Field Project Reports

By

Dr. S.Saravanan

(MAE - FETP Scholar 2001-2002)

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(Indian Council of Medical Research),
Mayor V.R. Ramanathan Road, Chennai-600 031.

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CERTIFICATION

This is to certify that all the field projects submitted in this Bound Volume are original work carried out by **Dr. S.Saravanan** during the two field postings of six months each under the guidance of faculty of National Institute of Epidemiology (ICMR), Chennai and the local supervisor specially nominated for this purpose. This is in partial fulfillment of the requirements for the degree of Master of Applied Epidemiology and has not been submitted earlier by him/her in part or whole for any other (Publication or degree) purpose.

DIRECTOR

Date

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MAE Course requirements

First field posting

A. Description of field placement site facilities, and laboratory facility available for outbreak investigation in field placement area.	Chapter II , Section I
B. Description of existing disease surveillance system, Chennai, 2000	Chapter II , Section II
C. Analysis of secondary data from surveillance system	Chapter II , Section III
D. Journal Critiquing	Chapter II , Section IV

Second field posting

A. Designing a surveillance system for dengue, Chennai	Chapter I, Section I
B. Evaluation of a National Programme -Measles eradication programme, Poondi Block,Tiruvallur Health Unit district, Tamilnadu, 2003	Chapter II, Section II

Investigation of an outbreak

A. Outbreak investigation of dengue fever, Chennai, 2001	Chapter III , Section I

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Chapter I

Section I

Designing a surveillance system for dengue, Chennai

1. Introduction

Dengue fever (DF) is an acute febrile viral disease frequently presenting with headaches, bone or joint and muscular pains, rash and leucopoenia as symptoms. Dengue hemorrhagic fever (DHF) is characterized by four major clinical manifestations: high fever, hemorrhagic phenomena, often with hepatomegaly and, in severe cases, signs of circulatory failure. Such patients may develop hypovolaemic shock resulting from plasma leakage. This is called dengue shock syndrome (DSS) and can be fatal[1].

Dengue epidemics are known to have occurred over the last three centuries in tropical, subtropical and temperate areas of the world. The first epidemic of dengue was recorded in 1635 in the French West Indies, although a disease compatible with dengue had been reported in china as early as 992 AD. Dengue or dengue-like epidemics were reported throughout the nineteenth and early twentieth centuries in the Americas, southern Europe, North Africa, the eastern Mediterranean, Asia and Australia, and on various islands in the Indian Ocean, the south and central Pacific and the Caribbean.

DF and DHF have steadily increased in both incidence and distribution over the past 40 years, 2500-3000 million people lived in areas potentially at risk for dengue virus transmission. Annually, it is estimated that20 million cases of dengue infection, resulting in around 24,000 deaths.[2]

In India, Dengue fever/Dengue hemorrhagic fever is a major public health problem in many states including Tamilnadu. In India the recorded outbreak of dengue fever was in 1812.Serological survey was first carried out in1952, showing that DEN-1 And Den-2 were wide spread. In 1960, DEN-4 was isolated in Vellore.

In Chennai, the capital of Tamilnadu, during the last five years it has became an annual seasonal disease with high incidence in September, October and November months. In the year2001 during September a large outbreak of febrile illness with hemorrhagic manifestation started, which was later confirmed to be a dengue fever (DEN-I) by serological diagnosis and Viral Isolation.

2. Justification

- Effective surveillance of Dengue infection is essential for monitoring endemic transmission and for early recognition of Impending Epidemics. Because of the large proportion of infections that never present at reporting health facilities, the efforts should be made to strengthen the Epidemiological surveillance system during inter-epidemic periods when clinicians may not be suspecting or reporting cases.

- Observation based on the last 5 years shows that DF is endemic in Chennai city and the incidence changes quickly to proportions of outbreak in the year 2001.Early identification of the outbreak by setting up a Epidemiological surveillance system will help the authorities to initiate early and effective control measures so that both incidence and case fatality can be brought down.

3. Objectives

- Early detection of the Outbreaks.
- Prompt Implementation of the Control measures

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3. Objectives

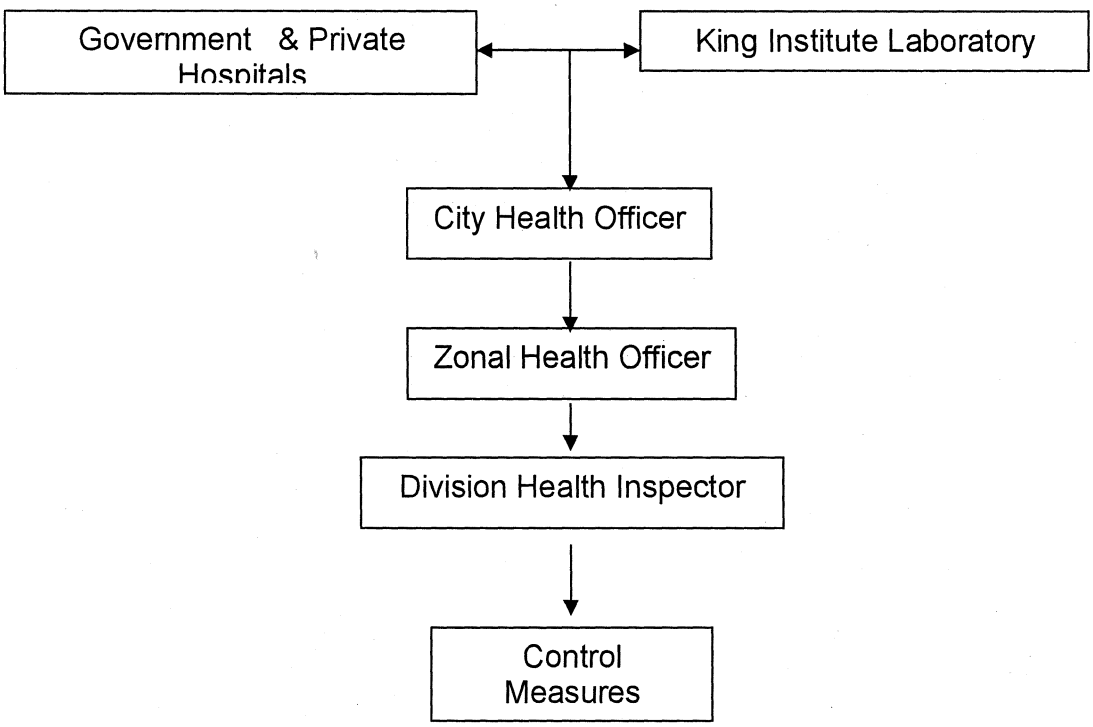
- Early detection of the Outbreaks.
- Prompt Implementation of the Control measures

4. Description of the existing surveillance system

4.1. Disease surveillance:

Dengue / Dengue Hemorrhagic fevers are notifiable diseases under Tamilnadu public Health Act 1939. All the suspected cases admitted in all the government and private hospitals should report it immediately to the Corporation health authorities. On receipt of information about the cases, the Corporation health officer in turn initiates the control measures. The control measures include mainly antiadult measures in form thermo fogging in the affected area & providing health education for source reduction. At present the reporting of cases was done only from the few Major Government & Corporate Hospitals. Passive surveillance should require case reports from every clinic, private physician and hospitals that provides medical attention to the population at risk. Figure 1 shows the detailed flow of information about the dengue cases.

Figure 1.Chart-showing flow of information about dengue cases,Chennai,2001

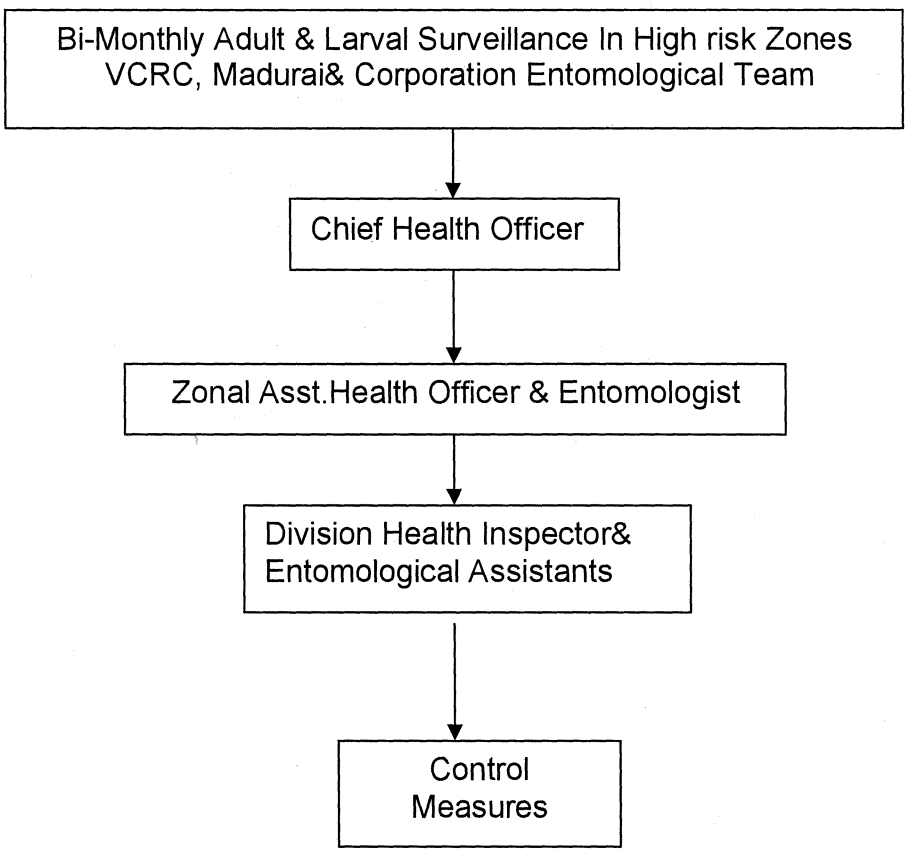


4.2. Vector surveillance:

Initially there was no specific surveillance for dengue vectors. Only at the time of reporting of cases adult and larval survey will be carried out to confirm the presence of the vectors and to initiate vector control measures.

Specific Vector surveillance for dengue was initiated in the month of May 2001 along with technical collaboration of Centre for Research in Medical Entomology (CRME) –Indian Council for Medical Research (ICMR) Institute, Madurai. Based on the previous years Incidence, the high risk Zones (VII&VIII) were selected and vector surveillance was carried out in certain divisions once in two months. Figure 2 shows the surveillance details.

Figure 2. Flow chart showing the existing vector surveillance for dengue Chennai, 2001



5. Description of the proposed surveillance system

Few countries have an effective epidemiological surveillance system and the capacity tomount a timely and effective response.

Four major areas in which surveillance can be improved are:

1. Through consistency of reporting standards. Standardized and clear case definitions for dengue fever and DHF/DSS as per WHO should be tracked and reported separately.
2. Both passive and active surveillance systems should be in place, with regional reference centers able to provide laboratory backup.
3. The epidemiological information must be refined for more effective use by policy makers and programme managers. Currently the epidemiological surveillance data are frequently incomplete, delayed and not used for decision-making purposes.
4. Indicators should be developed so that householders can see for themselves the status of dengue in their communities and any changes that their actions may bring about.

Epidemiological surveillance system must cover the following:

5.1.Disease Surveillance:

5.1.1.Passive surveillance

5.1.2.Active surveillance

5.2.Vector Surveillance:

5.2.1.Larval surveillance

5.2.2.Adult surveillance

5.1. Disease Surveillance:

5.1.1. Passive surveillance systems:

Objective:

- To Monitor the long-term trends in dengue transmission

Component:

- Disease Reporting System

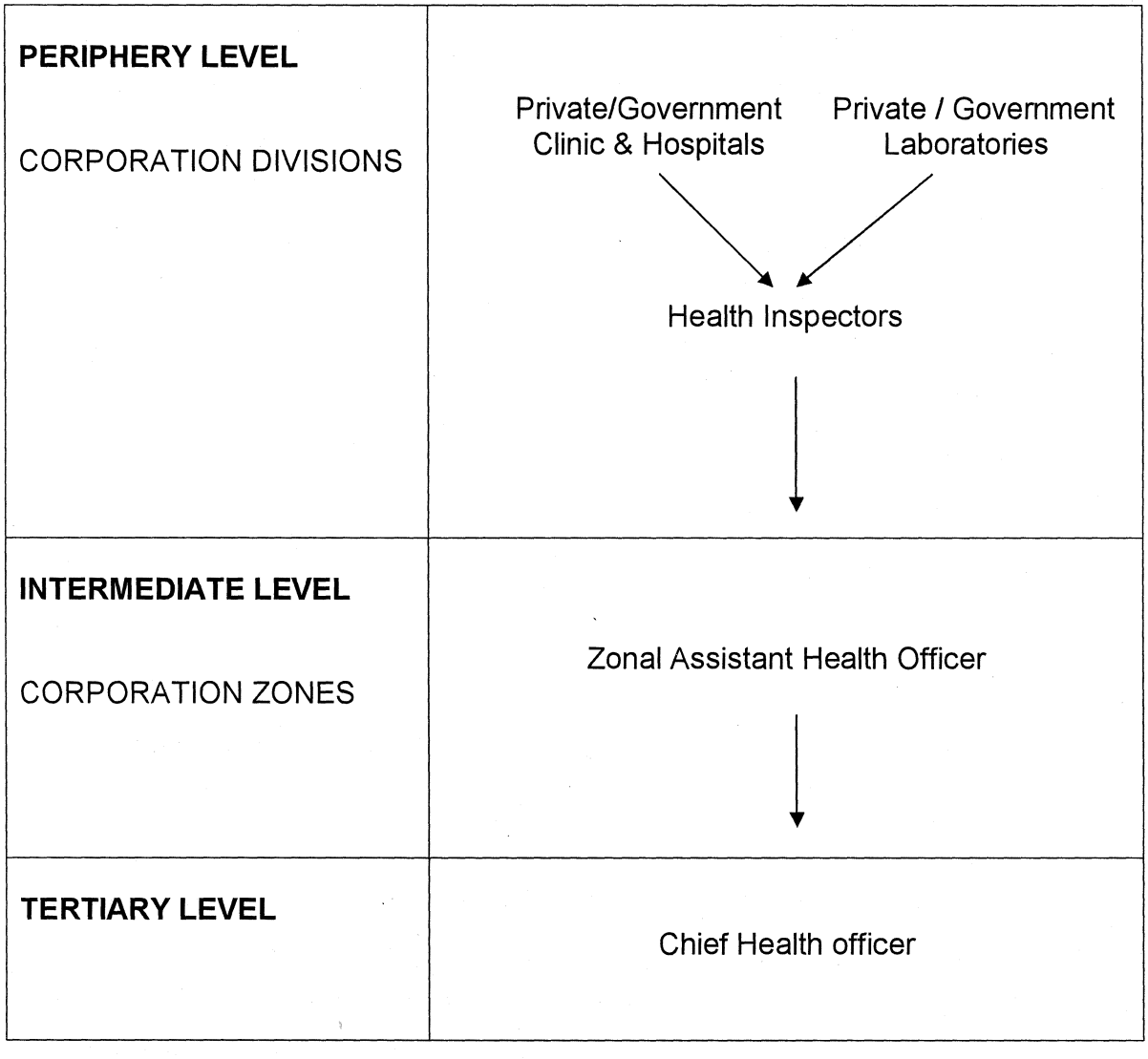
Approach:

The Passive systems are not sensitive and have low specificity since cases are not laboratory confirmed. Passive surveillance should require case reports from every clinic, private physician and hospitals that provide medical attention to the population at risk. Thus the existing passive surveillance system should be strengthened based on standard **Case definition** (Annex I**)** and formalized mandated reporting.

Routine weekly reporting of data of suspected, probable and confirmed cases has to be initiated at the peripheral level. In the absence of reporting from the peripheral clinics/hospitals responsibility has to be fixed for the Health Inspector in charge of that division to collect the report. (Figure 3)

However even when mandated by law passive surveillance is insensitive, because not all clinical cases are correctly diagnosed during the periods of low transmission, when the level of suspicion among medical profession is low.By the time dengue cases are detected and reported by the physicians under a passive surveillance system, substantial transmission had already occurred and may even peaked. In this case, it is often too late to control the epidemic. Hence, an active, laboratory-based surveillance needed to predict epidemic dengue/DHF.

Figure 3. Flow chart showing report collection at various levels, Chennai, 2001



5.1.2. Active surveillance system:

Objective:

- To monitor disease activity during the inter epidemic period /dengue transmission in a community i.e.
    1. where the transmission is occurring
    2. which serotypes are circulating
    3. what kind of illness is associated with dengue infection
- To provide early warning for epidemic transmission.

In order to accomplish this, the active surveillance system must have good diagnostic laboratory support in virology, bacteriology, and parasitology. The laboratory also should know where to refer specimens for testing.

Components:

1. Fever alert system
2. Sentinel Clinic/Physician
3. Sentinel Hospital

Since dengue viral infection are often presenting as non-specific viral syndromes, and they are maintained in a silent transmission cycle, Fever alert system and sentinel Clinic are designed to monitor non-specific viral syndromes in the community. (Figure 4)

Sentinel Hospitals are designed to monitor severe disease. (Figure 5)

Approach:

Figure 4: Flow chart showing the flow of information in the Fever alert system and sentinel clinics of proposed dengue surveillance system, Chennai, 2001

Component	Staff / Centre	Approach
Fever alert system	*Health Inspector & *Multipurpose health Worker- Female In corporation Division offices/health posts	Any Increase in febrile activity in the community. ↓ Zonal Health officer ↓ Epidemiological Investigation ↓ Blood samples from representative cases of febrile illness ↓ Reference Laboratory for virus isolation and for IgM antibodies.
Sentinel Clinics	Corporation Dispensaries& Private Clinics	Representative samples taken year round weekly once among the non-specific febrile Illness cases ↓ Blood from the representative cases taken from 3 to 15 days after the onset of symptoms ↓ Reference Laboratory for virus isolation and for IgM antibodies.

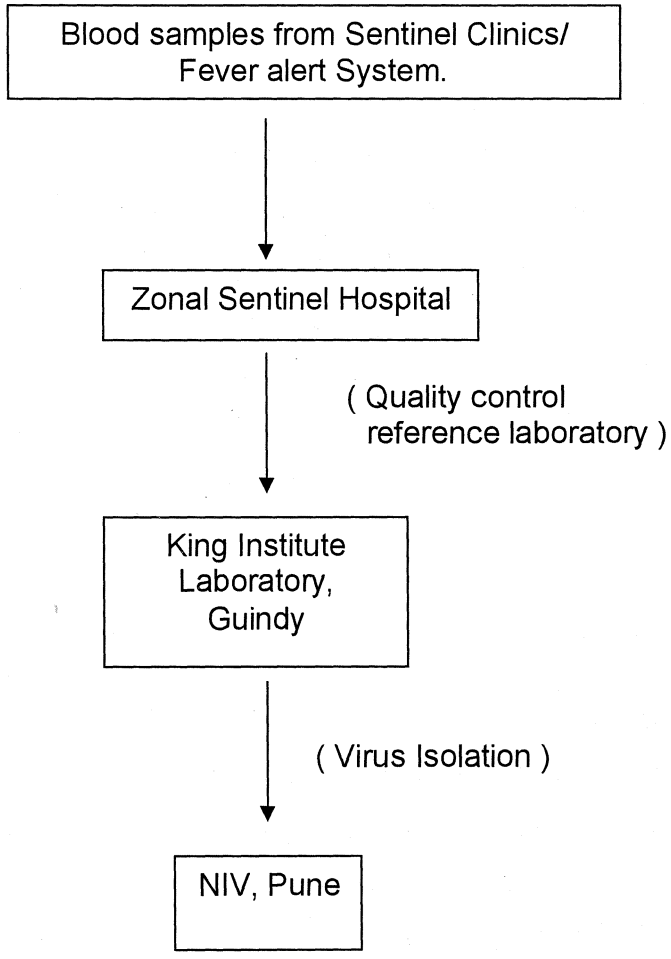
Figure 5. Flow chart showing the flow of information in the Sentinel hospital of proposed dengue surveillance system, Chennai, 2001

Component	Staff / Centre	Approach
Sentinel Hospitals	*Communicable disease hospital, Tondiarpet *Medical college Hospitals *Corporate Hospitals i.e. Child Trust Hospital, Apollo Hospital, representing each zone	• All patients with any haemorrhagic manifestation • An admission diagnosis of viral encephalitis , Aseptic meningitis • Fatal outcome cases follwing viral prodromes. ↓ Blood and Tissue samples taken during hospitalization and/or at death ↓ Reference Laboratory for virus isolation and for IgM antibodies.

5.1.3.Reference Laborotory:

Serological testing facility like Haemagglutination inhibition (HI) test, MAC-ELISA & Rapid serological test kit should be made available in the Sentinel hospitals and they will act as refernce laborotry for receiving samples fom all the sentinel clinics/Fever alert system.The King Institute Public Health Laboratory, Guindy will act as a Quality control reference laboratory & and for storing samples for virus Isolation at National institute of virology (NIV), Pune (Figure 6)

Figure 6: Flow chart showing Reference laboratories for dengue surveillance,chennai 2001



5.2.Vector surveillance:

Surveillance for Aedes. aegypti is important in determining the distribution, population density, major larval habitats, spatial and temporal risk factors related to dengue transmission.

Table 1 (Annexure II) shows various surveillance methods available for detection and monitoring of larval and adult population. The selection of appropriate methods depends on surveillance objectives, levels of infestation, and availability of resources. Thus in Chennai, as the house index level is ≥ 5 %, the larval survey, Collection of mosquitoes on human during biting, and Collection of resting mosquitoes can be initiated.

Vector surveillance for Dengue should be incorporated in the existing Vector surveillance for the Malaria & Filaria. Under the Technical guidance of CRME, Madurai & VCRC, Pondichery, Surveillance standard has to be framed for daily/weekly routine surveillance for assessing Larval& Adult Indices.

5.2.1. Larval surveillance:

The commonly used larval indices are

- House Index
- Container Index
- Breteau's Index

They are useful for determining general distribution, seasonal changes, and principal larval habitats, as well as for evaluating environmental sanitation programmes. Classical larval indices used in *Aedes* surveillance appear to have limited use in assessing transmission risk and are a poor proxy for measuring adult abundance. Moreover, such traditional house-to-house larval surveys are labour intensive and are plagued by difficulties of access, particularly in urban

settings. The less visible and inaccessible breeding sites, such as roof gutters, wells and other subterranean breeding sites are often overlooked. Of particular importance, however, is their adaptation for use as container-specific larval indices to guide and monitor larval control measures including source reduction efforts.

The precise level of vector infestation that constitute a 'risk' level for dengue transmission are influenced by many factors, including mosquito longevity and immunological status of the human population. There are examples where dengue transmission occurs even when the house index was less than 2%(e.g. Singapore).

Therefore the limitation of these indices must be recognized and studied carefully to determine

- how they correlate with adult female population densities, and
- how all indices correlate the disease-transmission risk

5.2.2. Adult surveillance:

The commonly used Adult indices are

- Adult Landing/biting Density
- Adult resting density.

Adult vector sampling procedures can provide valuable data for specific studies, such as seasonal population trends, transmission risk, transmission dynamics, and evaluation of adultciding intervention.

However, results may be less reproducible than those obtained from sampling of immature stages. The collection methods also tend to be labour intensive and heavily dependent on the collector's proficiency and skill.

When there is a risk of virus transmission, human biting collections are also considered unethical

5.2.3. Epidemiological interpretation of vector surveillance:

The Epidemiology of dengue infection may be complicated because Aedes.aegypti may probe repeatedly on one or more persons during a single blood meal. The correlation of different entomological indices in terms of actual disease transmission is difficult. The interpretation of the Epidemiology of Dengue transmission must take into account inter-urban population movement, focality of Aedes population within the urban area, and fluctuation in adult population densities, which influence transmission intensity

Man-vector contact is a critical parameter, which is more closely linked to the risk of dengue transmission. Hence the level and type of vector surveillance selected should be determined by operational research activities conducted at the local level.

6. Data collection & Analysis:

6.1. Reporting Format: Annexure III

6.2. Data flow:

- The Reports collected under Disease Surveillance (Active &Passive) and Vector surveillance from the divisions has to be forwarded to the Zonal Level where it will be consolidated and forwarded to the Corporation Head office. (Annexure IV)

- The Reports collected under Vector surveillance from the divisions has to be forwarded to the Zonal Level where it will be consolidated and forwarded to the Corporation Head office. (Annexure V)

6.3 Data analysis:

In the Corporation Head Office final consolidation and Analysis will be done under the

Guidance of National Institute Of Epidemiology, ICMR, Chennai.

6.4. Data dissemination:

The final Information will be disseminated to all the participating units in the form of Monthly report.

7. Epidemic prepardness and response

For contigency planning of Dengue epidmic control , it is essential for creation of multidisciplinary Emergency Action Committee (EAC) and a Rapid Action Team(RAT).

7.1. Emergency Action Committee (EAC):

The EAC is entrusted with all administrative action and coordinates all activities aimed at emergency interventions.

Constitution:

The EAC will comprise

1. Commisssioner –Chairman
2. Deputy Commissioner(Health) – Vice-Chairman
3. Health Officer – Member secretary

   Members:
4. Chief Vector control o fficer,
5. Health educators,
6. Director,King Institute Laboratory,
7. Additional Director of public health &preventive medicine (Malaria&Filaria),
8. Dean,Medical colleges,
9. Chief Medical officers of other Corporate Hospitals &
10. Representatives from the participating Institutes(NIE,VCRC,CRME,NIV)

Function:

- To take all administrative actions and to coordinate activities
- To draw urgent plan of action and resource mobilization
- To liase with other departments
- To interact with the news media and NGOs for dissemination of information related to health education and community participation.

7.2. Rapid Action Team (RAT)

The RAT undertakes epidemiological investigation and control measures.

Constitution:

The RAT will comprise

1. Zonal Health Officer
2. Zonal Entomologist
3. Dispensary Medical officers
4. Health Inspectors
5. Multipurpose Health Workers

Functions:

- To undertake urgent epidemiological and entomological investigations.
- To provide emergency logistical support & training in case management for local health staff.
- To supervise the application of vector control measures.
- To carry out health education activities.

8. References

1. Prevention and Control of Dengue and Dengue Haemorrhagic Fever: WHO Regional Publication, SEARO, and No.29, WHO, 1999

2. Dengue Haemorrhagic fever, Diagnosis, treatment, prevention and control, second edition, WHO, Geneva 1997.

3. WHO Recommended surveillance standards,1999

4. MMWR, July22,1994/43(SS-2);7-19:Dengue surveillance United States,1986-1992,

5. Julia Gill et al Dengue Surveillance in Florida, 1997-1998, Emerging Infectious disease Journal ,CDC,Volume 6,No.1, Jan-Feb 2000

9. Annexures

Annexure I: Recommended Cases Definition

DENGUE FEVER:

Clinical description: An acute febrile illness of 2-7 days duration with 2 or more of the following: headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestations, leucopenia.

Laboratory criteria for diagnosis:

One or more of the following:

- Isolation of the dengue virus from serum, plasma, leukocytes, or autopsy samples,
- Demonstration of a fourfold or greater change in reciprocal IgG or IgM antibody titers to one or more dengue virus antigens in paired serum samples,
- Demonstration of dengue virus antigen in autopsy tissue by immunohistochemistry or immunofluorescence or in serum samples by EIA,
- Detection of viral genomic sequences in autopsy tissue, serum or CSF samples by polymerase chain reaction (PCR).

Case classification

Suspected:

A case compatible with the clinical description.

Probable:

A case compatible with the clinical description with one or more of the following:

- supportive serology (reciprocal hemagglutination-inhibition antibody titre greater than 1280, comparable IgG EIA titre or positive IgM antibody test in late acute or convalescent-phase serum specimen),

- Occurrence at same location and time as other confirmed cases of dengue fever.

Confirmed: A case compatible with the clinical description, laboratory-confirmed.

DENGUE HEMORRHAGIC FEVER:

A probable or confirmed case of Dengue and Hemorrhagic tendencies evidenced by one or more of the following:

- Positive tourniquet test
- Petechiae, ecchymoses or purpura
- Bleeding: mucosa, gastrointestinal tract, injection sites or other
- Haematemesis or melaena
  and thrombocytopenia (100 000 cells or less per mm3)
  and evidence of plasma leakage due to increased vascular permeability, manifested by one or more of the following:
- more than 20% rise in average hematocrit for age and sex
- more than 20% drop in hematocrit following volume replacement treatment compared to baseline
- signs of plasma leakage (pleural effusion, ascites, hypoproteinemia)

DENGUE SHOCK SYNDROME:

All the above criteria, plus evidence of circulatory failure manifested by rapid and weak pulse, and narrow pulse pressure (less than 20 mm Hg) or hypotension for age, cold, clammy skin and altered mental status.

Source: WHO Recommended Surveillance Standards 1997

Annexure II

Table 1. Aedes aegypti surveillance methods[2]:

	Methods					
Objective	Larval survey	Collection on humans	Collection of resting mosquitoes	Ovitrap	Tyre larvitrap	Insecticide susceptibility
Baseline infestation surveys	x			x		x
Control programme monitoring, Low infestation levels: <5% house index	X	x	x	x	x	
Control programme monitoring, Low infestation levels: ≥5% house index	X	x	x			
Surveillance against reinfestation	X			x	x	
Verification of eradication	X	x	x	x	x	
Evaluation of control methods	x	x	x	x	x	x

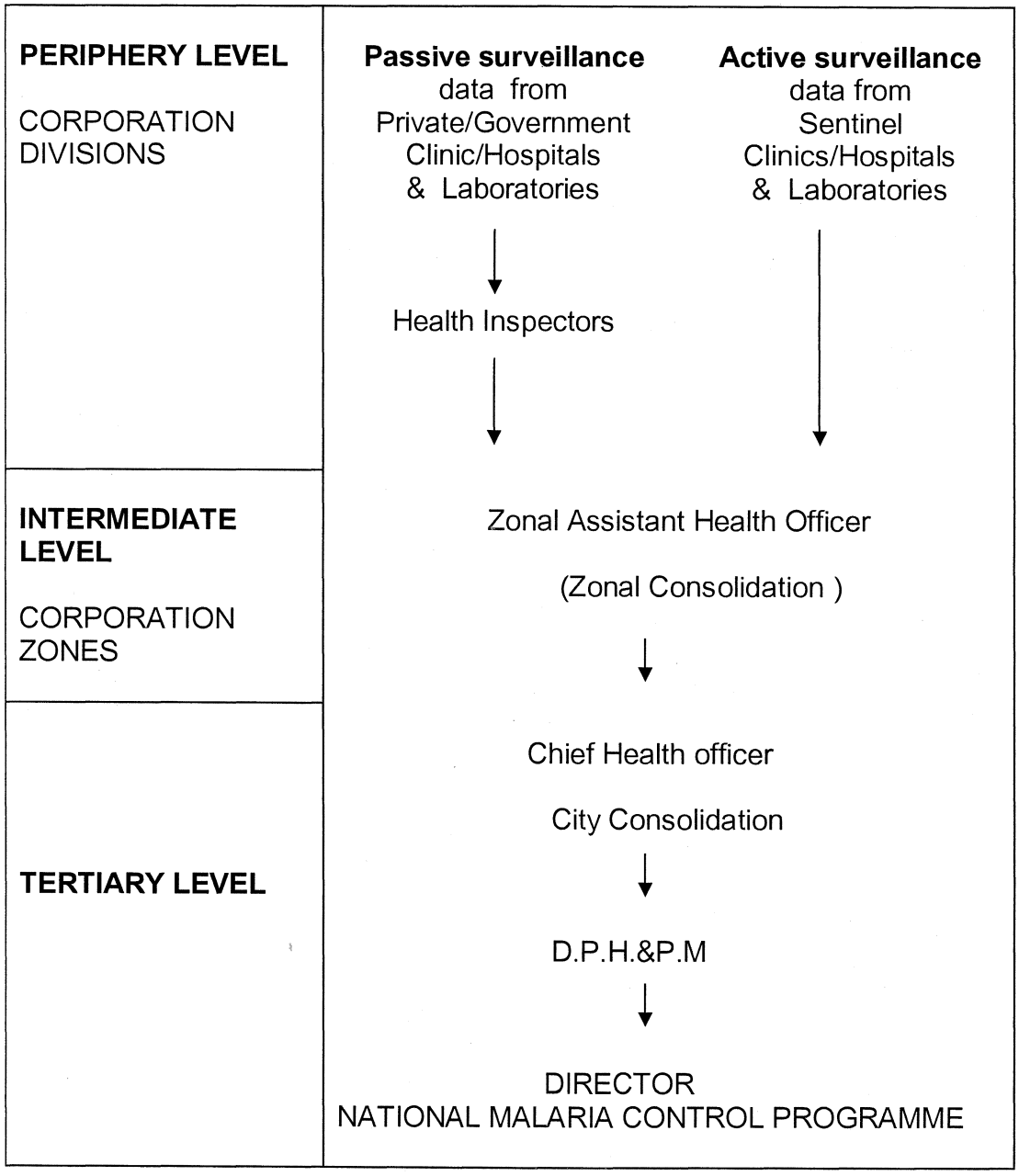
Annexure III

Surveillance case reporting format

Hospital Name: **Date:**

SL. NO	NAME& ADDRESS	AGE	SEX	OP/ IP No:	D.O.A	DIAGNOSIS				SEROLOGY				OUT COME
						DF sus / prob / conf	DHF	DSS	VHF	Specimen taken Yes/No	Lab. name & Specimen Number	Test MAC-ELISA/ HI /Others	Result	

ANNEXE IV: FLOW CHART SHOWING DATA FLOW IN THE PROPOSED DISEASE SURVEILLANCE SYSTEM:



ANNEXE- V: FLOW CHART SHOWING DATA FLOW IN THE PROPOSED VECTOR SURVEILLANCE SYSTEM

PERIPHERY LEVEL CORPORATION DIVISIONS	Weekly Adult & Larval Surveillance by entomological field assistants ↓
INTERMEDIATE LEVEL CORPORATION ZONES	Monthly Adult & Larval Surveillance Zonal Entomologist ↓
TERTIARY LEVEL	Chief Vector Control officer Corporation ↓ Centre for Research in Medical Entomology Pondicherry

Section II

Evaluation of a National Programme

Measles Eradication Programme, Poondi Block, Tiruvallur Health Unit District, Tamilnadu, 2003

1. Introduction

Evaluation has been defined as systematic investigation of merit, worth, or significance of an object. Program evaluation is an essential practice in public health; however, it is neither practiced consistently across program areas, nor sufficiently well integrated into the day-to-day management of most programs.[1]

Effective program evaluation is a systematic way to improve and account for public health actions by involving procedures that are useful, feasible, ethical, and accurate. The goal of evaluation is to identify and account for both intended and unintended effects, i.e. to examine the relationship between the programme activities and observed consequences.[2]

Measles is an acute, highly infectious disease of childhood caused by specific virus of the group myxoviruses. It Is associated with high morbidity and mortality in developing countries like India. The case fatality rate in cases of measles ranges from 1.8 to 7.6 percent [3]. Thus measles is still a leading killer among vaccine-preventable diseases of childhood. The complications of measles infection like diarrhoea, pneumonia and even death are preventable by measles immunization.

Achieving immunization coverage of at least 95 percent of children less than one year of age is necessary for elimination of the disease. In addition to the periodic measles immunization, the strengthening of the surveillance system is necessary to interrupt measles transmission and to eliminate the disease.

The main objective of the existing Measles Eradication Programme is achieving 100% immunization coverage of children less than one year of age in order to reduce incidence of measles and to initiate control measures following occurrence of measles case by ring immunization and to arrange therapeutic measures for preventing the complication of measles like diarrhoea and pneumonia. Measles is targeted for a reduction by 90% in incidence and by 95% in mortality, by the year 2005[4].

2. Objectives

2.1. General Objective:

- To evaluate the Measles Eradication Programme in the rural population of Poondi Block in Tiruvallur Health Unit District, Tamil Nadu.

2.2. Specific Objective:

a. Identify Health Sub centre with poor level of performance i.e. where the immunization coverage is at unacceptable level (i.e., < 95 %) in Primary Health Centre area
b. Assess the knowledge and reporting system for measles among the health staff involved in the implementation of the programme.

3. Existing system description

3.1. Objectives:

The following are the objectives of the measles eradication programme:

a. Achieve immunization coverage of 100 % for measles through routine immunization with measles vaccine for all children at the end of 9 months.
b. Monitor trends and detect outbreaks.
c. Identify contacts of the cases for initiating ring immunization.
d. Minimize the effect of disease and disability among the persons already ill.

3.2. Case Definition:

Under the Child Survival and Safe Motherhood (CSSM) and Reproductive and Child Health (RCH) Programmes, training was given to all filed Health Workers and Medical Officers (MOs) to diagnose measles based on the following case definition.

Any person with fever, generalized maculopapular rash, cough, coryza or conjunctivitis.

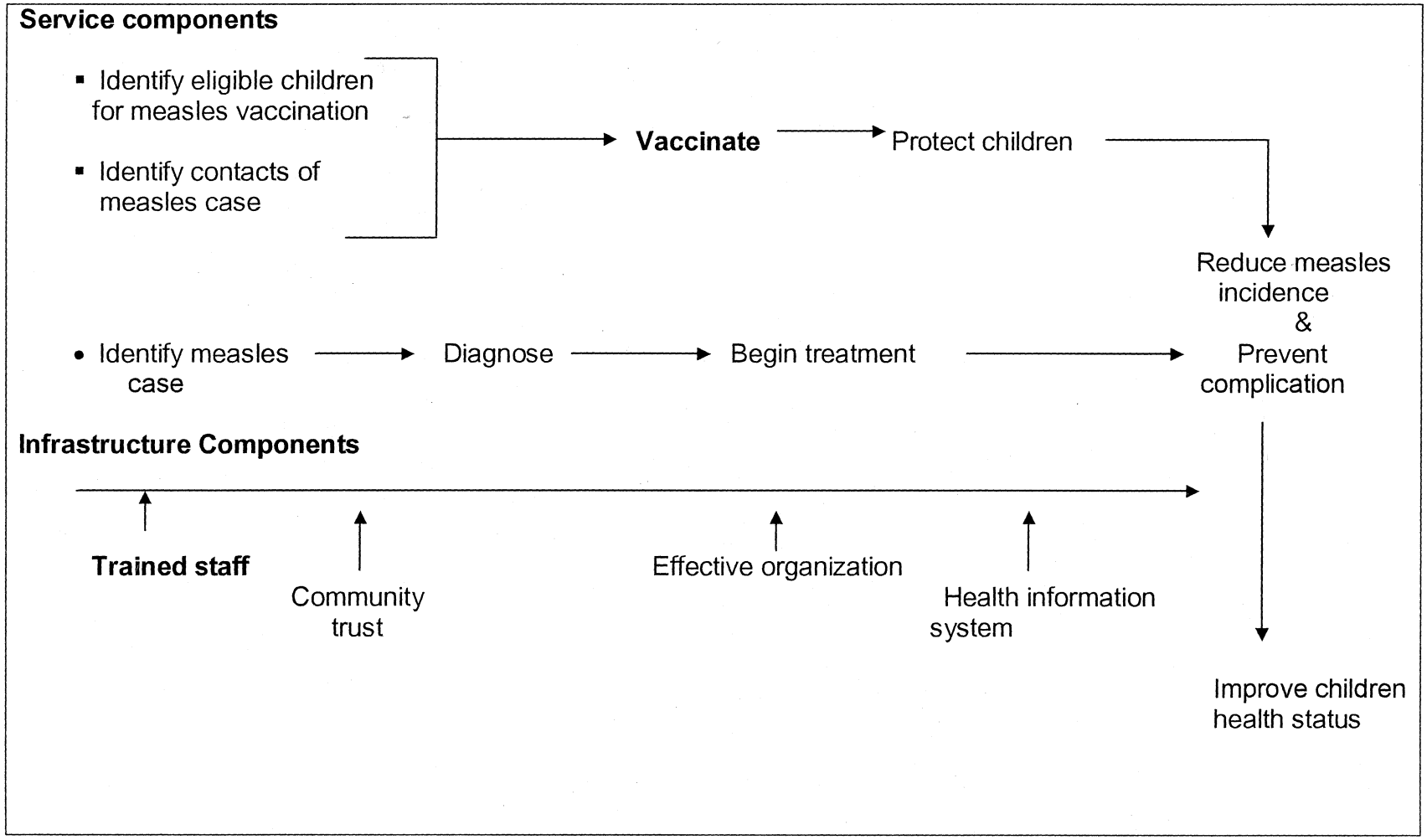
(OR)

Any person in whom a clinician suspects measles infection.

3.3. Logical model for Measles Eradication Programme:

Figure 1 displays the service and infrastructure components needed for the measles eradication programme.

Figure 1. Logical model for measles eradication programme



3.4. Components & Operation

Each Primary Health Centre (PHC) has two Medical Officers (MOs), One Health Inspector (Selection grade) and One Sector Health Nurse (SHN). In addition to this the Block Primary Health Centre has one Block Medical Officer (BMO), One Block Health Supervisor, and One Community Health Nurse. Each PHC has 5 to 6 Health Subcentre (HSC) attached to it. In each HSC, there will be one Health Inspector & One Village Health Nurse (VHN). The VHN will carry out immunization activities in the villages attached to the HSC on every Wednesday. The vaccines are stored in the PHC.

Measles cases detected during their routine field activities, by the Health Inspector & VHN has to be informed to the MO of the PHC. The MO in turn clinically confirms the diagnosis and informs it to the BMO and Deputy Director of Health Services (DDHS). Control measures will be carried out in the affected area immediately by initiating ring immunization to the children below 5 years and by providing Vitamin "A" to the affected individuals and to the close contacts. Even if there is no case, a 'zero report' has to be submitted every week.

Service Components

The service components of the measles eradication programme are as follows:

- Immunizing all infants with measles vaccine at the end of 9th Month but before completion of first year
- Diagnosing the measles case using case definition
- Reporting to the higher authorities
- Treating the affected to prevent the complication
- Initiating Ring Immunization to prevent spread

Infrastructure Components

The infrastructure components that are available for the programme as follows:

1. Trained staff with adequate knowledge about disease and its surveillance
2. Community trust
3. Effective organisation
4. Health Information System (HIS)

4. Methodology

4.1. Study Area & Study Population:

Tiruvallur Health Unit District has 11 Blocks, with rural population of 13,03,375 in 1542 villages. There are about 34 PHCs, 240 HSCs providing health care services to the rural population. The evaluation was conducted in Poondi block of the district. This block is located 10 kilometres west of district capital.

Poondi block:

The population of Poondi block is 91, 285. The health service is provided by the 3 PHCs, out of which, Poondi Primary Health Centre was purposively selected for the Lot Quality Assurance Sampling (LQAS) study to identify HSC with immunization coverage less than 95 %.

The application of LQAS to all the 3 P.H.C.s in the Poondi Block would have been ideal; however, on account of operational convenience, it is decided to under take the study in one P.H.C. only.

The population of the Poondi PHC is 26,983 and there are about 44 villages, covered by 6 HSCs. The immunization for measles as well as for other Vaccine Preventable Diseases were carried out in all the HSCs.

4.2. Study Design:

- LQAS was used to identify the HSC in Poondi PHC area that has low measles immunization coverage i.e. less than 95 % in children between 12-23 months of age.

- Structured questionnaire was used to assess the knowledge about measles and its reporting system among the health staff involved in the implementation of the programme in the Poondi block selected for the study.

4.3. Study Method:

4.3.1. Lot Quality Assurance Sampling

Lot Quality assurance Sampling (LQAS) was developed in the 1920s as a quality control technique for goods produced on a factory assembly line[6]. It was used to examine a small number of units randomly selected from each lot. If the number of defective items in that small sample of units exceeds a predetermined number, the lot was discarded. Otherwise the lot was accepted.

The number of units tested and the maximum allowable number of defects were determined to ensure that there was a high probability that the lots accepted contained no more than specified proportion of defective goods, and the lots rejected contained a relatively a high proportion of defective goods. Since the 1980s, use of LQAS has increased. In 1991, WHO identified LQAS as one of the more practical rapid assessment method.

The sample size and decision values for LQAS are based on the risks that the investigators are willing to take. The sample size is the number of units that are selected from each lot. The decision value is the number of "defective" items that need to found before the lot is deemed unacceptable. There are two types of risk

Type I error: The amount of risk we are willing to take for incorrectly judging an unacceptable lot as being acceptable. Type I error has serious implication and is therefore set at 5 % (Consumer Risk).

Type II error: The amount of risk we are willing to accept for judging an acceptable lot as unacceptable. Type II error is not so serious and is set at 10 % (Producer risk)

Thus the Null Hypothesis is that the coverage in the sub centre is less than 95 % (H_o: P < 95 %) and therefore unacceptable i.e. low performance. The Alternate Hypothesis is that the coverage in the sub centre is more than (or) equal to 95 % (H_a: P $\geq$ 95 %), which is acceptable i.e. good performance.

The sample size **n** and the decision value **d** are selected so that the lots with high immunization coverage have a good chance of being classified as acceptable and those with poor immunization coverage as unacceptable. The sample size required at 5 % level of significance and decision value (d) or 2 is determined to be 73 children in the age group of 12 – 23 months using Stanely Lemeshow and Scott Taber sampling plans[7].

If **d** = 0 or 1 the sample size required may be smaller (35/56 respectively), but more of the adequately covered (good performance areas) will be classified as inadequately covered (low performance) areas. On the other hand if **d** takes values of 3 or 4 or above, the sample size required will be larger (86/96 or above) resulting in excessive fieldwork. The value of **d** therefore chose as 2.

The four –celled table presented in the Figure 2 describes the consequences of the testing procedure.

Figure 2: Consequences of the testing procedure

		Truth		
		Actual Coverage		
		High Coverage	**Low Coverage**	
Survey Decision	Unimmunized Children ≤ 2	1 - β Sensitivity	α Consumer Risk	" Accept" the lot. ← Reject the Null Hypothesis
	Unimmunized Children > 2	β (Provider Risk)	1 - α Specificity	" Reject" the lot. ← Accept the Null Hypothesis

Thus in the each lot i.e. sub centre coverage area 73 children will be assed for Measles Immunization Status.

- If the number of unimmunized children exceeds 2 accept the Null hypothesis and reject the Lot i.e. the coverage in the HSC is less than 95 % (Low Performance)
- On the other hand, if the number of unimmunized children is 2 or less than 2 reject the null hypothesis (accept the Alternate hypothesis) and accept the Lot i.e. the coverage in the HSC is more than or equal to 95 % (High Performance)

Operational Procedures:

Poondi PHC has 6 HSCs with population ranging from 4,500 to 5,000. The expected number of children aged 12-23 months was be 80 to 100 per HSC. Instead of selecting children aged 12-23 months, households were selected for each of the selected sub centre by simple random sampling. List of villages and approximate number of households within each village in the sub centre area were collected from the primary health centre.

Thus a comprehensive list of villages with the number and cumulative number of households were prepared and 73 random numbers between 1 and the total number of households were chosen. This helps to identify the village selected for the study and the number of children to be identified in the selected village.

The exact household to be visited was determined by random selection of household from the street in the village and enquiry will be made for eligible child in the survey age group. Assessing the age was not a problem[8], since 90 % of mothers provide birth certificates in Tamil Nadu. If the initial household did not have an eligible child, the nearest household to the right visited and this was continued until a child of survey age was found. If more than one eligible child is present in the household, the details were collected from the youngest child[9].

The Measles immunization status of the child was obtained by interviewing the mother/guardian and also from the Immunization cards wherever they are available. When mother/guardian was not available, the household was excluded for consideration. The sampling can be stopped after the decision number of non-immunized persons is reached. But to obtain an overall population estimate, the entire sample was surveyed.

Definition of Measles Immunized Child:

Immunization undertaken after completion of nine months but before the completion of 12 months.

4.3.2: Assessment of knowledge:

A structured questionnaire was used to assess the knowledge about measles and its reporting system. The questionnaire was administered to 30 Paramedical staff involved in the implementation of the programme in all the 3 P.H.C.s in the Poondi Block.

4.4. Data Collection and Analysis:

4.4.1. Lot Quality Assurance Sampling:

Team comprising District level officer, HSC level VHN& HI were formed. Totally 3 teams were involved in this study. Each team covered 2-sub centre. The investigator gave training on LQAS methodology and data collection methods. The data was collected using LQAS- Survey format (Annexure-I). The investigator monitored the quality of the data by randomly verifying the data collected by the team.

4.4.2: Assessment of the knowledge:

Information regarding the knowledge about measles and its reporting system was collected using structured questionnaire (Annexure-II) among the 30 Paramedical staffs involved in the implementation of the programme in all the 3 P.H.C.s in the Poondi Block.

4.4.3. Analysis:

The data collected was analysed using Epi info 6.04d.

5. Results

5.1. LQAS Study:

Table 1 shows the results of the LQAS. Two HSCs were classified as having less than 95%, since the number of defective children in these are more than expected defective children, i.e., more than 2 unimmunized children were detected in the survey. In order to obtain the overall estimate of the measles immunization coverage, the results from the entire subcentre were appropriately combined and it was found to be 97.7%.

TABLE: 1 Sub-Centre wise, Immunization Coverage by LQAS, in the Poondi Primary Health Centre, Tiruvallur District, Tamilnadu, 2003

Name of the H.S.C	Number of eligible children surveyed	Number of unimmunized children detected	Remarks
Neyveli	73	4	Reject the lot; Accept the Null hypothesis i.e., the immunization coverage is <95%
Vellathukkottai	73	3	Reject the lot; Accept the Null hypothesis i.e., the immunization coverage is <95%
Meyyur	73	2	Accept the lot; Reject the Null hypothesis i.e., the immunization coverage is ≥ 95%
Chitampakkam	73	1	Accept the lot; Reject the Null hypothesis i.e., the immunization coverage is ≥ 95%
Poondi	73	0	Accept the lot; Reject the Null hypothesis i.e., the immunization coverage is ≥ 95%
Nambakkam	73	0	Accept the lot; Reject the Null hypothesis i.e., the immunization coverage is ≥ 95%

Regarding the source of information on the date of birth it was found that the birth certificates were available only for the 21 (5%) children. Immunization cards were available only in 91 (20.8%) children. Out of 428 immunized children, 419 (97.9%) had their immunization in the government setup, and 9 (2.1%) had their immunization in the private set up (Table 2)

TABLE 2: Distribution among the survey population, the availability of birth certificates, immunization card, and the place of Immunization

Response to question	n	%
The source of information on the date of birth		
Birth Certificate	417	95
Horoscope/ oral	21	5
Total	**438**	**100**
Availability of Immunization card		
Yes	347	79.2
No	91	20.8
Total	**438**	**100**
The source of Immunization		
Government	419	97.9
Private	9	2.1
Total	428	100

5.2. Knowledge about measles:

The results of knowledge about measles and its surveillance activities are presented in Table 3. Regarding case definition for measles, only 17 (56.6%) knew the correct case definition for measles. The correct time of measles vaccination was known to 21 (70%) health workers. Route of administration of measles vaccine was correctly mentioned as subcutaneous by most of them except two health workers. Twenty-five health workers knew that the vaccine should be used within 5 hours of reconstitution.

On receiving information about a case of measles, 21 (70%) of health workers says that they will visit the affected children and then inform it to the medical officer. When enquired about the time interval between noticing the time interval between noticing / receiving information about the case and reporting, 29 (96.6%) health workers told that they would inform the medical officer immediately and only one health worker told that she would inform only during the weekly review meeting. Out of the 29 health workers who said that they would inform medical officer immediately 16 (55.2%) said that they would inform by telephone.

In regard with the control measures to be taken, 5 (16.6%) of health workers informed that they will initiate Ring Immunization to the close contacts, 4(13.4%) of health workers informed that they provide only Vitamin A prophylaxis to the close contacts & to the case, and about 21 (70%) informed that they will do the both. Regarding the feed back decision from the higher-level following notification, 21 (70%) informed that there will be feed back decision. All the health workers had undergone training on measles vaccination and surveillance activities.

TABLE 3: Health workers (n=30) knowledge about Measles, vaccination and its surveillance activities, Poondi Block, Tiruvallur District, Tamilnadu, 2003.

Question regarding knowledge	**Correct response n (%)**
What is the Case definition for measles?	17 (56.6)
When will you give Measles vaccination?	21 (70)
What is the route of administration of measles vaccine?	28 (93.4)
After reconstituting the vaccine it should be used within 5 hours	25 (83.3)
What will you do when you notice / receive information about measles?	21(70)
What is the time interval between noticing / receiving information about the case and reporting?	29 (96.6)

TABLE: 4 Health workers (n=30) knowledge about Measles, vaccination and its surveillance activities, Poondi Block, Tiruvallur District, Tamilnadu, 2003.

Response to question	n	%
What are the modes of communication used for reporting the information to the higher level?		
a. By phone	16	55.2
b. In person	13	44.8
c. By special messenger	0	0
What control measures you take in the area to prevent further spread?		
a. Ring Immunization to the Close contacts	5	16.6
b. Vitamin 'A' prophylaxis to the Close contacts & to the case	4	13.4
c. Both	21	70.0
d. None of the above	0	0
What is the time interval between noticing a case of measles and taking control measures?		
a. Same day	25	83.3
b. At the convenient time	1	3.3
c. During weekly Immunization day	4	13.4
Whether you had received any Training for Case detection & Control measures related to Measles?		
Yes	30	100
No	0	0
Is there any feedback decision from higher level following notification?		
Yes	21	70
No	9	30

6. Discussion

6.1. LQAS - Lot Quality Assurance Sampling

Immunization can have the desired effect only if sufficient doses are administered to children at the appropriate ages. Thus, Measles immunization during infancy, i.e., after completion of nine months but before the completion of 12 months is the goal of Measles Eradication health programmes and achievement of this goal is the simplest indicator of programme performance. Monitoring of this indicator at the population level should provide an assessment of overall programme functioning, but should also identify operational units with poorer coverage, so that their performance can be improved.

Earlier, the lot quality assurance sampling techniques were designed to provide a rapid and simple determination of output quality and traditionally used in industry for quality-assurance purposes. Now, the method is particularly valuable for measuring immunization coverage because it overcomes an important limitation *of* the commonly used 30cluster survey technique, that is, the inability to identify areas with low immunization coverage.

Lot quality assurance sampling procedures proved useful in identifying small health areas with poorer vaccination performance. This information, combined with further assessment of performance problems and timely corrective action helped to improve immunization coverage. In addition to providing information on small health areas, LQAS can provide more current information on vaccination programme performance by assessing immunizations 'in progress' in addition to completed immunizations, as is usually done in coverage surveys.

In this Study, the lot quality assurance sampling method was used to assess the coverage of measles vaccination in six HSCs of Poondi P.H.C, in Tiruvallur District, Tamilnadu. It provided information needed to identify and target

interventions to specific areas with low coverage. The results were then used to focus limited resources on areas with unacceptable coverage rates. Thus out of six subcentres in the poondi Primary health centre area, the level of immunization coverage in the two subcentres were below the 95%. The overall Immunization coverage in the Poondi P.H.C area was 97.7%. Thus this study helped to identify the subcentre with low coverage level. Out of 428 immunized children, 419 (97.9%) had their immunization in the government setup, which indicated the proper availability and utilisation of immunization services in the rural areas. Regarding the source of information on the date of birth it was found that the birth certificates were available only for the 21 (5%) children. This highlighted the importance of registration of birth and issual of free certificates as per the act.

Limitations of the method include the need for an accurate population census as a sampling frame and the requirement that children be selected randomly. A further limitation is that determination of the optimal sampling scheme is not simple because of the need to calculate the needed sample size and number of allowable defects based on the hypergeometric distribution. Furthermore, for this method to work it is necessary for the supervisor to be conscientious about following the procedures of random sampling.

Quality assurance sampling techniques can be useful tools to identify programme problems, enabling targeting of supervision to selected health areas. Such sampling would be most appropriately done as part of routine monitoring or supervisory activities and not as special surveys. Although LQAS was earlier used mainly for enhancing vaccination performance in campaigns, the method would be most useful for monitoring and improving immunization coverage as part of primary health care as done in this study. The method would also permit simultaneous monitoring of various components of the health programme through the use of different indicators.

6.2. Knowledge about disease vaccination and surveillance activities:

The proportion of individuals who knew about the correct time for measles vaccination, the correct route of administration and usage of vaccination following reconstitution were, 70%, 93.4% & 83.3% respectively. This showed the inadequate knowledge among the health workers.

In the measles surveillance related activities, identification of cases by the using case definition, and case reporting were very important. However, in this study the number of health workers who knew about the correct case definition was 17 (56.6%) and only 21(70%) knew about the correct procedure to be followed on receiving information about the occurrence of measles case in the area. Similarly the correct containment measures to be taken in the area to prevent further spread, and time interval between noticing a case of measles and taking containment measures were 70% (n=21) & 83.3% (n=25) respectively. Thus about 30% to 40% of health workers lack knowledge on measles surveillance related activities despite the fact that all the health workers had undergone training on Measles vaccination and Surveillance activities.

Thus the lack of knowledge about measles vaccination and measles surveillance could be corrected by having re-orientation training among the Health workers. The Medical officers of the P.H. C could play an active role in overcoming this problem. Thus, during regular weekly review meetings, the information on disease and its surveillance could be discussed. The Medical officers should to be motivated by the district level officers during the monthly review meeting regarding the same.

7. Recommendations

- Lot Quality assurance sampling techniques could be used as part of routine monitoring or supervisory activities and not as special surveys at the Primary Health centre level.

- Re-orientation training for the Health workers during regular weekly review meeting

8. References:

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9. Annexure

Annexure-I: LQAS-Survey Form for Measles Immunization

Name of the Interviewer: Name of the Block:

Name of the P.H.C: Name of the H.S.C:

Name of the Village: Name of the Street:

House hold Visited		1	2	3	4	5	6	7	8	9	10	Total
Door No:												
Eligible Child	(Yes/No)											
	If yes, Name											
	Sex (M/F)											
Date of Birth	Date											
	Source (B.C*/ Oral)											
Immunization Card	(Yes/No)											
Immunization Status	(Immunized / Not immunized)											
	Date											
	Source											

Date: Signature of the Interviewer

Annexure-II

Questionnaires for field health workers in health post

1. What is the case definition for Measles?
    a. Any person with generalized maculopapular rash, and cough, running nose or conjunctivitis,
    b. Any person with fever, generalized maculopapular rash, and cough, running nose or conjunctivitis
    c. Any person with fever, generalized maculopapular, rash

2. When will you give Measles vaccination?
    a. During 9 th month of age.
    b. After completion of nine months but before the completion of 12 months.
    c. Any time, from birth to 12 months.

3. What is the route of administration of Measles vaccine?
    a. Oral
    b. Intra muscular
    c. Subcutaneous

4. After reconstituting the vaccine it 8hould be used within -----?
    a. 1 hour
    b. 5 hours
    c. 24 hours

5. What will you do when you notice /receive information about measles?
    a. Visit to the affected area, examine the affected person, report to the Medical officer
    b. Report to Medical officer
    c. Will not report

6.What is the time interval between noticing / receiving information about the case and reporting?

a. Immediately

b. During weekly review meeting

c. Only during Monthly report submission

7.What are the modes of communication used for reporting the information to the higher level?

a. By phone

b. In person

c. By special messenger

8.What control measures you take in the area to prevent further spread?

a. Ring Immunization to the Close contacts

b. Vitamin A prophylaxis to the Close contacts & to the case

c. Both

d. None of the above

9.What is the time interval between noticing a case of measles and taking control measures?

a. Same day

b. At the convenient time

c. During routine weekly Immunization day

10.Whether you had received any Training for Measles Vaccination & Surveillance?

a. Yes

b. No

11. Is there any feedback decision from higher level?

a. Yes

b. No

Chapter II

Section I

Description of field placement site facilities, and laboratory facility available for outbreak investigation in field placement area.

Description of Field Placement Site Facilities, Chennai Corporation, 2000

1. Introduction

The Chennai Corporation is the oldest, being in first Municipal Corporation to be formed in the entire country in the year 1688.With reference to Chennai city it is to be noted that the health care delivery is provided by the following agencies

1. Institution under the Corporation of Chennai
2. Institution under the control of Tamil Nadu Government/ Organization
3. Institution under the control of Central Government /Organization
4. Private Institutions

The Health Department in the Corporation is under the control of Deputy Commissioner). It has two wings.

1. Public Health Wing
2. Family Health Wing

Major Health activities covered by Corporation of Chennai

1. Medical Care,
2. Family welfare and RCH -Reproductive and Child health care,
3. School Health Programme
4. Improvement of Environmental Sanitation
5. Control and surveillance of communicable diseases
6. Collection and reporting of vital statistics
7. Health Education
8. Mobile health check up programme
9. Implementation of various health programmes like RNTCP-Revised National Tuberculosis control programme, AIDS-control, Malaria and Filarial Control.

The detailed information (as on: - 01-04-2000) on demographic and health facilities is given below :

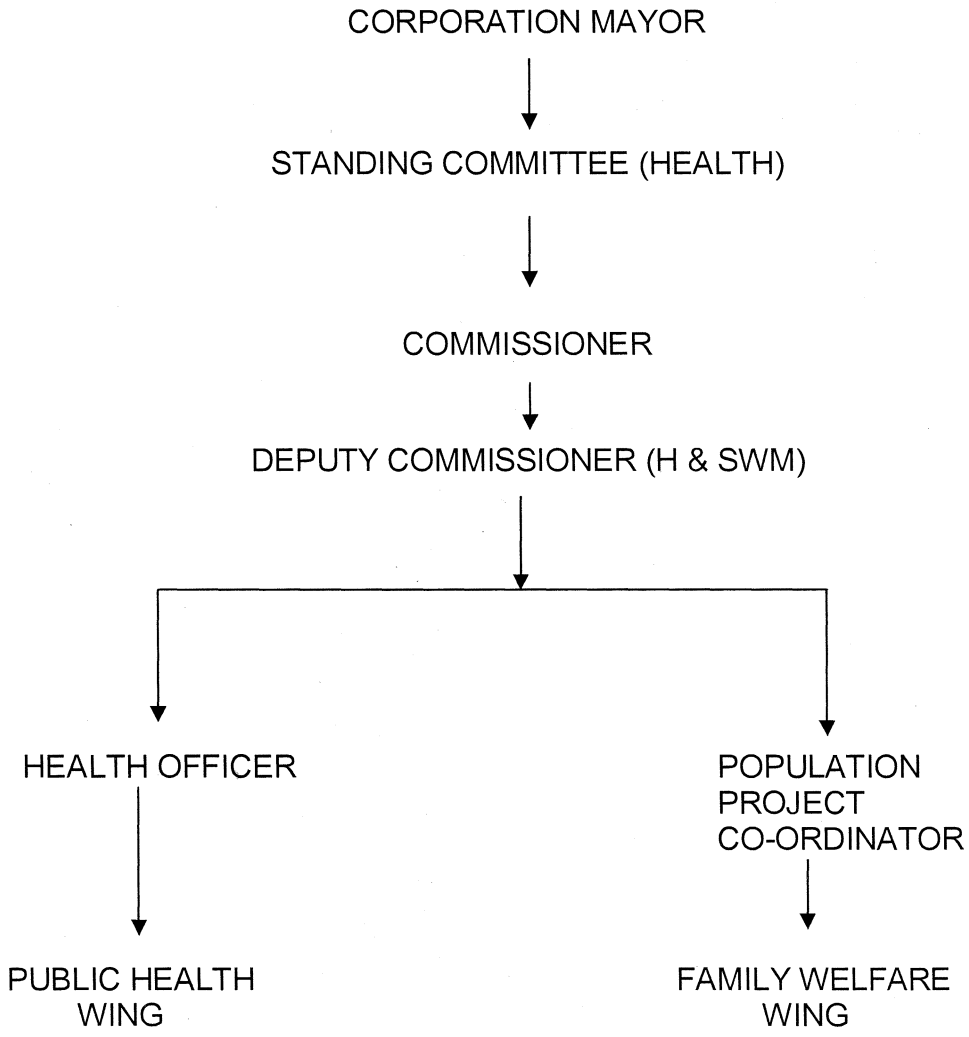
1.	Area of Chennai City	174 sq.km
2.	Estimated mid year population	46,67,302
3.	No. of zones	10
4.	No. of division	155
5.	No. of division in each zone	13 to 18
6.	Approximate population per division	25000-30000
7.	Total No. of slums	1207
8.	No. of Corporation dispensaries	74
9.	No. of Malaria Clinics attached to dispensaries	30
10.	No. of family welfare centres	93
11.	No. of corporation Hospital	1
12.	No. of Government Hospitals (State/Central)	26
13.	No. of Private Medical Practitioners	10,000
14.	No. of Private Nursing Homes	367

2. Administrative Setup

The flow chart (figure 1) shows the overall administrative set up in the Chennai Corporation, Health department.

Figure 1: Administrative set up of Health department

Chennai Corporation



3. Public health wing

The Chief Health Officer heads the Public Health Wing. The flow chart (figure 2) shows the overall administrative set up in the Public health wing of Chennai Corporation, Health department.

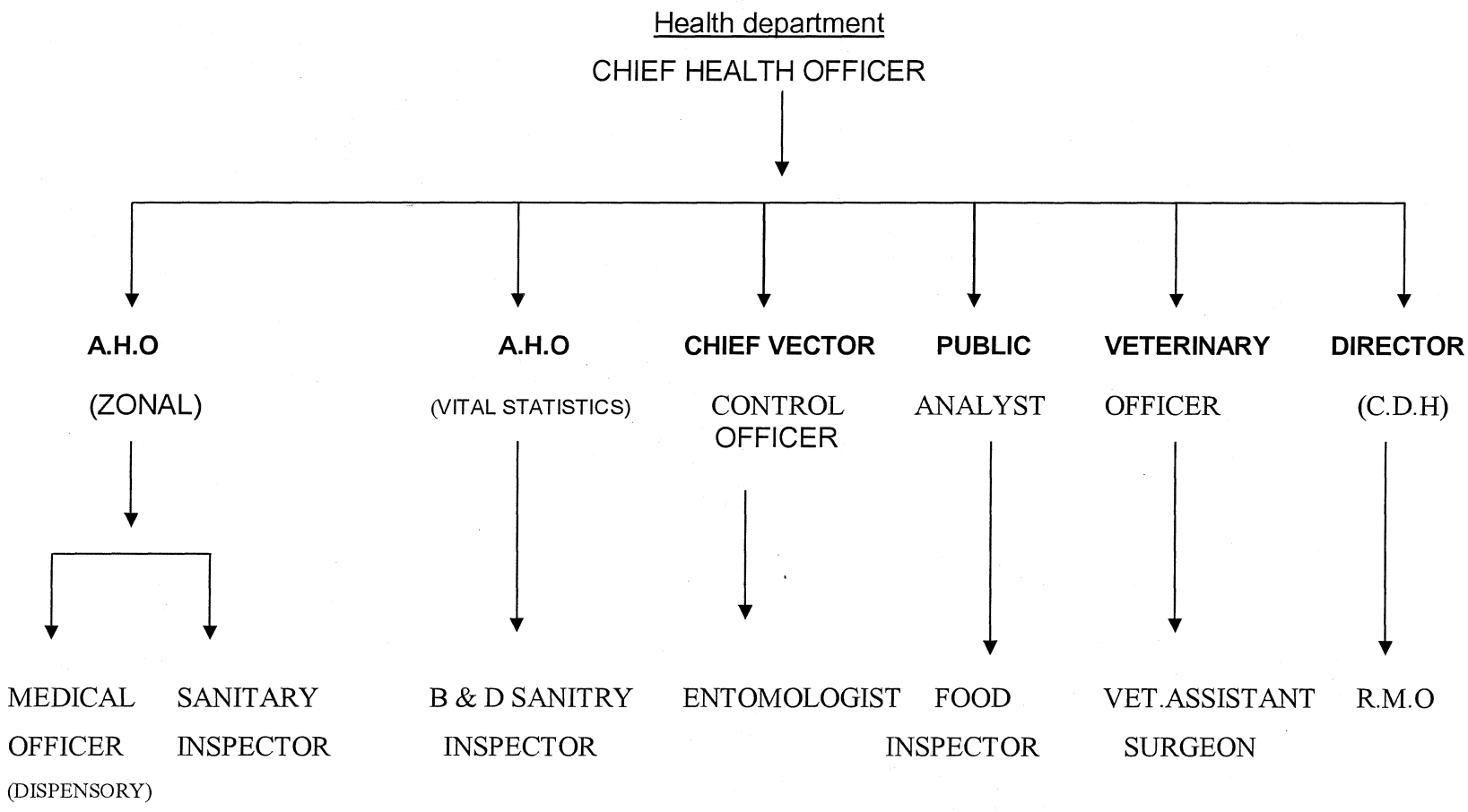
The Asst. Health Officer in each zone is responsible for implementing the Public Health Act, Prevention of food adulteration Act, and Chennai city Corporation Act, through Sanitary Inspectors and Food Inspectors. The Corporation dispensary headed by Medical Officer is under the control of Assistant Health Officer. The Assistant Health Officer (Vital Statistics) is responsible for implementing the birth and death act though Sanitary Inspectors (B&D.S.I.)

The implementation of National Malaria and filarial control programme is carried out under the supervision of Chief Vector Control Officer.

Service Rendered: -

1. The implementation of various National Programme like RNTCP, AIDS control, RCH, Malaria and filarial control programme.
2. Implementation of Public Health Act, PFA and Chennai Corporation Act.
3. Conduction of family health awareness campaign.
4. Registration of vital events.
5. School Health Programme, & Slum Health Programme
6. Mobile Health check up programme
7. Improvement of Environmental Sanitation
8. Control and surveillance of communicable diseases

Figure 2: Administrative set up, Public health wing of Chennai Corporation



(B& D-Birth and Death, R.M.O- Resident Medical Officer)

4. Family Welfare Wing

Family welfare department is headed by Population Project Co-ordinator. The flow chart (figure 3) shows the overall administrative set up in the Family welfare wing of Chennai Corporation,Health department. Family Welfare Programme was implemented in corporation of Chennai as early as 1965 as a Pilot Project. The reorganized Family Welfare scheme was started on 1967

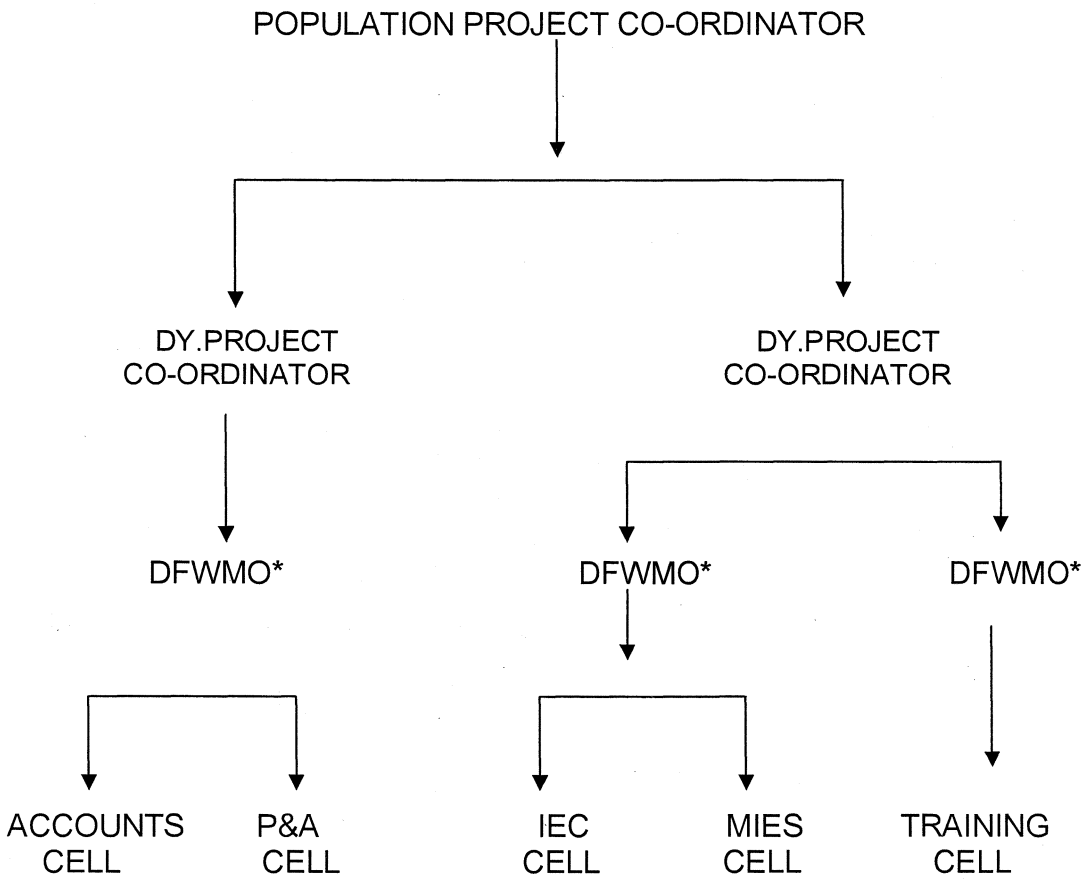
With one district family welfare Bureau functioning at ripon building and 33 urban family welfare centres on the basis of 50,000 population functioning under National family welfare programme. There are about 25 health centres on the basis of 35,000 populations under Urban out reach service scheme since 1986 to render primary health care to urban slums.

The World Bank aided IPP-V was introduced in 1988. Under this scheme the existing urban family welfare centre and Maternity centres were re-organized into Health Posts. At present there are about 93 health posts in Chennai Corporation and each covering about 35,000 populations.

Service rendered: -

1. MCH Care
2. Immunization
3. I.U.D. Infection
4. Sterilization
5. Post partum Project
6. Ultra sonogram facility 21 Health Post
7. Facilities for caesarean operation – 15 Health Posts

Figure 3: Administrative set up, Family welfare wing of Chennai Corporation Health department



* **DFWMO** (DISTRICT FAMILY WELFARE MEDICAL OFFICER)

5. ANALYSIS

The data collected from the Public health wing and Family welfare wing were analysed under the following headings.

5.1. Socio-Demographic Characteristics

5.2. Health Parameters

5.1. Socio- Demographic Characteristics

The demographic data analysed were given below.

5.1.1. Total Population-Zone Wise:

The details were given in Table 1. Out of ten zones in the Chennai Corporation zone III has the highest population. Total number of families residing in the corporation area was 932001 and the Average family size was 5.

Table 1:Zone wise population of Chennai corporation ,2000

ZONE	POPULATION
I	365602
II	510033
III	588136
IV	477626
V	461983
VI	485049
VII	467382
VIII	491823
IX	384432
X	435236
TOTAL	**4667302**

5.1.2. Population Density

The Total area of Chennai Corporation is 174 Sq.km, and the population density is 26,824/ Sq.Km

5.1.3..Population By Sex & Age group

The distribution of the General population according to Age & Sex was given in the Table 2.The Male Female sex ratio was 1000:967. The slum Population Comprises 39.82 % of general population. The Age &Sex wise distribution of Slum Population was given in Table 3

Table2: Distribution of Population by age & sex, Chennai Corporation, 2000

AGE GROUP	TOTAL POPULATION	
	MALE	FEMALE
0-1	13015	42139
1-4	170364	154556
5-9	178092	171018
10-14	190738	185378
15-19	179743	168249
20-24	249959	248744
25-29	259933	260286
30-34	212509	201503
35-39	162484	146735
40-44	119219	105807
45-49	129652	122366
50-54	122107	125926
55-59	104341	104231
60-64	89295	90324
65-69	72851	76727
70-74	52604	55213
75 +	35071	35313
Total	**2372787**	**2294515**
Grand Total	**4667302**	

Table3: Distribution of Slum Population by age & sex, Chennai Corporation, 2000

AGE GROUP	SLUM POPULATION	
	MALE	FEMALE
0-1	19538	19349
1-4	70150	68605
5-9	76581	75596
10-14	82973	80220
15-19	70949	71462
20-24	116471	103890
25-29	106453	111082
30-34	82682	80595
35-39	61837	57413
40-44	46012	39735
45-49	45662	45782
50-54	42257	39478
55-59	37323	33968
60-64	28332	27709
65-69	22263	21091
70-74	19617	17890
75 +	18391	17320
Total	**947491**	**911185**
Grand Total	**1858676**	

5.1.4.. Distribution of population by religion:

The population by various religions was given in the table 5.

Table 5: Distribution of population by Religion, Chennai 2000

RELIGION	MALE	FEMALE	TOTAL
HINDU	1826801	1789389	3616190
MUSLIM	299646	269639	569285
CHRISTIAN	228910	218947	447857
OTHERS	17430	116540	133970
TOTAL	2372787	2294515	4667302

5.1.5. Fertility Indicators:

The total live Birth in the Chennai corporation during the year 2000 was 82357, and the Crude Birth rate was 17.6 per 100 population. The total number of Eligible couples was 7543021and the couple protection rate was 65%. The Total Fertility rate was 1.79. The Mean age at Marriage for Male & Female was 28 & 22 yrs respectively.

5.1.6. Total literacy rate:

The total literacy rate in the Chennai corporation was 80.14%.The literacy rate in Male & Female were 75.32% &80.14 % respectively.

5.2. Health Parameters

The Health parameters were discussed under the following headings.

5.2.1. Vital Events

5.2.2. Morbidity Pattern

5.2.3. Mortality Pattern

5.2.1. Vital Events For the Year 2000:

The Crude Birth Rate in the Chennai Corporation was 17.6 per 1000 population. The Comparison of Birth Rate for the year 2000 with previous year data shows slight increase (Figure 1). The Crude death rate was, 3.7 per 1000 population and comparison of death Rate for the year 2000 with previous year data shows decline (figure 2)

The Infant Mortality Rate and Maternal Mortality Rate were 15.5 & 0.2 per 1000 live birth respectively. Comparison of Infant Mortality Rate for the year 2000 with previous year data shows decline (figure 3). Comparison of Maternal Mortality Rate for the year 2000 with previous year data shows decline (figure 4). This indicates better Reproductive and child health care services.

5.2.2. Morbidity Pattern:

Morbidity pattern among the cases attending the Corporation Dispensary for the year 1999 & 2000 were shown in the Table 6.It shows that Pyrexia of Unknown origin and Upper respiratory tract infection were the leading causes of morbidity

Table 6: Distribution of Morbidly among patients attending Chennai Corporation Dispensary, 1999 &2000

	Year 1999		Year 2000	
Cause	**Number**	**Percent**	**Number**	**Percent**
PUO	329259	20.49	313741	17.89
URI	231351	14.40	275573	15.71
Skin Problems	123613	7.69	118461	6.75
ENT Problems	69915	4.35	69611	3.97
Diarrhoea	61676	3.84	59908	3.42
Dysentery	51938	3.23	44217	2.52
Eye Problem	51482	3.20	39488	2.25
Dental Problem	44256	2.75	40870	2.33
Injury	41882	2.61	36192	2.06
LRI	34287	2.13	74403	4.24
Malaria	26071	1.62	16891	0.96
Anaemia	3746	0.23	11068	0.63
Others	537281	33.44	653742	37.27
Total	**1069476**	**100.00**	**1100423**	**100.00**

5.2.3. Mortality Pattern:

Analysis of Mortality pattern among the deaths registered in the Corporation for the year 1997 to 1999 shows, senility is the leading cause of Death in all the three years (Fig.5).

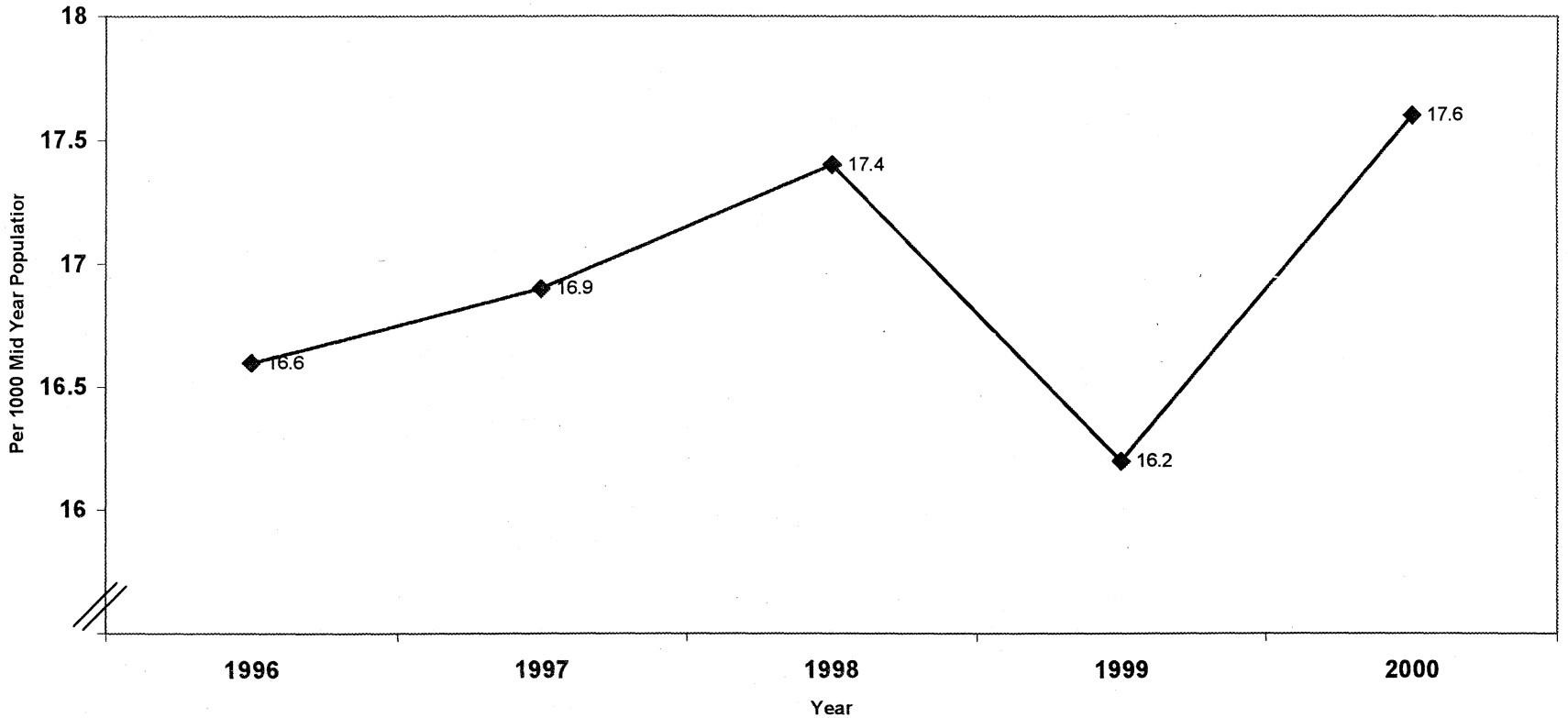
Among the Non-Communicable diseases Heart Attack (Myocardial Infarction) Ranks first and death due to Traffic accidents were increasing (Fig.6)

In the Communicable diseases Pyrexia Of Unknown Origin ranks first, but the trend shows decline in the death due to that. (Fig.7)

6. Summary

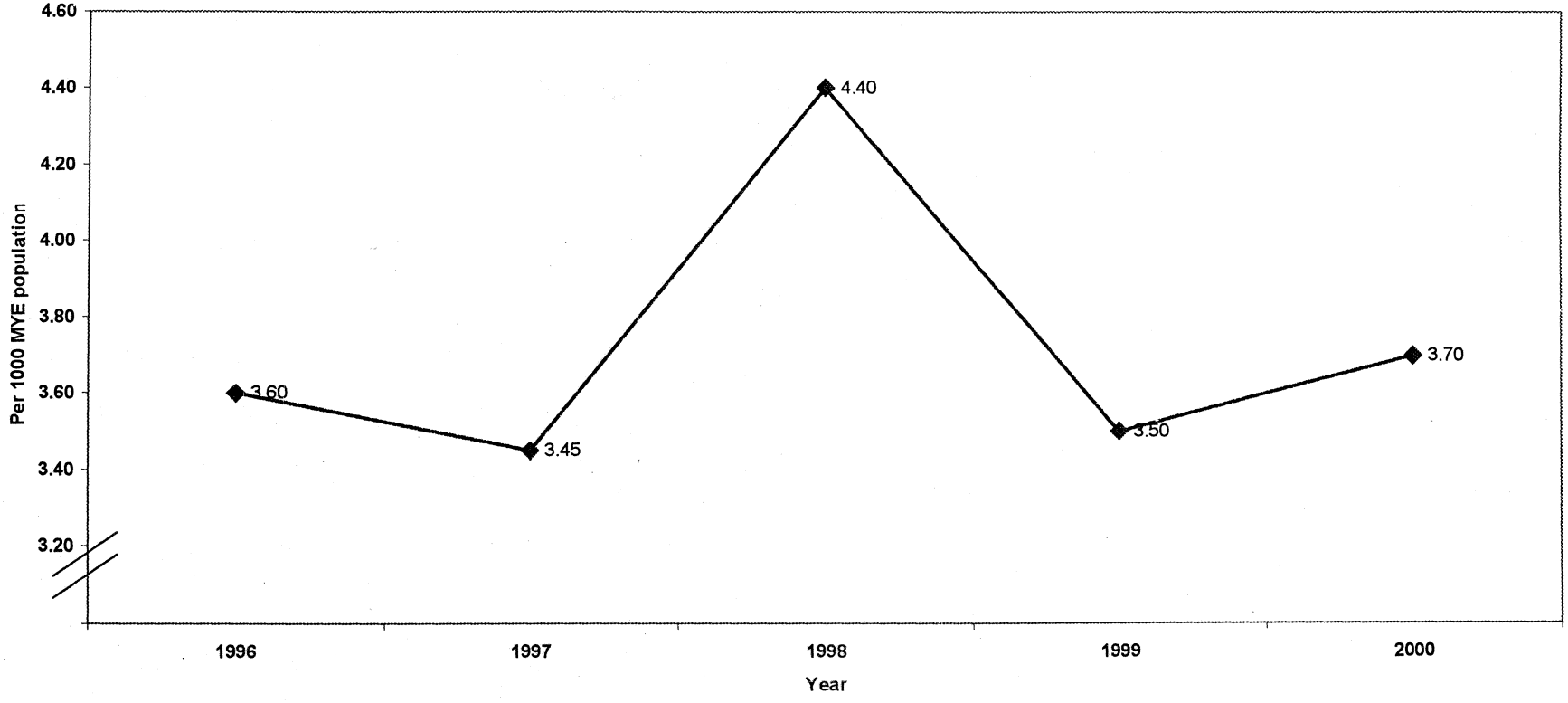
Chennai Corporation is one of the thickly populated metro cities in India. The chief of health department is the deputy commissioner of Chennai Corporation. The services are rendered through two wings viz Public health & Family health wings. The city has large network of hospitals and dispensaries providing curative and preventive services to Chennai population. The public health wing headed by Chief health officer, involved in the Disease surveillance and outbreak response function. The city has good number of corporate hospitals & private practioners.

Figure1
Crude Birth rate,chennai,1996-2000



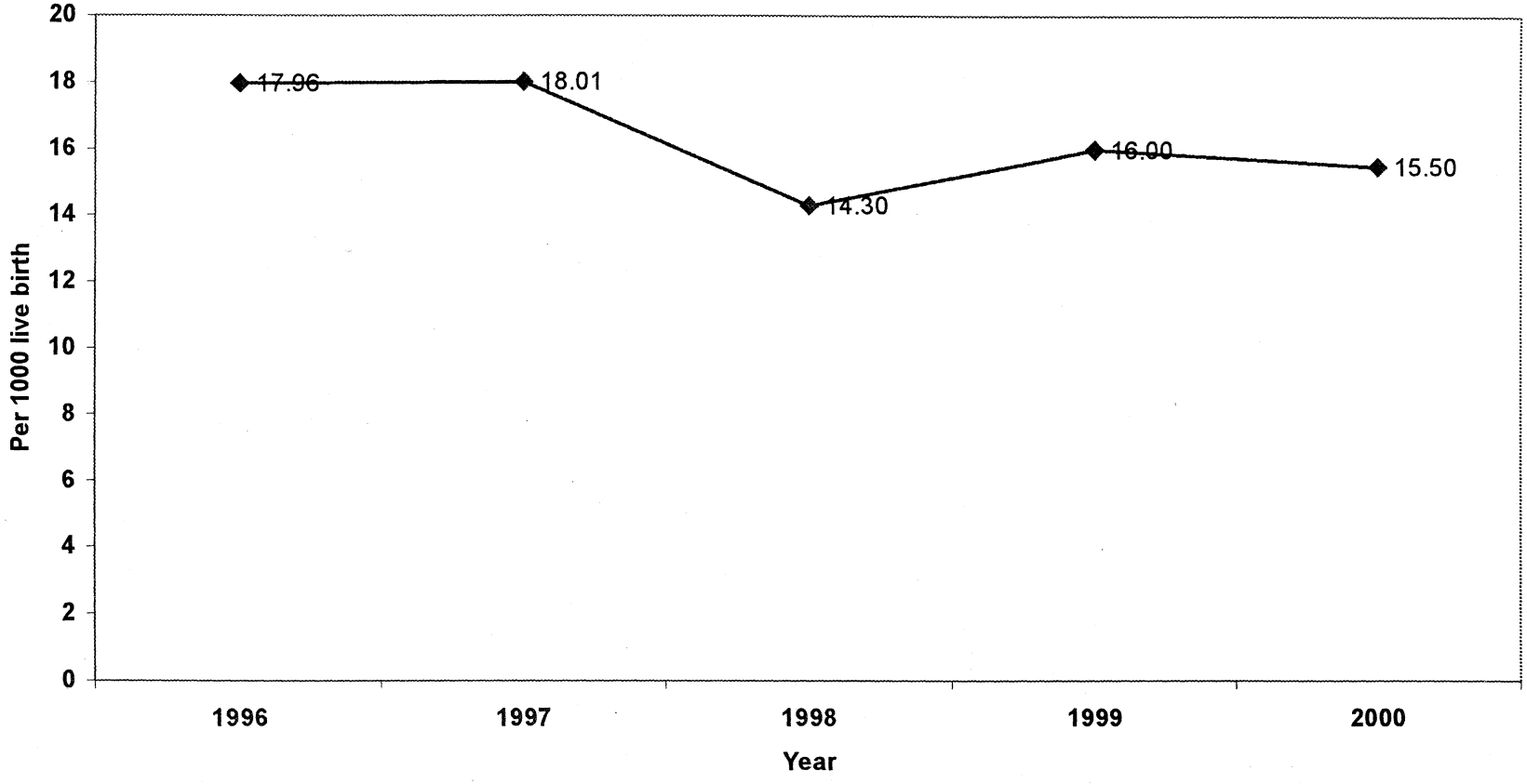
Source: Chennai Corporation Health Department

Figure2
Crude Death rate,Chennai,1996-2000



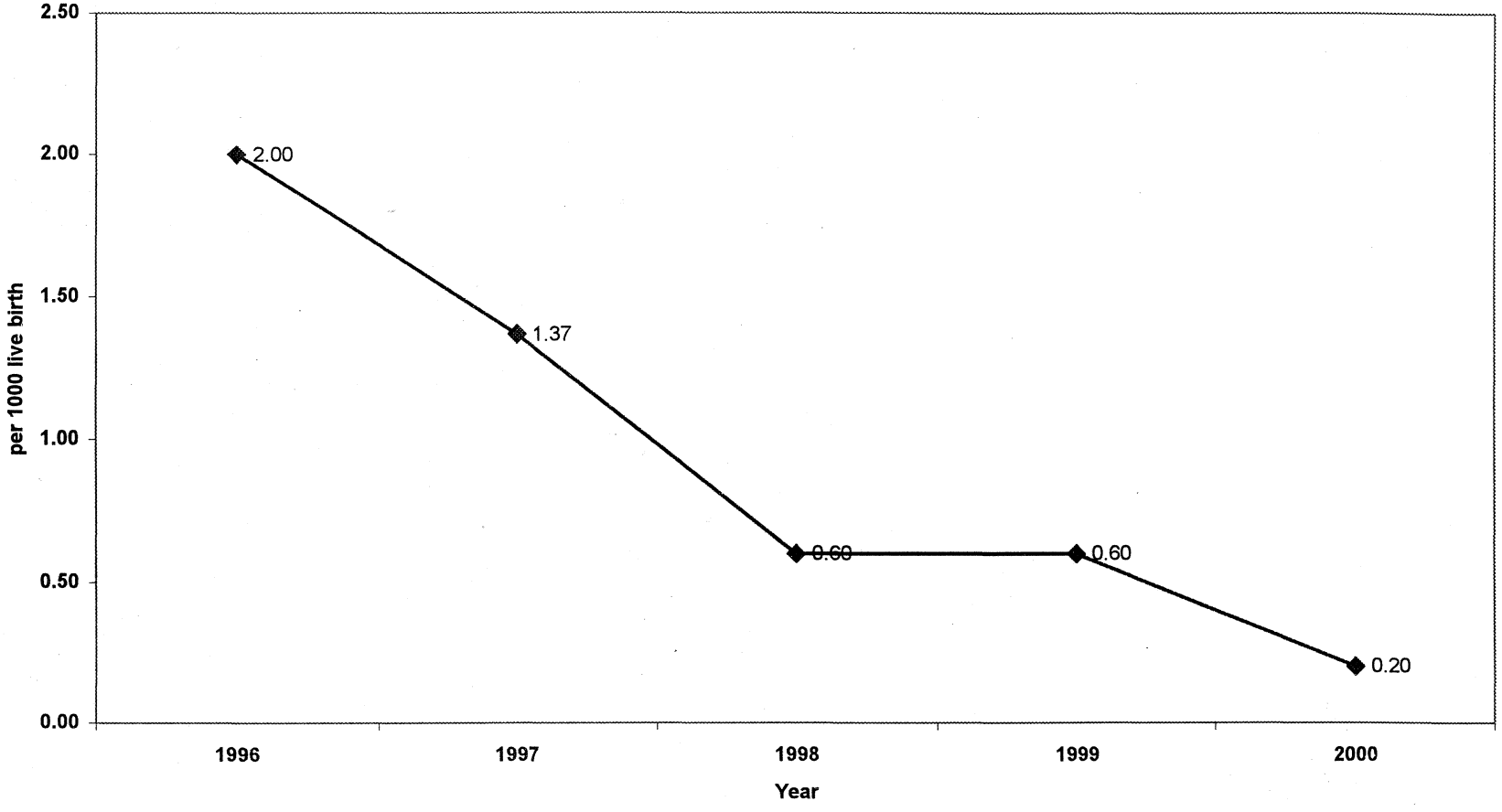
Source: Chennai Corporation Health Department

Figure3
Infant Mortality Rate, Chennai,1996-2000



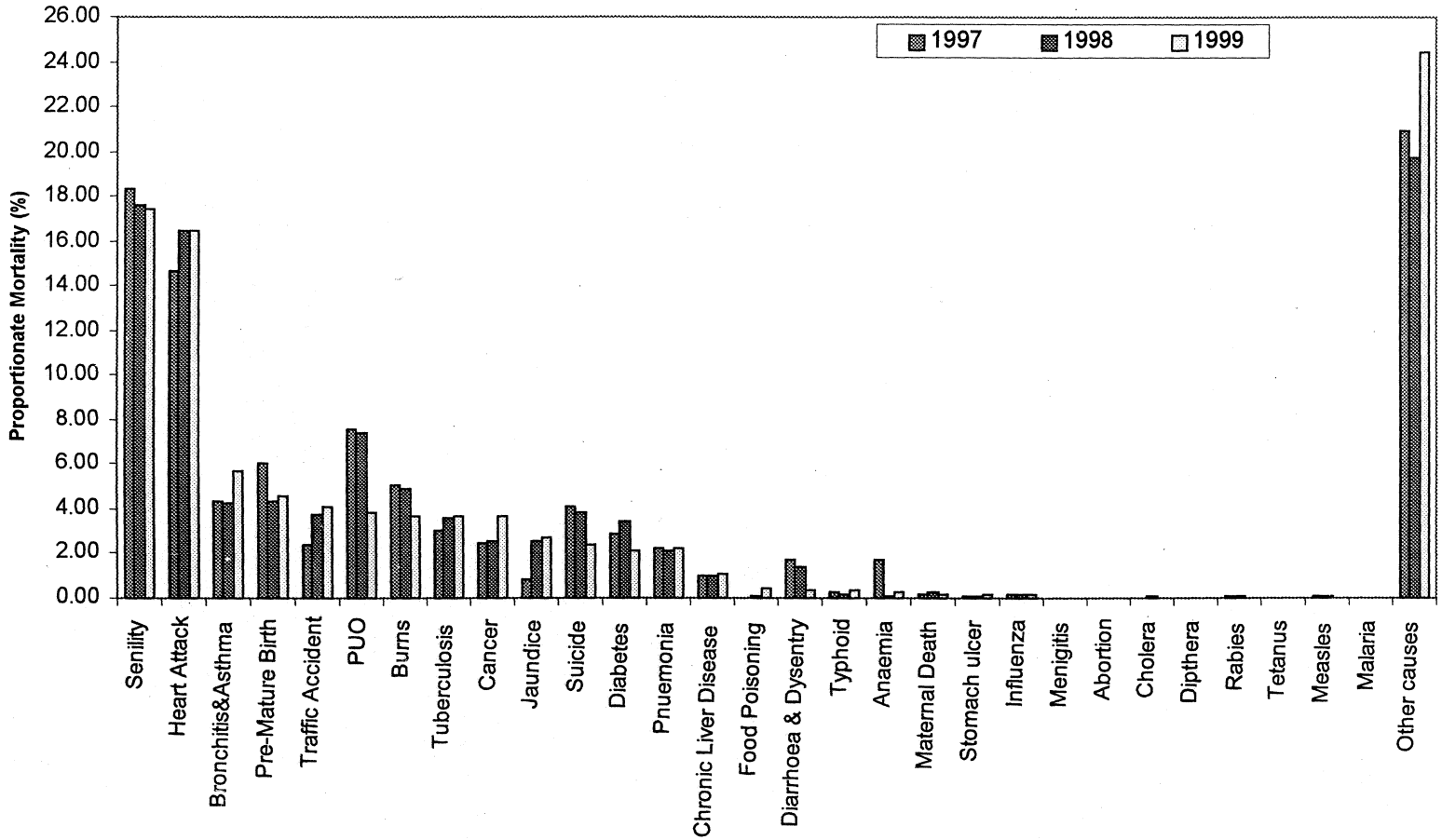
Source: Chennai Corporation Health Department

Figure 4
Maternal Mortality Rate,Chennai,1996-2000



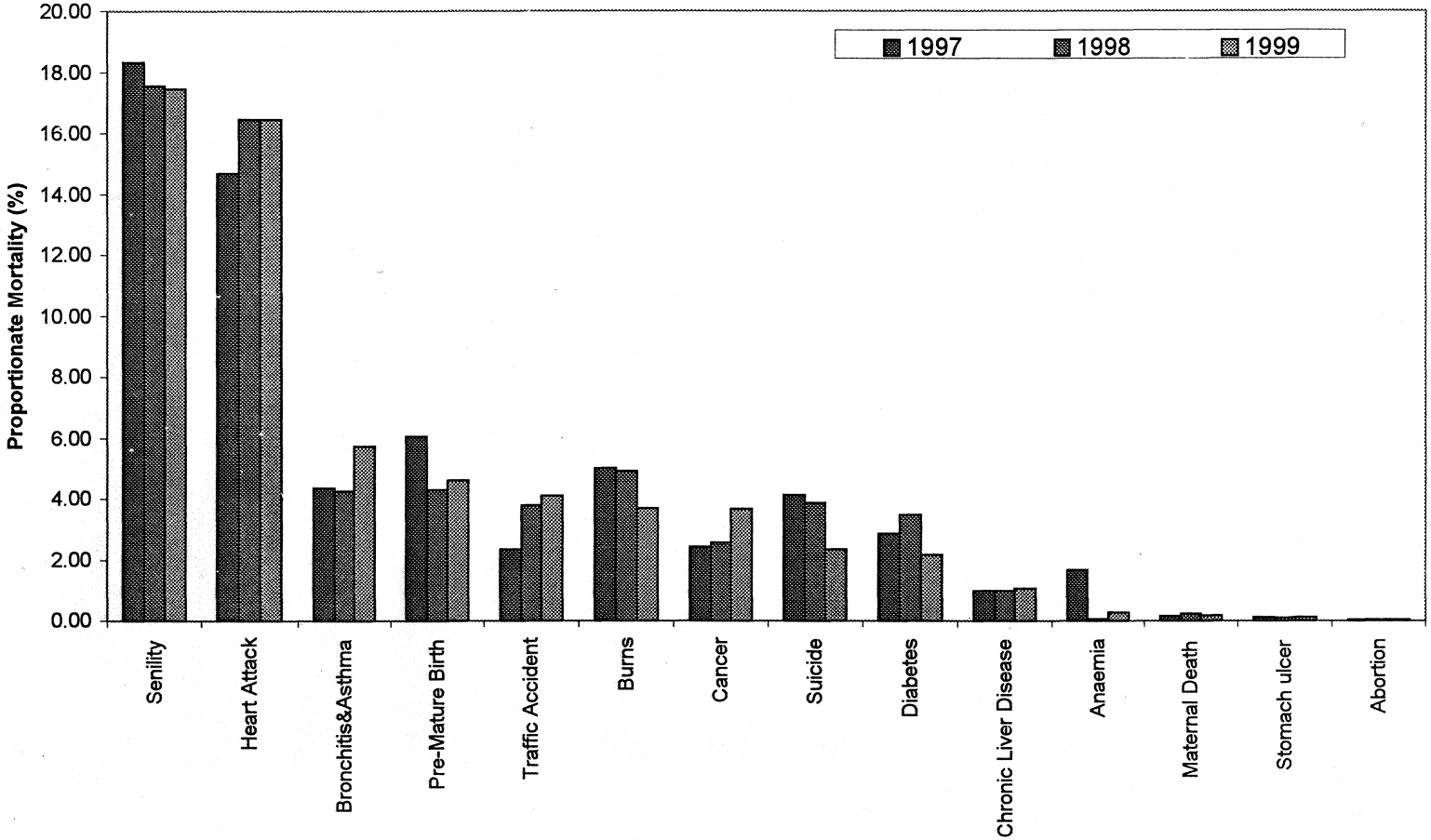
Source: Chennai Corporation Health Department

Figure 5
Mortality pattern by Cause, Chennai, 1997-1999



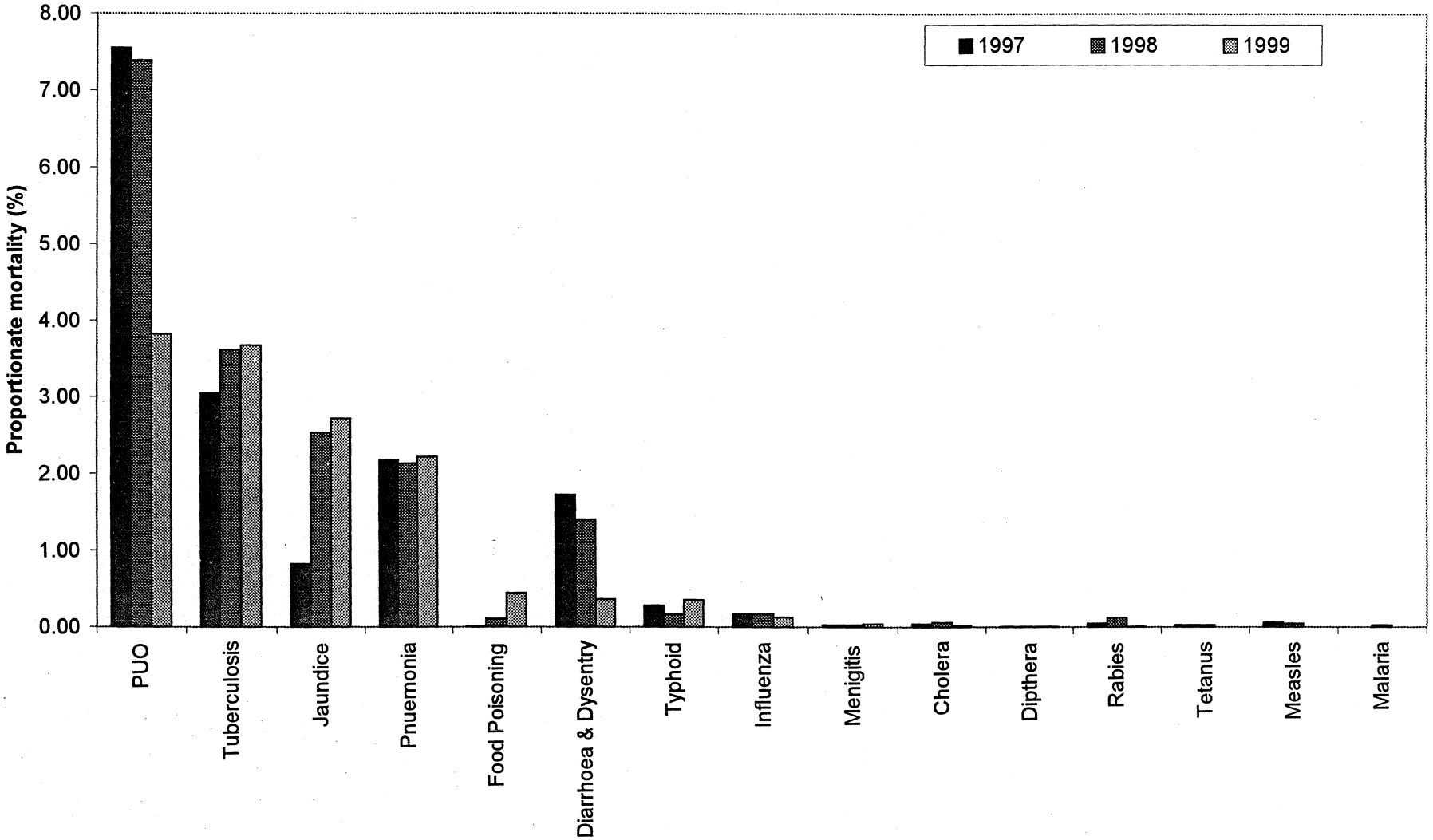
Source: Chennai Corporation Health Department

Figure 6
Mortality patternn of Non-communicable diseases,in Chennai,1997-1999



Source: Chennai Corporation Health Department

Figure7
Mortality pattern of Communicable Diseases,Chennai,1997-1999



Source: Chennai Corporation Health Department

Laboratory facility available for outbreak investigation in field placement area.

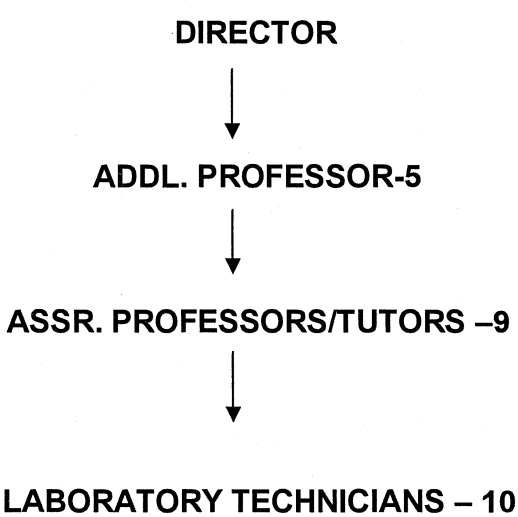
1. INTRODUCTION

The laboratory chosen for the appraisal was the Microbiology Laboratory, Institute of Microbiology, Madras Medical College; Chennai.It is situated within the campus of the college.

Bacteriology, Serology, Mycology tests were performed in the laboratory. It serves for the population attending the government general hospital of madras medical college, Chennai. It also receives samples from other peripheral government hospitals in the Chennai city.

For special investigation like HIV-testing & Leptospiral testing it receives samples from all government &private hospitals in Chennai City. The microbiology laboratory & the institute of microbiology, madras medical college is headed by the Director & Professor. The flow chart (figure 1) shows the administrative setup in the laboratory

Figure 1: Administrative Set-up in the Microbiology Laboratory.



2. OBJECTIVES:

- To asses the facilities available for handling the outbreak.

- To understand a core of laboratory tests, the procedures and time required for producing the results.

3. METHODOLOGY:

The details were collected by interviewing the staffs working the Laboratory and also by observation of certain tests.The details of various tests performed in the laboratory was given in the Table 1

Table 1: Total number of tests performed for the year 1997 to 2000

Tests	1997 – 1998	1998 – 1999	1999 –
1. Urine culture	**13,900**	**9957**	**14625**
2. Blood widal	**1980**	**1839**	**1673**
3. Test for Brucella	**455**	**96**	**52**
1. Blood culture			
• **Enteric & Non enteric**	**1375**	**1517**	**1135**
• **Miscellaneous**	**5605**	**4447**	**6418**
5. Theatre swab	**1208**	**1200**	**1610**
6. HBs –Ag	**520**	**2829**	**2840**
7. AFB	**1095**	**2133**	**2924**
8. Anaerobic Organism	**72**	**50**	**100**
9. Fungus	**157**	**490**	**418**
10. HIV	**24000**	**17960**	**20580**

A detailed report on the observation and interpretation of the following were given below:

3.1. Bacteriology tests:

3.1.1. Faecal sample processing

3.1.2. Sputum sample processing

3.1.3. Blood sample processing

3.2. Serology tests:

3.2.1. Elisa tests

3.2.2. Agglutination tests

3.3. Specific organism test processes:

3.3.1. Salmonella species

3.3.2. Shigella species

3.4. Special test:

3.4.1. Leptospirosis

3.1. BACTERIOLOGY TESTING

3.1.1. BLOOD SAMPLES:

Samples are incubated in BHI (brain heart infusion broth) and routine sub cultures are made at 24hrs, 48hrs & 1 week intervals. Following sub culturing, identification of micro – organism and sensitivity tests are done.

In this method the following organisms were identified

- Staphylococcus aureus.
- Streptococcus viridans
- Enterobacteriaceae
- Pseudomonus
- Salmonella typhi
- Samonella paratyphi

3.1.2. FAECES SAMPLES:

Initially direct microscopy is performed. Specimens are then plated on selective media. Negative cultures are excluded at 48hrs. Following sub-culturing idenfication of microorganism and sensitivity are done for Salmonella typhi and Vibrio cholerae.

3.1.3. SPUTUM SAMPLES

- AFB – staining:

Direct sputum smear and smear after concentrations were stained by modified ZIEL–NEELSON technique and examined under microscope for Mycobacterium tuberculosis

- Culture for bacterial pathogens:

Initially samples are examined by direct microscopy Samples are than plated on Blood agar plate & Mackonkey agar plate. Organisms grown are subjected to identification & sensitivity tests. In this method the organisms like Klebsiella, Pseudomonus, Pneumococci,& H.Influenza were identified.

3.2. SEROLOGY TESTING

3.2.1.ELISA TEST:

For HIV

The state AIDS – cell sponsored laboratory in the Institution serves as voluntary testing and counseling center for HIV. The laboratory serves as national reference center for HIV. The laboratory is supported by Tamil Nadu state AIDS – control society & NACO. Serological Testing facilities available are Elisa & Western blot.

For Hepatitis

The serology for Hepatitis- B, surface antigen is performed. Samples received are batched and serology is performed once in a week.

3.2.2. AGGLUTINATION TEST:

Tube agglutination test for Salmonella and Brucella were done daily. For salmonella the reports are ready in 24 hours and for Brucella the reports are ready in 48 hours.

3.3. SPECIFIC ORGANISM TEST PROCESS

3.3.1. SALMONELLA SPECIES

Specimens are plated on to routine media and on the following day urease negative colonies are selected. The selected colonies are put up for bio-chemical tests and then confirmation by side agglutination test with high titre sera.

Media for Stool Specimen:

Direct plating on Mackonkey media. Enrichment in selenite – F broth. Subculture on Maconkey DCA media. The time taken for isolation of the organism is 48- 72 hours.

Media for blood specimen:

Direct plating on blood agar plate & Maconkey plate. The time taken for isolation of the organism is 72 -96 hours.

3.3.2. SHIGELLA SPECIES

Specimens are plated onto routine media and on the following day urease negative colonies are selected. The selected colonies are put up for bio – chemical tests and then confirmation by side agglutination test with high titre sera

Media for Stool Specimen:

Direct plating on Mackonkey media. Enrichment in selenite-F broth. Subculture on Maconkey DCA media. The time taken for isolation of the organism is 48- 72 hours.

3.4. SPECIAL TEST

Leptospirosis:

Testing facility for Leptospirosis was started in the year 1994 and test was done only for the samples received from Government Institutes. In the year 1998 the facility was extended to other Private Institutes also. Various types of tests available are given in the Table 2.

Table 2. Tests for Leptospirosis.

TEST	SPECIMEN	TIME DURATION
Dark field Microscopy	**Blood & Urine**	**15 – 20 mts.**
Culture	**Blood**	**2-26 weeks**
Macroscopic Slide Agglutination Test	**Serum**	**20 – 30 mts**
Microscopic Agglutination Test	**Serum**	**3-4 hrs**
ELISA	**Serum**	**3 – 4 hrs**
Latex Agglutination Test	**Serum**	**20 –30 mts**

4. Quality Control

External Quality Assurance Scheme

- For HIV – serological tests: Samples were sent to CDC – Atlanta, once in 3 months
- For Leptospirosis Seological Tests: Samples were sent to royal Tropical Institute, Amsterdam, Netherlands, once in 3 months
- For rest of the Tests: Samples were sent to Christian Medical College, Vellore

Section II

Description of existing disease Surveillance system, Chennai, 2000

1. Introduction

Surveillance is the ongoing and systematic collection, analysis and interpretation, and dissemination of risk factor, exposure, or outcome specific data for use in public health practice.

The data collected by Public Health Surveillance system can be used to

- Estimate the magnitude of a health problem.
- Portray the natural history of the disease.
- Detect epidemics.
- Document the distribution and spread of a health event.
- Facilitate epidemiologic and laboratory research.
- Test hypothesis,
- Evaluate control and preventive measures.
- Monitor changes in infectious agents.
- Detect changes in the health practices.
- Programme planning.

A surveillance system is usually established as an integral part of a health care system in order to monitor priority health events.

Effective communicable disease control relies on effective disease surveillance. Surveillance activities have developed in an uneven way. Many activities are managed by different vertical diseases control programmes.

Under Sec 62 of the Tamil nadu Public Health Act, 1939 the Director of Public Health & Preventive Medicine had declared the following Communicable Diseases as the Notifiable Infectious Disease.

List of Notifiable Infectious Diseases in Tamil Nadu

S.No	Diseases
1	Cerebrospinal fever
2	Chicken pox
3	Diphtheria
4	Leprosy
5	Cholera
6	Measles
7	Plague
8	Rabies
9	Scarlet Fever
10	Small pox
11	Typhoid/Enteric Fever
12	Tuberculosis
13	Infectious Hepatitis
14	Epidemic Influenza
15	Whooping cough
16	Virus Encephalitis
17	Hemorrhagic fever
18	Malaria
19	Tenaus
20	Poliomyelitis
21	AIDS

2. Existing system

The Chennai Corporation is the oldest, being the first Municipal Corporation to be formed in the entire country in the year 1688.

Chennai is a metropolitan city with an area of 174 Sq. Km & Population of 46.2 lakhs. The city is situated in the East Coast of India. The climate in Chennai is Tropical with monsoon on September- November. The city is divided into 10 zones.

The Health Care services for the city is provided by 74 corporation dispensaries, 93 family welfare centres, 22 Government Hospitals, 1 Corporation hospital, 3 Medical College Hospitals, & 347 Private Nursing Homes.

With reference to Chennai city it is to be noted that the Notifiable disease surveillance / reporting is carried out by the following two wings of the Corporation Health department, which are under the control of Deputy Commissioner (H &SWM)

- Family Health Wing
- Public Health Wing

The family health wing carries out the vaccine preventable diseases reporting and the public health wing carries out the reporting of rest of the Notifiable diseases along with Leptospirosis.

Family health wing is headed by Population Project coordinator. The Zonal medical officers of the 15 family welfare zones & Medical officers of the 93 health posts in the Chennai Corporation are responsible for reporting the Vaccine preventable diseases, through Multipurpose Health Worker (female).

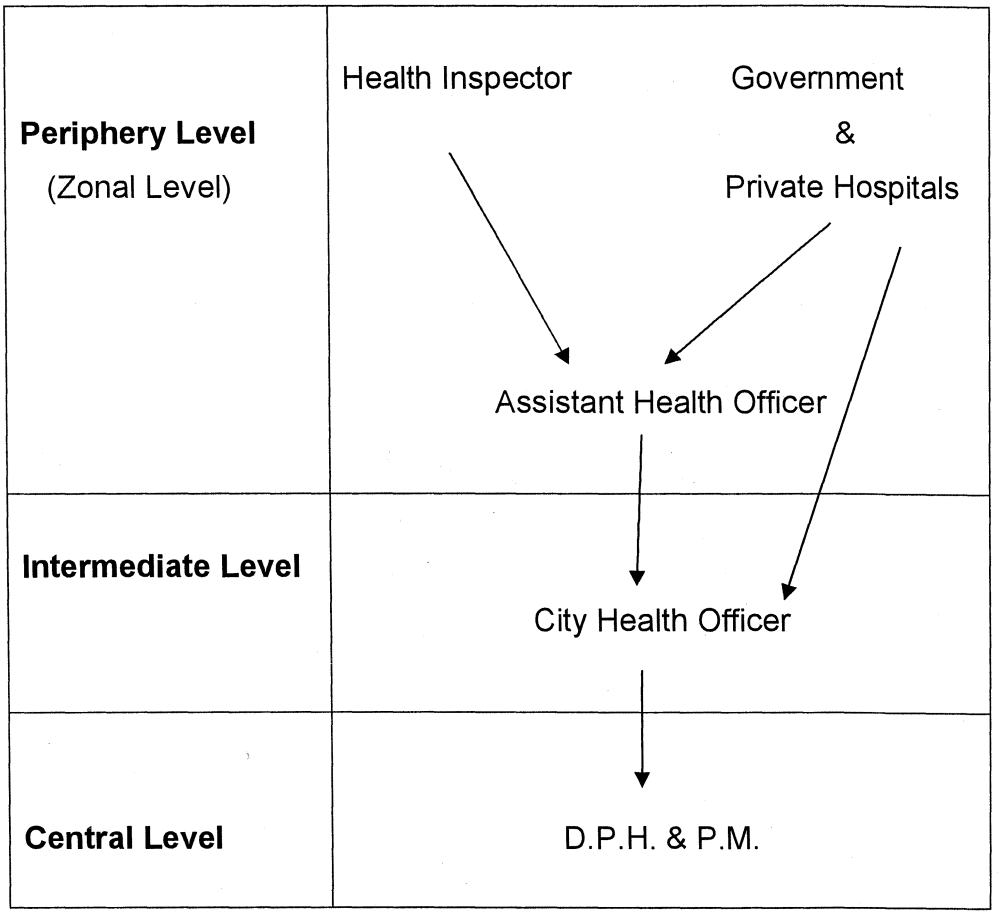
The flow of information from the field health staffs to the higher authorities was shown in the figure 1.

Figure 1: Flow Chart Showing Flow Of Information for Notifiable Vaccine Preventable Diseases

Periphery	Multipurpose Health Worker (Female) ↓
Health post level	Medical Officer ↓
Zonal level	Zonal Medical Officer ↓
Intermediate Level	Population Project Co-ordinator ↓
Central Level	D.P.H. & P.M

The Chief Health Officer heads the Public Health Wing. The Asst. Health Officer in each zone is responsible for implementing the Notifiable disease reporting under the Tamil nadu Public Health Act 1939, through Sanitary Inspectors.

FLOW CHART SHOWING FLOW OF INFORMATION FOR NOTIFIABLE DISEASES OTHER THAN VACCINE PREVENTABLE DISEASES



3. Conclusion

At present only the reporting component of surveillance system is functioning with varying degree of sensitivity.

In regard with the Vaccine preventable diseases surveillance, except for poliomyelitis where there is acute flaccid paralysis surveillance & in regard with the other Notifiable diseases, except for cholera and malaria, for the rest of the Notifiable diseases, the following core functions of the disease surveillance system are not carried out:

- Case detection
- Reporting by Government & Private Hospitals
- Investigation and confirmation
- Analysis and interpretation
- Feedback

4. Recommendations

- Setting of standard case definition
- Setting up laboratory support
- Training & Supervision of the Medical and Paramedical field workers for efficient reporting and for appropriate analysis
- The reporting by the private & government medical institution has to be strengthened
- Appropriate, motivating feedback from intermediate and central levels.

Section III

Analysis of secondary data from surveillance system

1. Introduction

Communicable Diseases are major cause of Morbidity & Mortality in both urban and rural areas of Tamil Nadu. Epidemics caused by the infectious communicable diseases are Public Health Emergencies. The Mid year population of Tamil Nadu in the year 2000 was 6,21,49,000 with 26 % of population lives in urban areas and 74 % of the population lives in rural areas.

The Directorate of Public Health and Preventive Medicine is responsible for the control & prevention of the infectious communicable diseases in the state of Tamil Nadu. The control of communicable diseases is carried out by the Municipal Health centres in the urban areas & by the Medical Officers of the Primary Health Centres in rural areas. The Deputy Director of Health Service in the District is the Officer responsible for controlling & preventing the occurrence of communicable diseases in the District.

The Municipal Health Officers & the Primary Health Centre – Medical Officers in the District collects the communicable disease report from all the Government hospitals and the Private Practioners in their respective areas every month And forward it to the Deputy Director of Health Service in the District who in turn consolidates the whole district and forward it to the Director of Public Health and Preventive Medicine.

Epidemic co-ordination committee meeting will be held every month in the office of the Joint Director of Health Services to discuss about the communicable diseases reported in the district. The Deputy Director of health services will be the Member secretary for that meeting, and all the Municipal Health Officers and Resident Medical Officers of the Government Hospitals in the district will attend the meeting.

Under Sec 62 of the Tamil Nadu Public Health Act, 1939 the Director of Public Health and Preventive Medicine, declared the following Communicable Diseases as the Notifiable Infectious Disease (Table 1)

TABLE: 1 List of Notifiable Infectious Diseases in Tamilnadu.

Sl.No	Diseases
1	Cerebrospinal fever
2	Chicken pox
3	Diphtheria
4	Leprosy
5	Cholera
6	Measles
7	Plague
8	Rabies
9	Scarlet Fever
10	Small pox
11	Typhoid/Enteric Fever
12	Tuberculosis
13	Infectious Hepatitis
14	Epidemic Influenza
15	Whooping cough
16	Virus Encephalitis
17	Hemorrhagic fever
18	Malaria
19	Tetanus
20	Poliomyelitis
21	AIDS

National Surveillance Programme for Communicable Diseases was launched in two Revenue Districts of Tamil Nadu in the year 1998-99. The main objective of the programme was capacity building at District, Regional & State Levels for disease surveillance and control & prevention of the communicable diseases.

By analysing the disease burden, orientation & training can be given to the field staffs towards the diseases of Public Health importance in that area and adequate Control and Preventive Measures can also be taken to prevent the occurrence of the Epidemic.

2. Objectives

a) To Analyze the Communicable diseases Burden in the state of Tamil Nadu for the year 2000.

b) To Compare the Communicable diseases burden in the year 2000 with the available previous year data.

3. Methodology

The reported data, from the immunization section, Vector borne diseases section, and Epidemic section of the Directorate of Public Health & Preventive Medicine were collected & analzyed in the following headings.

a) Respiratory infection

b) Gastro intestinal infection

c) Surface infection

d) Arthropod-borne infection

e) Zoonotic infection

f) Vaccine preventable diseases

g) Sexually transmitted diseases

4. Results

1) The Percentage of the reported communicable diseases by the type of infection in the year 2000 is shown in the (fig 1)
2) The communicable diseases reported for the year 2000 is shown in the (fig 2)
3) Among the respiratory infections, ARI is the leading cause for morbidity in the year 2000 and it follows the same pattern for the year 1997&1998 (fig 3)
4) Among the gastro intestinal infections, Dysentery is the leading cause for morbidity in the year 2000 and it follows the same pattern for the year 1997 & 1998 (fig 4)
5) Among the arthropod-borne diseases, Malaria is the leading cause for morbidity in the year 2000 and it follows the same pattern for the year 1997 & 1998 (fig 5)
6) Among the Zoonotic diseases, leptospirosis is the leading cause for morbidity in the year 2000 and it follows the same pattern for the year 1997 & 1998 (fig 6)
7) Among the STD, gonorrhea is the leading cause for morbidity in the year 2000 and it follows the same pattern for the year 1997 & 1998 (fig 7)
8) The prevalence of leprosy in the year 2000 was 5 per 10,000-population and shows remarkable decline, when compared with previous year data (fig 8)
9) The malaria incidence in the year 2000 was 67 per 100,000 population and also shows decline in the trend (fig 9)

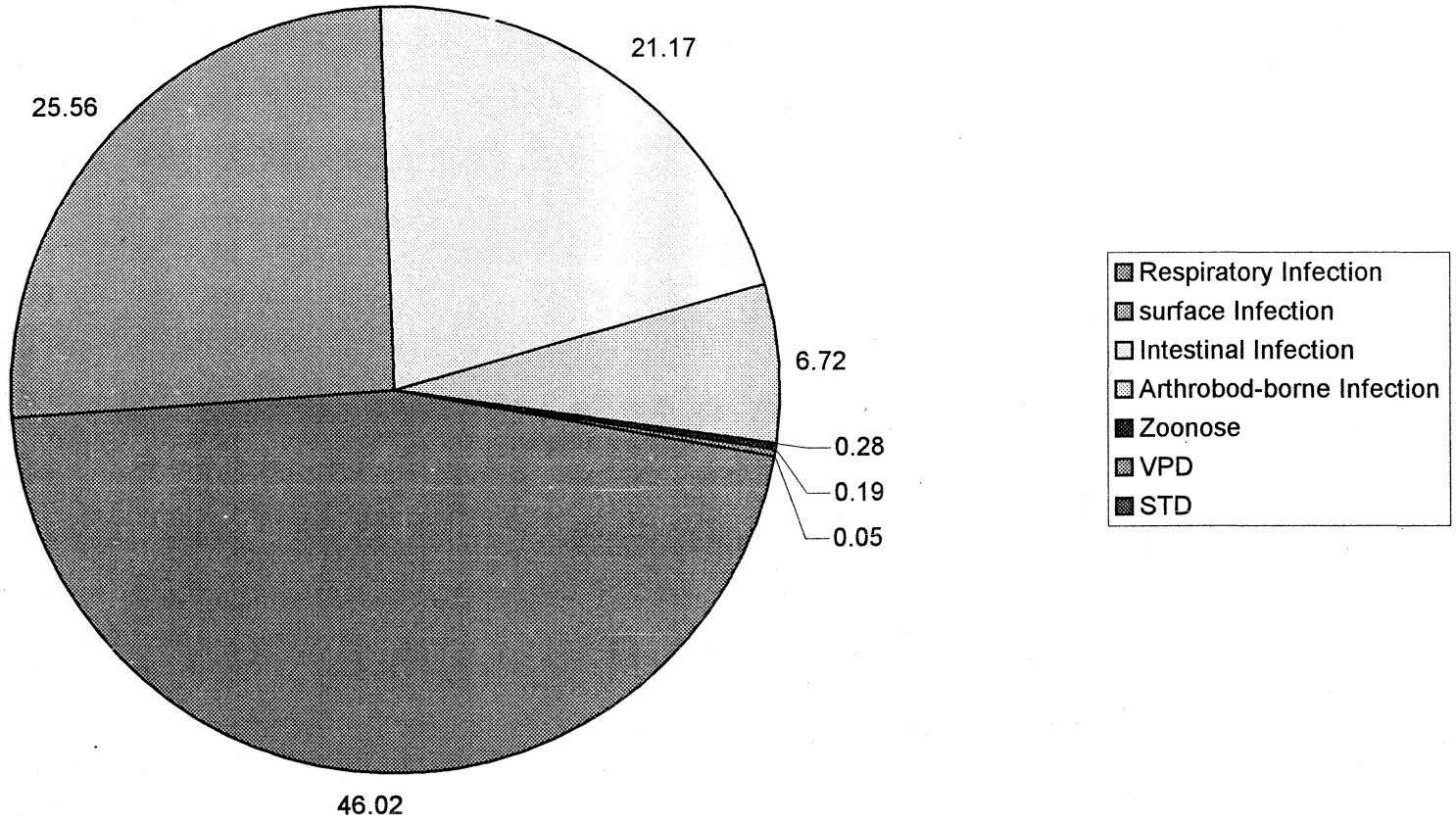
10) Among the Vaccine preventable diseases

a) Measles is the leading cause for morbidity in the year 2000 and it shows the declining trend when compared with the previous years data (figure 10.1)
b) No polio case was reported in the year 2000 and it shows the declining trend when compared with the previous years data (figure 10.2)
c) Two cases of Diphtheria were reported in the year 2000 and it remains static for the past three years (figure 10.3)
d) No Pertusis case was reported in the year 2000 and it is remaining so since 1997 (figure 10.4)
e) Two cases of Neonatal Tetanus were reported in the year 2000 (figure 10.5)

5. Conclusion

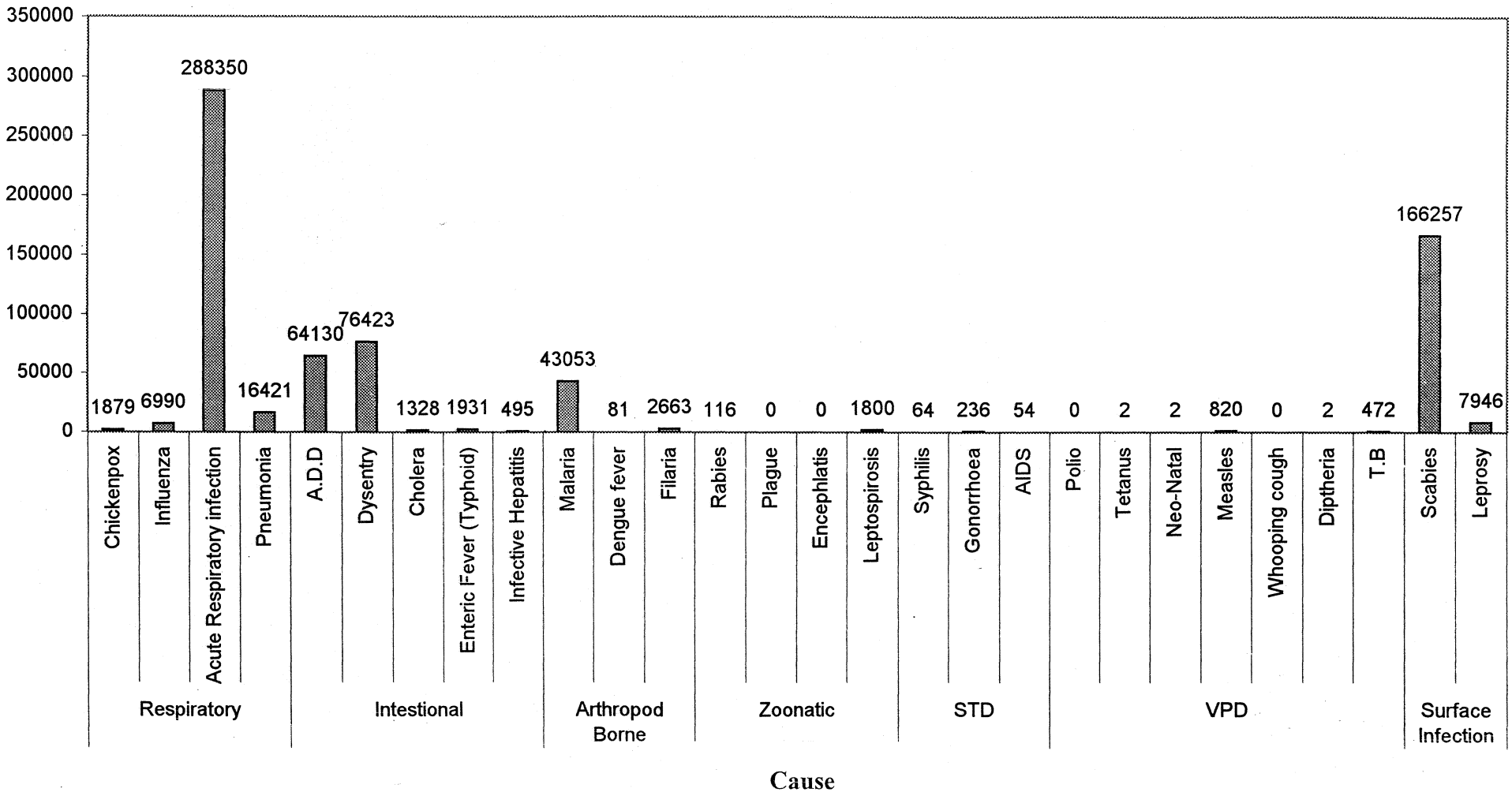
Vaccine preventable diseases shows remarkable decline when compared to the other diseases. Among the VPD, measles still remains the leading cause of morbidity. The increasing trend of AIDS causes great concern. The alarming raise of leptospirosis has to be taken into account to initiate an effective control programme.

Figure 1
Percentage of Reported Communicable diseases,by Type of Infection,Tamilnadu,2000



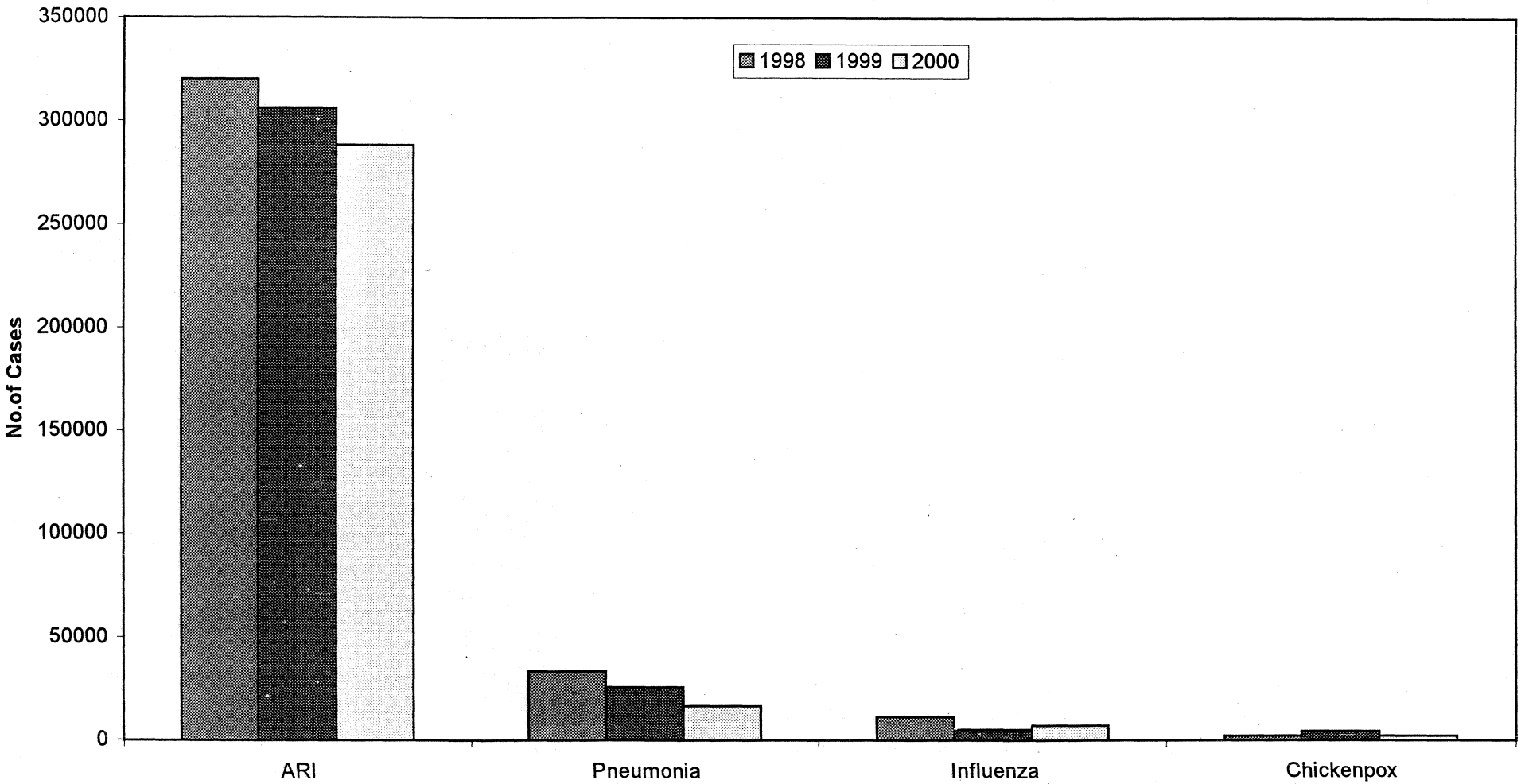
Source: Directorate of public health and preventive medicine.

Figure 2
Reported Communicable diseases ,Tamilnadu,2000



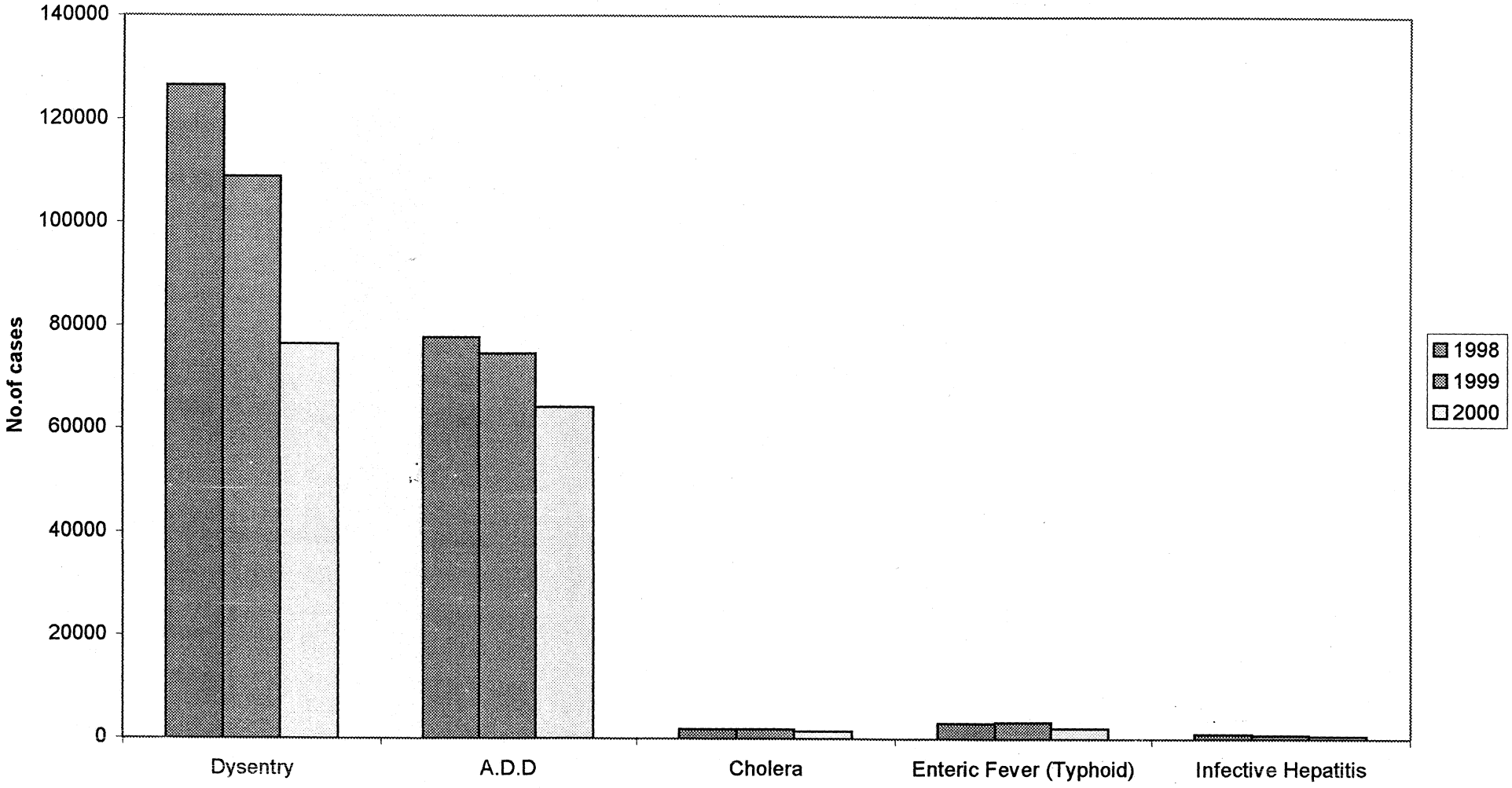
Source: Directorate of public health and preventive medicine.

Figure 3
Reported Respiratory Communicable Diseases,by Cause,1998-2000



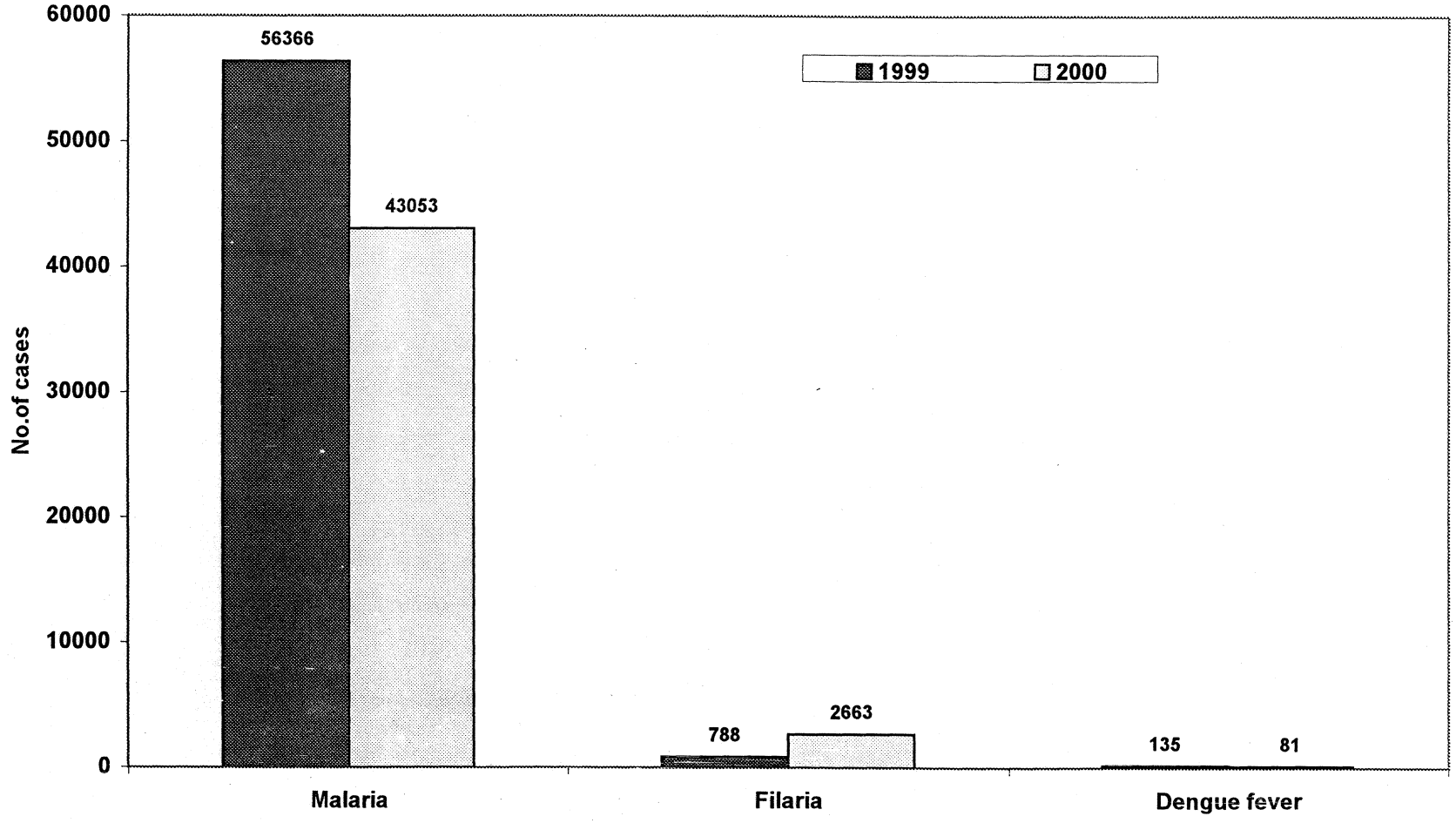
Source: Directorate of public health and preventive medicine.

Figure 4
Reported GastroIntestinal Communicable Diseases,by Cause,Tamilnadu,1998-2000



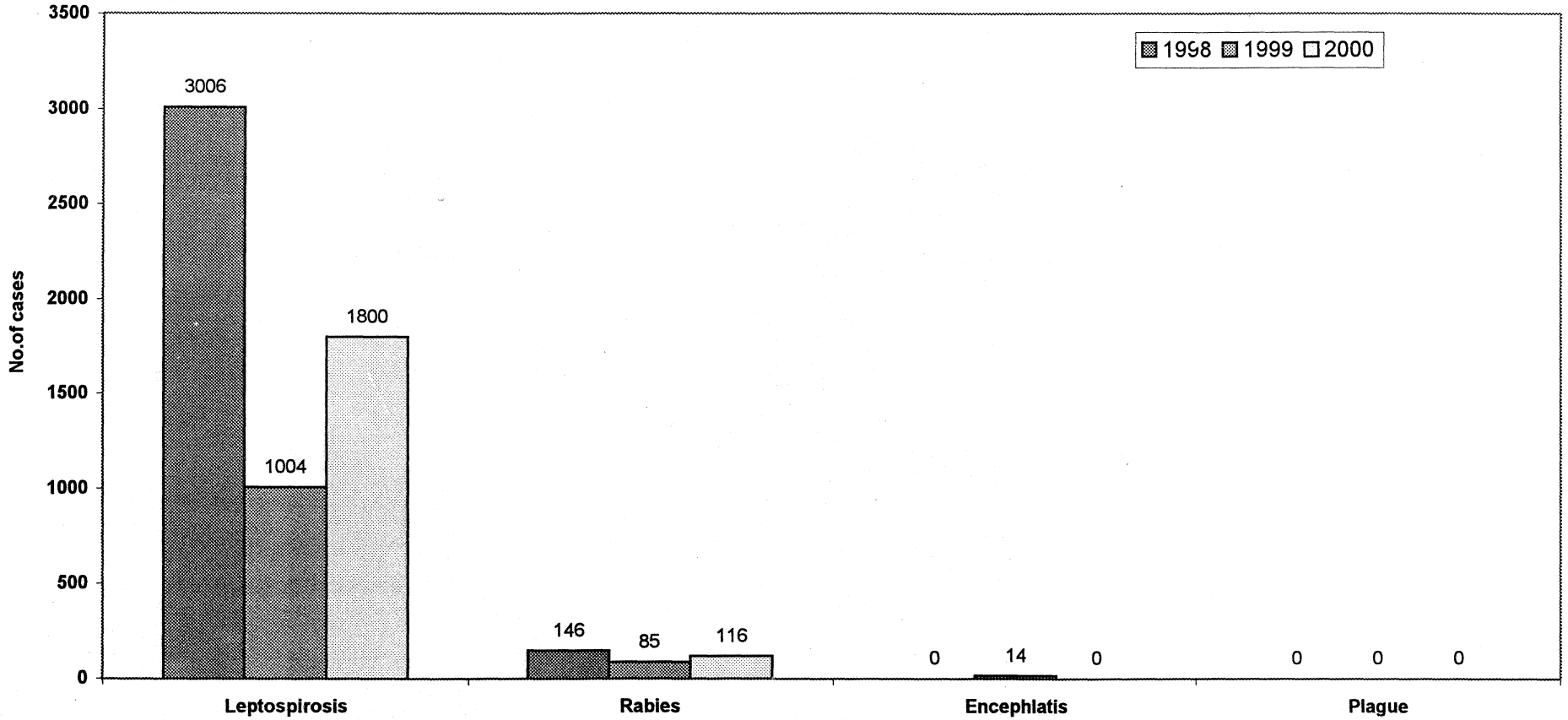
Source: Directorate of public health and preventive medicine.

Figure 5
Reported Arthropod diseases,by cause,1999-2000



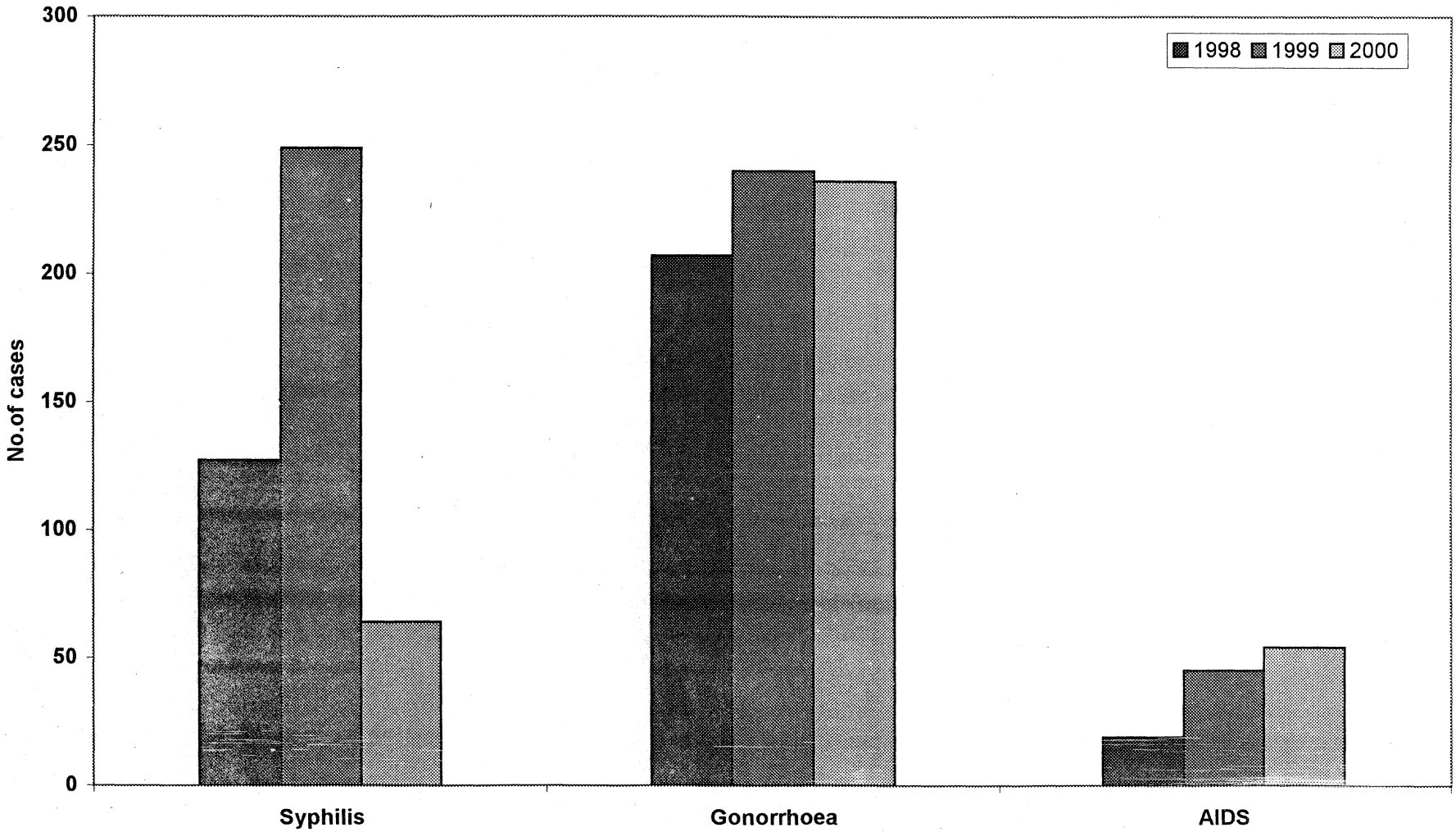
Source: Directorate of public health and preventive medicine.

Figure 6
Reported cases of Zoonatic diseases,by cause,Tamilnadu,1998-2000



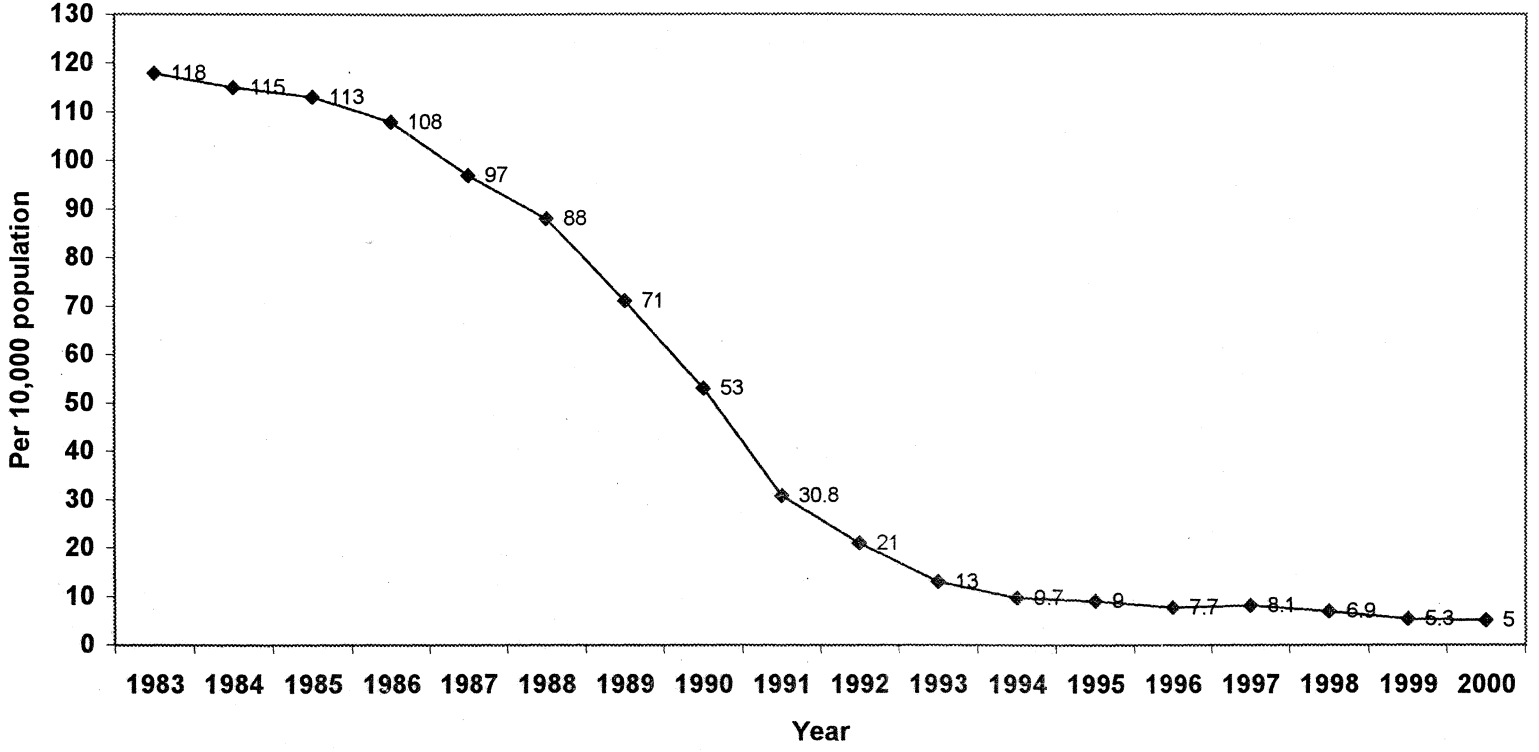
Source: Directorate of public health and preventive medicine.

Figure 7
Reported STD cases, by cause,Tamilnadu,1998-2000



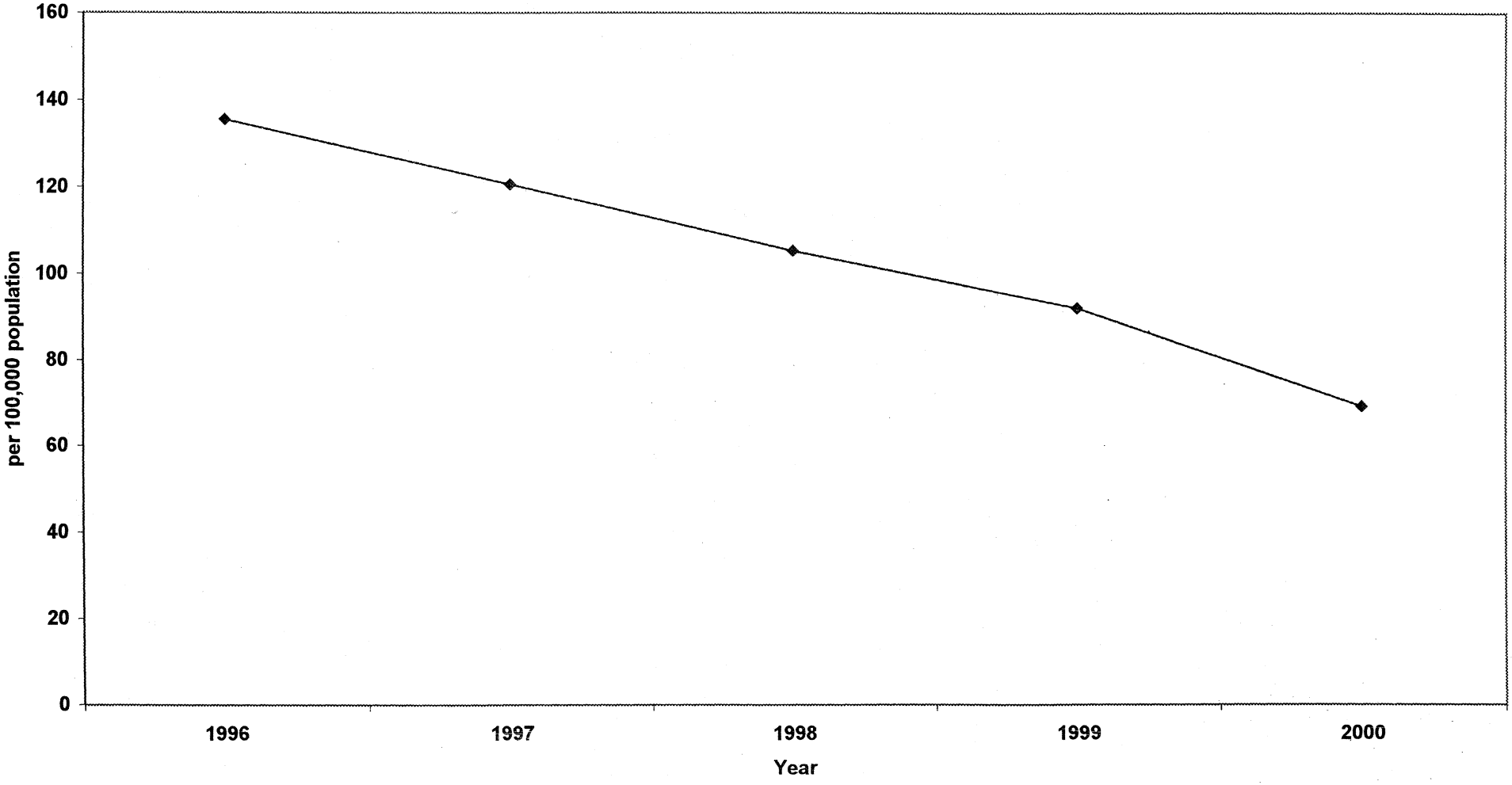
Source: Directorate of public health and preventive medicine.

Figure 8
Prevalance of Leprosy ,Tamil nadu,1983-2000



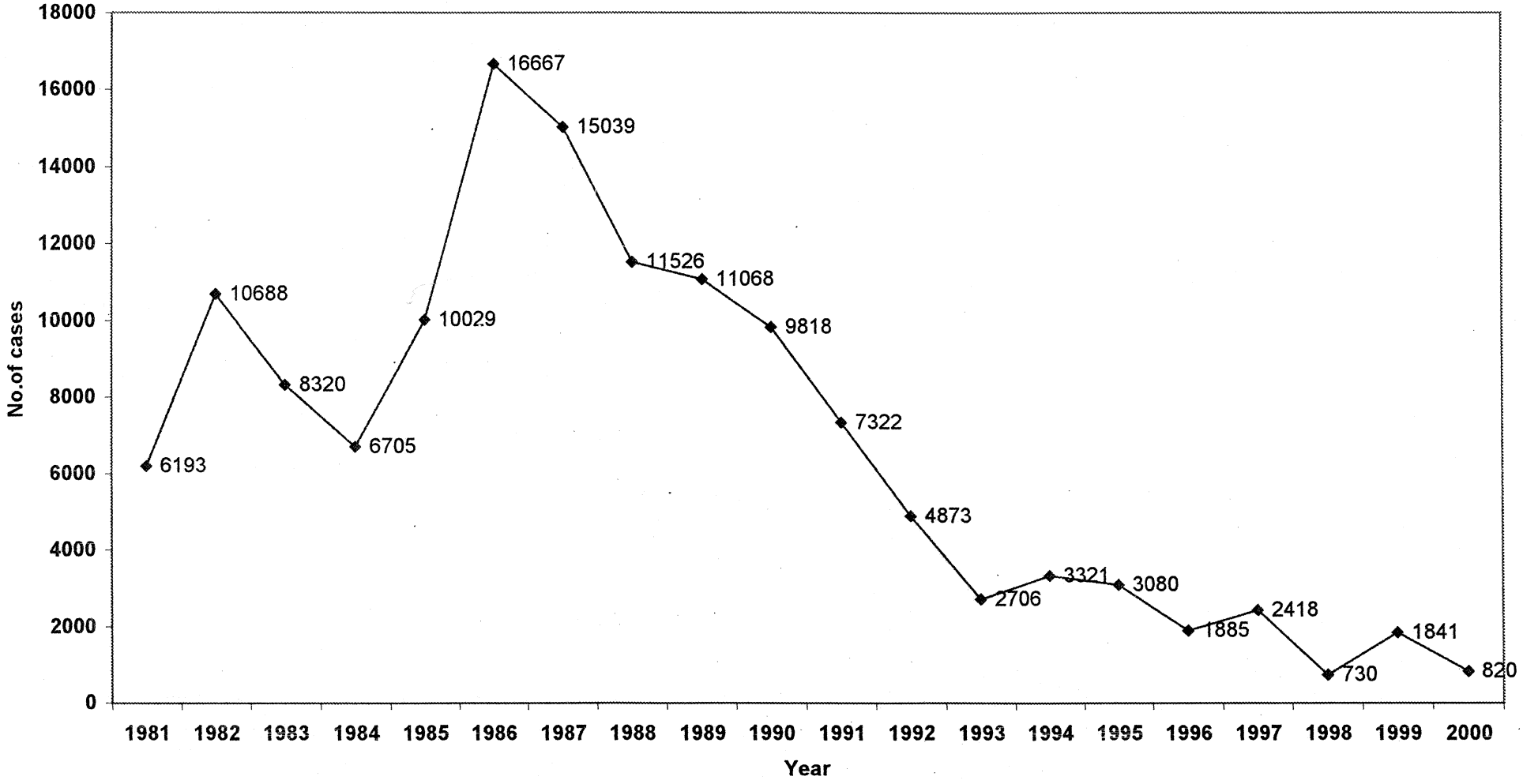
Source: Directorate of public health and preventive medicine.

Figure 9
Malaria Incidence,Tamilnadu,1996-2000



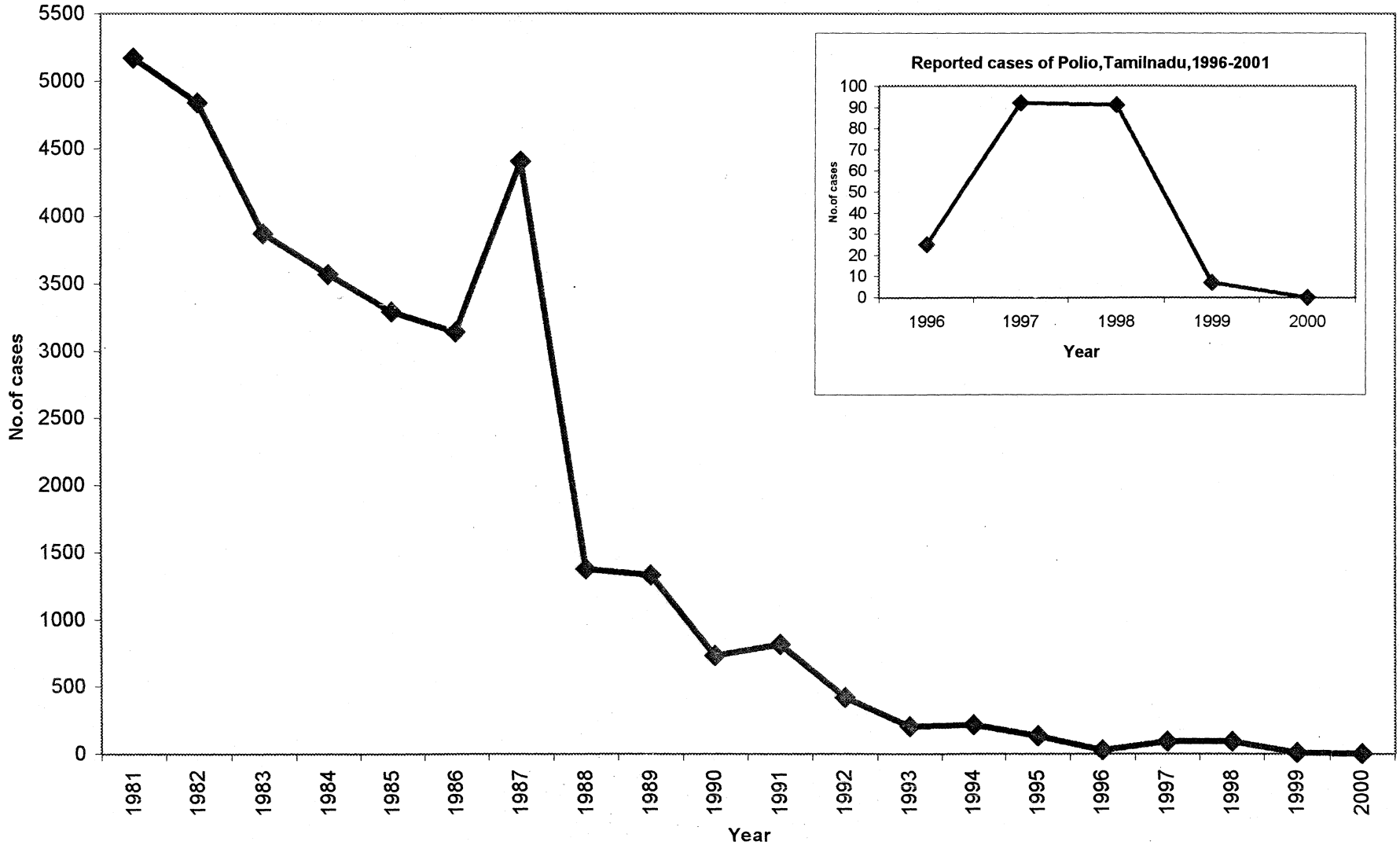
Source: Directorate of public health and preventive medicine.

Figure 10.1
Annual Reported Measles Cases,Tamilnadu,1981-2000



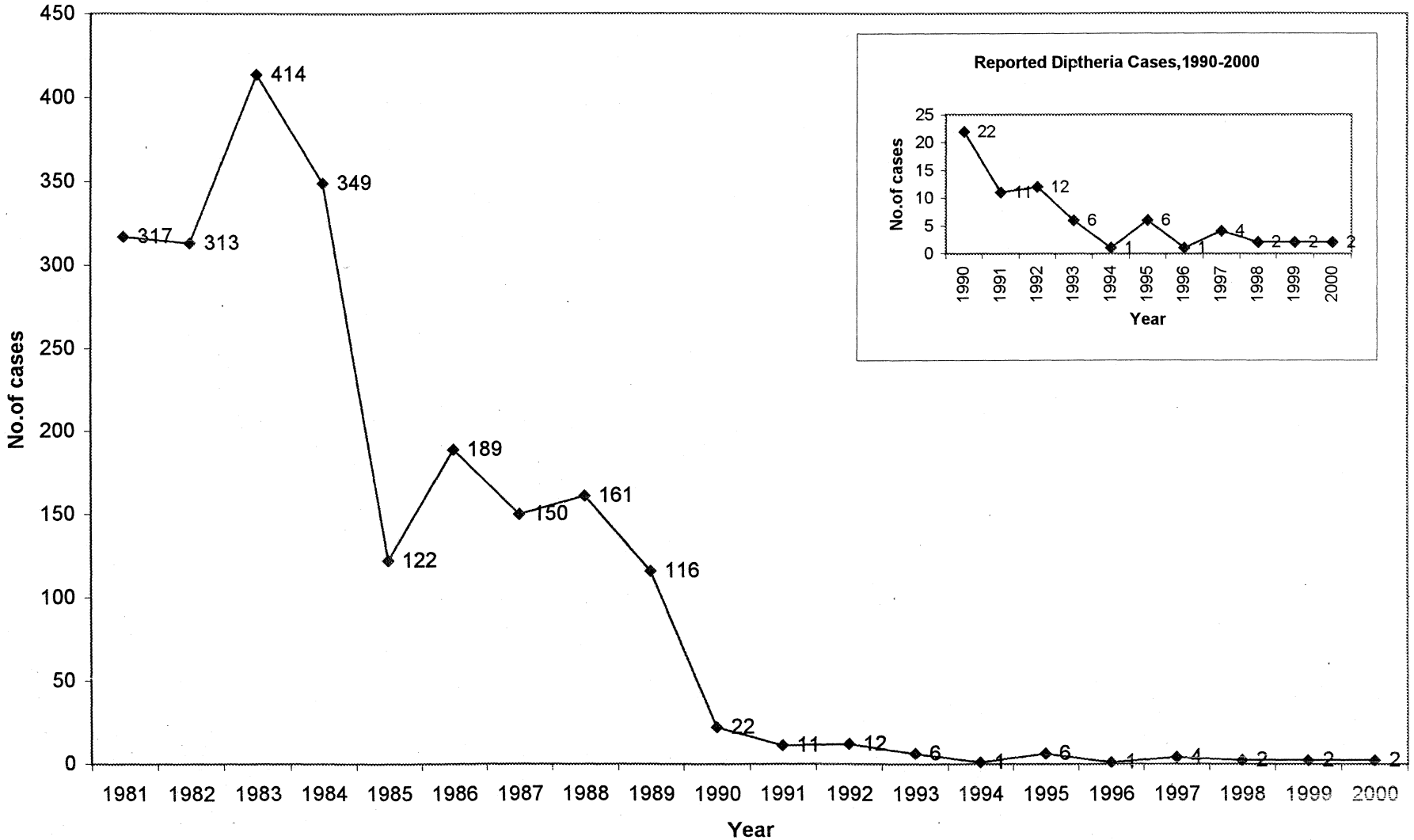
Source: Directorate of public health and preventive medicine.

Figure 10.2
Annual Reported cases of Polio,Tamilnadu,1981-2000; with inset of 1996-2000



Source: Directorate of public health and preventive medicine.

Figure 10.3
Annual Reported Diptheria cases ,Tamilnadu,1981-2000;with inset of 1990-2000

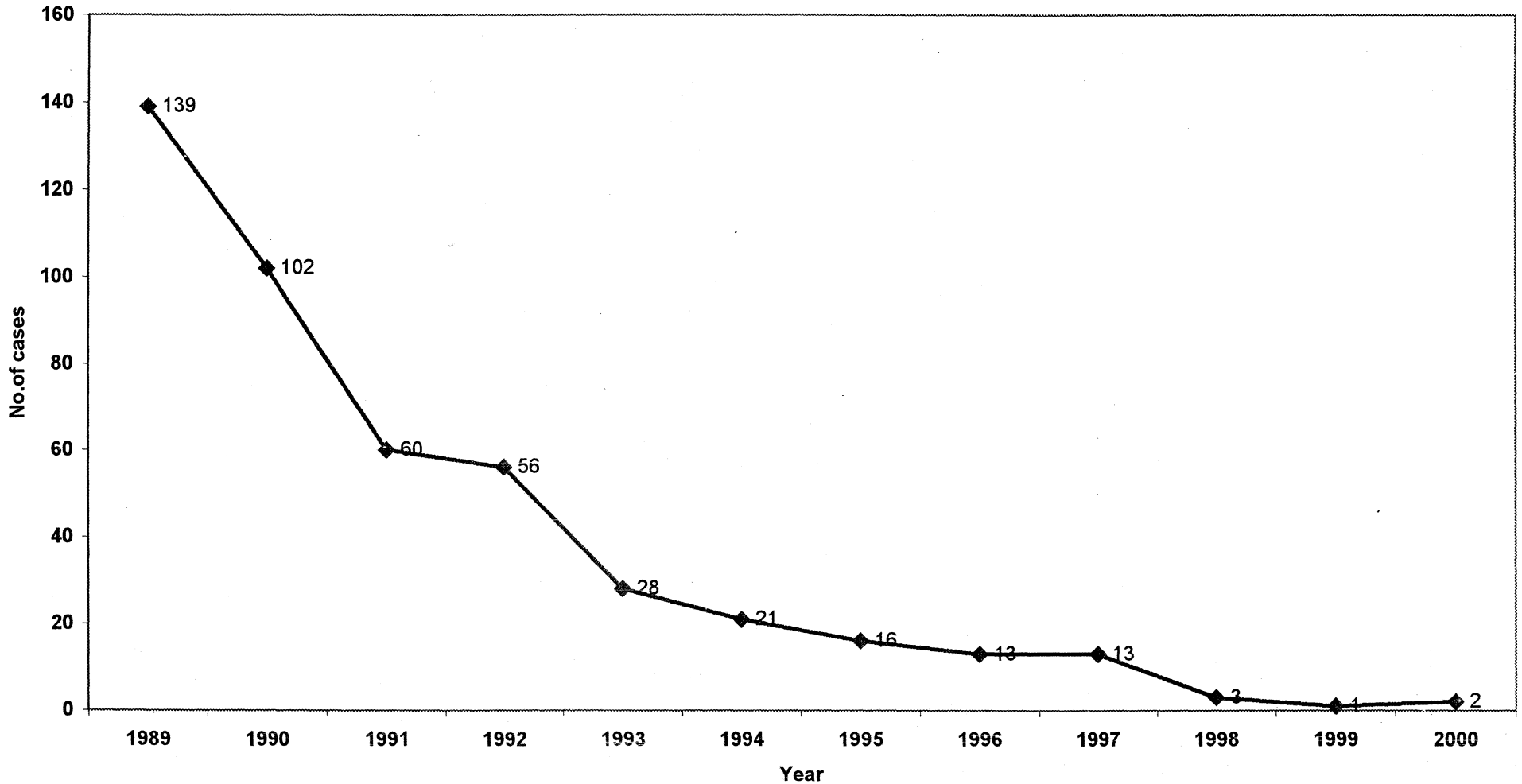


Source: Directorate of public health and preventive medicine.

Figure 10.4
Annual Reported Pertussis cases, Tamilnadu,1981- 2000

Source: Directorate of public health and preventive medicine.

Figure 10.5
Annual Reported Neo Natal Tetanus Cases,Tamilnadu,1989-2000



Source: Directorate of public health and preventive medicine.

Section IV

Journal Critiquing

Journal 1

Morgan D, Mahe C, Mayanja B and Whitworth JAG. Progression to symptomatic disease in people infected with HIV-1 in rural Uganda: prospective cohort study. BMJ 2002;324:193-7.

1. Background and Objective of the study:

In the published literature, very few studies have reported the time from seroconversion to HIV-1 symptomatic disease. These studies suggest that progression of disease in patients infected with HIV-1 in Africa is very rapid as compared to rich countries.

The objective of the study is to estimate the rate of progression from seroconversion to symptomatic disease in HIV –1 infected adults. The second objective is to assess the rates of common conditions associated with HIV-1 infection in HIV-1 infected persons before they developed AIDS compared to those not infected with HIV-1.

2. Design:

This is a prospective cohort study. The participants of this study are from a large study that followed the dynamics of HIV-1 infection with annual HIV-1 serosurveys of the general population.

3. Exposure factor:

The cohort for this study comprised of prevalent cases diagnosed at the time of survey as well as the incident cases detected during annual surveys. The controls were those who were negative for HIV-1 antibodies randomly selected from the population.

So, the exposure factor was the presence of HIV-1 antibodies. It was measured during annual serosurveys.

4. Outcome:

Among participants with negative antibodies for HIV-1 the date of seroconversion was measured. Clinical and performance scale of staging system (WHO staging system) for patients infected with HIV –1. This assessment was done by clinical staff were blinded to the HIV status of the participants.

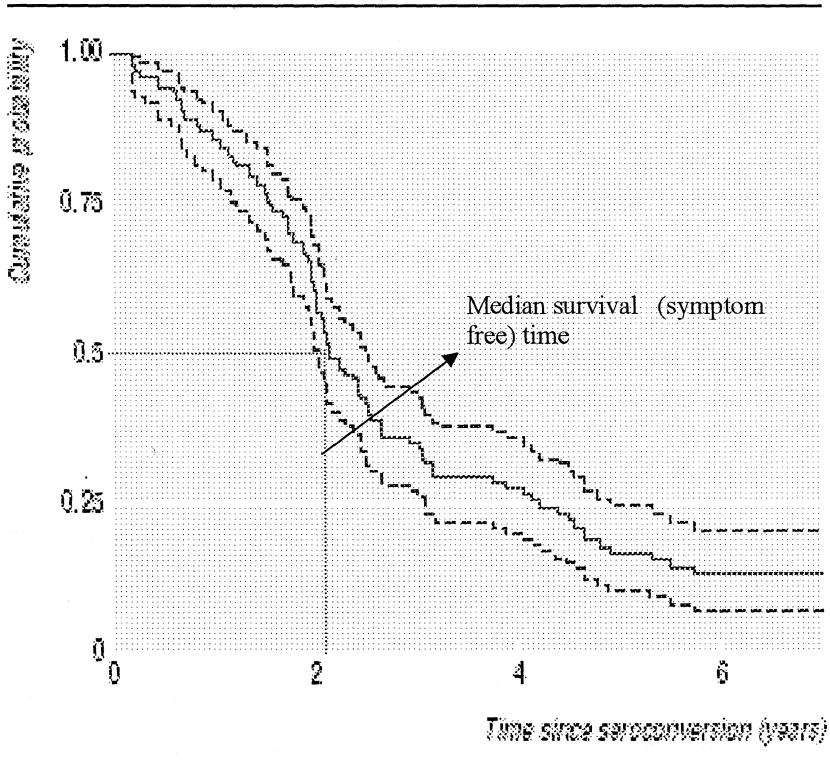
5. Statistical analysis:

Kaplan-Meier survival methods were used to estimate the median survival time (i.e., symptom free time) and cumulative probabilities for times to the various clinical end points.

6. Main results of the study:

The progression of disease in HIV-1 infected patients is very rapid. The median time (i.e., the duration taken for 50% of the study cohort) from seroconversion was 25 months for WHO stage 2 of clinical AIDS (figure 1) and 46 months for WHO stage 3.

Cumulative probability (95% confidence intervals) of remaining symptom free from time of seroconversion (Kaplan-Meier plot)



(Modified from Morgan *et al.* 2002, Figure 1)

The rates of most common clinical conditions associated with disease progression (weight loss > 10%, mucocutaneous manifestations, bacterial infections, chronic fever and chronic diarrhea) among HIV-1 infected patients were significantly higher than controls, although the conditions were also relatively frequent among HIV-1 negative patients.

7. Internal validity:

7.1. Bias

The does not suffer from selection bias, since the controls have been selected randomly from the large cohort. The investigators have enrolled more than 80% of the target population and the compliance rates had been very high. Assessment of clinical status would have been affected by interviewer bias. It was avoided by blinding the clinical staff to the HIV status of the study subjects. However, we feel that much 'harder' outcomes such as CD4 T lymphocyte count, RNA copies present in the blood are good endpoints. These end points could have provided unbiased estimate of the disease progression rather than clinical endpoints.

7.2. Confounding:

It is well known that the level of malnutrition is very high in this setting. Assessment of malnutrition at the baseline level would have been useful, since we feel that nutritional status could confound the assessment of clinical progression of the disease.

7.3. Statistical significance

The statistical results reported in the paper are $p < 0.05$ in regard to the difference in the incidence of a common clinical condition between the two groups. The statistical tests are appropriate. Multivariate analysis could have helped in getting the rate ratios (for the presence of clinical conditions among the HIV-1 positive individuals as compared to HIV-1 negative controls) adjusted for the presence or absence of other conditions. The proportion that was left

censored was very high. Thus, median time from seroconversion to WHO stage 2 was calculated based on smaller number of incident cases (n=51), who progressed from Stage 1 of clinical illness.

7. 4. Temporal relationship

The time relationship is appropriate as the HIV-1 status was measured at the start of the study and the clinical progression over time was measured during the follow-up period.

7.5. Dose response

The dose response that we can think of was for association between weight loss and HIV-1 status. The rate ratio for 5-10% weight loss was 1.1 and for weight loss more than 10% the rate ratio was 2.8. While the former was marginally statistically significant, the later was statistically significant and the Rate ratio was twice that of the former.

7.6. Consistency within the study

Certain clinical conditions, like, oral candidiasis, pulmonary tuberculosis and herpes zoster which were classically reported to be associated with clinical progression of HIV infection, had high rate ratios. It needs to be mentioned here that very small number of patients suffered from these clinical conditions among the HIV-1 negative group.

8. External validity:

High level of participation and compliance of study subjects permit the investigators to generalize the findings of the study to rural South Western Uganda. It is difficult to assess whether the findings from this study could to extrapolated to other African settings. The study setting is totally different from other developing countries in the world in many respects. Hence, the results are not applicable to other developing countries.

9. Comparison of the results with other studies:

9.1. Consistency with other studies

The study design is a powerful one. The present study has reported rapid progression from seroconversion to symptomatic diseases, which is in agreement with findings of other studies in similar African settings like Kenya and Haiti. Further assessment might require up-to-date review of the literature

9.2. Biological plausibility

Plausibility in terms of biological mechanism is in consistent with what has been observed and reported in the natural history of HIV infection worldwide. The authors state that the rapid progression in this setting is most likely to be due to high prevalence of symptoms and signs suggestive of infection with HIV-1 in the general population.

9.3. Coherence

The current study showed a major effect in that the presence of symptoms is a poor guide for staging disease associated with HIV-1 infection in African settings.

10. Conclusions:

The study presented data from a well-designed cohort study on the clinical manifestations of infection with HIV-1 in rural Uganda. The key findings suggest that symptoms suggestive of HIV-1 infection develop very rapidly (median time from sero-conversion to symptomatic disease is approximately 25 months) and the clinical conditions associated with HIV-1 are frequently present in the general population also. The proportion left censored is very high. This might have resulted in over-estimation of median time from seroconversion to symptomatic disease. The background level of other conditions (like bacterial infection, malaria) among general population confounded the assessment of clinical progression among HIV-1 infected individuals.

Journal 2

Cesar JA, Victoria CG, Barros FC, Santos IS and Flores JA. Impact of breast feeding on admission for pneumonia during postneonatal period in Brazil: nested Case-Control Study. BMJ 1999;31:1316-20.

1. Background and Objective of the study:

Several studies in the developing countries have reported the protective effect of breast-feeding against acute lower respiratory infections (ALRI) particularly pneumonia among children. However, causality has not been established at the time of this study. The primary objective of this study is to assess the protective effect of breast-feeding against pneumonia among infants. The secondary objective is to assess whether protection varies with age.

2. Design:

This is a case-control study nested within a longitudinal study of mothers and their children. It is a case base, or inclusive design, i.e., a child which became a case at, say, 9 months, would have been a control at an earlier age.

3. Study population:

Cases were infants who were born in 1993 and admitted to a hospital in Pelotas, Southern Brazil for pneumonia. The controls were infants without pneumonia. The controls were ratified for age but not matched at the individual level.

4. Exposure factor:

The main exposure factors assessed were type of milk consumed, use of fluid, and semi-solid or solid supplements. The main confounding factors assessed were: social class at the household level; age and educational status of the mother; parity and weight gained during pregnancy. The cases were interviewed at the home 'soon' after the infant was discharged from the hospital. The same questionnaire was used to interview controls. Information on diet was obtained for exact age of 30 days.

5. Outcome:

The outcome was variable was admission for pneumonia as per the medical records available at the hospital. Two independent pediatricians reviewed the records and diagnosed the child having pneumonia using a standard case definition. When they disagreed a third referee established the final diagnosis.

6. Statistical analysis:

Odds ratios and 95% confidence intervals were calculated. Unconditional logistic regression was used according to a previously determined hierarchical framework.

7. Main results of the study:

The relative risk for admission for pneumonia for infants receiving breast and formula milk or other fluids alone was 3.8 (95% CI: 1.7,8.9) and 16.7 (95% CI: 7.7, 36.0).

Odds ratios for developing pneumonia according to type of food given

Variable	Cases (n=152)	Controls (n=2301)	Odds ratio (95% CI)* Crude	Adjusted†
Type of milk consumed				
Breast milk alone	9	779	1.0	1.0
Breast and formula milk	23	583	4.5 (2.1 to 9.9)	3.8 (1.7 to 8.9)
Other fluids alone (completely weaned)	120	1049	19.0 (9.3 to 38.7)	16.7 (7.7 to 36.0)
P value			<0.001	<0.001
Fluid supplementation				
Fluids given	149	2280	4.5 (1.4 to 14.5)	1.3 (0.3 to 4.9)
Fluids not given	3	161	1.0	1.0
P value			<0.001	0.73
Solid and semisolid supplementation				
Supplements given	97	1226	13.4 (7.6 to 23.5)	8.5 (4.7 to 15.4)
Supplements not given	55	1165	1.0	1.0
P value			<0.001	<0.001

*Stratified by age groups of 1-2.9, 3-5.9, and 6-11.9 months.
†For sex, social class, family income, and maternal schooling, age, parity, and weight gained during pregnancy. In addition, each feeding variable was controlled for the other two.

(Cesar JA *et al.* BMJ, 1999, Table 3)

After adjustment for confounding, the risk of pneumonia for children receiving the fluid supplements disappeared. The infants receiving solid and semisolid supplements were 9 times (OR: 8.5; 95% CI: 4.7,15.4) most likely to be admitted with pneumonia as compared to those who did not receive such supplements. The protective effect of breast- feeding was found be modified by the age of the child. The protection was markedly stronger among young infants than at later ages.

8. Internal validity:

8.1. Bias

The authors have adequately addressed all the methodological limitations with respect to systematic error. They have also discussed these issues in the discussion part of the paper. Reverse causality bias was handled in the following manner. The children whose respiratory illness resulted to a change in breast-feeding pattern was regarded as still breast fed infants who had stopped because of a respiratory infection up to two months before admission for pneumonia.

Recall bias is a major problem in a case-control study especially when information was sought retrospectively on feeding patterns at the beginning of a particular age interval for a child in a given age range. The effect of misclassification was assessed and it was found that the odds ratio for breast and formula milk has been underestimated whereas the odds ratio for other fluids has been overestimated. The concordance for the type of milk was fairly high (kappa index 0.81). It is likely that the results study did not suffer from recall bias. However, the authors could have provided the distribution of time of interview for case patients after discharge from the hospitals.

The measurement bias was avoided by the use of independent referees for reviewing the case records.

8.2. Confounding

The investigators have addressed various confounding factors. Almost 250 variables had been collected using the questionnaire.

8.3. Strength of association

Odds ratio (an indirect estimate of relative risk) has been used for assessing the strength of association. The adjusted odds ratio reported for type of milk consumed and solid or semi solid supplements were in the range of approximately 4 to 17, which reflects the high magnitude of association for these variables. Interaction between age and type of food given against pneumonia is an interesting observation.

Odds ratios for developing pneumonia according to type of food given stratified for age

Type of food	Adjusted Odds Ratio (95% CI)		
	Age group		
	1-2.9 months	3-5.9 months	6-11.9 months
Breast milk alone	1.0	1.0	1.0
Breast and formula milk	2.9 (0.8,10.5)	3.4 (0.9,13.5)	3.7 (0.4,33.8)
Other fluids alone (Completely weaned)	61.1 (19.0,195.5)	10.1 (2.8, 36.2)	9.2 (1.2, 69.7)

(Cesar JA *et al.* BMJ, 1999, Table 4)

8.4. Dose-response

Dose response has been observed for the association of different levels of social class, maternal schooling and parity for the outcome pneumonia. The linear trend for these variables was statistically significant. The interaction between age and the magnitude of association with type of food is another evidence for dose-response.

8.5. Internal consistency

As discussed above, the linear trends observed for some socio demographic variables and its association with pneumonia are reflective of consistency of findings within the study.

9. External Validity:

The findings of the study are consistent with what was observed elsewhere. The interaction between age and level of protection offered by breast-feeding has not been reported earlier. The findings reinforce the need for promoting breastfeeding among mothers of very young infants as well as timely introduction of supplementary foods.

The study results are applicable to the eligible as well as to the source population, since the cohort is under close observation for a long period. The generalization of the results to other target populations is difficult to spell out. The authors could have provided details of admission rates, household treatment and traditional practices for pneumonia in this setting.

10. Plausibility:

Biological plausibility of a link between breast-feeding and pneumonia is well known. In this study the risk of hospitalization for pneumonia was 17 times greater for infants who were not breast fed as compared to those who were exclusively breastfed. Even for children who received both maternal and formula milk, the risk was four times greater than that for children who received breast milk alone. Marked dose-response effect along with above-mentioned biological plausibility the causal association between breast-feeding and pneumonia is well established and strongly supported by this study.

11. Conclusions :

The protective effect of breast-feeding against pneumonia among infants was assessed in southern Brazil. The study design was a nested case-control study. The study showed that breast –feeding protected children against pneumonia and the protection varied considerably according to the age of the infant. The study has strong internal validity. The external validity with respect to source population is very strong. All biases have been well taken care of. The authors have discussed possible methodological limitations. The interaction between age and the protective effect of breast-feeding on pneumonia is reported for the first time (when this paper was published). The study also established the causal association between breast-feeding and pneumonia beyond doubt.

Chapter III

Section I

Outbreak investigation of Dengue fever, Chennai, 2001

1. INTRODUCTION

The dengue viruses are members of the genus Flavivirus and family Flavivirdae. There are four virus serotypes, which are designated as DEN 1, DEN 2, DEN 3, DEN 4. Infection with anyone serotype confirms lifelong immunity to that virus serotype. Although all four serotypes are antigenic ally similar, they are different enough to elicit cross protection for only a few months after infection by any one of them [1,2].

Dengue viruses are transmitted from person to person, by Aedes (Ae) mosquitoes of the subgenus Stegomyia. Ae.aegypti is the most important epidemic vector, but other species such as Ae.albopictus, Ae.polynesiensis, have also been incriminated as secondary vectors [1,2].

Dengue viruses infect humans and several species of lower primates. Humans are the main urban reservoir of the viruses. Dengue virus strain grows well in insect tissue cultures and on mammalion cell cultures after adaptation.

In Chennai, the capital of Tamil Nadu, during September 2001 a large outbreak of febrile illness with hemorrhagic manifestation started, which was later confirmed to be a dengue fever (DEN 1) by serological diagnosis and Viral Isolation.

Chennai is a metropolitan city with an area of 174 Sq. Km & Population of 42.6 lakhs (census 2001). The city is situated in the East coast of India. The Climate in Chennai is Tropical with monsoon at September – November.

Dengue is endemic in Chennai with high incidence of cases reported during the monsoon period, September-December. Dengue / Dengue Haemorrhagic fevers are notifiable diseases under Tamil Nadu Public Health Act 1939.

2. OBJECTIVES:

- To define the magnitude of the outbreak in terms of Time, Place, Person
- To analyse clinical pattern of the probable cases, with supportive serology
- To determine the factors responsible for the occurrence
- To make recommendation to prevent recurrence

3. METHODOLOGY

A team of epidemiologist physician, immunologist, entomologist, & statistician was constituted with collaborative efforts from State & Corporation Health Departments and Various ICMR Institutes to carry out detailed outbreak investigation.

3.1. Confirming the existence of the outbreak:

Month wise reported dengue cases data from the year 1998 were collected from the corporation and comparisons of current data with the previous years data was done.

3.2. Verification of the diagnosis:

Laboratory criteria

For diagnosis as probable cases as per the WHO recommended surveillance standards: One or more of the following

- Supportive serology reciprocal Haemagglutination-inhibition antibody titre > _ 1280, comparable IgG EIA titre or positive IgM antibody titres in late acuate or convalescent-phase serum specimen
- Occurrence at same location and time as other confirmed cases of dengue.

For diagnosis as confirmed cases as per the WHO recommended surveillance standards: One or more of the following:

- Isolation of the dengue virus from serum, plasma, leukocytes, or autopsy samples.
- Demonstration of a fourfold or greater change in reciprocal IgG and IgM antibody titres to one or more dengue virus antigen in paired serum samples.
- Demonstration of dengue virus antigen in autopsy tissue by immunohistochemistry or immunoflorescence or serum samples by EIA.
- Detection of viral genomic sequences in autopsy tissues, serum or CSF samples by polymerase chain reaction (PCR).

Serology

The most commonly used serological techniques for the diagnosis of dengue infection are MAC-ELISA (IgM antibody capture enzme-linked immunosorbentassay) and the HI (Haemagglutination-inhibition) test. In cases where only a single specimen is available, detection of anti-dengue IgM by MAC-ELISA permits the diagnosis of recent dengue infection even in primary dengue infection where the level of Haemagglutination-inhibition antibody would not be diagnostic.

Initially Laboratory verification of the diagnosis was done by Chromatographic immunoassay (Pan-Bio-test), which detects both anti-dengue IgG and IgM antibodies. The accuracy of the test is unknown since they have not been properly validated. [1,2] Hence, 82 samples tested by Panbio test kit were again subjected to NIV kit based on MAC ELISA

Since there was difficulty in getting paired samples from the patients for demonstrating fourfold greater change in reciprocal IgG and IgM antibody titres to one or more dengue virus antigen it was decided to carry out IgM antibody capture enzme-linked immunosorbent assay (MAC-ELISA). National Institute of Virology (NIV) kit based on MAC ELISA & Panbio test kit was used to detect anti-dengue IgM.

Virus Isolation

Eight blood specimens were also collected from the clinically suspected acute cases admitted in the Stanely Medical College & Institute of Child Health for Viral isolation and serotyping from the lymphocytes at the National Institute of Virology, Pune. Only acute phase sera (within four days of onset of symptoms) were collected for this purpose.

Blood samples were collected in heparanised tubes and transported in room temperature. The samples were centrifuged at 1500 rpm and buffy coats were separated and the serum is freezed at -50° C. With proper Cold Chain maintenance the samples were then airlifted to NIV, Pune.

3.3. Establishing a case definition:

By establishing a case definition as per the WHO recommended surveillance standards 4 all government & private Health Care providers were sensitised to report all the cases based on the case definition given below to the health authorities.

Case Definition:

Clinical description:

An acute febrile illness of 2-7 days duration with 2 or more of the following: headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestations, leucopoenia.

Laboratory criteria for diagnosis:

Isolation of dengue virus from serum, plasma, leucocytes.

Demonstration of fourfold or greater change in reciprocal IgG or IgM antibody titres to one or more dengue virus antigens in paired serum samples.

Case classification:

Suspected: A case compatible with the clinical description.

Probable: A case compatible with the clinical description with one or more of the following:

- Supportive serology reciprocal Haemaglutination-inhibition antibody titre >_1280, comparable IgG EIA titre or positive IgM antibody titres in late acute or convalescent –phase's serum specimen.
- Occurrence at same location and time as other confirmed cases of dengue.

Confirmed: A case compatible with the clinical description that is laboratory Confirmed.

3.4. Performing Descriptive Epidemiology:

Characterization of the outbreak in relation to the Time, Place, Person, was done by using the date on the reported cases.

Time: Based on the Date of Reporting of the cases Epidemic curve was drawn.

Place: The zone wise incidence of the reported cases per 10,000 populations during the outbreak & before the outbreak for the year 2001 was calculated for the 10 zones in Chennai. By using the software map info a digital map was drawn.

Person: Age and Sex Specific incidence of the reported cases per 10,000 populations was calculated.

3.5. Clinical Profile:

To analyze the clinical pattern of the disease during the outbreak, data was collected from the IgM dengue antibody positive cases admitted in the Government Institute of Child Health, Egmore. By using the questionnaire clinical & demographic details were obtained retrospectively from the cases sheets among the 228 children admitted between 1st September to 10th November 2001.

3.6. Entomological Studies:

To Asses the entomologic indices and its role in the disease transmission an Entomological study was conducted by the Centre for Research in Medical Entomology (ICMR) Madurai along with the Corporation Health Department in September 2001, November 2001 & February 2002. The results were compared with the previous entomological conducted in May 2001, & July 2001.

3.7. Environmental Analysis:

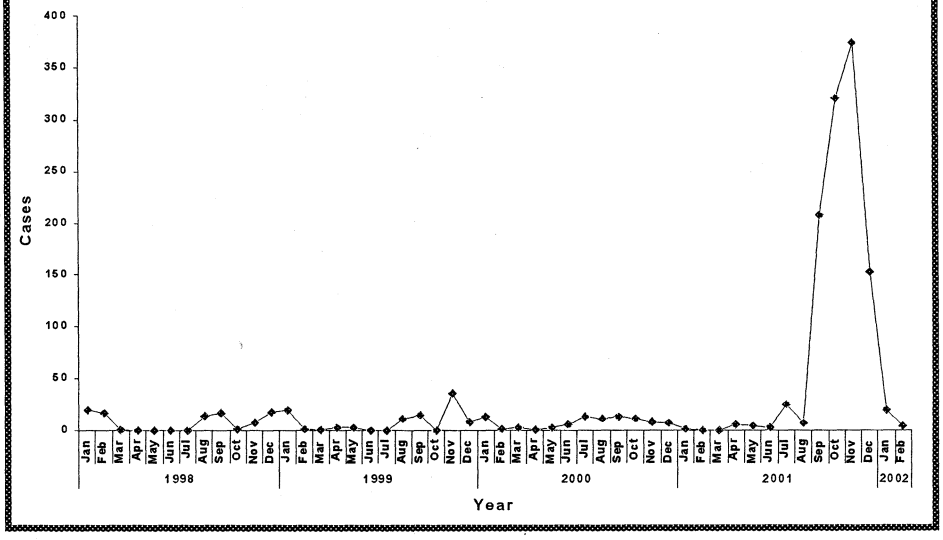
To study about the relationship of various Meteorological conditions like temperature Humidity, & Rainfall to the outbreak the daily meteorological data for the year 2001 & 2002 & monthly meteorological data for the year 1998 – 2000 were collected and analyzed.

4. Results

4.1. Confirming the existence of the outbreak:

Analysis of month wise reported dengue cases data from the year 1998 clearly shows that the number of cases reported for the month of September 2001 was in excess of the expected frequency, which confirms the Outbreak (figure 1)

Figure 1. Reported cases of Dengue by month, Chennai,1998-2002



4.2. Verification of the diagnosis

Serology:

The detection of dengue specific IgM antibody in the late acute-phase serum specimen of affected individuals by Chromatographic immunoassay (Pan-Bio test) & by MAC ELISA (IgM antibody capture enzyme-linked immunosorbent assay) verifies the diagnosis. The level of agreement between the two tests in detecting IgM antibody is fair (Kappa Test Ratio=0.497)

Laboratory Agreement between Two tests (MAC-ELISA & Pan-Bio) in detecting Anti-dengue IgM antibody of 82 patients

		MAC-ELISA test	
		IgM Positive	IgM negative
Pan-Bio test	IgM Positive	43	9
	IgM Negative	10	20

By keeping MAC-ELISA test result as gold standard, the sensitivity & specifically of the Pan-Bio test were as follows:

Sensitivity : 43/53 = 81 % ; Specificity : 20/29 = 69 %

Virus Isolation:

Isolation of Dengue virus from all the eight samples tested Confirms the diagnosis. Further sero typing of four of the samples shows Dengue sero type I

4.3. Performing Descriptive Epidemiology:

Based on case definition, 1078 cases of dengue were reported to the Corporation Health Department. The total reported cases includes 439 probable cases i.e. those who were positive for IgM antibody test in late acute phase serum specimen & 639 suspected cases based on the above case classification.

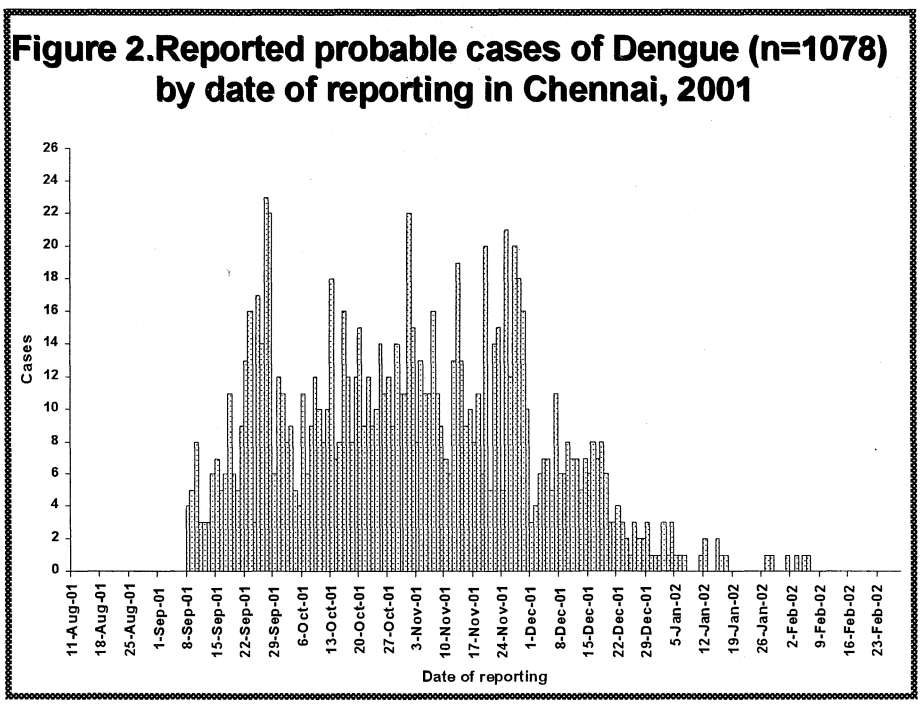
Based on the WHO Case definition the 639 suspected cases were also considered as probable cases, since all that suspected cases occurred from the same location and time as other confirmed cases of dengue fever.

Characterization of the outbreak data in relation to the Time, Place, & Person shows the following results;

Time

The outbreak started in the first week of September 2001 (based on the date of reporting) and ended in the month of February 2002 (fig 2)

Figure 2.Reported probable cases of Dengue (n=1078) by date of reporting in Chennai, 2001

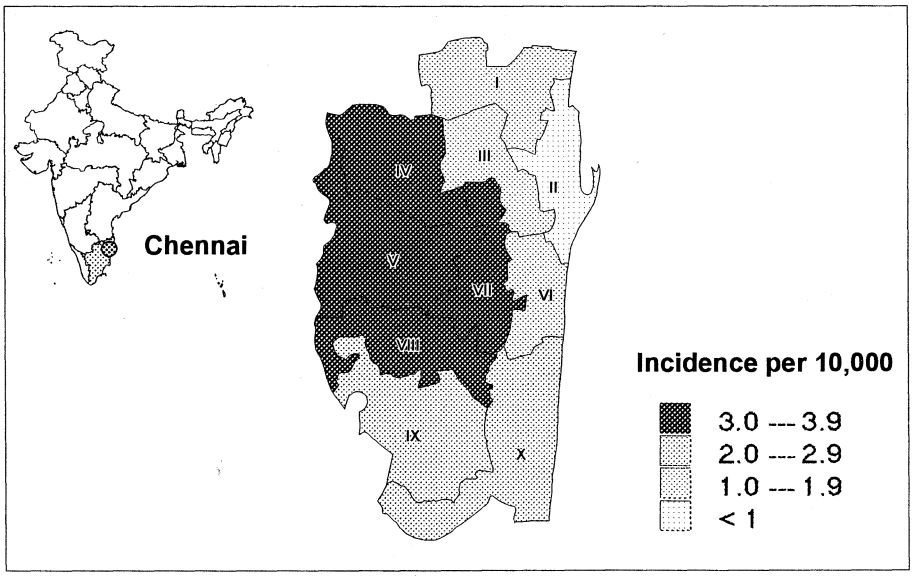


Place:

Out of 10 zones in Chennai, the high incidence of >3 per 10,000 populations was noticed in zone IV, V, VII & VIII. The total number of reported cases in these zones during the outbreak was high (632) when compared to the rest of the zones (446). The differences in the proportion of the cases reported in these Zones (0.03%), when compared with the rest of the Zones, (0.01%) are significant statistically ($\rho<0.0001$).

Zone wise distribution of the reported cases is presented in figure 3.

Figure 3. Reported probable cases of Dengue by Zone of residence, Chennai, 2001



Person:

The incidence of reported cases of dengue fever during the outbreak was 2.3 per 10,000 populations, and there is significant difference in the high proportion of cases among male as compared to female ($\rho<0.05$). The reported dengue fever case incidence by age & sex was shown in the Table 1.

Table 1. Incidence (per 10,000) of reported probable cases of Dengue by age-group and sex, Chennai, 2001

Age-group (Years)	Male	Female	Total*
0-1	24.80	15.80	20.40
1-4	8.40	8.60	8.50
5-9	10.20	10.50	10.30
10-14	4.60	3.40	4.00
≥15	0.10	0.06	0.08
Total	2.40	2.10	2.30

* Chi square trend; P<0.00001

Further analysis revealed that the incidence was much higher in below 14 years age group as compared to >15 years age group and the difference is significant ($\rho<0.0001$). The DHF outbreak in Calcutta in 1990 also reported dengue in infection mostly in children [10].

In the below 14 years age group high proportion of cases was noticed in below 1 year age group (0.20) when compared to the other age groups i.e.1-4 years (0.09), 5 – 9 years (0.10), & 10 – 14 years (0.04) and the difference between these age group is significant (ρ=0.0001). One possible explanation is that it may be due to Tran placental transmission of maternal antibodies i.e. passively acquired antibodies in infants 1. There is no significant difference in the proportion of cases among male and female in these age groups except in the below 1 year category where the difference is significant (ρ<0.01).

The total number of deaths reported during the outbreak was 12 and the case fatality rate among the reported cases was 1.11%. The case Fatality ratio among female is high when compared to female and the difference is statistically is significant (ρ<0.001) - Table 2

TABLE 2: Case fatality ratio of reported probable cases of Dengue by age group and sex, Chennai, 2001.

Age-group (Years)	Male	Female	Total*
0-1	0.93	2.99	1.72
1-4	0.69	2.99	1.80
5-9	1.09	1.11	1.10
10-14	0.00	0.00	0.00
≥15	0.00	0.00	0.00
Total	0.68	1.62	1.11

4.4. Clinical Profile:

Analysis of clinical pattern among the 228 Children who were positive for dengue specific IgM antibody shows that, fever (95.17%) & vomiting (55.26%) were the predominant symptoms and hepatomegaly (62.71%) & pleural effusion (42.54%) were the predominant signs. Haemorrhagic manifestation was seen in the 28% of the cases (Table 3)

Table 3. Clinical features of hospitalized, IgM positive probable cases of Dengue, Chennai, 2001

Clinical Features	% (n =228)
Symptoms:	
Fever	95
Vomiting	55
Rashes	11
Myalgia	6
Head ache	4
Signs:	
Hepato megaly	63
Pleural effusion	43
Haemorrhagic manifestation	28
CNS manifestation	19
Shock	10
Ascites	3

The exact mechanism for hemorrhagic manifestation and shock is not well under stood in dengue infection but, it has been hypothesized that the severity of DHF compared with DF is explained by the enhancement of virus multiplication in macrophages by heterotrophic antibodies resulting from previous dengue infection[1]

4.5. Entomological Studies:

Entomological study carried out in the endemic zones (VII & VIII) at the time of outbreak in the month of September and November and compared with entomological survey data that was done in the month of May and July 2001 (Table 4) shows Very high House Index, Breteau's Index and Adult Vector resting density during Outbreak (Table 4)

The Breteau's index showed a positive correlation coefficient with the number of cases reported during these months (r=0.97)

Table 4. Vector indices in Chennai, May 2001-Feb 2002

Vector Indices	May 2001	July 2001	Sep 2001	Nov 2001	Feb 2002
Larval:					
House Index	23.10	26.59	29.62	38.31	16.27
Breteau Index	28.70	34.58	41.59	66.37	20.38
Adult:					
Female Vector Per man- hour density (Resting collection)	2.87	3.96	4.79	14.9	10.29

House Index: Percentage of Houses infested with larvae and/or pupae
(<1 % Low Risk; ≥ 10 %High risk of Transmission)

Breteau Index: Number of positive Containers per 100 houses Inspected
(<5 Low Risk; ≥ 20 High Risk of Transmission)

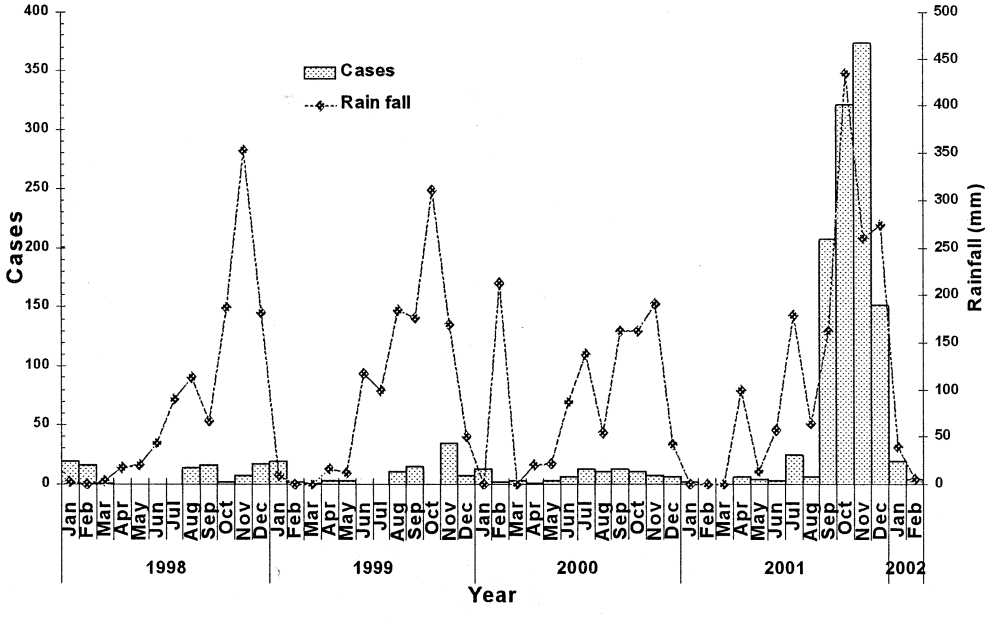
Per man-hour density : Number of Adult female vector collected per human hour of effort
(0-2 Low Risk; >2 High Risk of Transmission)

4.6. Environmental Analysis:

Month wise Analysis of Meteorological data shows that there is intermittent rainfall in the month of July 2001 well before the onset of monsoon and the monsoon started in September 2001.

The number of cases reported increases with the onset of monsoon. (Figure 6)

Figure 6. Rainfall and reported cases of Dengue by month, Chennai,1998-2002



4.7. Control measures:

Sensitization of general public on dengue infection, personal protection measures, and the role of public in the in the vector control was initiated through mass medias & through health care providers.

Proper solid waste disposal for reducing breeding places & Modification of man made larval habitats were carried out with community /NGO/College students participation

Vector control measures like Space spraying of Insecticides – Thermal fogging were done in the affected areas.

Sensitization of health care providers on management of dengue infection and its complication i.e. Improving case management was done

Serological diagnostic facilities & adequate quantities of intravenous fluids and fresh blood and platelet concentrates were made available in all the government and private hospitals.

Dengue Control day - an awareness campaign was conducted with the involvement of college students (Figure 5)

Figure 5. Community participation in Dengue control Chennai, 2001

5. Conclusion

Dengue fever is endemic in Chennai and shows seasonal variation with high incidence following the onset of monsoon. Certain Zones remain potentially high risk, for dengue fever.

In the year 2001, due to acute shortage of water, regular water supply through pipes was stopped. So, people stored the water in every conceivable way leads to proliferation of Aedes aegypti.

The high entomological indices above the threshold level in the months of May & July 2001 during that period may play a vital role in the initiation of the outbreak. The public health education about covering water storage containers with tight fitting lids/screens and provision of piped water supply will help in source reduction.

As there is no epidemiological surveillance mechanism, initiation of the disease surveillance & continuation of the regular vector surveillance is essential for monitoring the endemic transmission and for early recognition of impending epidemics.

As early diagnosis of the disease and admission of the patients to hospital is necessary to reduce the case fatality rate, Standard protocol for case detection & management should be made available in all government and private hospitals. Community participation in the integrated vector control is essential in preventing and controlling the Dengue outbreak.

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Section II

Conference presentations

Conference presentations

1. Poster presentation of the Outbreak investigation of dengue fever, Chennai, 2001 at the International Epidemiology Association's South East Asian regional conference at Jhansi, India.

2. Poster presentation of the Outbreak investigation of dengue fever, Chennai, 2001 at the International Epidemiology Association's conference at Montreal, Canada.

The Poster presentations Abstract was given below

OUTBREAK INVESTIGATION OF DENGUE FEVER, CHENNAI, 2001

Saravanan.S*, Suresh Kumar.S.K**, VenkataRao.T.V**, Gupte.M.D**

* MAE-FETP scholar, **National Institute of Epidemiology (ICMR) Chennai, India

INTRODUCTION: In India, Dengue fever/Dengue hemorrhagic fever is a major public health problem in many States including Tamilnadu. During the month of September, 2001 Chennai City (capital of Tamilnadu) reported large number of probable cases of Dengue fever.

OBJECTIVE: To investigate the outbreak of dengue in Chennai.

METHODOLOGY: A detailed outbreak investigation was carried out after confirming the existence of the outbreak. This includes verification of the diagnosis, establishing the case definition, epidemiological characterization of cases, entomological & environmental analysis.

RESULTS: The reported number of cases (n=1078) was clearly in excess, which confirmed the existence of the Outbreak. The detection of dengue specific IgM antibody & viral isolation verified the diagnosis. The outbreak started in the first week of September 2001 and ended in the month of February 2002. Incidence of cases was very high in three zones (out of 10 zones) in Chennai. The overall incidence of reported cases was 2.3 per 10,000. The incidence was much higher in below 14yrs age group as compared to >=15 yrs age group ($p<0.0001$). High incidence (2 per 1000) was observed in the age group below 1 year. Both the sexes were equally affected in all the age groups except in infants ($p<0.01$). The case fatality rate among the reported cases was 1.02%. The predominant presenting features in a group of hospitalized and confirmed cases (n=228) of Dengue fever were: fever (95%), vomiting (55%), hepatomegaly (62%), pleural effusion (42%) & hemorrhagic manifestation (28%). Entomological study showed that the Breteau's Index (BI) was very high during (BI=42) as well as before (BI=34) the outbreak (BI <5 low risk). Meteorological study revealed that there was intermittent rainfall well before the onset of monsoon in September 2001.

CONCLUSION: Dengue fever is endemic in Chennai and it shows seasonal variation. Certain zones remain potentially high-risk, for dengue fever. The high entomological indices might have played a vital role in the initiation of the outbreak. Epidemiological surveillance mechanism is essential for monitoring the endemic transmission, for early recognition of impending epidemics. This will help in preventing and controlling Dengue outbreaks in future.

Key words: Dengue fever, Outbreak, Chennai