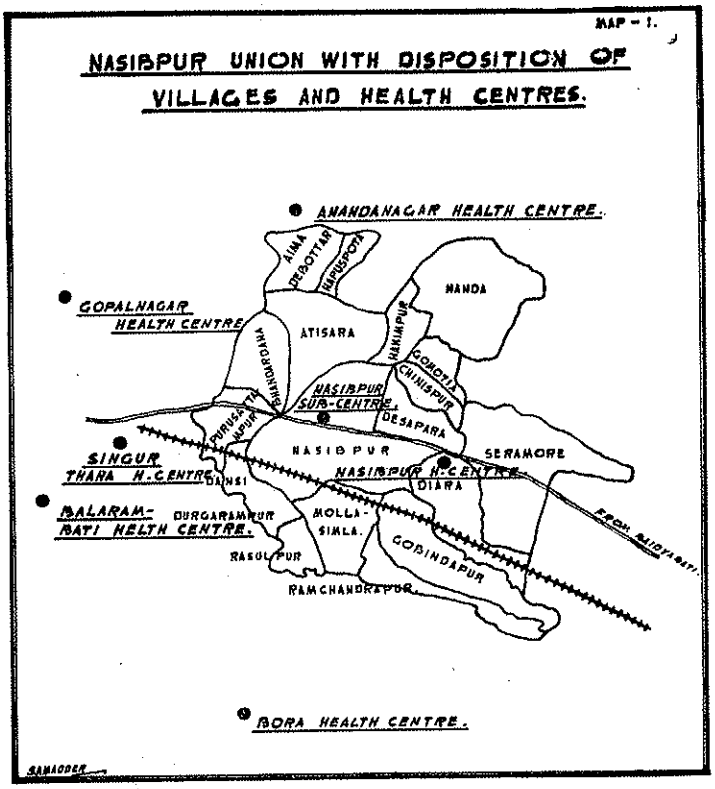
A special feature of this survey is that the entire data were collected by the participants who are medical men trained in public health and no para-medical personnel were involved in the programme. The work was started on 15th October 1959 and continued upto the end of February 1960, with an addition of one month more for statistical computational work and preparation of the report.

HEALTH ACTIVITIES AT SINGUR—ORGANISATIONAL CONSIDERATIONS

Nasibpur union is situated in the Singur thana under Chandernagar sub-division in Hooghly district of West Bengal. There are 5 other unions included in Singur thana and these are Anandanagar, Gopalnagar, Balarambati, Singur and Bora. These six unions together constitute the "area of operation", with a total area of 57 sq. miles and containing a population of one lakh. Thana Health Centre is situated in the Singur union whereas in each of the other 4 unions a Union Health Centre with 10-12 beds is present. In 1953 under the MCH Expansion Project aided by WHO and UNICEF the area of operation consisting of these six unions was selected. It is the outcome of collaboration between Government of India and Government of West Bengal in establishing training, demonstration and research programme in public health in this area. The Health Centres at Singur, Balarambati,

Bora and Gopalnagar are run by Government of West Bengal while those at Nasibpur and Anandanagar by Government of India through Rural Health Unit and Training Centre under All-India Institute of Hygiene and Public Health (Map 1). Besides this, two

and to organise basic and applied researches in public health coupled with the establishment of health service of a high order, the Institute has provided through each of its Sections specialist staff who are locally stationed for the purpose.



new Sub-Centres, one each at Dearah and Paltagarh have been established for improved maternity and child health service and training of the public health workers. These Sub-Centres are also managed by Government of India.

The local administration of Health Centres at Nasibpur and Anandanagar unions is looked after by the Rural Health Unit & Training Centre at Singur. The Officer-in-Charge of Administration of Rural Health Unit & Training Centre, Singur is the administrative head of the Government of India set-up in this area and he is responsible to the Director of the All-India Institute of Hygiene and Public Health through the Professor of Public Health Administration of the Institute.

The Rural Health Unit & Training Centre is being utilised by the Institute as a Practice Field for its various categories of students in Public Health. To meet this particular need

At Singur, by the side of the Government of India establishment, the Government of West Bengal have set-up the Thana Health Centre with 50 beds in charge of a Medical Officer of Health. The West Bengal Government set-up includes Dr. H. C. Mookherjee Health School for training auxiliary health workers and is situated by the side of the Government of India establishment. The staffing pattern of the Singur Thana Health Centre is as follows:

M.O.	...	...	2
Nurse	...	...	10
Compounder	...	...	1
Health Assistant	...	...	2
Public Health Nurse		...	1
Trained Dai	...	...	1

The District Board, Hooghly, used to maintain a 4 bedded maternity home attached to the Rural Health Unit & Training Centre where normal deliveries were conducted. But

with the opening of Health Centres at different unions this arrangement at present is discontinued, and instead a Paediatric Ward with 6 beds is run by Government of India for investigations and treatment of nutritional deficiency cases mainly.

NASIBPUR UNION—A GENERAL OUTLINE

On the north Nasibpur union is bounded by Anandanagar union, on the south by Bora union, on the west by Singur union and on the east it confronts Bhadreswar and Serampore thana areas. The Baidyabati-Tarakeswar road runs from east to west virtually bisecting the union into north and south. This road maintains a very important link between the rural and urban life and because of the transport of the local produce for marketing outside, heavy vehicular traffic on it is on the increase. A regular bus service between Sheoraphuli and Tarakeswar plies on this road. The Tarakeswar branch of the suburban railway between Howrah and Tarakeswar runs through this union at its south-western part. There are two railway stations in the union at Dearah and Nasibpur villages. Electrification of this branch line has made it quite convenient for people to travel by rail for various purposes. Another significant feature is that the river Saraswati traverses the entire union from south to north with definite inclinations to the western part of the union. At its both ends it terminates in the river Hooghly and is also connected with river Damodar through some feeder canals. The Baidyabati-Tarakeswar road intersects and divides it into northern and southern parts. Although originally it was a big river being the main channel of communication between villages, presently it is just a narrow rivulet which dries up totally at certain places during some months of the year. But in rainy season parts of it still act as important means of communication by boat since at this time most of the village roads turn to be unfit for all types of traffic.

Nasibpur union consists of the following 19 villages:

1. Purusattampur
2. Nasibpur
3. Mollasimla
4. Dhansi
5. Durgarampur
6. Rasulpur
7. Gobindapur
8. Ramchandrapur
9. Dearah
10. Seramore
11. Desapara
12. Bhandardah
13. Chinispur
14. Gomotia
15. Hakimpur
16. Nanda
17. Atisewra
18. Hapuspota
19. Aima-debottar

Some villages like Nasibpur, Mollasimla, Atisewra are very big while others like Dhansi, Chinispur, etc. are rather small having only a few families in them. Some of the peripheral villages are bordering the three unions, e.g. Bora, Singur and Anandanagar and therefore are quite a distance from the central part of the union. This point is of particular importance and will be taken into consideration more elaborately later on.

In regard to the set-up and mode of living the villages are mostly alike meaning thereby that there are less of diversities amongst villages than are usually thought of. Almost everywhere the village appearance is rather typical e.g. green vegetation, ponds or dobas and thatched houses interspersed. Almost all the roads of villages are kutcha, a few of them are cart tracks while the rest are foot tracks which are very narrow zig-zag pathways leading from one house to the other. The district board and union boards are responsible for the maintenance of the main roads leading to the villages. But nearly all the roads are in a very bad condition throughout the year and nominal repair works done now and then seem to be thoroughly inadequate.

HEALTH CENTRE—NASIBPUR

Nasibpur Health Centre has got 12 beds of which 6 are for the male ward and the other 6 constitute the female ward. The staffing pattern of the Health Centre and the Sub-Centre is as follows:

Nasibpur Health Centre

Medical Officer (Male)	...	1
Health Visitor (Lady)	...	1
Nurse	...	3
Midwife	...	1
Trained Dai	...	1
Health Inspector	...	1
Compounder	...	1

Nasibpur Sub-Centre

Lady Medical Officer	...	1
Lady Health Visitor	...	2
Public Health Nurse	...	1
Midwife	...	2

Other sources

Besides the service provided by Government of India through its elaborate staff and equipment, the union is also conveniently situated near some other Health Centres wherefrom local people can obtain medical relief. The people also avail of the medical facilities from sub-divisional hospital as well as from local practitioners. The sub-divisional hospital of Chandernagar has 115 beds while that of Serampore contains 76. Instances are not rare when for specialised treatment people do come to Calcutta and attend the city hospitals. It appears therefore that quite a good number of agencies are available in this union in so far as medical aid is concerned.

Methodology of survey

The records of hospital admissions in Thana Health Centre, Singur and Nasibpur Health Centre for the period from 15th October 1958 to 14th October 1959 i.e. just one year, were analysed. This period tallied with the subsequent interviewing in villages for obtaining information on past illness. In analysing the Hospital Registers, only those people who attended these Centres from Nasibpur union during the above one year period were taken into consideration and the data were tabulated village-wise for all these nineteen villages. With this preliminary information it was possible to build up a hypothesis which could be tested in the subsequent investigations.

List of diseases and disorders

For recording the morbidity and mortality figures. strict uniformity in nomenclature and classification is demanded to eliminate errors as far as practicable. A list of diseases or disorders under suitable classifications and groupings following closely the International classification of Diseases and Disorders (W.H.O. 1955) was prepared. Certain modification with additions and alterations was made in the list basing on the experience through pretesting and subsequent interviewing in the villages. This list was, for practical purposes, limited to the broad headings leaving out the individual sub-headings under classification. Past illness was elicited through questions about the symptoms and in case of present illness, wherever possible, through actual examination without taking recourse to laboratory investigation.

Another aspect of the statistical recording of events in a community is the need for some provision for counting admissions in hospitals or otherwise of individuals who are not sick. The largest single example of such cases is births. For this reason this list includes classification for pregnancy, complications of pregnancy, abortion, still birth, delivery, complications of delivery, puerperium, etc.

For each disease a code number is given which is used by the interviewer in the field and subsequently by the statisticians in the processing of collected data.

Schedule

The schedule used for recording information is as follows: On the left side of the schedule recordings are made as to total members in a family, name of the head of the family and his occupation and educational status. In the middle part of the schedule diseases or disorders for each individual person of a family along with age and sex are recorded. These items of information are both for the past illness and present ailments. Here past illness indicates the one year period between 15th October, 1958 to 14th October, 1959. As the investigation started from 15th October, 1959, so for determining the morbidity for the last one year this period was fixed. This period of one year is the interval between the Durga Puja of 1958 and 1959 and therefore it was quite easy for villagers to supply answers to the queries.

For each item of disease noted, there is the next column indicating treatment received for the ailment i.e. source of the service rendered for the ailment. For recording source of service five code numbers were used on the following line:

Code No.: (1) for Thana Health Centre (Govt. of West Bengal)
(2) for Nasibpur Health Centre (Govt. of India)
(3) for local practitioners of all types including local dais.

(4) for other sources e.g. subdivisional, district or Calcutta hospital.
(5) None—i.e. no service availed of for the particular ailment.

Personal opinions of villagers as to the nature and quality of this or that service were disregarded altogether and instead factual data, basing on disease or disorder and service provided, were collected.

Presentation and Interpretation of Collected Data

The comparative analysis of the inpatients records of Thana Health Centre, Singur and Union Health Centre, Nasibpur for the 1 year period (October 15, 1958 to October 14, 1959) is shown below:

we think of the more number of beds in the Thana Health Centre. In going through the figures of respective villages it is found that villages like Seramore, Dearah, Desapara, Nasibpur which are quite near to the Union Health Centre account for the maximum number of cases while villages like Aima-debottar, Rasulpur, Hapuspota account for the lowest number of cases, these being situated on the outskirts of the Union. Again some of the villages being moderately nearer to the Thana Health Centre the people could have gone and availed of the service there but the figures shown in the table are not very suggestive. From the overall picture it can only be deduced that the maternity service at the Nasibpur Health Centre is quite popular and people living in outlying villages may not have regular opportunities to attend the Health Centre as and whenever they so desire.

Table I

COMPARATIVE ANALYSIS OF INPATIENTS' REGISTER OF THE THANA HEALTH CENTRE & NASIBPUR HEALTH CENTRE

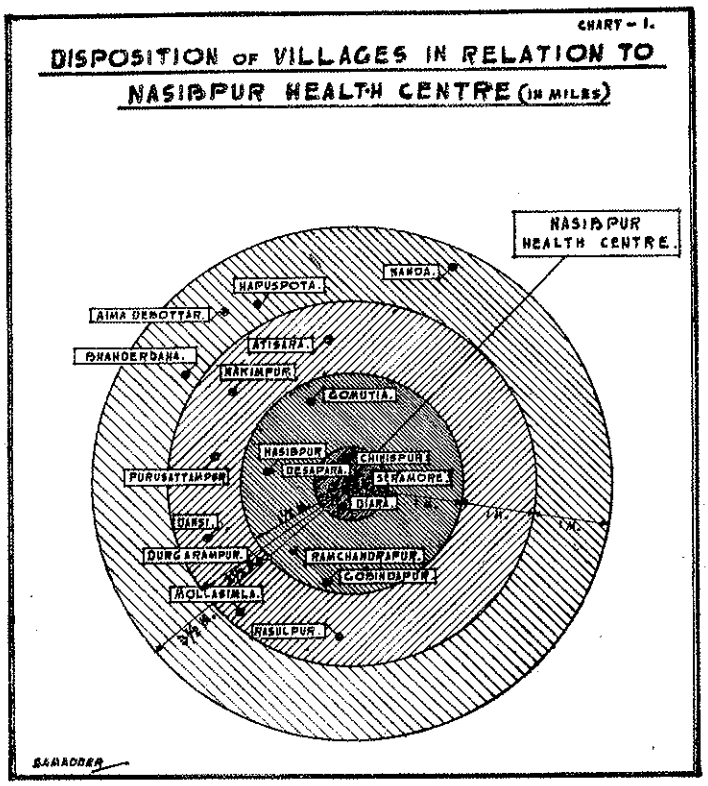
Village.	*Thana Health Centre.* Female				*Nasibpur Health Centre.* Female			
	Male.	General.	Maternity.	Total.	Male.	General.	Maternity.	Total.
Nasibpur	4	4	2	10	2	4	38	44
Desapara	2	1	—	3	11	7	50	68
Nanda	1	1	—	2	10	6	21	37
Gobindapur	—	—	—	—	1	—	22	23
Gomotia	—	1	—	1	2	4	13	19
Dearah	2	—	1	3	6	9	46	61
Ramchandrapur	—	—	2	2	—	2	21	23
Amia-debottar	1	—	1	2	—	—	1	1
Purusattampur	4	—	—	4	—	—	6	6
Mollasimla	1	2	—	3	—	1	8	9
Rasulpur	—	—	—	—	—	—	1	1
Hapuspota	—	1	1	2	—	—	2	2
Hakimpur	1	—	1	2	3	—	9	12
Durgarampur	1	1	—	2	—	—	3	3
Atisewra	9	1	3	13	—	—	15	15
Chinispur	—	—	—	—	8	4	14	26
Seramore	—	—	—	—	5	4	88	97
Bhandardah	1	—	—	1	—	—	—	—
Dhansi	—	—	—	—	—	—	—	—
Total:	27	12	11	50	48	41	358	447

The table shows that only 50 cases were treated in Thana Health Centre from Nasibpur Union whereas 447 cases were treated in Union Health Centre, Nasibpur. Of these, 11 maternity cases were admitted at Thana Health Centre and 358 maternity cases at Nasibpur Health Centre. Obviously there must be some reason for this difference when

From this preliminary observation it was thought to be worth-while to consider the question of disposition of villages in relation to the situation of the Union Health Centre. Although information was collected in every village on the same lines, the communication facilities to and from the villages, distance of each villages from the Union Health Centre

and any other feature which might be of special interest in respect of hospital attendance were also noticed. One chart was prepared showing this disposition of villages along with the distances of each of them from the Nasibpur Union Health Centre (Chart I). On

These villages are located in such a manner that the central part of each of them is not more than 1/2 mile from the Health Centre. Moreover these are on either side of the Baidyabati-Tarakeswar road and communica-



the basis of distance, the villages were re-arranged into 4 groups and the data collected from each village were compiled on group basis as follows:

Group I:

Village.	Population surveyed.	Number of families.
Seramore	1737	269
Desapara	997	146
Dearah	1201	189
Chinispur	223	23
Total:	4158	627

tion facilities are somewhat better than other villages.

Group II :

Village.	Population surveyed.	Number of families.
Nasibpur	1686	222
Gomotia	375	56
Ramchandrapur	576	82
Gobindapur	901	136
Total:	3537	496

The central position of the most distant of these villages is within 1½ miles from the

Health Centre. Communication facilities are moderate.

Group III :

Village.	Population surveyed.	Number of families.
Atisewra	1309	215
Hakimpur	426	65
Purusattampur	643	112
Dhansi	168	21
Durgarampur	331	52
Mollasimla	891	146
Rasulpur	494	101
Total:	4262	712

This group is situated within 2½ miles distance from the Health Centre. Excepting the village Purusattampur which is on either side of the main road, all other villages are away from the road and none of them has any direct and easy communication with the Health Centre. In approaching the Health Centre one has to detour this or that way necessitating much loss of time.

Group IV :

Village.	Population surveyed.	Number of families.
Nanda	1404	231
Hapuspota	922	124
Aima-debottar	735	103
Bhandardah	318	47
Total:	3379	505

These are the most distantly placed villages being on the northern outskirts of the union and between 3½ to 4 miles from the Health Centre. Communication facilities are extremely poor. From the village Hapuspota it takes more than one hour to reach the Health Centre and in rainy season it would seem to be quite impossible to attend the Centre. But these villages are just on or nearabout the border of Anandanagar Health Centre. Because of the nearness of that Health Centre to these villages it is quite convenient for people to go to Anandanagar for medical aid although uptill now inpatients service has not been provided there.

The total number of admissions in Thana Health Centre for the Nasibpur union being very small no further analysis is made of it. In Table II distribution of admissions in Nasibpur Health Centre for the same period and according to groupings of villages is shown:

It again shows that maternity cases are admitted in this Centre in overwhelmingly large number. The slight rise in percentage of maternity cases in Group III is due to relative fall in percentage of other cases. The decreased number in Group IV might be due to bad communication facilities. The distance between Health Centre and a village may affect equally the health worker and the person requiring medical aid. But even then, at this stage from the meagre data no definite conclusion can be made.

Table II

ADMISSIONS IN NASIBPUR HEALTH CENTRE ACCORDING TO VILLAGE GROUPINGS

	Group I	%	Group II	%	Group III	%	Group IV	%
Male	30	11.9	5	4.5	3	6.5	10	25.0
Female (General) ..	24	9.5	10	9.1	1	2.1	6	15.0
Maternity	198	78.5	94	86.2	42	91.3	24	60.0
Total:	252	100.0	109	100.0	46	100.0	40	100.0

Field Data—Interpretation

(i) *Distribution of source of service by distance :*

The village-wise data after proper tabulation has been re-arranged on the basis of the same groupings of villages. The data are quite voluminous since out of the 15,337 population surveyed 3,071 are accounted for the past illness and 1,526 for the present illness. The total morbidity figure for past and present illnesses is therefore 4,597. A summary of the compilation with groupings of villages is presented here. For the sake of convenience only the total number of cases as recorded for past illness, present illness and maternity cases (past and present) are included in three items (A, B, C) of the Table III shown below. The data can be interpreted in respect of the total population covered by the survey for each groupings.

Table III

DISTRIBUTION OF THE SOURCE OF SERVICE BY DISTANCE

	Group I villages	%	Group II villages	%	Group III villages	%	Group IV villages	%
A. Past Illness								
(1) Thana Health Centre	6	0.63	15	2.7	46	5.1	14	1.9
(2) Nasibpur Health Centre	484	50.9	222	42.6	233	26.1	215	30.6
(3) Local Practitioners ..	384	40.4	223	42.8	474	53.1	416	52.9
(4) Others	46	4.8	29	5.5	83	9.3	30	4.2
(5) None	30	3.1	31	5.9	55	6.0	27	3.8
Total:	950	100.0	520	100.0	891	100.0	702	100.0
B. Present Illness								
(1) Thana Health Centre	3	0.7	2	0.6	5	1.1	4	1.0
(2) Nasibpur Health Centre	216	54.9	156	52.7	168	37.8	104	27.3
(3) Local Practitioners ..	76	19.3	62	20.9	130	29.2	112	29.4
(4) Others	14	3.5	20	6.7	32	7.2	17	4.4
(5) None	84	21.3	55	18.5	109	24.5	144	37.7
(N.K.) Not known ..	—		1	0.3	—		—	
Total:	393	100.0	296	100.0	444	100.0	381	100.0
C. Maternity Cases (Past and Present)								
(1) Thana Health Centre	1	0.3	8	2.8	6	1.7	3	1.2
(2) Nasibpur Health Centre	222	67.8	169	60.7	94	27.8	42	16.9
(3) Local Practitioners ..	50	15.2	67	24.1	157	46.4	121	48.7
(4) Others	24	7.3	16	5.7	30	8.8	17	6.8
(5) None	30	9.1	17	6.1	51	5.0	65	26.2
(N.K.) Not known ..	—		1	0.3	—		—	
Total:	327	100.0	278	100.0	338	100.0	248	100.0

Table III is indicative of the relative importance of different source of service. Two main sources of service are the Health Centre and Local Medical Practitioners group and together constitute nearly 80% of total service in the area. Of this on an average 40% of total cases are treated by the Nasibpur Health Centre and 34% by the Local Medical Practitioners. In comparison with these, the other two services are somewhat insignificant. These two services have therefore been plotted in Figures I, II, III in relation to distance

Fig. I

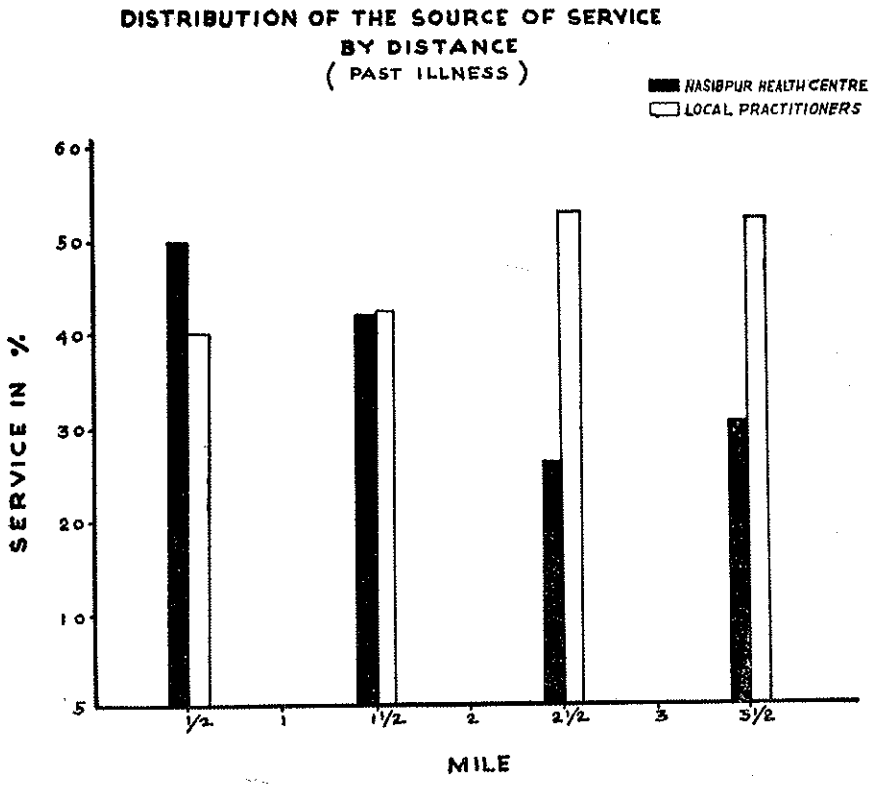


Fig. II

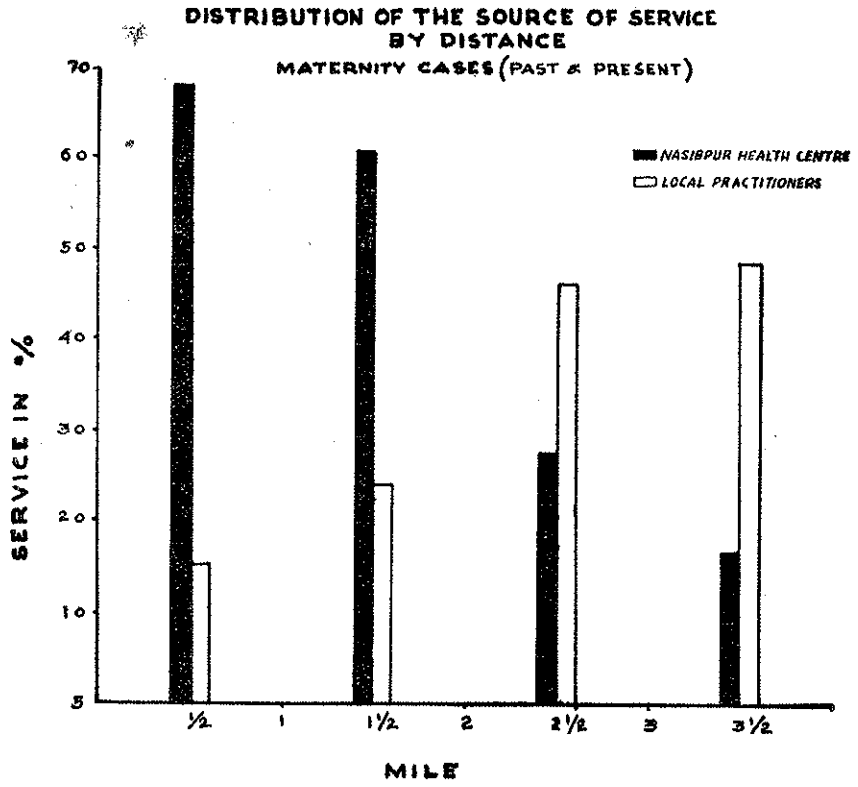
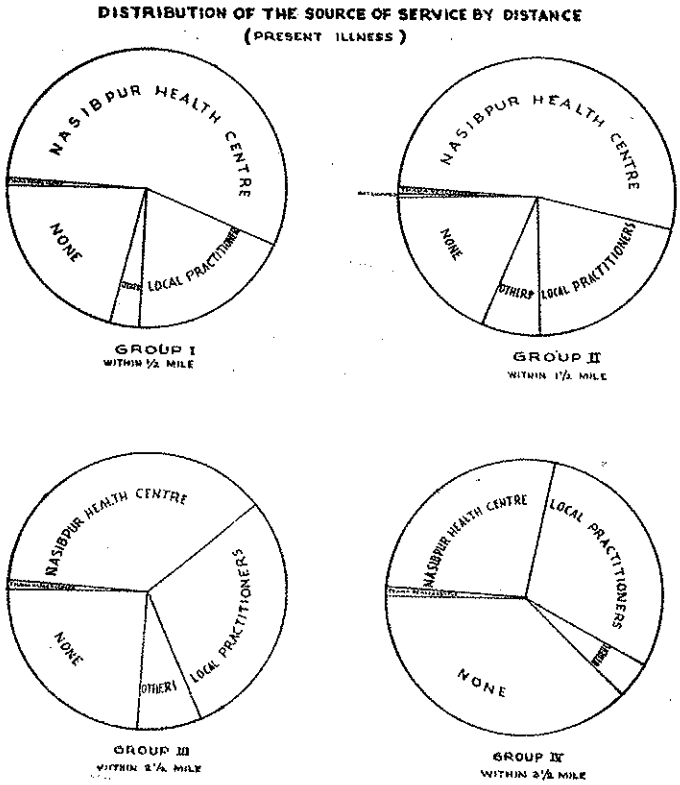


Fig. III



between Health Centre and village groupings. As distance increases Health Centre service decreases and Local Medical Practitioners' service goes up. This picture is uniformly apparent for past illness, present illness and maternity cases.

(2) *Distribution of source of service by age and sex :*

Tables IV and V indicative of source of service by age an sex respectively (for all villages) are shown below :

Table IV

(*Source of service by age*)

A. PAST ILLNESS

	0—4		5—14		15—34		35+	
	No. of cases.	%	No. of cases.	%	No. of cases.	%	No. of cases.	%
(1) Thana Health Centre	14	2.4	20	3.4	30	2.2	17	3.2
(2) Nasibpur Health Centre	238	41.7	241	41.3	512	37.3	162	30.2
(3) Local Practitioners ..	283	49.6	286	49.1	662	48.3	266	49.6
(4) Others	15	2.6	23	3.9	111	8.1	39	7.3
(5) None	21	3.7	13	2.3	57	4.1	52	9.7
Total:	571	100.0	583	100.0	1372	100.0	536	100.0

B. PRESENT ILLNESS

(1) Thana Health Centre	—	—	1	0.4	4	0.7	9	2.2
(2) Nasibpur Health Centre	142	48.2	138	53.3	229	41.7	132	32.5
(3) Local Practitioners ..	109	36.9	52	20.1	96	17.5	122	30.0
(4) Others	6	2.0	21	8.1	27	4.9	29	7.1
(5) None	38	12.9	47	18.1	193	35.2	114	28.2
Total:	295	100.0	259	100.0	549	100.0	406	100.0

Table V

DISTRIBUTION OF SOURCES OF SERVICE BY SEX

(*all villages*)

A. PAST ILLNESS

Source of service	Males		Females		Both sexes	
	No. of cases.	%	No. of cases.	%	No. of cases.	%
(1) Thana Health Centre	38	2.8	43	2.5	81	2.6
(2) Nasibpur Health Centre	462	34.3	692	40.3	1154	37.7
(3) Local Practitioners	706	52.4	791	46.2	1497	48.9
(4) Others	61	4.5	127	7.4	188	6.1
(5) None	81	6.0	62	3.6	143	4.7
Total:	1348	100.0	1715	100.0	3063	100.0

B. PRESENT ILLNESS

(1) Thana Health Centre	10	1.5	4	0.5	14	0.9
(2) Nasibpur Health Centre	238	35.5	406	48.2	644	42.6
(3) Local Practitioners	224	33.4	156	18.5	380	25.1
(4) Others	40	6.0	43	5.1	83	5.4
(5) None	158	23.6	234	27.7	394	26.0
Total:	670	100.0	843	100.0	1513	100.0

Almost all the age-group are mainly depenant on Health Centre and Local Medical Practitioners' service. For past illness on an average for all ages 37.7% people availed of Health Centre service and 49% people availed of Local Medical Practitioners' service. Variations for different age-groups are not marked. Same thing holds good for these two services in so far as sex is concerned. To sum up age and sex do not seem to have much of effect on the source of service.

(3) *Distribution of source of service by education :*

Table VI

SOURCE OF SERVICE BY EDUCATION

(*Head of the family*)

	Illiterate cases	%	Just Literate cases	%	Literate cases	%	N. K. cases	%
A. Past Illness								
(1) Thana Health Centre	35	2.7	36	2.6	9	2.1	1	3.0
(2) Nasibpur Health Centre	490	38.9	506	36.9	153	37.0	7	21.2
(3) Local Practitioners ..	588	46.7	683	49.9	215	52.0	16	48.4
(4) Others	77	6.0	83	6.1	25	6.0	3	9.0
(5) None	80	6.2	46	3.3	11	2.6	6	18.1
N.K.	1		—		—		—	
Total:	1271	100.0	1354	100.0	413	100.0	33	100.0
B. Present Illness								
(1) Thana Health Centre	4	0.6	9	1.3	1	0.4	1	4.0
(2) Nasibpur Health Centre	269	43.2	290	42.8	79	39.1	12	48.0
(3) Local Practitioners ..	127	20.4	182	26.8	67	33.1	4	16.0
(4) Others	30	4.8	34	5.0	19	9.4	1	4.0
(5) None	192	30.8	162	23.9	35	17.3	7	28.0
N.K.	—		—		1		—	
Total:	622	100.0	677	100.0	202	100.0	25	100.0

This is for all villages combined. Educational status of only the head of the family has been recorded in three categories e.g. illiterate, just literate, and literate:

Illiterate—cannot read and write
Just literate—can read and write
Literate—read in high school or college

This again shows that education of the head of the family has not much of an influence on the source of service. For past illness family members of all the three categories availed more of local practitioners service than of Health Centre service. But no definite conclusion can be drawn from that.

Measurement of Morbidity

From the past illness figures it will not be proper to deduce the morbidity rate as some of the morbidity figures might have been missed. This is because of the objective of present survey being determination of extent of sources of service, stress on important disease conditions during field visits to the people was made and therefore some of the diseases might have gone unrecorded.

But in so far as present sickness is concerned recordings were made on the basis of questionings pertaining to present and sometimes by actual examination of cases. It would therefore be appropriate to depend on these figures. In finding out the sickness rate the figures for pregnancy and delivery are excluded from the total figure of 1526 as these are really physiological conditions.

Total Population.	Present Sickness.	Pregnancy and delivery cases.	Actual Sickness.	Sickness %
15337	1526	323	1203	7.8

It may be noted that sickness rate during the General Health Survey conducted by Lal

and Seal at Singur in 1944, was found to be 12%. The present figure of 7.8% compares favourably with the previous figure.

Conclusions

(1) Thana Health Centre with its more number of beds does not cater much to the needs of the people of Nasibpur union.

(2) On an average 40% of total cases are treated by the Nasibpur Health Centre (Government of India) and 34% by Local Practitioners.

(3) Services from Nasibpur Health Centre do not radiate uniformly to all villages of the union. Villages nearer to Health Centre are served better because of the convenience in doing so. The three villages Hapuspota, Aima-debottar and Atisewra are situated at the northern outskirts of the union. It takes one hour or more for a person to come to the Health Centre from Hapuspota and the same applies to a health worker visiting the village from Health Centre. On the other hand, Anandanagar Union Health Centre is within $\frac{1}{2}$—$\frac{3}{4}$ mile from these villages. It will, therefore, be of much advantage if responsibility for rendering health service to the people of these villages is entrusted to Anandanagar Union Health Centre and people are allowed to avail themselves of medical aid from the Anandanagar Health Centre. This was also the suggestion put forward by villagers during the survey.

(4) 43.3% of total maternity cases (past and present) have been served by Nasibpur Health Centre and 33.6% by local practitioners including dais.

In villages within $1\frac{1}{2}$ mile of the Health Centre over 60% of maternity cases have been attended by Health Centre. This figure is reduced with the increase in distance till at a distance of $3\frac{1}{2}$—4 miles, only 17% cases have been served by Health Centre.

(5) Communication facility from village to village and from villages to the Nasibpur Health Centre is poor and is directly related to the nature and extent of health service availed of by the people.

(6) Age and sex of the people have no significant influence on the nature of service availed by them.

(7) Educational status of the head of the family has no obvious effect on the nature of service availed by people.

(8) Present sickness rate from this union comes to 7.8% and this compares favourably with the figure obtained by Lal and Seal in survey of Singur (1944) viz. 12%.

Summary

A study was undertaken in Nasibpur union under Singur Health Centre to assess the nature and extent of different source of services available in the area in so far as health care and medical relief are concerned. It shows that the integrated health service provided by the Government of India covers the maximum number of people of the area and next in order of priority comes the local practitioner service which is wholly curative in nature. Due to bad communication facilities between villages and the Nasibpur Health Centre the distant and outlying villages do not receive health care from the Health Centre to the same extent as the nearby villages. It is more so in case of maternity service which is otherwise quite popular in the area.

Acknowledgements

The authors express their deep gratitude to Dr. N. Jungalwalla, Deputy Director General of Health Services, for initiating the investigation and giving his valuable guidance while he was Director of the All-India Institute of Hygiene and Public Health. The authors also acknowledge with thanks the kind interest taken in the work by Dr. (Mrs.) Muktha Sen, present Director of the Institute. As for the technical assistance, the authors are indebted to the colleagues of the Sections of Sanitary Engineering, Statistics and Health Education of the Institute and the Rural Health Unit and Training Centre, Singur.

FILARIA SURVEY IN BASTI (UTTAR PRADESH)

By

Dr. A. P. SINHA, M.B., B.S., D.P.H.,

Filaria Control Officer, Basti

A—THE DISTRICT

General

1. Basti is the largest district of the State in population bounded on the North by Nepal, on the east by the district of Gorakhpur, on the south by the river Gogra and the district of Faizabad, and on the west by the Gonda district.

The total area of the district is 2,822 sq. miles and its population according to 1951 census was 23.88 lakhs but at present it is presumed that it is more than 24 lakhs. It has 6 tahsils, 13 parganas and 22 thanas (Police Stations) in the district. The various tahsils are Basti, Haraiya, Khalilabad, Bansi, Domariaganj and Naugarh.

Topography

2. The district lies within the plains and has fairly uniform slope, west-north-west to east-south-west. Roughly it can be divided into three tracts—the 'Uparhat', the 'tarhar', and the trans-Rapti land between the Rapti and Nepal boundary. The Uparhar has a fairly uniform level and is old land in which the rivers are no longer making appreciable changes and have become mere drains. It is a fertile and level plain. The rivers are Gogra, Kuano and Manorma a tributary of Kuano, and Ami. The 'tarhar' comprises of low valley of Gogra and the southern strip is known as 'manjha' which is the area flooded directly by the river Gogra. There are numerous 'tals' or ponds in this area. The trans-Rapti area is most heterogenous and is beyond the river Rapti and includes several very different areas. The rivers in this area are Rapti, Burhi-Rapti and the Banganga. This tract has a depressed belt of 'Kachar' following the course of Banganga and Burhi-Rapti rivers. Besides it there is a western tarai and this including 'Kachar' is very much liable to floods. The area is mostly low lying with deficient drainage and even little rains cause a great deal of water-logging in these areas.

Drainage

3. The natural drainage of the district is far from perfect. Almost the whole district is liable to floods and water logging with the result that considerable damage is done to the crops besides adverse effect on the health of the people. During recent years floods have become a permanent feature every year in the district.

Meteorology

4. The climate of Basti is neither too hot in summer nor too cold in winter. The maximum and minimum temperatures being 100°F. & 50°F. respectively. The rain fall is usually heavy and the proximity of hills tends to make the climate damp, especially at the end of the rains. This season was specially notorious for malaria, plague, cholera, and small-pox which used to take a heavy toll of life but are now considerably controlled by the Health Department. The average rainfall for the last quinquennium was about 50″. The relative humidity on an average is about 75 per cent.

Irrigation & Crops

5. The irrigation is from wells, rivers, tanks and lakes. Recently a tube well scheme has been enforced by the State Government and now some area has been provided with these tube wells. There are three crops Rabi, Kharif and Zaid. More acreage is sown in Kharif than in Rabi. The principal Kharif crop is paddy while the Rabi crops are wheat and barley. Sugar-cane cultivation has been quite popular and there are four sugar-mills operating in the district.

Density of Population

6. The district, although 9th in order of area stands first in the State in respect of population. The density per sq. mile is 847 while the average density of the State is 557 only. Mostly the population is rural or semi-urban in nature.

Vital Statistics & Diseases

7. The registration of births and deaths on the whole has not been satisfactory. However, the mean decennial birth and death rates during 1941-50 were 23.1 and 16.5 respectively. Fever was responsible for majority of the deaths and epidemics of cholera, plague and small-pox have played quite important role in it. The other diseases which have been prevailing in the district are Kala-azar, Goitre and Filaria.

Villages & Towns

8. The district has 6,948 villages, one town area and one municipality. The urban population is about 0.5 lakhs only while the rest of the population is rural or semi-urban. The villages are not very compact but are scattered and have a number of hamlets in them. The average population per hamlet being only 168, and a village having a population of 500 persons is said to be a big village in this district.

Occupation

9. About 90.7 per cent of the population is agriculturist in nature and only 9.3 per cent of the population depends on other sources. Cottage Industries have not been very popular here except the handloom industry which has been very much in progress amongst certain class of people who are known as weavers in the Khalilabad tahsil.

Houses & Households

10. There were 423,253 houses in the district out of which 415,927 were in villages and rest 7,326 were in the towns. The average number of persons per house in a village was found to be 5.6 and in town 6.2.

Sex Ratio and Marital Status

11. There were 957 females to every 1,000 males in the district. The sex ratio is smaller in the towns than in the villages. The unmarried people are about 35.3% of the population. Out of this 41.1% of the male population is unmarried, 51.4% is married and the rest 7.5% are widowers or divorced. Amongst the females 29.2% were unmarried, 58.5% married and 12.3% were widows or divorced. The system of early marriage and child marriage is quite prevalent.

Language & Literacy

12. More than 99.9% of the people speak Hindustani. Very few people speak Punjabi or Marwari. Male literacy has been found to be 12% while the female literacy is only 1.1%. Blind beliefs, strange customs and beliefs in the existence of evil spirits have been quite common here.

13. The number of people belonging to different religions are Hindus 82%, Muslims 17.9%, and others 1.1%. In the urban areas the Hindus form 77%, Muslims 22.4%, Christians 0.1% and Sikhs 0.4% of the population, the rest being others.

Castes & Groups

14. The scheduled castes form 1.9% of the total population. There are 4 Anglo-Indians and a few American Missionaries. About 1,305 persons in the district are displaced persons.

B—The Basti Town

General

1. The Basti town can be said to be a city of length without breadth. It is about 4 miles long and 1 mile broad and on the western and north-western side of the town the kuano river forms its boundary. The population of the Basti town according to 1951 census is 33,203 but it is presumed that it has grown to-day to 42,513. The town is not densely populated but is interspersed with areas of cultivation and fields. The area, if calculated according to compact population will come to 2 sq. miles.

Population

2. Out of the total population of 42,513, the male population is 24,577 and the females 17,936. The Hindus form about 40.2% of the population, the muslims about 22.3% while the rest are Sikhs and Christians. There are also a few American Missionaries living in the Basti town.

Water Supply

3. The water supply of the town is mostly from wells. Some better class of people have got hand pumps fitted to the wells. Recently

the local Municipal Board has started to supply chlorinated tube-well water through pipe lines, but very few houses have been provided with such water supply.

Drainage & Sanitation

4. There is no proper drainage system in the town. Large number of dirty waste water collections are found scattered all around the houses and in the streets. Every house situated on the main road has got a big kachcha Nala in front of it with no slope, as a result of which it serves only as a reservoir of waste water. The condition of sanitation in the town is highly unsatisfactory. There is no system of disposal of rubbish, refuse, and night-soil. The latrines are most unhygienic in nature and the system of conservancy is not satisfactory. On the whole the condition of sanitation and the hygiene of the town are most hopeless.

Housing

5. Most of the houses in the town are not pakka and many of them only give an appearance of a hut. The construction of the houses and the development of the town have been in a haphazard way. Most of the houses are ill-ventilated, low roofed and without arrangments for drainage of waste and rain water. The sanitation of the environment is very poor and breeding of flies, mosquitoes and other arthropods is quite common.

C—The Survey

Organisation

1. The survey was carried out in Basti district in the Special Study Area (*i.e.* the Basti town) and the Check Area by the Filaria Control Unit, Basti.

Two teams were formed, each consisting of one Filaria Inspector, two Superior Field Workers and two Inferior Field Workers, for one of the above areas for the parssitological work, besides the entomological Units to carry on the entomological work. The laboratory work was being done directly under the supervision of one of the Medical Officers and one Filaria Inspector assisted with a Superior and an Inferior Field Worker deputed for the work.

Time and period of Survey

2. The survey was done in both the Special Study and the Check Areas during the months of September, October and November. Every effort was made to carry on a detailed survey of the population and more than 15 per cent of the population was surveyed in both the areas. Random representative samples of the population from all the areas, covering all age groups, both the sexes, all the occupations and all the socio-economic status of the society were examined to find out the filarial incidence in the community. The survey was carried out between 7-30 to 11-30 p.m.

Technique

3. Besides filling the entries in the prescribed registers, blood smears were collected during the survey from house to house. The blood films were made with about 20 cmm of blood from each individual and smears of about $1\frac{1}{2}'' \times \frac{3}{4}''$ were prepared from it. The slides were then stained with J.S.B. Stain and Methylene blue stains before they were examined. Positive slides were subsequently re-examined for micro-filarial count.

D—The Result of Parasitological Survey

Infection Rate According to Age

1. The microlfilaria rate, as found in different age groups and in both the areas is given in the following Table No. I.

Table I

Age groups	Number of persons examined		No. of persons positive		Micro-filaria rate		Specie of infns.
	S.S.A.*	C.A.**	S.S.A.	C.A.	S.S.A.	C.A.	
2— 5 yrs.	252	227	8	8	3.1%	3.5%	
6—10 yrs.	590	635	42	50	7.1%	7.8%	Mf. bancrofti
11—20 yrs.	1092	1072	109	95	9.9%	8.8%	
21—30 yrs.	1533	1250	162	136	10.5%	10.8%	
31—40 yrs.	831	799	88	95	10.5%	11.8%	
41—50 yrs.	280	510	25	60	8.9%	11.7%	
Above 50 yrs.	142	209	21	23	14.8%	11.9%	
Total.	4720	4702	455	467	9.6%	9.9%	

1. The above table clearly shows that the microfilaria rate is higher as the age advances. The maximum number of people infected are between the ages 11—40 years. The average micro-filaria rates in Special Study Area and Check Area were 9.6 and 9.9 per cent.

2. The relation of infection with the sex of the people can be visualised from the following Table No. II.

Table II

Sex	No. of persons examined		No. ofp ersons positive.		Incidence.	
	S.S.A.	C.A.	S.S.A.	C.A.	S.S.A.	C.A.
Males	3696	3591	387	375	10.4%	10.4%
Females	1024	1111	68	92	6.8%	8.2%

According to the data available it is seen that the infection is slightly more in males than females. No special reason can be attributed as to why the females are less infected than the males.

3. The infection rate as found in various religions can be visualised from the following Table No. III.

Table III

Religion A	No. of person examined		No. of persons positive.		Microfilaria rate.	
	S.S.A.	C.A.	S.S.A.	C.A.	S.S.A.	C.A.
Hindus	4094	4201	388	399	9.4%	9.4%
Muslims	550	500	55	57	10 %	11.4%
Christian	39	—	10	—	25.7%	—
Sikhs.	37	—	3	—	8.1%	—

Relation of Infection with Status

4. The incidence of infection in relation to the socio-economic condition was not noted in particular but from general observations it was found that mostly the poor population was found affected. It cannot be said that the better class of people are immune but due to bad environmental hygiene in the poor classes the disease may be more due to more mosquito breeding in their locality.

Disease Rate

5. The idea of the disease rate in the community surveyed both in the Special Study and Check Areas can be had from the following Tables Nos. IV to VI:

Table IV

Age groups	No. of persons examined.		No. of persons diseased.		Disease rate.	
	S.S.A.	C.A.	S.S.A.	C.A.	S.S.A.	C.A.
2— 5 yrs.	252	227	7	4	2.7%	1.7%
6—10 yrs.	590	635	8	21	1.3%	3.3%
11—20 yrs.	1092	1072	119	79	10.9%	7.3%
21—30 yrs.	1533	1250	273	178	17.8%	14.2%
31—40 yrs.	831	799	188	91	22.8%	11.8%
41—50 yrs.	280	510	72	70	25.7%	13.7%
Above 50yrs.	142	209	32	26	22.5%	12.4%
Total:	4720	4702	701	469	14.8%	9.9%

Table V

DISEASE RATE IN RELATION TO SEX

Sex	No. of persons examined		No. of persons diseased		Disease rate.	
	S.S.A.	C.A.	S.S.A.	C.A.	S.S.A.	C.A.
Males	3696	3591	641	423	17.3%	11.6%
Females	1024	1111	60	46	5.8%	4.1%

Table VI

RELATION OF DISEASE MANIFESTATIONS WITH THE DISEASED POPULATION

S. No.	Manifestations	No. of people diseased		No. of people showing manifestations.	
		S.S.A.	C.A.	S S A.	C.A.
1.	Filarial fever	..	..	33	34
2.	Hydrocoele & other genital lesions	..	..	469	267
3.	Chyluria	..	..	2	5
4.	Swelling and ele-phantoide condition of the:—	701	469	..	..
(a)	Right upper ext.	..	..	37	17
(b)	Left upper ext.	..	..	30	21
(c)	Right lower ext.	..	..	62	66
(d)	Left lower ext.	..	..	66	58
(e)	Penile.	..	..	1	—
(f)	Breast	..	..	—	1

Endemicity rate

6. The endemicity rate has been worked out both in the Special Study and Check Areas and the results found can be summarised as in Table No. VII below.

Table VII

Area	No. of persons examined	No. showing infection in blood.	No. found diseased	No. of persons having infection and disease both.	Endemicity rate.
Special Study Area.	4720	455	701	62	23.1%
Check Area ..	4702	467	469	45	18.9%

7. The average Infestation Rate in the both areas has been worked out and the result is as follows:

1. Special Study Area ... 24 micro-filaria/20 c.mm.
2. Check Area 20 micro-filaria/20 c.mm.

E—THE ENTOMOLOGICAL SURVEY

Organisation

1. Capture stations were fixed in both of the above two areas, namely the Special Study and the Check Areas. Out of the 30 catching stations selected in the above two areas, 10 were of human dwelling type, 10 of cattle shed type and the remaining 10 were of mixed type. They were established in the various zones of the areas. The adult collections were made in between 6-30—8-30 hours, and 10 minutes were spent at each catching station by each Insect Collector. Larval collections were made weekly.

Technique

2. All the adults and larvae were brought to the laboratory where they were first of all identified. After that the adult mosquitoes were dissected for the presence of the filarial forms in them.

The Result

3. The results of the entomological survey can be expressed as given in the following tables.

Table VIII

TABLE SHOWING THE DENSITY OF THE VECTOR OF INFECTION

Area	Anophelene density	Culicine	C. fatigans
Special Study ..	65 (10 Man.H)	300 (10 m.h.)	252 (10 m.h.)
Check	56 (10 m.h.)	147 (10 m.h.)	74 (10 m.h.)

Table IX

TABLE SHOWING THE VARIOUS GENERA OF MOSQUITOES

Area	Total No. caught.	Culex	Anopheles	Aedes	Mansonoides
Special Study	2997	2221	643	129	4
Check	1474	710	701	10	53

Table X

TABLE SHOWING THE RESULT OF MOSQUITO DISSECTION

Area	Type of mosquito	No. dissected	No. Positive	Infection Rate	Species of mosquitoes found infected
Special	Anopheles	168	—	—	
	Culicines	359	36	10.03%	C. fatigans.
	C. fatigans	327	36	11%	
Check Area	Anopheles	131	—	—	
	Culicines	164	13	7.9%	
	C. fatigans	140	13	9.2%	

Table XI

TABLE SHOWING THE RESULT OF THE LARVAL COLLECTIONS CARRIED OUT IN THE SPECIAL STUDY AND THE CHECK AREAS.

Area	Larval specie	Average No. Found per dip	Remarks.
Special Study ..	C. fatigans.	250—350	Some of the places had plenty of Lemna plants, others had Algae and somewhere other Aquatic vegetations.
	A. subpictus.	100—150	
	C. vishnoi.	200—250	
Check	C. fatigans.	200—250	
	A. subpictus.	100—150	

F—The Summary

1. A Filarial Survey was carried out in the Special Study and the Check Areas of the Basti District from the months September to November in which about 15% of the population was examined by obtaining Random representative samples of the community.

2. The micro-filarial rate was found to be 9.3% in the Special Study Area and 10.7% in the Check Area. The disease rate was 15.2% in the Special Study Area and 6.7% in the Check Area. The endemicity rate in the Special Study Area was 27% while in the Check Area it was 16.3%. The average infestation rate was found to be about 23 micro-filaria in the Special Study Area and 16 in the Check Area. The specie of infection found was Micro-filaria bancrofti.

3. The Entomological Survey revealed that the chief vector of infection is *Culex fatigans* for which there were plenty of breeding places in the locality. Some mansonoides were also caught in certain localities but none of them had been found to carry infection so far. Pistia vegetation has not so far been reported from any pond from the localities where mansonoides were found. However, further work is necessary to establish whether the mansonoides is also the vector of infection in this district. At present it is difficult to say about its breeding place as the Pistia vegetation has not so far been reported.

Acknowledgements

The author is very much indebted to Dr. J. Rahman, Deputy Director Malariology, U.P. and Dr. M. V. Singh, Assistant Malaria Officer, U.P. for their valuable guidance and help on various occasions, and for the kind permission to bring out this paper. Thanks are also due to Sri S. K. Saxena and Sri R. C. Tripathi, Filaria Inspectors for their excellent field and laboratory work. I am also thankful to all my other staff namely Insect Collectors and the Field Workers for their hard work and assistance.

PREVALENCE OF SOME TOOTH AND GUM DISEASES AMONG THE SCHOOL CHILDREN OF CHETLA AREA

DR. P. M. ROY, M.S.C., D.Phil. (Cal.)

Statistician, Urban Health Centre, Chetla
All-India Institute of Hygiene and Public Health, Calcutta

With the assistance of

SRI S. C. BHOWMIK, SRI A. CHOUDHURY and MISS B. BRAHMA

1. INTRODUCTION

The importance of Dental Health to the happiness of the individual and to the welfare of the State has long been admitted in the Western countries. A hand-book on Oral Hygiene produced by the Dental Board of the United Kingdom about thirty years back and a recently produced book "Dental Health", for the school masters and mistresses by the same board under the editorship of Professor H. H. Stones of Liverpool University are the living testimonies to the value attached to dental health in U.K. In this background the object of the present paper is to study the prevalence of some common tooth and gum diseases among the school children of Chetla area, in the 71 and 72 constituencies (now known as wards) of Calcutta, as revealed by the records of the School Health and Dental clinics of the Urban Health Centre, Chetla.

2. METHODS AND MATERIALS

The basic material consists of the records of 1683 school children of the Chetla area medically examined at the schools by the School Health section during 1958, and 300 school children examined by Dr. B. C. Mitra of the Dental Clinic at the Urban Health Centre, Chetla. Out of 1683 school children examined at the schools, 420 were advised to attend the Dental clinic of the Centre for detailed check-up and treatment. 300 (71.4%) out of 420 attended the Dental clinic. Attendance of female children (161 out of 201, 80.0%) was significantly more (at 0.1 per cent level) than of the male children (139 out of 219, 63.5%). The other material used for the study was collected by the Statistics section through a Population Survey conducted during the year 1957.

3. PREVALENCE OF TOOTH AND GUM DISEASES

Distribution of 1683 school children of Chetla area medically examined at the schools by the School Health Section, by age, sex, and percentage found with some sort of tooth and gum diseases or complaints is shown in Table I. From the table it may be seen that on the whole 25 per cent of the school children suffer from some sort of tooth and gum disease, males suffering slightly more (26.6 p.c.) than the females (23.3 p.c.).

Prevalence of the diseases in general shows downward trend with the increase of age. The downward trend is more pronounced in case of females. Prevalence rate among males of the age-group 5—9 is 30.9 per cent which is (almost significantly at 5 per cent level) higher than the prevalence rate 24.7 per cent among the males of the age-group 10-14. Similarly prevalence rate among the females of the age-group 5-9 is 31.8 per cent which is significantly ($P < 0.1$) higher than the prevalence rate 21.0 per cent among females of the age-group 10-14.

Twenty per cent sample tabulation of the schedules of a household survey conducted in 1957 over the entire area of Chetla by the Statistics Section shows that 67.8 per cent of the male population of the age-group 5-14 and 59.1 per cent of the female population of the same age-group are school children. The same tabulation also shows that 6985 male population and 6143 female population of Chetla belong to the age-group 5-14. Thus in Chetla there are about 4736 male and 3631 female school going children of the age-group 5-14. Of these children roughly about 1283 males and 890 females are to be found with some sort of tooth and gum diseases or complaints. If we assume that the rate of prevalence is more or less same among the children

Table I

DISTRIBUTION OF 1683 SCHOOL CHILDREN OF CHETLA AREA, MEDICALLY EXAMINED AT THE SCHOOLS BY THE SCHOOL HEALTH SECTION, BY AGE, SEX AND PERCENTAGE FOUND WITH SOME SORT OF TOOTH AND GUM DISEASES

Age in years		Number Examined			Percentage found affected		
		Male	Female	Both Sexes	Male	Female	Both Sexes
Below	5	11	11	22	9.1	9.1	9.1
	5	21	23	44	28.6	26.1	27.3
	6	53	63	116	26.4	36.5	31.9
	7	73	43	116	32.9	30.2	31.9
	8	75	64	139	26.7	39.1	32.4
	9	82	68	150	36.6	23.5	30.7
Total for 5 to	9	304	261	565	30.9	31.8	31.3
	10	149	121	270	25.5	24.8	25.2
	11	108	132	240	31.5	22.0	26.3
	12	132	149	281	22.7	21.5	22.1
	13	70	70	140	18.6	12.9	15.7
	14	31	67	98	19.4	19.4	19.4
Total for 10 to	14	490	539	1029	24.7	21.0	22.7
15 and over		14	44	58	14.3	6.8	8.6
Not Known		3	6	9	33.3	16.7	22.2
Total for 5 to	14	794	800	1594	27.1	24.5	25.8
ALL AGES TOGETHER:		822	861	1683	26.6	23.3	25.0

of the age-group 5-14, whether they go to school or not, then the number of children suffering from tooth and gum diseases or complaints in the area works out to 1893 boys and 1505 girls.

Next, on the basis of the examination by the Dental Clinic of the 300 cases (who only, out of 420 cases discovered during the medical examinations at schools, attended the clinic) we shall work out the prevalence of caries, unhealthy gums, abnormal occlusion and hypocalcified enamel.

4. Prevalence of Some Specific Tooth and Gum Diseases

On the basis of the examinations indicated above we have worked out age-sex specific percentage prevalence of caries, unhealthy gums, abnormal occlusions and hypocalcified enamel among the school children of Chetla area, taking into account the number examined at the schools, the number found affected in these examinations, the number attending the dental clinic and the results of the dental clinic examinations in each age-sex specific sub-group. The detailed results are furnished in the Appendix I as Tables A & B. In this connection it may be added that in view of the fact that all defectives found during the medical examinations at the schools have not attended the clinic, it has been necessary to estimate the number of students at risk, from which the dental clinic cases have been drawn. This has been done on the assumption that within an age-sex specific group the ratio of the dental clinic cases to the number of students at risk is same as the ratio which the number of defectives found during the medical examinations at the schools bears to the total number of students examined (within the same age-sex specific group). The

estimates in whole numbers are presented in Table II (in calculating percentage prevalence of Tables A & B of Appendix I fractions were also utilised).

areas as per Bengal School Inspection Reports of 1934 and 1935) were found with caries.

In a recent study on the growth rate of school children at Chetla by Halder and

Table II

DETAILS OF NUMBER OF STUDENTS FROM WHICH THE 300 DENTAL CLINIC CASES HAVE BEEN DRAWN

Age	Male	Female	Total	Age	Male	Female	Total
—5	11	11	22	10	71	121	192
5	21	23	44	11	67	96	163
6	42	36	76	12	53	79	132
7	55	43	98	13	43	70	113
8	75	54	129	14	26	57	83
9	49	68	117				
				10—14:	260	423	683
5—9:	242	224	466				
				15 & over	7	44	51
				5—14:	502	647	1149
				All ages:	520	702	1222

From the Tables A & B of Appendix I it may be seen that 20.9 per cent of male students have caries, 18.9 per cent spongy gums, 1.2 per cent hypertrophied gums (in all 20.1 per cent unhealthy gums), 5.4 per cent abnormal occlusion and 0.8 per cent hypocalcified enamel.. Similarly 17.5 per cent of female students have caries, 15.8 per cent spongy gums, 1.2 per cent hypertrophied gums (in all 17.0 per cent unhealthy gums), 5.7 per cent abnormal occlusion and 0.7 per cent hypocalcified enamel. In this connection, for general information, it may be mentioned that in a nutrition survey and feeding experiment conducted among 341 school children in Singur, the rural controlled community practice field of the All-India Institute of Hygiene and Public Health, Calcutta by Sen *et al* (1945) it was found that

(1) 14.5 per cent (considered as high at that time) were suffering from spongy and bleeding gums; and

(2) 42.4 per cent (considered as unexpectedly very high at that time as against 12.8 per cent in Calcutta, 10.0 per cent in the municipalities, and only 9.5 per cent in rural

Sundararajan (1958), among other things, the following were reported:

PRECENTAGE INCIDENCE OF DEFICIENCY DISEASES AMONG THE CHILDREN OF THREE DIFFERENT SCHOOLS UNDER EXPERIMENT

Deficiency condition	Chetla Boys' School (345)	Chetla Girls' School (352)	National School (227)
..	..	..	..
..	..	..	..
6. Gingivitis	46.6	20.8	2.0
7. Caries tooth	23.7	20.9	15.0

Note: The figures in the parenthesis indicate the number of students assessed in each school.

It may be noted that in this later case the pooled percentage prevalence (male and females, 75.8 per cent) were found with caries. tooth work out as 25.8 per cent and 20.5 per cent respectively. Implications of the prevalence obtained in our study will be discussed separately.

(i) *Prevalence of Caries:*

Out of 300 cases (139 males, and 161 females, 75.8 per cent) were found with caries.

Table III

DISTRIBUTION OF 139 MALE DENTAL CLINIC CASES ACCORDING TO AGE, SEX AND AMOUNT OF CAR IES

Age in Years	AMOUNT OF CARIES													Total number of cases	AVERAGE AMOUNT OF CARIES PER		
	0	1	2	3	4	5	6	7	8	9	10	11	15		Caries case	Dental clinic case	School child
Below 5	—	—	—	—	—	—	—	1	—	—	—	—	—	1	7.0	7.0	0.64
5	—	—	1	1	—	—	—	1	—	—	1	1	1	6	8.0	8.0	2.29
6	1	2	1	1	2	1	2	1	—	—	—	—	—	11	3.5	3.5	0.94
7	2	3	1	3	4	4	1	—	—	—	—	—	—	18	3.5	3.1	1.02
8	3	2	3	3	1	2	3	1	1	1	—	—	—	20	4.3	3.7	0.97
9	2	—	5	1	2	2	3	1	1	1	—	—	—	18	4.6	4.1	1.48
10	2	4	4	3	—	3	—	—	2	—	—	—	—	18	3.3	2.9	0.74
11	11	2	3	2	—	2	—	—	1	—	—	—	—	21	3.2	1.5	0.48
12	3	3	3	2	1	—	—	—	—	—	—	—	—	12	2.1	1.6	0.40
13	3	1	2	1	—	—	1	—	—	—	—	—	—	8	2.8	1.8	0.33
14	1	2	1	—	—	1	—	—	—	—	—	—	—	5	2.3	1.8	0.35
15 and above	—	—	1	—	—	—	—	—	—	—	—	—	—	1	2.0	2.0	0.29
All ages:	28	19	25	17	10	15	10	5	5	2	1	1	1	139	3.8	3.1	0.76

females, 75.8 per cent) were found with caries. Thus 77.7 per cent of the attending cases were with caries. The distribution of the 300 cases by age, sex and amount of caries is shown in tables III & IV. In these tables information regarding average amount of caries (a) per caries case, (b) per dental clinic case and (c) per school child are also given.

cause structural deformity of enamel and dention, which renders teeth more vulnerable to caries.

(3) Excessive intake of refined carbohydrates such as sweet biscuits, chocolates etc. takes place in the early ages creating more favourable fields than in the older ages.

Table IV

DISTRIBUTION OF FEMALE DENTAL CLINIC CASES ACCORDING TO AGE, SEX AND AMOUNT OF CARIES

Age in Years	AMOUNT OF CARIES											Total no. of Cases	AVERAGE AMOUNT OF CARIES PER		
	0	1	2	3	4	5	6	7	8	9	10		Caries case	Dental Cl. case	School child
Below 5	—	—	—	—	—	—	—	—	—	—	1	1	10.0	10.0	0.91
5	—	1	—	—	1	1	1	1	—	—	1	6	5.5	5.5	1.43
6	2	1	3	2	3	—	1	—	—	1	—	13	3.6	3.1	1.12
7	4	—	2	2	2	—	1	—	1	1	—	13	4.6	3.2	0.95
8	6	—	6	3	3	—	1	1	1	—	—	21	3.6	2.6	1.00
9	1	5	4	2	2	2	—	—	—	—	—	16	2.5	2.3	0.54
10	4	2	8	2	3	6	3	1	—	—	1	30	3.9	3.9	0.83
11	5	2	4	3	4	1	1	—	1	—	—	21	3.4	2.6	0.56
12	6	4	4	—	1	1	—	—	1	—	—	17	2.6	1.7	0.36
13	6	2	1	—	—	—	—	—	—	—	—	9	1.3	0.4	0.06
14	5	1	1	1	3	—	—	—	—	—	—	11	3.0	1.6	0.32
15 and avove	—	2	—	—	—	1	—	—	—	—	—	3	2.3	2.3	0.16
All ages	39	20	33	15	22	12	8	3	4	2	3	161	3.5	2.7	0.61

From the tables it is seen that on the whole, amount of caries is found more among the children of lower ages than among those of higher ages. The following are some factors which are responsible for these types of things:

(1) In the early ages mostly there are deciduous and mixed dentition where oral hygiene is generally neglected.

(2) Deficiencies of vitamins A, D and calcium during the calcification period of teeth

The above and the fact that careous teeth disappear naturally with the appearance of new (permanent) teeth replacing the old (deciduous) ones provide some plausible explanation as to why the average number of careous teeth almost regularly declines with age.

Let us now examine whether prevalence of caries cases varies from sex to sex and from age-group 5-9 to 10-14 significantly. For the purpose the following contingency table (Table V) may be considered:

Table V

RELATION OF CARIES CASE PREVALENCE WITH AGE AND SEX

Age-group	Male			Female			Both sexes		
	Caries affected	Caries free	Estmd. Popln. at risk	Caries affected	Caries free	Estmd. Popln. at risk	Affected	Garies free	Estmd. Popln. at risk
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
5— 9	65	177	242	56	168	224	121	345	466
10—14	44	216	260	62	361	423	106	577	683
Total:	109	393	502	118	529	647	227	922	1149

Applying the X^2—test at the table V we arrive to the following conclusions:

(1) Prevalence of male caries cases (27.5%) in the age-group 5-9 is significantly higher (at 1% level) than the prevalence of male caries cases (17.4%) in the age-group 10-14. ($X^2=6.707$ with 1 d.f.)

(2) Prevalence of female caries cases (25.8%) in the age-group 5-9 is significantly higher (at 1% level) than the prevalence of male caries cases (14.6%) in the age-group 10-14. ($X^2=9.824$ with 1 d.f.)

(3) Prevalence of male caries cases (27.5%) in the age-group 5-9 is not statistically different from the prevalence of female caries cases (25.8%) in the same age-group ($X^2=0.125$ with 1 d.f.)

(4) Prevalence of male caries cases (17.4%) in the age-group 10-14 is not statistically different from the prevalence of female caries cases (14.6%) in the same age-group ($X^2=0.469$ with 1 d.f.)

Next, let us examine whether amount of caries per caries case varies significantly from sex to sex and age-group to age-group. For the purpose, Table VI is constructed from Tables III & IV.

Table VI

AVERAGE AMOUNTS OF CARIES PER CARIES CASE, APPROPRIATE DEGREES OF FREEDOM, CORRECTED SUM OF SQUARES, MEAN SQUARES AND F'S BY SEX AND AGE- GROUP

A. MALE

Age-group (in yrs.)	D.F. for Mean square	Av. amount of caries	Sum of squares	Mean squares	Appropriate F for testing equality of mean squares of different age-groups
(1)	(2)	(3)	(4)	(5)	(6)
5— 9	64	4.446	472.062	7.376	1.875
10—14	43	2.864	169.182	3.934	—
Total:	107	3.807	641.244	5.993	—

B. FEMALE

Age-group (in yrs.)	D.F. for Mean square	Av. amount of caries	Sum of squares	Mean squares	Appropriate F for testing equality of mean squares of different age-groups
(1)	(2)	(3)	(4)	(5)	(6)
5— 9	55	3.661	280.554	5.101	1.247
10—14	61	3.323	249.548	4.091	—
Total:	116	—	530.102	4.570	—

C. BOTH SEXES

Age-group (in yrs.)	D.F. for mean squares	Sum of squares	Mean squares	F for testing equality of mean squares for males and females within same age-groups.
(1)	(2)	(3)	(4)	(5)
5— 9	119	752.616	6.325	1.446
10—14	104	418.730	4.026	1.040

From the values of F of Table VI it may be seen that variances within the age-group 5-9 and the age-group 10-14 for males as well as the variances for males and females within the age-group 5-9 are significantly different. Thus the comparison between the average amount of caries per male caries case of the age-group 5-9 with the average amount of caries per male caries case of the age-group 10-14 or per female caries case of the age-group 5-9 cannot be done decisively with the help of t-test unless the values of the appropriate t's are significant (page 124, Fisher, 1944). Let us now work out the appropriate t's one by one and examine how they behave. In cases where the variances are significantly different we shall also apply Fisher-Behrens' d-test (*vide* page 3 of "Statistical Tables" by Fisher and Yates, 1957) to settle the cases finally.

(a) *Difference between average amounts of caries for male caries cases for the age-groups 5-9 and 10-14 :*

With the help of the values listed in Table VI the appropriate 't' works out as 3.310 with 107 d.f. which is significant at 1 per cent level. Hence the test is decisive that average amount of caries per male caries case is less in the age-group 10-14 than in the age-group 5-9. This conclusion is supported more strongly by Fisher-Behrens' d-test, as from the values listed in Table VI 'd' works out as 3.494 with $\theta = 48°5'$ and d.f. 64,43 (which is significant even at 0.5% level).

(b) *Difference between the average amounts of caries for female caries cases for the age-groups 5-9 and 10-14 :*

The appropriate 't' in this case works out as 0.858 with 116 d.f. which is not significant. This shows that average amount of caries per female caries case does not significantly decrease from the age-group 5-9 to the age-group 10-14.

(c) *Difference between average amounts of caries per male and female caries cases within the age-group 5-9 :*

The appropriate 't' in this case works out as 1.678 with 119 d.f. which lies between 10 and 5 per cent points of 't'. In view of what has been stated in the beginning in connection with the F-tests, the t-test is indecisive.

The appropriate Fisher-Behrens' 'd' in this case works out as 1.735 with $\theta = 48°9'$ and d.f. 64, 55 (which is not significant). Thus it may now be safely concluded that within the age-group 5-9 the average amount of caries per caries case does not differ from sex to sex.

(d) *Difference between average amounts of caries per male and female caries cases within the age-group 10-14 :*

The appropriate 't' in this case works out as 1.160 with 104 d.f. which is not significant. This shows that there is no significant difference between the averages.

(ii) *Prevalence of Unhealthy Gums :*

Out of the 300 cases (139 males, 161 females), 224 (105 males, 75.5%; 119 females, 73.9%) were found with unhealthy gums, 210 (99 males, 71.2%; 111 females, 68.9%) with spongy gums and 14 (6 males, 4.3%; 8 females, 5.0%) with hypertrophied ones. Thus 74.7% of the attending cases were with unhealthy gums. From Tables A & B of Appendix I it is seen that 20.1 per cent of male Chetla students and 17.0 per cent of female Chetla students have unhealthy gums. There is practically no variation in percentage prevalences of unhealthy gums among males from the age-group 5-9 to the age-group 10-14, they being equal to 21.1 and 20.4 percentages respectively ($X^2 = 0.006$ with 1 d.f.). Similarly per cent prevalence (16.6) of unhealthy gums among the females of age-group 10-14 does not significantly differ from the percent prevalence (20.8%) of the same among the females of age-group 5-9 ($X^2 = 0.517$ with 1 d.f.). Within the age-group 5-9 or 10-14 percent prevalence of unhealthy gums among the males does not significantly differ from that of females (X^2 being equal to 0.072 and 1.004 with 1 d.f. respectively). If we restrict ourselves to spongy gums only, we observe that

(1) percent prevalences among the males do not differ from the age-group 5-9 (21.1) to the age-group 10-14 (18.4) ($X^2 = 0.539$ with 1 d.f.).

(2) percent prevalences among the females do not significantly differ from the age-group 5-9 (20.3) to the age-group 10-14 (14.8) ($X^2 = 1.282$ with 1 d.f.).

(3) Within the age-group 5-9 percent prevalences do not significantly differ from male (21.1) to female (20.3) ($X^2 = 0.151$ with 1 d.f.).

(4) Within the age-group 10-14 also per-cent prevalences do not significantly differ from male (18.4) to female (14.8) ($X^2=0.677$ with 1 d.f.).

But among those with unhealthy gums there is no male hypertrophied case with age less than 10 as against as many as 6 hypertrophied male cases in the age-group 10-14. Let us examine whether this is significant or not. For the purpose Table VII is constructed from the Tables A and B of appendix I.

in its prevalences among the males as well as among the females from the age-group 5-9 to the age-group 10-14 (4.3% to 5.4% in case of males and 5.5% to 6.2% in case of females). But none of the increases are significant (X^2's being equal to 1.495 and 0.053 respectively with 1 d.f.). Within the age-groups there is also no substantial change in the prevalences from male to female (4.3% in case of males and 5.5% in case of females; $X^2=0.395$ with 1 d.f.) although apparently prevalence is

Table VII

RELATION OF HYPERTROPHIED GUM PREVALENCE WITH AGE

Age-group	Male			Female			Both Sexes		
	Hyper-trophied	Not Hyper-trophied	Popln. at risk	Hyper-trophied	Not Hyper-trophied	Popln. at risk	Hyper-trophied	Not Hyper-trophied	Popln. at risk
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
5— 9	0	242	242	1	223	224	1	465	466
10—14	6	254	260	7	416	423	13	670	683
Total:	6	496	502	8	639	647	14	1135	1149

Following the procedure of exact treatment of 2 × 2 table indicated by Fisher (1944) we obtain 0.019 in case of males between age-groups 0-9 and 10-14, and 0.669 in case of females between the same age-groups as the probabilities of obtaining the observed sets or more extreme sets of frequencies which might have been observed. Prevalences among males and females do not differ significantly either within the age-group 5-9 (probability of obtaining the observed set being 0.481) or within the age-group 10-14 ($X^2=0.101$ with 1 d.f.). Overall prevalences (males and females together) differ very significantly from the age-group 5-9 to the age-group 10-14 (probability of obtaining the observed set being 0.007).

(iii) *Prevalence of Abnormal Occlusion :*

Out of the 300 cases (139 males, 161 females), 65 cases (26 males, 18.7%; 39 females, 24.2%) were found with abnormal occlusion. Thus 21.7 per cent of the attending cases were abnormal occlusion cases. From Table A & B of Appendix I it is seen that 5.4 per cent of male Chetla students and 5.7 per cent of female Chetla students have abnormal occlusion. There is slight increase slightly more in case of females. Within the age-group 10-14 the prevalences among males and females are practically identical they being respectively 6.1% and 6.2% ($X^2=0.002\%$ with 1. d.f.).

(iv) *Prevalence of Hypocalcified Enamel :*

Out of the 300 cases (139 males, 161 females), only 10 cases (5 males; 3.6% and 5 females; 3.1%) were found with hypocalcified enamel. Thus 3.3 per cent of the attending cases were hypocalcified enamel cases. From Tables A & B of appendix I it may be seen that only 0.77 per cent of male Chetla students as against 0.67 per cent of female Chetla Students are with hypocalcified enamel. But all the male cases and 60 per cent (3 out of 5) of the female cases were found among those with ages less than 10. In case of females also there was no case with age above 10.

Following the procedure of exact treatment of 2 × 2 table indicated by Fisher (1944) we observe that the prevalence rate of 1.75 among the males of 5-9 group as against 0 rate found amongst males in the age-group 10-14 may be regarded as significant ($p=0.053$). In case of females we observe that the 1.44 per cent prevalence found within the age-group

5-9 cannot be regarded as significantly higher than the 0.37 per cent prevalence within the age-group 10-14 ($p=0.229$). Prevalences cannot be regarded as diffent from one sex to another either within the age-group 5-9 ($p=0.542$) or within the age-group 10-14 ($p=0.383$).

5. Co-prevalences of the Diseases

So far we have considered the prevalences of the diseases in isolation. That is we have not yet studied how prevalence of one disease is associated with the prevalences of the other in the same group. Here we propose to examine the question of the co-prevalences of tooth and gum diseases.

All the ten hypocalcified enamel cases were found with normal occlusion. But in view of the smallness of the data this fact cannot be regarded as significant ($p=0.578$). The distribution of the ten cases according to the condition of gum and the amount of caries they had are shown in Table VIII.

From the study of Table IX we lead to following observations:

(1) Although 83.8 per cent of the male caries cases (93 out of 111) and 83.6 per cent of the female caries cases (102 out of 122) have normal occlusion, only 22.5 per cent of males (93 out of 494) and 15.4 per cent of females (102 out of 663) with normal occlusion as against 69.2 per cent of males (18 out of 26) and 51.3 per cent of females (20 out of 39) with abnormal occlusion have caries. This fact is very significant to show that prevalence of caries is highly associated with abnormal occlusion in case of both males ($X^2=34.535$ with 1 d.f.) and females ($X^2=30.535$ with 1 d.f.). Per cent prevalences of male and female abnormal occlusion cases with caries work out as 3.46 and 2.85 respectively.

(2) 0.48 per cent of males (2 out of 415) and 1.54 per cent of females (9 out of 583) with healthy gums as against 22.9 per cent of males (24 out of 105) and 25.2 per cent of females (30 out of 119) with unhealthy gums have abnormal occlusion. These show that abnormal occlusion is highly associated with unhealthy gums in case of both males ($p=10^{-15}\times 3.84$) and females ($X^2=100.03$ with 1 d.f.). Per cent prevalence of males and females with both unhealthy and abnormal occlusion work out as 4.62 and 4.27 respectively.

(3) Within the cases with unhealthy gums, 50.0 per cent of males (3 out of 6) and 50.0 per cent of females (4 out of 8) with hypertrophied gums and 21.2 per cent of males (21 out of 99) and 23.4 per cent of females (26

Table VIII

DISTRIBUTION OF THE TEN HYPOCALCIFIED CASES BY SEX AND ACCORDING TO OTHER DISEASE CONDITIONS

Condition of gum	Sex	Amount of caries								No. of caries cases	Av. amount of Caries per	
		0	2	3	4	7	9	10	Total		Caries case	Hypocalcified case
(1)	(2)											
Healthy:	Male	2	—	—	—	1	—	—	3	1	7.00	2.33
Spongy:	Male	—	—	—	—	1	—	1	2	2	8.50	8.50
	Female	—	1	1	1	—	1	1	5	5	5.60	5.60
	Both sexes together	—	1	1	1	1	1	2	7	7	6.43	6.43

From the Table VIII it may be seen that neither the variation in the amount of caries from healthy to spongy groups of hypocalcified cases is of any importance ($F=1.406$ with $n_1=2$, $n_2=6$) nor the difference in the average amounts of caries per hypocalcified case is of any significant order ($t=1.661$ with 8 d.f.).

In order to study the prevalence of caries, unhealthy gums and abnormal occlusion conjointly (irrespective of the fact whether they are hypocalcified or not) the 300 cases by sex are factorially distributed in Table IX in summary form.

Table IX

DISTRIBUTION OF 300 (THREE HUNDRED) DENTAL CLINIC CASES BY SEX AND ACCORDING TO THE CONDITIONS OF GUM AND OCCLUSION AS WELL AS BY AMOUNT OF CARIES

Condition of gum	Condition of Occlusion	Total no. of cases		Total no. of caries cases		Av. amount of Caries per caries Case		Corrected sum of squares for caries.	
		Male	Female	Male	Female	Male	Female	Male	Female
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Healthy:	Normal ..	32*	33*	23	28	3.57	2.46	77.65	56.96
	Abnormal ..	2	9	1	6	2.00	2.83	—	22.83
	Total:	34	42	24	34	3.50	2.53	80.00	80.47
Spongy:	Normal ..	78	85	68	73	3.84	3.85	549.22	381.34
	Abnormal ..	21	26	16	12	4.19	4.25	62.44	78.25
	Total:	99	111	84	85	3.91	3.91	613.24	461.25
Hypertrophied:	Normal ..	3	4	2	1	5.00	4.00	18.00	—
	Abnormal ..	3	4	1	2	2.00	3.00	—	2.00
	Total:	6	8	3	3	4.00	3.33	24.00	2.67
Total Unhealthy:	Normal ..	81	89	70	74	3.87	3.85	569.84	381.36
	Abnormal ..	24	30	17	14	4.06	4.07	66.94	82.93
	Total:	105	119	87	88	3.91	3.89	637.26	464.86
Total:	Normal ..	113	122	93	102	3.80	3.47	649.12	477.41
	Abnormal ..	26	39	18	20	3.94	3.70	70.94	112.20
	Total:	139	161	111	122	3.82	3.51	720.40	941.31

*We have already estimated 520 males and 702 females as the population from which the 300 cases (139 males and 161 females) were drawn. Therefore for applying any test one should take 520−139+32=413 males and 702−161+33=574 females instead of 32 and 33 respectively as males and females with healthy gum and normal occlusion.

out of 111) with spongy gums have abnormal occlusion. These show that abnormal occlusion is slightly more associated with hypertrophied gums than with spongy gums in case of both males ($p = 0.1309$) and females ($p=0.1068$) but the differences are not of statistical importance.

(4) 5.78 per cent of males (24 out of 415) and 5.83 per cent of females (34 out of 583) with healthy gums, and 82.9 per cent of males (87 out of 105) and 72.1 per cent of females (88 out of 119) with unhealthy gums were found with caries. These show, inspite of the fact that 21.6 per cent of carious males (24 out of 111) and 27.9 per cent of carious females (34 out of 122) were with healthy gums, that prevalences of caries are highly significantly associated with unhealthy gums in case of both males ($X^2=291.930$ with 1 d.f.) and females ($X^2=314.640$ with 1 d.f.). This is also true if the effect of abnormal occlusion is eliminated by restricting the study within the group of normal occlusion only. Within the last mentioned group it is found that 86.4 per cent (70 out of 81) of the males and 83.2 per cent (74 out of 89) of the females with unhealthy gums as against 5.6 per cent (23 out of 413) of the males and 4.9 per cent (28 out of 574) of the females with healthy gums have carious teeth. These show that even within the cases with normal occlusion prevalences of caries are significantly associated with unhealthy gums in case of both males ($X^2=284.403$ with 1 d.f.) and females ($X^2=356.607$ with 1 d.f.).

(5) Within the cases of unhealthy gums, 84.9 per cent of males (84 out of 99) and 76.6 per cent of females (85 out of 111) with spongy gums, and 50.0 per cent of males (3 out of 6) and 37.5 per cent of females (3 out

of 8) with hypertrophied gums had carious teeth. These show that carious cases are associated more with spongy gums than with hypertrophied gums in case of both males ($p=0.061$) and females ($p=0.028$). In fact 96.6 per cent (84 out of 87) of carious males with unhealthy gums and 96.6 per cent (85 out of 88) of carious females with unhealthy gums belong to the group of spongy gums.

(6) Per cent prevalences of males and females with unhealthy gum, abnormal occlusion and carious teeth work out as 3.27 and 1.99 respectively.

(7) Leaving out the trivial cases with few observations it may be seen that in general in both the sexes average amount of caries per caries case is found more among those with unhealthy gums than among those with healthy ones, and among those with abnormal occlusion than among those with normal occlusion. Difference between average amounts of caries per caries case with healthy gums and normal occlusion, and with spongy gums and abnormal occlusion is 0.623 in case of males and 1.786 in case of females. The latter difference is significant at 1% level ($t=2.753$ with 38 d.f.) inspite of the fact that the mean sum of squares 7.1136 (of caries) for the females with spongy gum and abnormal occlusion is significantly different (at 1% level) from the mean sum of squares 2.1096 for females with healthy gum and normal occlusion ($F=3.372$ with $n_1=11$, $n_2=27$).

The above observations are from table IX in which analyses have been presented separately for male and female, combining all age-groups. But we have already found age to be a significant factor rather than sex. In fact prevalence of caries, spongy gums and hypocalcified enamel show downward trend with age whereas the prevalences of abnormal occlusion and hypertrophied gums show upward trend with age. In this background it is interesting to examine how the relations observed in Table IX behave when analyses are carried out in the different age-groups. Such analyses (for both sexes combined) are presented in Table C of Appendi-I. Study of this table shows that

(i) 23.6 per cent in the age-group 5-9 (105 out of 445) and 13.3 per cent in the age-group 10-14 (85 out of 640) of the children with normal occlusion as against 76.2 per cent in the age-group 5-9 (16 out of 21) and 48.8 per cent in the age-group 10-14 (21 out of 43) of the children with abnormal occlusion have caries. These show that prevalence of caries is highly associated with abnormal occlusion in both the age-group 5-9 ($X^2=26.185$ with 1 d.f.) and 10-14 ($X^2=453.921$ with 1 d.f.). Both the decreases in the percentages of carious cases from 23.6 in the age-group 5-9 to 13.3 in the age-group 10-14 for those with normal occlusion and from 76.2 in the age-group 5-9 to 48.8 in the age-group 10-14 for those with abnormal occlusion are noteworthy; but in the former case ($X^2=18.624$ with 1 d.f.) the decrease is significantly sharp whereas in the later case ($X^2=3.279$ with 1 d.f.) it is not. Per cent prevalences of abnormal occlusion cases with caries work out as 3.4 in the age-group 5-9 and 3.1 in the age-group 10-14.

(ii) In the age-group 5-9, 1.9 per cent cases (7 out of 370) with healthy gums as against 14.6 per cent cases (14 out of 96) with unhealthy gums, and in the age-group 10-14, 0.72 per cent cases (4 out of 558) with healthy gums as against 31.2 per cent (39 out of 125) with unhealthy gums have abnormal occlusion. These show that abnormal occlusion is highly associated with unhealthy gums in both the age-groups 5-9 ($X^2=25.657$ with 1 d.f.) and 10-14 ($X^2=155.730$ with 1 d.f.), the association being significantly stronger in the later age-group than in the former ($X^2=7.338$ with 1 d.f.). Percentage of abnormmal occlusion among those with healthy gums decreases from 1.9 in the age-group 5-9 to 0.72 in the age-group 10-14. But this decrease is not statistically significant ($X^2=1.715$ with 1 d.f.). Per cent prevalences of the cases with unhealthy gums and abnormal occlusion work out as 3.0 in the age-group 5-9 and 5.7 in the age-group 10-14.

(iii) Within the group of unhealthy gums of the age-group 10-14, 53.8 per cent of the cases with hypertrophied gums (7 out of 13) as against 28.6 per cent of the cases with spongy gums (32 out of 112) have abnormal occlusion. This shows that in the age-group 10-14 abnormal occlusion is associated more with hypertrophied gums than with spongy gums. But the difference is not statistically significant. ($X^2=0.972$ with 1 d.f.).

(iv) 10.0 per cent in the age-group 5-9 (37 out of 370) and 3.2 per cent in the age-group 10-14 (18 out of 558) of the cases with healthy gums as against 85.2 per cent in the age-group 5-9 (84 out of 96) and 70.4 per cent in the age-group 10-14 (88 out of 125) of the cases with unhealthy gums have carious teeth. These show that carious teeth are significantly associated with unhealthy gums in both the

age-groups 5-9 ($X^2=234.139$ with 1 d.f.) and 10-14 ($X^2=346.365$ with 1 d.f.).

(v) Within the cases of unhealthy gums in the age-group 5-9 there is only one case of hypertrophied gum, which is free from caries as against 84.4 per cent of the cases with spongy gums (84 out of 95) having caries. In the age-group 10-14, 73.2 per cent of the cases with spongy gums (82 out of 112) as against 46.2 per cent of the cases with hypertrophied gums (6 out of 13) have carious teeth. These show that carious teeth are associated more with spongy gums than with hypertrophied gums in both the age-groups although the difference in association is found not of significant order in any of the age-groups 5-9 ($X^2=2.898$ with 1 d.f.) and 10-14 ($p=0.125$).

(vi) In the age-group 5-9, 9.5 per cent cases with spongy gums (9 out of 95) as against 1.9 per cent cases with healthy gums (7 out of 370) have both abnormal occlusion and carious teeth. This shows that in the age-group 5-9 co-prevalence of caries and abnormal occlusion are significantly more among those with spongy gums than among those with healthy gums ($X^2=10.890$ with 1 d.f.). In the age-group 10-14, 16.1 per cent of the cases with spongy gums (18 out of 112) and 23.1 per cent of the cases with hypertrophied gums (3 out of 13) as against 0.0 per cent of the cases with heathy gums (0 out of 558) have both abnormal occlusion and carious teeth. Thus in the age-group 10-14 co-prevalence of caries and abnormal occlusion is also significantly more among those with spongy gums or hypertrophied gums than among those with healthy gums ($p=3.089\times10^{-15}$ and $p=9.226\times10^{-6}$).

(vii) In both the age-groups average amount of caries per caries case is more among those with unhealthy gums than among those with healthy gums, and within the group of spongy gums it is more among those with abnormal occlusion than among those with normal occlusion. Difference between average amounts of caries per caries case with healthy gums and normal occlusion, and with spongy gums and abnormal occlusion is 1.878 in the age-group 5-9 and 0.278 in the age-group 10-14. The first difference is significant. ($t=2.741$ with 37 d.f.).

6. Role of Some Associated Factors in Relation to Tooth and Gum Diseases

While discussing the prevalences of tooth and gum diseases questions naturally arise about the role of cleaning teeth, mouth breathing, etc. and the relation of oral and dental condition with the specific prevalences.

For valid study of such roles or relations it is necessary to have the relevant information regarding all the school children wherefrom the dental clinic cases were drawn. That is, in order to study the valid relation between (i) habit of cleaning teeth, and dental and oral condition, or gum condition or amount of caries, (ii) dental and oral condition, and amount of caries, or gum condition, (iii) mouth breathing and gum condition or occlusion etc. it is not sufficient to have particulars about the affected persons only but it is also necessary to collect relevant information regarding all the subjects at risk. In our case relevant particulars are available only for the 300 dental clinic cases. These can only give a restricted but of course valuable picture of the actual situation. Before we proceed to bring out that restricted picture let us discuss with reference to a particular relation which might be observed among the 300 dental clinic cases, the different implications or meanings they may have for the actual but unknown situation in the population. This discussion will help us to understand the necessity and mode of planning for future study.

(i) *Implications of an observed relation among affected persons for the population from which the affected persons are drawn:*

Let us consider about the relation of the habit of regularly cleaning teeth with the prevalence of tooth and gum diseases. In the first instance it is to be mentioned that about the habits and practices of the subjects say for an instance the habit of cleaning teeth regularly or irregularly, the statements of the persons concerned are accepted as true and in general they are not the results of constant and continuous observations. Subject to this limitation straightforward study of the records of the affected persons might lead to one of the following three observations:

(a) All or most of them might not have the habit of cleaning teeth regularly.
(b) All or most of them might have the habit of cleaning teeth regularly.
(c) Percentage of persons having or not having the habit of cleaning teeth regularly might be about fifty.

In case of observation (a) one feels confident about the correctness of data because the relation among the dental cases shows what we intuitionally expect to be true in the

population although strictly speaking there is no rational basis for it. From the finding it is not possible to infer any of the following:

(1) that the affected persons were affected because of their habit of not regularly cleaning teeth. This is because it may be that majority of the affected persons gave up the habit of cleaning teeth regularly after being affected as they have found that their way of cleaning teeth was meaningless as that could not prevent the onset and spread of the disease. They might have also a feeling that in fact it is the habit of cleaning teeth regularly which might be responsible for the diseases.

(2) that all or most of the persons who were free from the diseases were of the habit of cleaning their teeth regularly. This is because it may be that some factors other than the habit of cleaning teeth regularly have saved them from being attacked with the diseases.

But the result is useful in the following two ways:

(1) We know the percentage of the diseased persons who do not have the habit of cleaning teeth regularly, which habit is very essential for the healthy preservation of tooth and gum (which knowledge we have from the controlled studies and scientific reasoning of other scientists in the field).

(2) The knowledge helps us to know the volume of the problem of making the people conscious regarding the habit of cleaning teeth regularly.

In case of observation (b) one feels on the face of it as if the records have not been properly collected (which in fact need not be true). But the finding is useful as we know that at least the majority of the affected persons are of the habit of cleaning their teeth regularly which habit is essential not only for the good health of tooth and gum but also for prevention of some stomach troubles, although from the finding it is not possible to infer any of the following:

(1) That all or majority of the population from which the cases had been drawn are of the habit of cleaning their teeth regularly.
This is because the population might really be in the habit of not cleaning teeth regularly. It is the affected persons mostly who might have developed the habit of cleaning the teeth regularly after contracting the disease or the diseases.

(2) That the habit of cleaning tooth regularly has no effect on the incidence of tooth and gum diseases at least in the population under study. This is because it may be that so far as the affected persons are concerned or even the whole population, the method of cleaning itself is defective.

In case of observation (c) usually workers have two types of feelings in their minds. First, the data is not large enough to show the good effect of the habit of cleaning teeth regularly. Secondly, the usual one that as if the data has not been collected properly. But in fact the factors already indicated while discussing the observation (a) and (b) might be in operation, either singly or jointly.

From the above discussions the limitations of drawing straightforward conclusions from the records of the affected persons only are clear. The question now arises whether apart from the straightforward conclusions indicated in the discussion it is possible to extract some specific information regarding the role of the habit of cleaning teeth regularly from the records of the affected persons, which information can be obtained from those records only. The answer to the question is in the affirmative. I have in view what may be termed as 'differential role or relation' of the habit of cleaning teeth in the prevalence of tooth and gum diseases. Let me explain what I mean by the 'differential role or relation'. Suppose we have faithful records of all the affected persons of the population under study, giving complete information regarding (i) unhealthy gums, (ii) carious teeth and (iii) the habit of cleaning teeth. The information what we want to convey in answering the question 'whether the habit of cleaning teeth differ significantly among the three groups—one with unhealthy gums only, the second with carious teeth only, and the third with both unhealthy gums and carious teeth' is the 'differential relation' of the habit of cleaning teeth. To study this type of 'differential relation' the records of the affected persons only *are necessary and sufficient.* This is very important.

(ii) *Picture in General:*

To start with let us examine whether the *stated* habit

of mouth breathing and *observed* dental and oral conditions among the dental clinic cases change with age and sex. With regard to the observed dental and oral conditions of the dental clinic cases it may be mentioned that the cases had been classified by the Dentist into 'good', 'fair' and 'bad' on the basis of his clinical observations of the overall picture of the oral cavity (covering teeth, gums, tongue, cheek and palate) of the individuals examined. The relevant information is furnished in Table X.

From Table X it is seen that 74.1 per cent of the male affected persons and 85.7 per cent of the female affected persons stated that they were of the habit of cleaning teeth regularly. These may lead to the conclusion that habit of cleaning teeth regularly have no effect on the prevalences of tooth and gum diseases if interpreted uncritically. But really perhaps these indicate that either the affected persons adopted the habit after contracting the disease or diseases, or their methods of cleaning were defective or they did not always state the true habit. The real situation can be brought out only by the study of the population at risk. The stated habit of cleaning teeth regularly increased from 67.1 per cent in the age-group 5-9 to 82.8 per cent in the age-group 10-14 in case of males, and from 76.8 per cent in the age-group 5-9 to 93.2 per cent in the age-group 10-14 in case of females. The latter increase is significant at 1% level ($X^2=7.297$ with 1 d.f.) and the former one is nearly significant at 5% level ($X^2=3.627$ with 1 d.f.). This differential increase shows that the subjects become more conscious about the habit of cleaning teeth regularly with the increase in age. The awakening of consciousness is more rapid among the females than among the males within the age-groups under study. In fact the level of consciousness as revealed by the stated habit of cleaning teeth regularly in the age-group 10-14 by females is almost significantly greater than the same by males ($X^2=3.063$ with 1 d.f.). Of course even within the age-group 5-9 this consciousness is found more among the females than among the males although difference is not statistically significant. ($X^2=1.223$ with 1 d.f.).

It may be of some interest to know what were used to clean the teeth by those who stated the habit of cleaning teeth regularly. Of course in absence of information about the time and real mode of cleaning this knowledge is not sufficiently informative specially in view of the following:

(a) The aim of oral hygiene, as carried out by the individual, is to remove all particles of food from the mouth after eating and drinking.

(b) Since bacteria can begin to act on food particles within $1\frac{1}{2}$ minutes of eating, oral hygiene to be effective, must be undertaken at once. Delay is dangerous to dental health.. As a minimum the teeth should be brushed after breakfast, after lunch and most important of all, after the last food or drink at night. (Stones)

(c) In India just after taking any type of food or drink, and after attending nature's call, at any time, washing of hands and mouth is obligatory as religious taboo, especially among the Hindus. But brushing of teeth is mostly done after eating and drinking, with fingers instead of by a pasted brush. By habit of cleaning it is generally taken as the habit of first cleaning in the morning after leaving bed (and preferably after attending the nature's call).

In view of the above and for smallness of data of the users of tooth brush and *Datan*. Tables XI and XII are given for general information only. No attempt is made in this article to study the differential effects they may be associated with.

Table XI shows that a very high percentage of the students use only fingers for cleaning their teeth regularly. From Table XII it may be noted that average amount of caries per caries case is more among the finger users than among the toothbrush users. But the difference is not significant in case of either males ($t=0.785$ with 73 d.f.) or females ($t=1.429$ with 99 d.f.). Average amount of caries per caries case among the *datan* users shows peculiar results. The average in case of males is almost significantly less than the average amount of caries per caries case among the finger users ($t=1.910$ with 69 d.f.) whereas in case of females it is higher than the latter average. This peculiarity may be due to the fact that female students are less expert in using *datans* than the male students. Scrutiny of the basic data shows that the two female students who were using datans were of six years of age

Table X

RELATION OF CLEANING TEETH, MOUTH BREATHING AND DENTAL AND ORAL CONDITION WITH AGE AND SEX

Items of information	Nature of information		AGE IN YEARS									
			MALE					FEMALE				
			—5	5—9	10—14	15 and above	All ages	—5	5—9	10—14	15 and above	All ages
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Habit of cleaning teeth:	*Regular*	No.	—	49	53	1	103	—	53	82	3	138
		%	—	67.12	82.81	100.00	74.10	—	76.81	93.18	100.00	85.71
	Irregular	No.	1	24	11	—	36	1	16	6	—	23
		%	100.00	32.88	17.19	—	25.90	100.00	23.19	6.82	—	14.29
Habit of mouth breathing:	*Yes*	No.	1	42	27	—	70	—	25	39	2	66
		%	100.00	57.53	42.19	—	50.36	—	36.23	44.32	66.67	40.99
	No	No.	—	31	37	1	69	1	44	49	1	95
		%	—	42.47	57.81	100.00	49.64	100.00	63.77	55.68	33.33	59.01
Dental and Oral Condition:	*Good*	No	—	11	6	—	17	—	15	14	1	30
		%	—	15.07	9.38	—	12.23	—	21.74	15.91	33.33	18.63
	Fair	No.	1	33	29	1	64	—	41	46	2	89
		%	100.00	45.21	45.31	100.00	46.04	—	59.42	52.27	66.67	55.28
	Bad	No.	—	29	29	—	58	1	13	28	—	42
		%	—	39.73	45.31	—	41.73	100.00	18.84	31.82	—	26.09
	Total:		1	73	64	1	139	1	69	88	3	161

Table XI

DISTRIBUTION OF DENTAL CLINIC CASES WITH REGULAR HABIT OF CLEANING TEETH ACCORDING TO SEX, DENTAL AND ORAL CONDITION AND THE ARTICLES USED FOR CLEANING

Dental and Oral condition	Articles used for cleaning teeth	Male		Female		Total	
		No.	% (p.c.)	No.	% (p.c.)	No.	% (p.c.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Good	Toothbrush ..	2	13.33	8	33.33	10	25.64
	Datan ..	1	6.67	—	—	1	2.56
	Finger ..	12	80.00	16	66.67	28	71.79
	Total:	15	100.00	24	100.00	39	99.99
Fair	Toothbrush ..	6	13.04	12	15.00	18	14.29
	Datan ..	1	2.17	2	2.50	3	2.38
	Finger ..	39	84.78	66	82.50	105	83.33
	Total:	46	99.99	80	100.00	126	100.00
Bad	Toothbrush ..	3	7.14	6	17.65	9	11.84
	Datan ..	1	2.38	1	2.94	2	2.63
	Finger ..	38	90.48	27	79.41	65	85.53
	Total:	42	100.00	34	100.00	76	100.00
Total:	Toothbrush ..	11	10.68	26	18.84	37	15.35
	Datan ..	3	2.91	3	2.17	6	2.49
	Finger ..	89	86.41	109	78.99	198	82.16
	Total:	103	100.00	138	100.00	241	100.00

Table XII

RELATION OF THE AMOUNT OF CARIES WITH THE STATED HABIT OF CLEANING TEETH REGULARLY WITH TOOTHBRUSH, DATAN AND FINGER

Articles used for cleaning teeth	Male			Female		
	Number with caries	Av. amount of caries per car. c	Corrected sum of squares	No. with with caries	Av. amount of caries per car. c	Corrected sum of squares
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Toothbrush	7	3.14	34.8571	17	2.65	43.8824*
Datan	3	1.33	0.6667	2	4.50	0.5000
Finger	68	3.85	344.5294	84	3.45	400.8095
Total:	78	3.69	—	103	3.34	—

whereas the ages of the three male students were 8, 9 and 10.

With respect to the stated habit of mouth breathing it may be observed that 50.4 per cent of males as against 41.0 per cent of females were of this habit. This difference, although substantial is not statistically significant (X^2=2.281 with 1 d.f.). But the difference between the percentages of male and female mouth-breathers within the age-group 5-9 is significant at 5% level (X^2=5.633 with 1 d.f.). The percentage of male mouth-breathers falls from 57.5 in the age-group 5-9 to 42.2 in the age-group 10-14. In case of females strangely enough it increases from 36.2 per cent in the age-group 5-9 to 44.3 per cent in the age-group 10-14. The fall in case of males and the increase in case of females, however, are not significant (X^2s being equal to 2.628 and 0.739 respectively with 1 d.f.).

In the light of the above discussion, it is interesting to observe that so far as dental and oral conditions are concerned males and females taken together, 15.7 per cent could be classified as good, 51.0 per cent as fair (giving 66.7 per cent as not bad) and 33.3 per cent as bad. But the picture is significantly different (at 2% level) for the different sexes (X^2=7.921 with 2. d.f.). In case of males 12.2 per cent were of good dental and oral condition, 46.0 per cent of fair condition (giving 58.3 per cent as of not bad condition) and 41.7 per cent of bad condition as against 18.6 per cent of good condition, 55.3 per cent of fair condition (giving 73.9 per cent as of not bad condition) and 26.1 per cent of bad condition. In cases of both males and females deterioration in the condition is observed from the age-group 5-9 to the age-group 10-14. This deterioration is more marked in case of females than in case of males (X^2 being 3.559 and 1.142 respectively with 1 d.f.).

In table XIII we present the overall relation between the stated habit of cleaning teeth and the observed dental and oral condition.

Table XIII

OVERALL RELATION BETWEEN THE HABIT OF CLEANING TEETH, AND DENTAL AND ORAL CONDITION

Dental and Oral condition	*Habit of cleaning teeth*											
	MALE						FEMALE					
	Regular		Irregular		Total		Regular		Irregular		Total	
	No.	% (p.c.)	No.	% (p.c.)	No.	% (p.c.)	No.	% (p.c.)	No.	% (p.c.)	No.	% (p.c.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Good ..	15	14.56	2	5.56	17	12.23	24	17.39	6	26.09	30	18.63
Fair ..	46	44.66	18	50.00	64	46.04	80	57.97	9	39.13	89	55.28
Bad ..	42	40.78	16	44.44	58	41.73	34	24.64	8	34.78	42	26.09
Total:	103	100.00	36	100.00	139	100.00	138	100.00	23	100.00	161	100.00

From table XIII it may be noted that in case of males, practically there is no difference in the habit of cleaning teeth between the two groups—one with dental and oral condition bad and the other with not bad (X^2=0.035 with 1 d.f.). By applying exact treatment for 2 × 2 table it is also seen that the change in the cleaning habit, between the two groups with good and fair conditions is also not significant (p=0.140). In case of females also no significant relation is observed between the cleaning habits and either the three categories of dental and oral conditions (good, fair and bad) (X^2=2.836 with 2 d.f.) or the two categories of bad and not bad of the dental and oral conditions (X^2=0.592 with 1 d.f.).

Let us now proceed to present our findings regarding the habit of cleaning teeth, mouth breathing, dental and oral condition in relation to the prevalences of tooth and gum diseases.

(iii) *Habit of clearing teeth, mouthbreathing, dental and oral condition, and the diseases:*

From the data, as already indicated, we cannot draw straight-forward valid conclusions

regarding the relation between caries prevalence and the stated habit of cleaning teeth or mouthbreathing or observed dental and oral conditions. But we can study whether amount of caries varies with the practices or conditions. In Table XIV we present some results in this direction.

in the average amounts of caries per caries case do not show any significant relation except in case of females with good and fair dental and oral conditions. The average amount of caries per caries case of females with fair dental and oral conditions (3.836) is significantly higher (at 1 per cent level) than

Table XIV

RELATION OF THE AMOUNT OF CARIES WITH THE HABIT OF CLEANING TEETH WHEN OBSERVED DENTAL AND ORAL CONDITIONS ARE TAKEN INTO CONSIDERATION

Dental and oral condition	*Habit of cleaning teeth*					
	Male			Female		
	Regular	Irregular	Total	Regular	Irregular	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Good:						
No. with caries	9	2	11	18	6	24
Av. amount	3.778	2.000	3.455	2.000	2.833	2.208
Corrected sum of squares ..	23.555	2.000	30.729	20.000	22.834	45.960
Fair:						
No. with caries	35	16	51	61	6	67
Av. amount	3.314	3.750	3.451	3.820	4.000	3.836
Corrected sum of squares ..	167.541	81.000	250.624	289.010	10.000	299.199
Bad:						
No. with caries	34	15	49	24	7	31
Av. amount	4.059	4.800	4.286	3.125	6.143	3.806
Corrected sum of squares ..	199.886	214.400	420.003	100.625	44.855	194.833
Total:						
No. with caries	78	33	111	103	19	122
Av. amount	3.692	4.121	3.820	3.340	4.421	3.508
Corrected sum of squares ..	400.618	315.517	720.405	457.10)	114.636	590.490

From table XIV we observe that in general except only in case of males with dental and oral condition good) average amount of caries per caries case is more among those with irregular habits than among those with regular habits of cleaning teeth. In case of females with bad dental and oral conditions average amount of caries per caries case is significantly higher at 1 per cent level ($t = 3.137$ with 29 d.f.) for those with irregular habit (6.143) than for those with regular habit (3.125) of cleaning teeth. In other cases the differences observed are not of significant order. It is interesting to note that with respect to dental and oral conditions variations

the corresponding average for females with good dental and oral conditions (2.208) ($t = 3.431$ with 89 d.f.). This type of significant relation is also observed among the subgroup of females with regular habit of cleaning teeth ($t = 3.387$ with 77 d.f.). From table XV given below it may be noted that about 55 per cent of males with unhealthy gums had bad dental and oral conditions independent of their habits of cleaning teeth. But peculiarly enough, only 32.04 per cent of females with unhealthy gums and of the habit of regularly cleaning their teeth had bad dental and oral conditions. Why there is such a difference remains an open question.

Table XV

DISTRIBUTION OF THE STUDENTS WITH UNHEALTHY GUMS ACCORDING TO THE HABITS OF CLEANING TEETH, AND THE OBSERVED DENTAL AND ORAL CONDITIONS

Dental and oral condition	*Habit of cleaning teeth*											
	Male						Female					
	Regular		Irregular		Total		Regular		Irregular		Total	
	No.	% (p.c.)	No.	% (p.c.)	No.	% (p.c.)	No.	% (p.c.)	No.	% (p.c.)	No.	% (p.c.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Good ..	2	2.63	—	—	2	1.90	2	1.94	1	6.25	3	2.52
Fair ..	32	42.11	13	44.83	45	42.86	68	66.02	7	43.75	75	63.03
Bad ..	42	55.26	16	55.17	58	55.24	33	32.04	8	50.00	41	34.45
Total: ..	76	100.00	29	100.00	105	100.00	103	100.00	16	100.00	119	100.00

We shall now study the differential relation of the habit of cleaning teeth with respect to unhealthy gums and caries. Relevant information for the study is furnished in Table XVI.

From Table XVI it may be noted that the percentage of differently affected persons do not vary substantially from the group of regular habit to the group of irregular habit of cleaning teeth except in case of males with unhealthy gums but with no caries, and with unhealthy gums as well as caries. In this later case the variation is almost significant ($p=0.053$) to show that caries flourish more in the group with irregular habit than in the group with regular habit of cleaning teeth. If we consider the average amount of caries per caries case we observe that only in case of females with unhealthy gums it increases significantly (at 5 per cent level) from 3.667 in the group of regular habit to 5.154 in the group of irregular habit of cleaning teeth ($t=2.188$ with 86 d.f.).

Table XVI

DISTRIBUTION OF THE DISEASED CASES TO SHOW THE DIFFERENTIAL RELATION OF THE HABIT OF CLEANING TEETH

Categories of the diseased persons	*Habit of cleaning teeth*					
	Male			Female		
	Regular	Irregular	Total	Regular	Irregular	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
With unhealthy gums but no caries:						
Number	17	2	19	28	3	31
Percentage	18.09	5.71	14.73	21.37	13.64	20.26
With healthy gums and caries:						
Number	18	6	24	28	6	34
Percentage	19.15	17.14	18.60	21.37	27.27	22.22
Average amount of caries	3.389	3.833	—	2.464	2.833	—
Corrected sum of squares	46.278	32.833	—	156.964	22.833	—
With unhealthy gums and caries:						
Number	59	27	86	75	13	88
Percentage	62.77	77.14	66.67	57.25	59.09	57.51
Average amount of caries	3.783	4.185	—	3.667	5.154	—
Corrected sum of squares	352.183	282.074	—	370.667	69.692	—
Total:						
Number	94	35	129	131	22	153
Percentage	100.01	99.99	100.00	99.99	100.00	99.99

Next, we shall examine the differential relation of mouthbreathing with abnormal occlusion. Here, to see whether mouthbreathing is likely to be responsible at least partially for abnormal occlusion we shall restrict our study to two things only. First, we shall examine whether percentage of mouth breathers among the persons with abnormal occlusion increases or decreases with age. Secondly whether there is any relation between mouth breathing and abnormal occlusion in the groups of carious cases or in the groups of unhealthy gums.

Table XVII

DISTRIBUTION OF STUDENTS WITH ABNORMAL OCCLUSION BY AGE, SEX AND HABIT OF MOUTH BREATHING

Age groups	*Mouth Breathing*									
	Male					Female				
	Yes		No		Total	Yes		No		Total
	No.	% (p.c.)	No.	% (p.c.)		No.	% (p.c.)	No.	% (p.c.)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
5— 9	6	66.67	3	33.33	9	8	66.67	4	33.33	12
10—14	9	52.94	8	47.06	17	15	55.56	12	44.44	27
Total:	15	57.69	11	42.31	26	23	58.97	16	41.03	39

From table XVII it may be noted that in case of both males and females the habit of mouthbreathing by those with abnormal occlusion decreases with increase in age. But the decrease is not significant in case of either males or females ($p=0.413$ and 0.390 respectively).

From table XVIII it appears that there is no relation between mouthbreathing and abnormal occlusion in case of either carious males ($X^2=0.0016$ with 1 d.f.) or carious females ($X^2=0.0087$ with 1 d.f.).

From table XIX it appears that there is also no relation between mouthbreathing and abnormal occlusion in case of either males with unhealthy gums ($X^2=0.8902$ with 1 d.f.) or females with unhealthy gums ($X^2=0.0761$ with 1 d.f.).

Table XVIII

DISTRIBUTION OF CARIOUS STUDENTS BY HABIT OF MOUTH BREATHING AND NATURE OF OCCLUSION

Mouth breathing		*Nature of Occlusion*					
		Male			Female		
		Normal	Abnormal	Total	Normal	Abnormal	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Yes:	No.	49	11	60	44	9	53
	% (p.c.)	81.67	18.33	100.00	83.02	16.98	100.00
No:	No.	44	7	51	58	11	69
	% (p.c.)	86.47	13.53	100.00	84.06	15.94	100.00
Total:	No.	93	18	111	102	20	122

7. Summary

(1) On the whole 25.0 per cent school children of Chetla suffer from some

Table XIX

DISTRIBUTION OF STUDENTS WITH UNHEALTHY GUMS BY HABIT OF MOUTH BREATHING AND NATURE OF OCCLUSION

mouth breathing		*Nature of occlusion*					
		Male			Female		
		Normal	Abnormal	Total	Normal	Abnormal	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Yes:	No.	44	15	59	38	13	51
	% (p.c.)	74.58	25.42	100.00	74.51	25.49	100.00
No:	No.	37	9	46	51	17	68
	% (p.c.)	80.43	19.57	100.00	75.00	25.00	100.00
Total:		81	24	105	89	30	119

sort of tooth and gum diseases, males suffering slightly more (26.6%) than the females (23.3%). In general, prevalence is more among the children of lower ages than among those of higher ages.

(2) 63.5 per cent of male students as against 80.0 per cent of female students who were found with some sort of tooth and gum diseases at the time of medical examination at the schools attended the Dental Clinic of the Urban Health Centre for detailed examinations. Thus attendance by female affected children is significantly more than by male affected children.

(3) 20.9 per cent of male students have caries, 18.9 per cent spongy gums, 1.2 per cent hypertrophied gums (in all 20.1 per cent unhealthy gums), 5.4 per cent abnormal occlusion and 0.8 per cent hypocalcified enamel. Similarly 17.5 per cent of female Chetla students have caries, 15.8 per cent spongy gums, 1.2 per cent hypertrophied gums (in all 17.0 per cent unhealthy gums), 5.7 per cent abnormal occlusion and 0.7 per cent hypocalcified enamel.

(4) In case of both males and females per cent prevalences of caries, spongy gums and hypocalcified enamel decrease with age whereas percent prevalences of hypertrophied gums and abnormal occlusion increase with age. In case of males the former three decrease from 27.5, 21.1, and 1.8 in the age-group 5-9 to 17.4, 18.4 and 0.0 respectively in the age-group 10-14, and the later two increase from 0.0 and 4.3 in the age-group 5-9 to 2.0 and 6.1 in the age-group 10-14. Similarly in case of females the former three decrease from 25.8, 20.3 and 1.4 in the age-group 5-9 to 14.6, 14.8 and 0.4 respectively in the age-group 10-14, the later two increase from 0.5 and 5.5 in the age-group 5-9 to 1.7 and 6.2 respectively in the age-group 10-14. The decreases in the prevalences of hypocalcified enamel in case of males, and caries cases in case of both males and females are statistically significant. In case of males or considering both the sexes together the increase in the prevalence of hypertrophied gums with age is also statistically significant.

(5) Average amount of caries per caries case is 3.8 for males and 3.5 for females. These amounts decrease from 4.4 and 3.7 in the age-group 5-9 to 2.9 and 3.3 respectively in the age-group 10-14. The decrease from 4.4 to 2.9 is statistically significant.

(6) Under the existing conditions, on the basis of a hypothesis (propounded) that 'once caries attacks teeth, if left uncared for, chance of its further spreading to a new tooth does not generally depend on the amount of caries already present' it can be shown that, chance of being attacked with caries is 223 in 1,000 in case of a male student, and 165 in 1,000 in case of a female student, the former being significantly higher

than the latter. Chance of spreading caries to new teeth of an affected child (male or female) is 75 in 100.

(7) Prevalence of caries cases is highly associated with abnormal occlusion in both the age-groups and in case of both males and females. The decrease in the percentage of carious cases (both sexes together) among those with normal occlusion is from 23.6 in the age-group 5-9 to 13.3 in the age-group 10-14, which is significantly sharp.

(8) Percentages of the cases with caries (both sexes together) for those with abnormal occlusion are 76.2 and 48.8 in the age-groups 5-9 and 10-14 respectively. These yield percent prevalences of the caries cases with abnormal occlusion (both sexes together) in the age-groups 5-9 and 10-14 as 3.4 and 3.1 respectively.

(9) Percent prevalences of the caries cases with abnormal occlusion are 3.5 in case of males and 2.9 in case of females.

(10) Prevalence of abnormal occlusion is highly associated with unhealthy gums in case of both males and females, and also in both the age-groups 5-9 and 10-14. This association is slightly more in case of hypertrophied gums than in case of spongy gums.

(11) Percent prevalences of the cases with unhealthy gums and abnormal occlusion are 4.6 in case of males and 4.3 in case of females, and taking both the sexes together 3.0 in the age-group 5-9 and 5.7 in the age-group 10-14.

(12) In case of both males and females, the prevalence of caries is highly associated with unhealthy gums, this association being more with those with spongy gums than with those with hypertrophied gums.

(13) Per cent prevalences of males and females with unhealthy gums, abnormal occlusion and carious teeth are 3.3 and 2.0 respectively.

(14) In general, in both the sexes average amount of caries per caries case is found more among those with unhealthy gums than among those with healthy ones, among those with abnormal occlusion than among those with normal occlusion.

(15) The level of consciousness for cleaning teeth regularly as revealed by the stated habit of patients is found significantly more among the females than among the males.

(16) Average amount of carries per caries case is more among the finger users than among the tooth-brush users.

(17) In general dental and oral conditions of females are found significantly better than those of males although slight deterioration in the conditions from the age-group 5-9 to the age-group 10-14 is found in case of both males and females.

(18) In case of both males and females no relation is found between the stated habits of cleaning teeth and the observed dental and oral conditions.

(19) In general within all the age-groups of different dental and oral conditions average amount of caries per caries case is found more among those with irregular habits (stated) than among those with regular habits (stated) of cleaning teeth but only in case of females with bad dental and oral conditions the difference is significant.

(20) The stated habit of cleaning teeth does not show any substantial relations with respect to unhealthy gums and caries cases except in case of males with unhealthy gums, among which caries cases show positive association with the habit of irregular cleaning.

(21) Considering average amount of caries per caries case it is observed that only in case of females with unhealthy gums it significantly increases from 3.667 in the group of regular habit to 5.154 in the group of irregular habit of cleaning teeth.

(22) In case of both males and females the habit of mouthbreathing by those with abnormal occlusion decreases with increase in age although the decreases are not of significant order. Within the group of either carious males or males with unhealthy gums or carious females or females with unhealthy gums there is no relation between mouthbreathing and abnormal occlusion. From these, one is led to surmise that abnormal occlusion has really no relation with mouthbreathing.

8. Conclusion

In conclusion we want to draw the attention of the readers to the following points which are to be kept in mind for proper assessment of the results obtained in the study:

(i) The school children medically examined are from a number of selected schools and not a sample selected randomly from all the school children of the area.

(ii) The nature and extent of tooth and gum diseases among the non-respondent 120 school children (out of 420 who were advised to attend the dental clinic) are not known. It may be that their conditions were less serious than the conditions of those who attended. It is also quite possible that some of them had taken medical assistance from elsewhere.

(iii) In view of the fact stated in (i) and (ii) it is not possible to state definitely how far the school children studied represent all the school children of Chetla area although from general knowledge of the Schools in the area it may be reasonably assumed that the school children studied form a fairly representative cross section of all the school children of the area.

(iv) How far the picture should have changed had all the 420 children advised by the School Health Clinic (out of 1683 medically examined at the schools) attended the Dental clinic or had all the 1683 children been examined by the Dental clinic itself remains an open question.

(v) Normal and abnormal occlusion had been based on Angle's classification only. The malocclusion cases were mostly protrusive jaw, close bite and open bite.

9. Acknowledgement

The author is grateful to Dr. N. Jungalwalla, Director, All India Institute of Hygiene and Public Health, Calcutta for his keen interest in the work, and the encouragement and advice received from him from time to time. He is also thankful to Dr. K. C. Patnaik, Associate Professor of Social and Preventive Medicine of the Institute -cum- acting Officer-in-Charge of the Urban Health Centre, Chetla for providing with necessary administrative facilities, to Dr. S. K. Sen Gupta, School Health Officer and Dr. B. C. Mitra, Dentist of the same centre for making available the relevant records for the study.

References

1. 'Dental health', edited by Prof. H. H. Stones under the auspices of the Dental Board of the United Kingdom (n.d.).

2. Sen, P. C., Seal, S. C., and Sankaran, G. (1945) —'A study of the nutritional status of a group of primary school children in a rural area of Bengal with special reference to the effects of "Multivitamin Pearls". Unpublished report, All-India Inst. of Hyg. & Pub. Hlth, Calcutta.

3. Halder, K and Sundarajan, A. R.—'Effect of supplement of skimmed milk and vitamin A on the growth rate of school children in Calcutta. Alumni Association Bulletin, A.I.I.H. & P.H., Calcutta, Vol. VII, No. 10, 19-23.

4. Fisher, R. A.—Statistical methods for Research Workers, ninth edition, 1944. Oliver and Boyd Ltd.

5. "Statistical Tables" by Fisher, R. A. and Yates, F., fifth edition, 1957. Oliver and Boyd Ltd.

APPENDIX—I
Table A

PREVALENCE OF CARIES, UNHEALTHY GUMS, ABNORMAL OCCLUSION AND HYPOCALCIFIED ENAMEL AMONG THE MALE SCHOOL CHILDREN OF CHETLA

Age	No. examined at the schools	No. (out of col. 2) found with tooth and gum diseases	No. (out of col. 3) examined at dental Cl.	NUMBER OUT OF COL. (4) FOUND WITH						PERCENTAGE OF CHETLA STUDENTS FOUND WITH					
				Caries	UNHEALTHY GUMS			Abnormal Occlusion	Hypocalcified enamel	Caries	UNHEALTHY GUMS			Abnormal Occlusion	Hypocalcified enamel
					Spongy	Hypertrophied	Total				Spongy	Hypertrophied	Total		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Below 5	11	1	1	1	1	—	1	—	1	9.09	9.09	—	9.09	—	9.09
5	21	6	6	6	5	—	5	—	1	28.57	23.81	—	23.81	—	4.76
6	53	14	11	10	7	—	7	1	—	24.40	16.81	—	16.81	2.40	—
7	73	24	18	16	14	—	14	1	—	29.22	25.56	—	25.56	1.82	—
8	75	20	20	17	15	—	15	2	1	22.66	20.00	—	20.00	2.67	1.33
9	82	30	18	16	10	—	10	5	2	32.53	20.33	—	20.33	10.17	4.07
5 to 9	304	94	73	65	51	—	51	9	4	27.54	21.13	—	21.13	4.26	1.75
10	149	38	18	16	14	1	15	2	—	22.67	19.84	1.42	21.26	2.83	—
11	108	34	21	10	15	3	18	10	—	14.99	22.49	4.50	26.98	14.99	—
12	132	30	12	9	10	—	10	2	—	17.05	18.94	—	18.94	3.79	—
13	70	13	8	5	4	1	5	2	—	11.61	9.28	2.32	11.61	4.64	—
14	31	6	5	4	4	1	5	1	—	15.48	15.48	3.87	19.36	3.87	—
10 to 14	490	121	64	44	47	6	53	17	—	17.43	18.40	2.00	20.40	6.09	—
15 and above	14	2	1	1	—	—	—	—	—	14.29	—	—	—	—	—
Not Known	3	1	—	—	—	—	—	—	—	—	—	—	—	—	—
Total for 5 to 14	794	215	137	109	98	6	104	26	4	21.30	19.44	—	20.68	5.39	
All ages together:	822	219	139	111	99	6	105	26	5	20.94	18.90	1.19	20.09	5.39	0.77

APPENDIX—I

Table B

PREVALENCE OF CARIES, UNHEALTHY GUMS, ABNORMAL OCCLUSION AND HYPOCALCIFIED ENAMEL AMONG THE FEMALE SCHOOL CHILDREN OF CHETLA

Age	No. examined at the schools	No. (out of col. 2) found with tooth and gum diseases	No. (out of col. 3) examined at Dental Cl.	NUMBER OUT OF COL. (4) FOUND WITH						PERCENTAGE OF CHETLA STUDENTS FOUND WITH					
				Caries	UNHEALTHY GUMS			Abnormal Occlusion	Hypocalcified enamel	Caries	UNHEALTHY GUMS			Abnormal Occlusion	Hypocalcified enamel
					Spongy	Hypertrophied	Total				Spongy	Hypertrophied	Total		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Below 5	11	1	1	1	1	—	1	—	—	9.09	9.09	—	9.09	—	—
5	23	6	6	6	4	—	4	1	1	26.09	17.39	—	11.39	4.35	4.35
6	63	23	13	11	10	—	10	2	1	30.89	28.08	—	28.08	5.62	2.81
7	43	13	13	9	8	—	8	2	1	20.93	18.61	—	18.61	4.65	2.33
8	64	25	21	15	12	1	13	4	—	27.90	22.32	1.86	24.18	7.44	—
9	68	16	16	15	9	—	9	3	—	22.07	13.24	—	13.24	4.41	—
5 to 9	261	83	69	56	43	1	44	12	3	25.79	20.29	0.46	20.75	5.48	1.44
10	121	30	30	26	24	—	24	6	2	21.48	19.82	—	19.82	4.94	1.65
11	132	29	21	16	18	1	19	6	—	16.74	18.83	1.05	19.87	6.26	—
12	149	32	17	11	8	1	9	5	—	13.89	10.10	1.26	11.36	6.32	—
13	70	9	9	3	9	—	9	5	—	4.28	12.86	—	12.86	7.15	—
14	67	13	11	6	6	5	11	4	—	10.58	10.58	8.82	19.40	7.06	—
10 to 14	539	113	88	62	65	7	72	26	2	14.64	14.84	1.70	16.55	6.20	0.37
15 and above	44	3	3	3	2	—	2	1	—	6.88	4.55	—	4.55	2.27	—
Not Known	6	1	—	—	—	—	—	—	—	—	—	—	—	—	—
Total for 5 to 14	800	196	157	118	108	8	116	38	5	18.28	16.62	1.30	17.92	5.97	0.72
All ages together:	861	201	161	122	111	8	119	39	5	17.45	15.79	1.20	17.00	5.66	0.67

APPENDIX—I

Table C

DISTRIBUTION OF DENTAL CLINIC CASES BY AGE-GROUPS (BOTH SEXES COMBINED) AND ACCORDING TO THE CONDITION OF GUM AND OCCLUSION AS WELL AS BY AVERAGE AMOUNTS OF CARIES

Condition Gum	Condition of Occlusion	Total no. of cases in age-grp.		Total no. of caries cases in age-grp.		Av. amount of caries per caries case in age-grp.		Corrected sum of squares for caries in age-grp.	
		5-9	10-14	5-9	10-14	5-9	10-14	5-9	10-14
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Healthy:	Normal	39*	23*	30	18	3.233	2.444	83.3669	38.4446
	Abnormal	7	4	7	—	2.714	—	23.4283	—
	Total:	46	27	37	18	3.135	2.444	108.3243	38.4446
Spongy:	Normal	81	80	75	64	4.426	3.109	574.3456	250.2348
	Abnormal	14	32	9	18	5.111	3.722	36.8889	91.6111
	Total:	95	112	84	82	4.500	3.244	615.0000	347.1226
Hypertrophied:	Normal	1	6	—	3	—	4.667	—	18.6666
	Abnormal	—	7	—	3	—	2.667	—	2.6666
	Total:	1	13	—	6	—	3.667	—	27.3333
Total Unhealthy:	Normal	82	86	75	67	4.427	3.179	574.3456	275.8517
	Abnormal	14	39	9	21	5.111	3.571	36.8889	97.1450
	Total:	96	125	84	88	4.857	3.273	615.0000	375.4624
Total:	Normal	121	109	105	85	4.086	3.024	683.9447	321.9605
	Abnormal	21	43	16	21	4.063	3.571	82.9375	97.1450
	Total:	142	152	121	106	4.082	3.132	771.1956	424.1428

*As in the case of table IX, for applying test, here one should take 466—142+39=363 and 683—152+23=554 instead of 39 and 23 respectively as children of age-groups 5—9 and 10—14 years, with healthy gum and normal occlusion.

INDIAN JOURNAL OF PUBLIC HEALTH

Official Quarterly Journal of the Indian Public Health Association

VOLUME IV JULY 1960 NUMBER 3

CONTROL OF LEPROSY

Leprosy is the oldest contagious disease known as such in the world. It is one of the diseases of human beings which is mentioned in the oldest available scriptures; it also happens to be the first human disease for which the causative germ was discovered (Hansen, 1873). Since then a world of knowledge has been gained regarding infection and infectious diseases and a large number of them have been effectively controlled but leprosy still presents a difficult problem inspite of the discovery of the organism and fairly effective drugs. The characteristics of the disease are its slowness and chronicity, and worse than that are its ugliness and deformity that follow. Non-susceptibility of experimental animals to the infection and failure to cultivate the organism in artificial media have greatly limited the scope of experimentation, and our knowledge about the transmission of infection of leprosy, and its control has remained incomplete. The theory of prolonged contact may be actually one of long incubation period. In a recent socio-epidemiological investigation of the leprosy patients in Calcutta not more than 10 percent could give a history of contact with a known patient. It appeared to the investigator that like tuberculosis, leprosy infection was also widespread in the city and that only the susceptibles had manifested the clinical symptoms broadly as tuberculoid or lepromatous type depending upon the nature of individual resistance.

The exact incidence of leprosy in India is not known but as a rough estimate it ranges from 15 to 20 lakhs, against which there are only about 20,000 beds and nearly 1,20,000 patients receiving treatment in a little over 1200 leprosy clinics in the country. In other words, only about 10 percent of the leprosy patients have had the opportunity of obtaining some medical care. The question however, is that even though it may be possible both theoretically and financially to organise sufficient treatment units and hospitals, would it bring forth the desired results under the conditions prevailing in the country? If not, what are the reasons and the remedies?

There are certain inherent difficulties in tackling the problem. Firstly, it is a social disease and is associated intimately with the idea of sin and God's wrath mixed up with various superstitious beliefs and customs, in addition to the ignorance of the mass regarding its cause and mode of spread. Moreover, the majority of the public consider it to be incurable and this was actually so not very long ago. Hence they are not convinced about the utility of treatment and

are reluctant to avail of the treatment centres even though these may be provided near their doors. Their attitude finds justification in the failure to recover from the deformities in the late cases although a bacteriological cure is obtained, emphasising the necessity for dissemination of knowledge and arrangement for rehabilitation.

The greatest obstacle in the way of controlling leprosy is however, the social stigma attached to this disease by all societies. Out of ignorance they ostracize not only all persons suffering from either infectious or non-infections leprosy but also their families, suspected cases and even non-leprosy. This stigma is also an important cause of concealment and avoidance of attending the clinics for treatment, except perhaps in large towns and cities. It also results in certain number cases in loss of self-confidence and interest in life or in moral and mental degradation leading to begging and even suicide. Thus with traditional notions about the nature of this disease, supplemented by the obvious mutilation of limbs in advanced cases, leprosy arouses in individuals a sense of fear, hatred, feeling of hostility, ostracizing behaviour etc., and in some a feeling of apathy. The fear prevails in almost all starta of society including even medical practitioners, who with only few exceptions avoid treating a leprosy patient. This attitude among the practitioners has developed out of two conditions besides fear of contracting the disease, namely, absence of drugs for ensuring cure and fear of losing other patients.

In addition to numerous social problems there are some other practical difficulties for the implementation of control measures namely, dearth of willing workers and trained personnel, interstate movement of lepers particularly beggar lepers, the problem of rehabilitation of lepers and sometimes of their families when the only earning member is afflicted with leprosy, employment of cured leprosy cases, etc. An effective plan for the control of leprosy should therefore take note of all the factors mentioned above under a scheme briefly outlined below:

(1) Full coverage of treatment to all known patients of leprosy in India through the establishment of Leprosy Control Units; Survey, Education and Treatment Centres; Constructive Survery and Physiotherapy Institutes and Vocational Training Centres for rehabilitation, as envisaged in Wardekar's Third leprosy Plan.

(2) The Leprosy Control Units, whenever possible, should be part and parcel of Polyclinics, Urban or Rural Health centre etc. in order to avoid identification as a special clinic for leprosy alone. (It may be a part of Skin Diseases Clinic or the latter may be used for screening leprosy cases for further action on a particular day in the week)

(3) The above may be supplemented by suitably located isolation homes, rehabilitation colonies and social services for patients and dependents whenever

needed. Early diagnosis and treatment can largely mitigate the question of rehabilitation by preventing complications and deformities.

(4) Survey, health education and social services should be dovetailed with common programmes as far as possible. Isolated programme for leprosy alone should be avoided and all attempts should be made to *carry the people with the programme.* This will be effective as well as economical.

(5) All medical trainees should compulsorily attend adequate number of lecture demonstrations on the diagnosis, treatment and prevention of leprosy and should be examined on the subject, so that they can undertake the responsibility of treatment, as for infectious disease, whenever required. Separate training arrangement should be made for specialisation and also for paramedical personnel including the social workers.

(6) Mobile dispensaries may be introduced for general purposes and a special day in the week may be alloted for the treatment of skin affections which would obviously include leprosy.

(7) The above arrangement should be the primary responsibility of the State Governments with central aid if necessary, but the coordination of all anti-leprosy work in the country, development of research work and institutions, and arrangement for frequent exchange of views on common problems should be the responsibility of the Central Health Ministry.

(8) A Model Central Act on Leprosy should be promulgated by the Parliament to deal with (i) Facilities for early diagnosis, treatment and prevention, (ii) Segregation centre for open cases and rehabilitation for late cases, (iii) Regional homes for beggar and crippled lepers, (iv) Restrictions of movement and of employment of open lepers, (v) Regulation controlling inter-state movements of beggar lepers, etc.

(9) Voluntary organisations should work in complete coordination with and under the supervision of the Government agencies.

(10) All leprosy workers employed under the Government should receive a special compensatory allowance in line with the other specialists in the field.

NOTES & NEWS

Indians World's Worst Fed People

According to the United Nations Food and Agricultural Organisation year book, the Irish are the world's best fed people and the Indians worst fed people, if calories consumed are considered the guiding factors. Calories available per capita per day for different people are as follows:

Irish:—3500 calories, Newzealanders—3430, Danish—3350, Englishmen—3260, Australians—3200, Swiss—3180, Canadians—3110. Next in the series come America and Argentina with 3100 calories each, followed by Norway with 3080, Finland 3070, Austria 3050, Turkey 2890 calories. Formosa tops the list of Far Eastern countries with 2330 calories. Japan's figure is 2,200, Pakistan-2,010 while the lowest for India is 1080 calories. Figures for Soviet Union, China and some other countries are not available.

Deteriorating Health of Bengali Students

The first report of the Board of Health of the Calcutta University covering the period 1953-59 presents a dismal picture of the state of health of University students in Calcutta. Examination of 3,920 male students from 20 Colleges and 1492 girls from women's colleges in 1958 and 1959 revealed that 41.81% suffered from general defects, 36.71% from malnutrition, 27.81% from defective vision, 10.27% from enlarged glands and 5.05% from skin diseases. The incidence of defective vision is higher among women.

The standard of students' health is deteriorating from year to year. Average weight and chest measurements had definitely decreased in almost all the age groups in 1958-59 compared to figures for 1938-40. Among male students, the percentage incidence of malnutrition and pyorrhoea remained almost constant but there was a decrease in the incidence of skin diseases, diseases of the heart and lungs and defective vision. Among women students there was an increase in the incidence of pyorrhoea, under-weight and defective vision but decrease in skin diseases and enlarged tonsils.

Antibiotic for Intravenous Administration

A new Antibiotic now available to hospitals is reported to be particularly effective against staphylococci resistant to the other antibiotics in current use. It is administered only by the intravenous route. It is not recommended for routine treatment, but for patients seriously ill with staphylococcal infections who are resistant to other antibiotics. Organisms sensitive to its action are said to include pneumococci, streptoccoi and clostridia.

First cultured from an Indonesian soil sample, it is a white solid, relatively stable and very soluble in water.

Rabies spread by wild animals

More than 145 thousand people were treated for rabies in the Philippines in 1958, about 60 thousand in the United States and many thousand in other countries throughout the world. In issuing these figures, the World Health Organisation pointed out that although the number of human deaths from rabies is small, this is due to the continuous efforts of health services and the administration of anti-rabies injections.

Out of 75 countries covered in a W.H.O. report, 52 said that cases had occurred in 1958, 23 that the disease was not present.

In the United States, six deaths from rabies occured in 1958 and five in 1959 upto 27th November. Of these cases, five were attributed to dog bites, three to bites from bats, one to a bite from a fox, one to a bite from a skunk and one unknown. A great deal of evidence has been brought forward to show the importance of the bat in maintaining the infection in wild life and causing infection in a man. Since 1953, 359 cases of bat rabies have been reported in the U.S.A.

The main reservoir in Germany is the fox: in 1958, 1,017 cases of rabies in foxes were recorded in the Federal Republic. The Iran Pasteur Institute reports 443 persons bitten by wolves, with 39 deaths, between 1949 and 1958. In other countries the disease has been discovered in cattle, donkeys, jackals, monkeys and other animals.

Vaccine against Syphilis

Laboratory animals have been immunized against syphilis by a crude protein vaccine in the course of investigations carried out by the University of Michigan Medical Center. Complete immunization was achieved in ten

per cent of the test animals and strong resistnce in another 40 per cent. No means of warding off initial infection from the disease had previously been found. The vaccine has not yet been tested on human beings.

In the course of research, quantities of spirochetes were destroyed by mechanical means and fractions of proteins and carbohydrates extracted from the pulp. These fractions consisted of crude mixtures of several types of proteins and carbohydrates, rather than single units.

It is hoped that future refinement of the vaccine may open the way toward world-wide immunization against yaws, pinta, bejel, and other syphilis-like diseases.

W.H.O. Malaria Report

Although malaria eradication was only started on any scale in 1958, the amount of knowledge accumulated was greater than in any other field of health, Dr. M. G. Candau, Director General of World Health Organisation, told the Executive Board, at its 25th session in Geneva.

Out of 1,237, 872,000 people in originally malarious areas of the world a total of 258,035,000 had been freed from this menance at the end of 1959, according to information received from governments. Another 641,404,000 lived in the 65 countries and territories where eradication programmes were in progress and 95 million were in another 33 countries and territories which had realistic plans for initiating such programmes.

The threat of insect resistance to residual insecticides had proved not to be an insurmountable problem. It affected only 30 million, or less than 5% of the total number of people in areas where eradication programmes were in progress.

Malaria and Salt

There are some areas where the mosquito vector bites in the open and does not rest indoors. In certain parts of Brazil the chief mosquito vector bites men and animals indiscriminately in the open air and rarely rests in the houses. The inhabitants are also nomadic in nature and live in shelters which have hardly any wass. Malaria control by residual insecticidal sprays in such areas is practically impossible. To get over these difficulties the local authorities thought of administering an anti-malaria drug to the entire population by mixing it with common salt which is used for preparing food. Preliminary experiments were undertaken to determine the proportion of drug necessary to suppress malaria without risk of toxicity, and to show that its properties were not destroyed by cooking. It was also necessary to ensure that the quantity of drug introduced did not produce any bitter taste in the food, and that the cumulative effect of this drug did not produce any resistance to it on the part of the malaria parasites. On the basis of experiments, a proportion of 0.3 grams of chloroquine to 10 grammes of cooking salt was found to satisfy all the required conditions. Small scale pilot experiments were started in 1953, and by 1959 the scheme was extended to the entire Amazon basin. The scheme is reported to have resulted in a marked reduction in the incidence of malaria, and the W.H.O. is exploring the possibility of introducing it in other regions where similar difficultires exist. The method is now being tried out in an area of northern Ghana having a population of 60,000.

Expert Committee on Malaria

A WHO Expert Committee on Malaria met in Geneva, from 25 to 30th July, 1960, to examine the present situation of malaria eradication in the world, and the prospects for the future. As many eradication programmes are reaching the more advanced stage, the committee reviewed the principles and techniques of evaluation and surveillance. Criteria of eradication were discussed in connection with the request of the Thirteenth World Health Assembly that the Director General "establish an official register listing areas where malaria eradication has been achieved, after inspection and certification by a WHO evaluation team". The committee also considered whether any revision of the dosages and cycles of residual insecticides commonly used at present should be recommended, and reviewed the use of antimalarial drugs to prevent reintroduction of malaria in the final stages of eradication and among nomadic populations.

The recent discovery that malaria of lower monkeys can be transmitted to man has implications for eradication programmes, since a reservior of Malaria in monkeys could conceivably add to the difficulties of eradicating human malaria in certain countries. While the dangers of this possibility should not be exaggerated, ways of dealing with the problem will have to be found, and these were dis-

cussed. The new discovery has its positive side, since the existence of a malaria parasite that caused the disease in man, but can also be studied in monkeys, could be extremely helpful for research.

Water Discharge of World Rivers

According to calculations by Dr. Mark Luovide, the Soviet hydrologist, the total discharge of all the rivers of the world is 36,560 cubic kilometres a year. Of this, the atlantic slope (including the Arctic ocean) accounts for 56% and remaining 44% is on account of the Pacific slope (including the Indian ocean). More than one third of the world total is discharged from the Asian continet.

The annual rain-fall of the earth is about 580,000 cubic kilometres, and thus the total annual river discharge is only a little more than 6% of the total rain-fall.

World Congress of Psychiatry

"The Third World Congress of Psychiatry, June 4-10, 1961, Montreal, Canada, is being held at the invitation of McGill University and under the auspices of the Canadian Psychiatric Association. Meeting on the American Continent for the first time, the Congress is expected to attract some 3000 delegates from 62 nations. Representatives will come from psychiatry and such allied fields as general medical practice, psychology, biochemistry, nursing, sociology, anthropology, social work, and pharmacology.

Copies of the Second Announcement, which carry information regarding programme and registration, may be obtained by writing the General Secretary, III World Congress of Psychiatry, 1025 Pine avenue West, Montreal 2, P. Q., Canada."

ABSTRACTS

The problem of Insecticide Resistance—Busvine J. R., Jour. Royal Society of Health, No. 4, 1959.

The author has discussed about the emergence of resistant strains. Beginning with DDT—resistant strains of house-flies in 1947, instances of resistance strains have multiplied every year, until now the trouble has been reported virtually from every country in the world. As well as DDT, cases of resistance to all the new chlorinated insecticides have been reported; subsequently organo-phosphorous compounds have been involved and even pyrethrins. Resistance has occurred in over 30 different insects of public health, comprising so many varieties that it has been reported for every important genus in the field except *Phlebotomus, Simulium* and *Glossina.*

The speed with which the resistant strains will come to replace the normal insects will depend on two factors (i) the prevalence of individuals possessing resistant genus in the original population and the nature of these genes; (ii) the intensity of selection pressure due to insecticide. The rate of development of resistance due to selection pressure has two aspects, the first demanding a highly efficient insecticide, and the second requiring its wide use. Anti-larval and other house spraying campaigns with the use of highly efficient residual insecticides and covering whole countries, must have had extremely far reaching effects on the insect populations in the houses. It is likely that the great multiplication of resistant strains which followed the use of these new insecticides may be a direct consequence of their very virtues.

There is no direct field evidence on the recession of resistance except in the case of house flies with regard to DDT. In some countries including Denmark and parts of U.S.A., DDT was abandoned for fly control some years ago, but when about four years later, it was tried once more, it had only transient success. This suggests that resistant strains, once developed, die out only very slowly.

True resistance is not a generalized immunity to all kinds of poison (described as "vigour tolerance"), which seems to be more of a logical concept than a practical problem, since it is doubtful whether it has ever arisen in the field. The really troublesome cases of resistance are specific to certain types of insecticide. Four main forms are known, embracing groups of insecticide which presumably have similar modes of action (i) DDT and analogous compounds, such as methoxychlor; (ii) BHC, dieldrin, aldrin, chlordane, endrin,

heptachlor, toxaphene, (iii) organo-phosphorous insecticides; (iv) pyrethroids.

Nearly always, when resistance develops to any of the insecticides mentioned above, it will automatically extend to other members of the groups. At the same time, the strain will normally remain susceptible to insecticides in the other groups. However, it is quite possible for an insect to develop resistance subsequently to other groups, and indeed this has already happened in strains of house-flies and bed bugs. At present, there are not many such cases of multiple resistance and this protects us from the full effects of resistance, because in most cases alternative insecticides are available.

However, the seriousness of the position is obvious; instead of a large number of alternative insecticides when resistance developes, there are only two or three types. Moreover, the first two groups contain all the newer contact poisons which combine efficiency with very long residual action.

The author has also discussed about the tests for detecting and measuring resistance for different insects, and also about the prevalence of resistance in Great Britain.

(G.G.)

Nutrition and Cardiovascular Disease—Sinclair H. M.—Jour. Royal Society of Health, No. 3, 1960.

There is no proof that relative deficiency in our diets of a particular type of Essential Fatty Acid (EFA) causes athero-sclerosis or coronary heart disease. But there is a great deal of circumstantial evidence. Diets high in non-EFA and low in EFA cause a high blood cholesterol, and this carried an increased risk of atherosclerosis and coronary heart disease. Decreasing this ratio by substituting corn and soyabean oils instead of butter, margarine and lard greatly decreases death from thrombo-embolic disorders (such as coronary thrombosis and cerebral thrombosis) in old people, according to a preliminary report from Copenhagen. Preliminary work of Kinsell has indicated that at least in early stages atherosclerosis can be reversed by raising content of EFA.

Increased dietary EFA and decreased non-EFA are achieved by increasing the amount of unprocessed unsaturated fats (vegetable seed oils—except coconut and olive—liver, kidney and other offals, poultry, fish, nuts, special margarines and certain "filled" milks) at the expense of foods relatively rich in non-EFA (processed meats, beef fat, butter and cream, ice-cream, ordinary margarine, mutton fat, lard).

The mechanism whereby atherosclerosis and coronary heart disease are produced, and the secondary role played by factors such as overweight, exercise and stress, are beginning to be understood. These are unimportant if the diet is correct, and act through accentuating a dietary fault that is becoming increasingly prevalent in the more privileged countries. But we are still grossly ignorant of the mechanisms and even the relevant analyses of food.

Proof of the importance of EFA in preventing coronary heart disease can only come from a large-scale trial on man. (G.G.)

The First Report on the Recent Population Census in the Soviet Union, Galina V. Selegon, Population Studies, 1960, Vol. XIV, No. 1.

The Soviet Union after a lapse of twenty years, conducted in January, 1959, its population Census and the first preliminiary summaries of the Census, published in May, 1959, have been derived from enumerators' reports. The report reveals a considerable decline in the rate of population growth during the last twenty years. The annual average rate of growth is 0.5% against 2.2% before collectivization, and is only slightly higher than the 0.3% of the period 1913-1926, the lowest rate of increase during this Century. The enormity of war losses, high mortality and the comparatively low birth rate which persisted during the first five years after the end of the last world war, contributed to the low rate of increase during the past twenty years.

The 1959 U.S.S.F. Census shows the total population as 208.8 millions of which 94.0 millions are males and 114.8 millions are females, and that reveals an increasing imbalance between numbers of men and women. The male deficit of 5 millions according to the 1926 Census increased to 7.2 millions in 1939 and to 20.8 millions in the present Census. Losses of the last war are surely one of the reasons, but the relatively high mortality of men in correctional institutions may also have contributed to this excess of females over males.

The Census findings reveal differential rates of growth in the constituent republics of the U.S.S.R. Higher rates of growth are

exhibited by the Far East, the Urals, Siberia and the republics of Central Asia, and are attributed to rapid industrial development of these parts. Considerable size of rural population of the European Region, and some other regions migrated to these republics to serve as labour. But altough heavy internal migration took place, the rank order of all regions by size of population did not show significant changes.

The latest Census reports a further growth of cities and the urban population, though at a slower rate, 65.0% as compared to 130.0% in the preceding period. Large cities with a population of 100,000 and over contributed most to the increase of the urban population—they accounted for over 50% of the total increase. Rural population decreased in almost all regions, but the maximum decrease occurred in the European Region.

(K.K.M.)

Morbidity and Mortality characteristics of Asian Strain Influenza, Tom D. Y. Chin et al, Public Health Report, 1960, Vol. 75, No. 2.

During the autumn of 1957 Asian influenza occurred in epidemic form in the greater Kansas City area and it was followed by a minor secondary wave during the winter of 1958. A survey of 5,022 persons during autumn epidemic indicated an attack rate of 34 per cent. The highest attack rate was observed in persons of age 10-19 years, and as age advanced, the rate declined.

The rate of clinical infection varied from 30.7 per cent in households of size 3, to 40.5 per cent in households of size 7 or more. The secondary attack rate was 14 per cent.

Altogether 253 deaths due to influenza and pneumonia were reported in Kansas City, M.O., from October 1, 1957 to March 31, 1958, and gave a mortality rate of 49.6 per 100,000.

The mortality curve showed two peaks, one in October and November, and the secondary peak towards the end of February. The highest death rate was found in the very young and the very old.

In seventy-three per cent of the persons who died there was a history of pre-existing chronic disease or other associated conditions, the majority of which were listed as Cardiovascular or chronic pulmonary tuberculosis.

(K.K.M.)

Smoking in Relation to Heart Disease, E. Cuyler Hammond, American Journal of Public Health, 1960, Vol. 50, No. 3, Part II.

The author first reviews the epidemiological findings on the subject and then gives a brief summary of other types of evidence. Pearl (1938) found that total death rate increases with amount of smoking, and heavy smokers have a much higher death rate than non-smokers. English *et al* (1940) reported that a positive association exists between cigarette smoking and coronary artery disease. A higher percentage of cigarette smokers was found among persons with coronary disease than among persons free of this disease. During the last ten years four groups of investigators carried out case-control studies of smoking in relation to coronary disease and the results of these studies are in close agreement with the above finding of English *et al.*

The findings of a prospective study by the author and Horn from the then available data are: Total death rates by type of smoking and by age at start of study showed that cigarette smokers had the highest death rates and non-smokers the lowest. Death rates for cigar and pipe smokers were only slightly higher than those for non-smokers. The mortality ratio for total deaths increases with amount of cigarette smoking. More than half of the excess deaths associated with cigarette smoking were due to coronary artery disease. Of the various heart diseases coronary artery disease was the only type of heart disease which showed a marked association with cigarette smoking. Further, a positive association was found between coronary artery disease and the amount of cigarette smoking. Finally, coronary disease death rate of men who had stopped cigarette smoking for a year or more was found to be lower than that for men who continued to smoke cigarettes. Whether the association of coronary heart disease with cigarette smoke is a causal relationship is yet to be established.

(K.K.M.)

BOOK REVIEW

"Introduction to Health Statistic"—By Satya Swaroop.

This book has been written by one who has had varied experience in the field of health statistics for over a quarter of a century as a teacher, administrator and research worker. He is well known to health statisticians all over the world due to the unique position he holds in the World Health Organization. As he was Professor of Statistics at the All India Institute of Hygiene and Public Health, he is particularly well known to the health workers in India. The book is written in a lucid style and can be used by every health officer for his day to day administration and also as a reference book.

(K.K.M.)

ASSOCIATION NEWS

Bihar State Branch:—The Executive Committee of the Bihar branch of the Indian Public Health Association met on 22-6-60 at the Public Health Institute, Patna, under the presidentship of Dr. B.B.A. Dalal. The Committee also decided to request the Director General of Health Services, Govt. of India to send them a copy of their Model Public Health Act for their consideration. It was also decided to organise district and local branches of I.P.H.A. in Bihar State and it was further resolved that the R.D.D.H.S., S.E.M.O., M.O.H., and P.H. Engineers be approached to extend their active co-operation in this respect. Dr. B. P. Jamuar was elected as the Joint-Secretary of the branch, in place of Dr. K. Prasad who was going to Calcutta for D.P.H. training.

NOTICE TO CONTRIBUTORS

The Indian Journal of Public Health is issued quarterly, one volume appearing in a year. The Journal is meant to publish mainly original contributions and results of original investigations relating to the problems of public health which broadly include, personal hygiene, public health service, vital statistics and population studies, social and preventive medicine, microbiology and public health laboratory service, mental health, public health engineering, housing and sanitation, tropical medicine and hygiene, epidemiology and communicable disease control, industrial and physiological hygiene, occupational health, maternal and child health, health education, nursing, midwifery, health visiting, food and nutrition, school health, dentistry, veterinary hygiene, medical education and history of medicine, etc.

Manuscripts for publications, books for reviews, field news, reports of associations or societies and correspondence relating to the editorial management, published papers, questionnaires and business matters concerning subscriptions, advertising, reprints, order for copies, change of address, exchange, etc., should be sent to the Associate Editor, Indian Journal of Public Health, All-India Institute of Hygiene and Public Health, 110, Chittaranjan Avenue, Calcutta-12.

All scientific papers, reviews, letters to the Editor and other original contributions should be sent exclusively for the Indian Journal of Public Health, and no articles published elsewhere or submitted simultaneosly to other periodicals can be accepted. The Editor's or Referee's comment on the article or any part thereof which neers clarification, ano acceptance or non-acceptance of the article for publication in the Journal will be duly communicated to the authors concerned.

All manuscripts should be sent in duplicate typewritten, double spaced with good margin on one side of the paper only. Authors are requested to enclose line drawings of all the diagrams in their paper drawn in Indian ink on smooth white Bristol Board. The drawing should be twice the size they will occupy in the Journal. Good prints of Photographs and Microphotographs should be sent to obtain clear impression in the final print. Authors are particularly requested to reduce the number of diagrams to an absolute minimum.

References to literature should be arranged thus: The Author's name, initials, year, abbreviation of Journal, volume and page. In the case of books or reports, the Author's name as above, the title in full, with the place and year of publication and page.

Contributors receive 25 reprints free of charge. Additional copies may be obtained at cost. The requirement of such copies should be indicated at the time of submission of the manuscript. Remittances should be made by draft or cheque or by postal order payable to the Managing Editor. For cheques on Banks outside Calcutta collection charges be added. Every paper submitted to the Journal will be subjected to the Editorial scrutiny and such modifications as are deemed necessary for clear expression and maintenance of standard.