Book
08

PUBLIC HEALTH RESOURCE NETWORK

PHRN

Disease Control Programmes

NATIONAL RURAL HEALTH MISSION
राष्ट्रीय ग्रामीण स्वास्थ्य मिशन
(2005-2012)

Book 8

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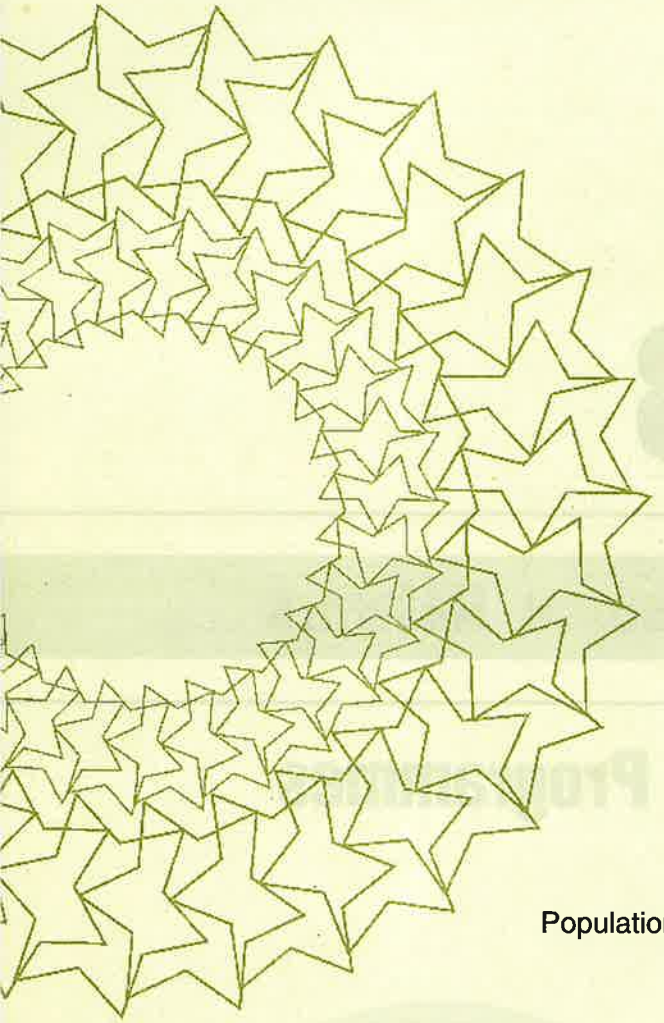
Disease Control Programmes



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Preface

Public Health Resource Network

The National Rural Health Mission's vision of a national programme planned at the district level, and if possible at the village level, needs an exponential increase in capacities across the board. The NRHM has initiated many steps in this direction. However the nation is vast and diverse. And there are many constraints in existing planning and implementing structures that would need to be overcome. This calls for the official national mission-led process to be supplemented with many varied, creative and massive endeavors at capacity building. State governments, health resource centers, different professional sections and different sections of civil society all need to contribute to meeting these enormous needs of capacity building.

This initiative, called the Public Health Resource Network (PHRN) aims to provide support to public health practitioners working in the districts in all aspects of district health planning and public health management. The central element of this initiative is a capacity building effort structured as a distance learning programme. This distance learning programme is not a substitute to formal professional public health training and it does not carry with it any guarantees of increased employment or career options. It is meant to support individuals and organisations both within and outside the health department who are committed to work for a more equitable and effective public health system. This programme complements official training and education programmes through an open-ended, more informal and immediate reaching out with information, tools and a diversity of programme options and perspectives.

A Mission needs Missionaries, and it needs them where the challenges are greatest- in the remote and most underdeveloped areas of the northern and eastern states, and indeed in all the under-served areas

of all the states. A Health Mission needs these missionaries to also be professionals, where being a professional is not one more form of privilege- but a competence that anyone willing to put in the time and effort – and a little expense – can acquire!! Thus the contact programmes at district, regional and state level would evolve into mechanisms of sharing of resources, and building mutual solidarity amongst those who work for change, and of those who work in the health sector because they seek to work for the poor. The true test of the programme is thus not the number of certificates that we issue but the better quality of district plans, a higher motivation of district teams and eventually better health outcomes in the district. The immediate context is the National Rural Health Mission. But hopefully the voluntary network that emerges will contribute over the years to the evolution of a network of district and block level resource groups who provide technical support to all efforts at decentralised planning and decentralised governance and to all societal efforts towards an equitable and just society.

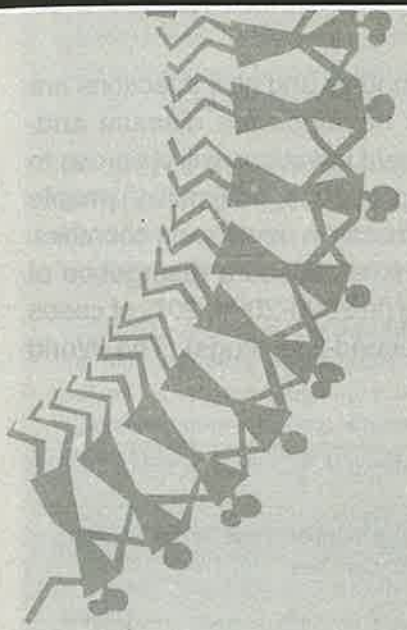
In this book, the eighth volume of the PHRN series, we address the core problems of intra-sectoral coordination. The disease control programmes are the true bastions of vertical health programmes, and though, at a theoretical level, everyone is convinced of horizontal integration, most are clueless on the scope for this kind of coordination in district level planning when almost every single programme parameter and monitoring indicator has been inflexibly defined at national and more often international levels. Yet, as this book shows, intra sectoral coordination for district planning is not only possible, it is essential for the success of these programmes. However, it would need a creative district planner to look into the black boxes of centrally packaged technologies and come up with interesting solutions that adhere to the guidelines and yet ford the many problems that one needs to address for successful district level disease control.

These books are written based on a synthesis of theory from academic public health with experience from district level public health practitioners. Many of the latter have no formal training on public health, but nevertheless are repositories of much public health knowledge. We intend to continue with this process inspired by a much more democratic vision of how knowledge is created. The PHRN looks forward therefore to an active process of feedback and interactions that leads to future editions that are enriched by district level experience. The PHRN has also set in place a large number of channels through which such knowledge can be shared, the most important of which is the PHRN website (http://www.shsrc.org) and the PHRN e-group (http://groups.yahoo.com/group/phrn2006).

Dr. T. Sundararaman
PHRN Programme Coordinator

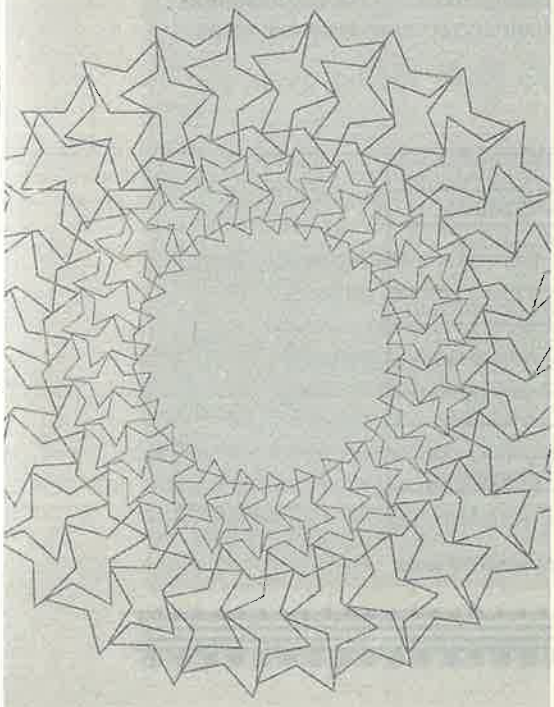
Lesson ONE

The Control of Tuberculosis in the District Plan



In this lesson we shall discuss:

- A basic understanding of what causes tuberculosis, and how it spreads
- Features of the RNTCP programme for control of tuberculosis
- Special situations- tuberculosis in children, in HIV patients and multi-drug resistant tuberculosis
- Incorporation of the control of tuberculosis in the district plan



INTRODUCTION

Tuberculosis (abbreviated as **TB** for Tubercle Bacillus) is a common and deadly infectious disease caused by the mycobacterium *Mycobacterium tuberculosis* or *Mycobacterium bovis*, which most commonly affects the lungs (pulmonary TB) but can also affect the central nervous system, lymphatic system, circulatory system, genitourinary system, bones and joints.

Over one-third of the world's population now has the TB bacterium in their bodies and new infections are occurring at a rate of one per second. Not everyone who is infected develops the disease and asymptomatic latent TB infection is most common. However, one in ten latent infections will progress to active TB disease which, if left untreated, will kill more than half of its victims. In 2004, 14.6 million people had active TB and there were 8.9 million new cases and 1.7 million deaths, mostly in developing countries. The rise in HIV infection levels and the neglect of TB control programs have caused a resurgence of tuberculosis. Drug-resistant strains of TB have emerged and are spreading (in 2000-2004, 20% of cases were resistant to standard treatments, and 2% were also resistant to second-line drugs). The World Health Organisation declared TB a global health emergency in 1993.

WHAT IS TUBERCULOSIS?

This disease is known by many names like 'disease of slimming', 'disease of wasting' and in most areas by the English acronym 'TB'. The most common form of TB is the tuberculosis of the lung where the patient has:

1. Persistent cough usually with sputum production for more than three weeks.
2. Fever for more than two weeks: the fever is mostly in the evening.
3. Blood in the sputum while coughing (haemoptysis)
4. Chest pain

Following this the patient begins to lose weight for the next six months to one year and if not treated would die sooner or later.[1] Night sweats and shortness of breath could also be visible symptoms.

This form of Tuberculosis is very common in our villages. It is estimated that for every village with 200 houses there are four cases of Tuberculosis. This form of TB spreads fast and hence you will also get clustering of cases in certain areas.

Tuberculosis can also affect other parts of the body; there is tuberculosis of the bone, kidney, intestine, uterus, eye, spine, brain, lymph nodes and skin.

TB	Complaints
Brain	Irritation, headache, seizures and unconsciousness
Uterus	Secondary infertility and early cessation of periods
Kidney	Painless passing of blood in the urine
Intestine	Alternating constipation and diarrhoea later obstruction
Eye	Irritability and watering
Spine	Back ache and bending of spine (gibbus)
Bone	Pus from bone, pain in bone
Joints	Joint pain and fluid accumulation in joint
Lymph nodes	Swelling in the neck and pus discharge from swelling
Skin	Small jelly like swellings on skin

1. If left untreated approximately 30%-40% of sputum smear-positive cases die within one year, and 50%-70% within 5-7 years.

How is TB spread? *or* How does a patient get tuberculosis?

Tuberculosis is a contagious disease. Like the common cold, it spreads through the air. Only people who are sick with TB in their lungs are infectious. When a person with the lung infection coughs, sneezes, talks or spits, they propel TB germs, known as bacilli, into the air. A person needs only to inhale a small number of these to be infected. Once it enters the normal person it usually settles in the lung to cause lung tuberculosis. It also gets into the lymph nodes and can also spread to the kidney, the spine, and the brain or into many other organs and cause an infection of these.

Not all those who get infected will manifest with the disease. Within 2 to 4 weeks after the infection, the person's body will begin to fight the bacteria (specific cell-mediated immunity) and 90% of people will be successfull in killing the bacteria or putting it in a 'prison' in the lymph nodes. The bacterium that is imprisoned "goes to sleep" inside the lymph node and does not multiply or cause disease.

But in 10% of people, the bacteria wins the battle and begins to multiply in the lung tissue and begins to slowly 'eat up' the lung and thus makes holes in the lungs (which are seen on the X-ray in the late stages of the disease.) These patients attempt to cough out the bacteria and produce a lot of sputum. The sputum is loaded with bacteria. When such a persons cough, millions of bacteria is sent out in the air. Each bacteria riding in a small droplet of saliva is now ready to get lodged in another person.

When the bacteria bypass the lung and reach the other organs, they begin to multiply there and cause disease but are not able to spread from there. The urine, stool or pus from a patient with non-lung TB is not infective, which means there is no live bacterium that is transmitted. Therefore patients with non-lung TB (extra pulmonary Tuberculosis) do not spread the disease, but may themselves die from the disease if not treated.

Therefore the patient with lung TB is called an 'open case', since she/he can spread the disease. It is important to note that within a month of treatment, the bacteria load in the patient drops rapidly and she/he can no more spread the disease.

As mentioned earlier, 90% of persons who are infected with TB are able to imprison the bacteria in the lymph node. These germs lie dormant for years, and if and when immunity falls, the bacteria get reactivated and cause tuberculosis disease. Most Indians are infected with tuberculosis, which means most of us harbour the TB germ in our lymph nodes.

Who are the 10% of cases that are not able to fight the Tuberculosis germ?

Those with a weak immune system are not able to fight the disease. They are:

1. Undernourished children and individuals: This is a major contributor for the development of the disease
2. HIV infection: Tuberculosis is also one of the most common and life threatening infections for people living with HIV– the risk level is a 100 times the normal person.
3. Diabetes: This alters cell immunity and diabetics are three times at higher risk to get the disease.
4. Age: The incidence of TB disease increases with age, which is partly explained by the cumulative increasing prevalence of TB infection. Two peaks in the incidence are observed – the first in the 1-4 years age group reflecting progression from a recent TB infection and the second, in adolescents and young adults. Risk of TB diseases also increases beyond the age of 60 years. These are all times of immunological vulnerability.
5. Smoking: The odds for developing TB disease increase with an increase in the number of cigarettes smoked.
6. Occupational: The risk of developing disease is 26 times greater among miners with silicosis compared to miners without silicosis, or quarry workers.

Those persons who live with an 'open case' in the same residence have a higher chance to get the disease. Thus children staying in the house of an infected person are likely to have a high risk of infection.

TB OF THE LYMPH NODES

In children the TB bacterium usually infects the lymphatic system after entering through the lungs and they will present as swellings in the armpits or in the neck. Occasionally these swelling burst out with pus (collar stud abscess) and they are generally painless and 'cold'. This can affect adults also.

TREATING A CASE OF TUBERCULOSIS

DIAGNOSIS

All patients who attend any health service and report cough for more than three weeks are asked to undergo 3 sputum checks. If two of them are positive for tuberculosis then treatment for TB is initiated. Such a case will be called **Smear-Positive Pulmonary Tuberculosis** . If the sputum smear test is negative for TB or if only one of the tests is positive then it is left to the clinical acumen of the doctor to decide on treatment. The doctor could ask for an X-ray (See Box below) to assist in the diagnosis. These cases are then called **Smear-Negative Pulmonary Tuberculosis** .

Tuberculosis of other organs has its own diagnostic protocols and procedures, when diagnosed these cases are called **Extra-pulmonary Tuberculosis** . In children a tuberculin test (mantoux) is done to diagnose TB.

Multiple drugs are used to treat tuberculosis and these drugs are given for a period of 6-8 months. The Government's RNTCP programme has three drug regimens which cater to all the different forms of tuberculosis except the very resistant forms and all three are available for free.

The following special issues in Tuberculosis treatment need to be considered carefully:

1. Nutrition: There is no need for any special diet for a TB patient. They just need to get adequate normal diet. While on treatment their appetite increases.
2. Ambulatory care: Most patients with Tuberculosis do not need to get admitted for initiating TB treatment. They can take their drugs while at home.
3. Stigma: There is a lot of stigma and discrimination a person with tuberculosis faces from the family, the community and sometimes even from health care workers. It is important to note that once a patient with TB begins treatment, then she/he is not as infective as before. Therefore advice like eating in separate vessels, not residing with family and taking care of young ones in the household should be given with caution and thought.

X-RAYS

X-rays are needed if TB symptoms are present and sputum is negative, but one has to remember the limitations of X-ray-based diagnosis. These are:

- 10-15% of culture-positive cases remain undiagnosed by X-ray.
- 40% of the patients diagnosed as having TB by X-ray alone, may not have active TB disease.
- High inter-reader variation is present in interpreting the X-ray.
- There is no shadow in the lungs that can be considered typical of TB.

HOW DO I PREVENT TB IN MY COMMUNITY?

Tuberculosis is preventable and can be controlled. Most of Europe was ravaged with the disease prior to the World War but have successfully contained the disease. We can learn from this.

The most important step is to ensure that all pulmonary TB cases are identified and treated. Since pulmonary TB is the only portal of spread for Tuberculosis, it is important to identify such persons early and treat them. Research has shown that people with TB usually have symptoms, and seek care. So there is no need to do house-to-house surveys to

find TB patients. It is important to train all our health staff and community health workers to ensure that all patients with cough for more than three weeks are asked to undergo sputum tests.

THE SOCIAL DETERMINANTS OF TUBERCULOSIS

Most of the risk factors of increased exposure and of increased progression from infection to disease relate to social determinants. Malnutrition is the most important of these and closely related to this is poverty. When there is a large section of the population below the poverty line, high tuberculosis prevalence is inevitable. Poverty acts not only through malnutrition, it also acts through living and working conditions. Where housing is poor and people live in overcrowded shanty houses and where the conditions of work are such that the atmosphere is dusty and the lungs are compromised due to this, tuberculosis is far more frequent. Where there is in addition high physical stress, the risks of TB mount. Thus rickshaw-pullers living in urban slums are known to have high levels of tuberculosis.

What are the implications that an understanding of the social determinants of tuberculosis has for the control of tuberculosis? It is clear from routine morbidity and mortality statistics that TB was declining in Europe long before the introduction of BCG and chemotherapy, suggesting that medical interventions may contribute little to controlle TB. The reasons for this decline remain unclear and have been attributed to the natural trend in the TB epidemic to abate with improved nutrition, improved housing with reduced overcrowding and better ventilation, lower family size and reduced poverty and social inequity. Obviously under such circumstances, the risk of exposure to infection and more importantly, the risk of infection progressing to infectious disease, both become much less. It is true that adding effective chemotherapy increases this rate of decline – and it did so in the developed countries also.

However in addition to the programme for identifying and treating Tuberculosis cases there needs to be a set of social measures that allow the poor and the sick, the minimum conditions of life. This should be independent of their earning capacity, knowing fully well that their earning capacity would be compromised by the disease. One measure suggested, for example, is to offer all such families an Antyodaya card so that there can be food supplementation along with drugs. Other is to link it to housing programmes. Yet another mandatory need is to improve occupational health through imposing minimum working conditions and the possibility of employers having to pay compensation for Tuberculosis incurred in their premises. Such ideas are not yet mainstream ideas, but districts which are able to get disaggregated data about Tuberculosis prevalence in different sections of the population would be able to identify and build in protective measures for vulnerable groups that could significantly contribute to the reduction of Tuberculosis, not to speak of the human rights aspect of this problem. In the long run, reduction of malnutrition and poverty and improved working and living conditions in combination with access to good diagnostic facilities and chemotherapy are the only sure way of eliminating Tuberculosis.

ROLE OF BCG VACCINE IN PREVENTING TUBERCULOSIS

Bacilli Calmette Guerin (BCG) derived earlier this century from Mycobacterium bovis, is the most widely used of vaccines. Unfortunately it has little effect on TB control. Fortunately, children generally do not get infectious forms of TB. The main stated benefit of BCG is in preventing serious disseminated disease in children. The efficacy of BCG also varies. Studies carried out around the world have demonstrated wide differences in the ability to protect from disease, ranging from 0-80%. The reasons for this variation are unclear, but the official consensus is that it still has a vital role in preventing disease in children and it is incorporated in Expanded Programme of Immunisation in most developing countries.

Districts which are able to get disaggregated data about tuberculosis prevalence in different sections of the population would be able to identify and build in protective measures for vulnerable groups that could significantly contribute to the reduction of tuberculosis, not to speak of the human rights aspect of this problem. In the long run reduction of malnutrition and poverty and improved working and living conditions in combination with access to good diagnostic facilities and additionally, chemotherapy are the only sure way of eliminating tuberculosis.

MANAGING THE RNTCP PROGRAMME AND DISTRICT PLANNING FOR THE TB PROGRAMME

Tuberculosis remains a major public health problem in India. Every year approximately 18 lakh people develop TB and about 4 lakh die from it. India accounts for one fifth of the global incidence of TB and tops the list of 22 high-TB burden countries. Unless sustained and appropriate action is taken, approximately 20 lakh people in India are estimated to die of TB in the next five years. In India, more than 40% of population is currently infected with TB bacilli.

Tuberculosis kills more adults in India than any other infectious diseases. Of these, young adults form the majority. Tuberculosis kills more women than maternal mortality.

In India EVERY DAY,

- More than 40,000 people become newly infected with the tubercle bacilli.
- More than 5000 develop TB disease.
- More than 1000 people die of TB (1 death every one-and-half minutes).

The main control strategy that is used today is called DOTS (Directly Observed Treatment, Short course).

The five major components of DOTS are:

1. Government/political commitment to sustained TB control activities.
2. Case detection by Microscopic Examination of Sputum smears among symptomatic patients who self-report to health services.
3. Standardised regimens of six to eight months treatment at least for all confirmed sputum positive cases, with directly observed treatment (DOT) for the initial two months.
4. A regular, uninterrupted supply of all essential anti-TB drugs.
5. A standardised recording and reporting system that allows assessment of treatment results for each patient and of the TB control programme overall.

The government scheme that takes forth the DOTS strategy is called the Revised National Tuberculosis Control Programme (RNTCP).

Under the DOTS strategy, patients swallow the drugs under direct observations of the health worker viz. the DOT provider. The selection of the DOT provider is not restricted to medical personnel. Any responsible person of the locality/community except a family member can function as DOTS provider. The patient is required to visit the designated DOTS center and consume the medicine in the presence of the DOT provider. In case the patient drops out or fails to attend the health facility on the scheduled day, it is the responsibility of the DOT provider to retrieve the patient to the system and ensure completion of the treatment regimen.

One of the unique features of this programme is the fact that patient-wise treatment boxes are available with the DOT provider with the full regimen of drugs needed to complete the treatment. This facility ensures availability of anti-TB drugs for a patient for her/his full course of treatment on the very first day she/he is registered.

The Revised National Tuberculosis Control Programme (RNTCP)

The National Tuberculosis Control Programme, in operation since 1962, was reviewed by an Expert Committee in 1992. Based on its findings and seeking synchrony with the Directly Observed Treatment, Short Course strategy, the Government of India evolved the Revised National TB Control Programme (RNTCP).

The RNTCP is implemented through TB Societies at the State and District levels. The State TB Officer and District TB Officers are responsible for the effective implementation of the programme in the States and Districts respectively. The District TB Societies are headed by the District Collectors while the state level society is headed by the State Health Secretary. These societies are to be merged into the district and state level societies under the NRHM guidelines.

The goal of RNTCP is to decrease mortality and morbidity due to TB and cut transmission of infection until TB ceases to be major public health programme. The goal is achieved through the following objectives:

Objectives

1. To achieve and maintain a cure rate of at least 85% among newly detected infectious (new sputum smear positive) cases and,
2. To achieve and maintain detection of at least 70% of such cases the population

However the programme stated an understanding that the target for case detection should be attempted only if cure rate to 85% is achieved among new sputum smear positive patients already detected.

STRUCTURE OF RNTCP PRGRAMME

The structure of RNTCP comprises of five levels, as follows:

1. National, 2. State, 3. District, 4. Sub-district Tuberculosis Unit (TU), 5. Peripheral health institution.

National and State level

The Central TB Division (CTD) is responsible for TB control in the whole country. A National Programme Manager, the Deputy Director General-TB (DDG-TB) is in charge of the tuberculosis programme in the country. States via State Tuberculosis Committees are responsible for directly monitoring and supervising the work of District TB control Societies. In major states, a State TB Training and Demonstration Centre (STDC) supports the state TB cell by providing training, supervision and monitoring etc.

District Level

The District Tuberculosis Center (DTC) is the nodal point for TB control activities in the district. The primary role of the DTC is managerial, with a District Tuberculosis Officer at the head. The District Tuberculosis Officer is assisted by Medical Officer, statistician, and other paramedical staff.

Sub-District Level TB Unit (TU)

A team comprising a specially designated Medical Officer – Tuberculosis Control (MO-TC), Senior Treatment Supervisor (STS) and Senior TB lab supervisor (STLS) is based in CHCs, Taluka hospital, and Block PHCs.

A Tuberculosis Unit (TU) covers a population of approximately 5 lakhs (2.5 lakhs in tribal, desert and remote and hilly areas). The TU will have one microscopy centre for every 1 lakh population (0.5 lakhs in tribal district, remote and hilly region) referred to as the designated microscopy centre (DMC). DMCs are also provided in Medical Colleges, ESI, Railway, NGOs, private and corporate hospitals, etc.

The MO-TC at the TU is responsible for organising sputum smear examination at all the microscopy centers of the sub-district, carrying out treatment categorisation of diagnosed patients (supporting other Medical Officers of the sub-district to do the same) and ensuring that treatment is as per guidelines at all DOT centers. He should ensure a regular supply of drugs and other logistics and ensure their uninterrupted availability in all the peripheral health institutions.

Peripheral Health Institutions (including those with microscopy centres)

These include dispensaries, PHCs, CHCs, referral hospitals, major hospitals, speciality clinics/hospitals (including health facilities), contracted-in private nursing homes etc. within the district. Some of these peripheral health institutions will also be DMCs.

The main functions at the PHI are to refer TB suspects or send their sputum specimens to DMC for examination and to:

- Carry out Treatment categorisation of diagnosed patients, give health education, identify DOT providers for them, and start the DOT in 7 days.
- Trace patients who interrupt treatment and bring them back to treatment.
- Maintain up-to-date TB treatment cards and records and make them available to supervisory staff when they visit the health facilities.
- Monitor and facilitate follow-up sputum smear examination.
- Identify and investigate contacts.
- Mention treatment outcome in the treatment cards.
- Identify and train DOT providers as and when needed, update list of DOT providers under intimation to MO-TC.
- Submit monthly report on programme implementation and logistics to the TU.
- Supervise and monitor DOT services in their jurisdiction.
- MOs of DMC are also responsible for supervision and monitoring the microscopy activity of their institution.

Critical steps in ensuring control of TB and success of RNTCP

1. Ensuring that 85% cases that are diagnosed to have infectious tuberculosis (Sputum Positive pulmonary tuberculosis) are cured.

   The usual cause of this is the discontinuation or irregular intake of medicines – due to difficulty in accessing drugs, migration for work, lack of understanding of the importance of completion of the course, seeking alternative cure in-between treatment. Such patients are not cured and could become resistant to drugs they have taken.

   To improve regular and easy access to drugs appropriate choice of a DOTS provider is the key. It is important to ensure that DOTS providers from the community are trained and active. There should be a choice of DOTS providers for the patient and the patient should be allowed to make a choice. The DOTS provider should also be sensitised on issues of stigma and discrimination. Often problems in drug supplies logistics leads to the hospital not having drugs or not being able to reach the drugs to the DOTS provider.

There should be a working system of transferring patients between sites and between states and districts and the patient should be able to demand for transfer from one DOTS provider at any time and however often required. Rigid rules such as having them to register only at the place of residence will not help in compliance.

Cure rates will have to be analysed regularly at the district level and audits conducted to find out the reason for treatment failure amongst those not cured. The various process indicators described below help the planning team to do this. If there are a large number of treatment failures, then a study on primary drug resistance needs to be carried out in the district.

2. Ensuring that 70% of all infective cases are identified and treated.
To do this one needs to understand that most patients suffering with tuberculosis do come to the health centres but are missed out due to any of the following reasons:

- The **health care provider not suspecting TB**, though they come with cough for more than three weeks.
- The patient being **not able to give three sputums** for testing for TB. This may be due to the fact that she/he has to come back the next day, or that they were not instructed properly or that the nearest diagnostic centre (microscopy centre) was not accessible to the patient.
- **Improper sputum sample:** It is important that the sputum sample comes directly form the lung. Some sputum samples given by the patient only contains saliva. Early-morning samples are supposed to have a higher yield of detecting TB. It is important to instruct the patient on the exact nature of producing a good sputum sample.
- **Poor microcopy skills of the technician:**Since the test is dependent on the technician identifying a TB bacilli, it is important to ensure the staining techniques are done properly, quality of stain used is good, adequate time is taken in studying a slide and there are adequate skills of the technician in recognising the bacilli.
- **Report not handed over to the patient:** This unfortunately is a very common problem. Many sputum positive cases do not come to take their reports. Addresses on the requisition slips are required and need to be followed up.

The health worker, ANM, Doctor, Lab supervisor and treatment supervisor need to work in coordination to ensure that no patient gets missed.

Estimating the Burden of the Disease

One method may be to measure TB disease prevalence directly by a survey backed by sputum examination and X-rays. From this measurement of prevalence, one could calculate the TB incidence knowing the duration of the disease. Since the incidence of tuberculosis is low, precise calculation of incidence from prevalence

data would require a very large sample size. Screening 10,000 people by sputum microscopy or miniature radiography would detect only 20-30 cases with wide confidence intervals, and would be very expensive.

Therefore the most widely used method of estimating the incidence is based on the Annual Risk of Tuberculosis Infection (ARTI), which is derived from tuberculin surveys that measures the prevalence of TB infection by age cohort within a community. This information is then used to calculate and average ARTI, which is then converted into the incidence estimate. This method has several limitations related to tuberculin skin testing, namely, standardisation of the tuberculin, the administration technique, its reading, interpretation of results especially in HIV-infected people and of cross reaction with BCG and environmental mycobacterium. Even if a more reliable test for measuring TB infection were available, the relationship between ARTI and incidence would be difficult to establish due to the lack of clear empirical information on the relationship and the impact of HIV infection on the natural history TB infection.

ARTI represents the proportion of population that gets newly infected (or re-infected) with tubercle bacilli over the course of one year. Currently the average ARTI in the country as a whole is estimated to be 1.5%. It has been estimated that for every 1% of ARTI, there are about 50 new pulmonary sputum smear-positive cases per 1,00,000 population per year. Out of the new TB cases 85%-90% are pulmonary and 10-15% are extra-pulmonary. Of the new pulmonary TB cases, 50% are expected to be sputum-positive.

This means that with an ARTI of 1.5% there will be 75 new smear-positive cases, 75 new smear-negative cases, 38 re-treatment cases, and 15 extra pulmonary cases totaling 203 cases per 1 lakh population per year.

Table 1.1 Current situation of Tuberculosis

Indicators	World	India
New TB cases	8,918,203	1,824,395
New TB smear positive case	3,939,079	814,570
New TB case rate	140	168
TB smear positive case rate	62	75
People living with TB	14,602,353	3,394,040
TB prevalence rate	229	312
TB deaths	1,693,051	329,115
TB death rate	27	30
DOTS coverage	83%	84%
DOTS detection rate	53%	57%
DOTS treatment success (2003)	86%	82%

Source: World Health Organisation (2006) *Global TB Database and Country Profile*, Global Tuberculosis Control - Surveillance, Planning and Financing, WHO, Geneva (www.globalhealth.org)

Diagnosis and Treatment protocol under the Revised National Tuberculosis Control Programme

Diagnosis

All out-patients with more than 3 weeks of cough are TB suspects- they must be referred for Sputum examination. If the health facility is not a designated microscopy center (DMC) the patient is referred to nearest such centre or else sputum could be collected and sent there. 3 samples are collected over two consecutive days.

1. One is collected on the spot, when first seen in the facility.
2. Second is collected at home by the patient the next day (early-morning sample) and brought to the hospital.
3. A third spot sample on the second day when the patient comes to give the sputum.

Sputum examination and TB drugs and treatment are FREE of charge at Govt facilities under RNTCP

The patient needs to be instructed about proper sputum collection. If sputum is not collected in a correct manner, a diagnosis may be missed. Results of a sputum test should be reported within a day.

Patients with three, or at least with two out three sputum positive smear results are diagnosed by the physician as having pulmonary sputum smear-positive TB. They are further classified as new or re-treatment case based on their previous treatment history, and appropriate therapy. (An X-ray is not essential for them, though usually one is done to help in follow up and look for complication.)

Patients with only one positive result out of three sputum smear examination must be get a chest X-ray examination. Patients, who have one smear positive and a chest X-ray compatible with TB as diagnosed by an MO, are diagnosed as having sputum smear positive TB.

If good diagnostic practices are followed as indicated above, it is expected that among the new pulmonary TB cases, at least 50% will be sputum smear positive cases. Patients in whom all 3 samples are smear-negative should be prescribed symptomatic treatment or broad-spectrum antibiotics for 10-14 days. But if the symptoms persist, then the sputum test is repeated.

Patient suspected of having extra pulmonary TB, and patients who are in prolonged contact with sputum smear positive patients, should have their sputum examined for AFB if they have cough of any duration. Procedures undertaken to arrive at the diagnosis of the extra pulmonary TB must be mentioned in the treatment Card.

Extra-pulmonary TB patients and contacts of smear positive TB patients should have 3 sputum smears examined regardless of the duration of cough.

Treatment

Directly Observed Treatment (DOT) is considered necessary to ensure that people take the TB medicine correctly. Various studies have demonstrated that about 30% of people do not take medicines as prescribed. Direct observation could be by a person who is accountable to health service, and accessible and acceptable to the patient. Often it is a health worker – paid or voluntary, or even a neighboring household volunteer – who is incentivised for doing this task (like the ASHA). Without supervision, the cure rate in TB patients is usually less than 60% and often much lower. With good supervision, it is

possible to achieve cure rates in excess of 90%.

Patients are classified into three categories for the purpose of treatment. The number of drugs and the duration of treatment are different in the three treatment categories of RNTCP. The information needed for categorisation of a TB patient includes: disease classification; results of sputum smear examination; history of previous treatment; type of case; and severity of illness. These categories must be strictly adhered to for deciding treatment.

Monitoring Treatment

The RNTCP has standardised a number of steps to monitor the treatment follow up. It is worth noting these as they form key issues of what are monitored.

1. Ensure correct treatment of smear-positive pulmonary TB patients by monitoring results of follow-up smear examinations for sputum smear conversion
2. Ensure correct treatment of smear-negative and extra-pulmonary TB patients by monitoring drug intake.
3. Register all patients who are put on anti-TB treatment.
4. All patients must be 'registered' within one month of treatment initiation.
5. Only one Tuberculosis Register is maintained at each TU.
6. Registration means assigning a TB number to a patient and monitoring the progress of the patient.
7. The STS is responsible for registering patients.
8. Tuberculosis Register contains all patient-related essential information.
9. Each patient has only one of the six outcomes (cured, completed treatment, died, failure, defaulted or transferred out)
10. While recording treatment outcome, write the exact date of last dose of drug consumption and not the last date when drugs were collected.

Intended Impacts of RNTCP

The first and most immediate effect of the programme should be a reduction in the number of people dying from TB. Without treatment, about 50% of people with infectious TB will die within two years. In poor programmes, this proportion falls to less than 30%, but in a good programme, the case fatality rate should be less than 5%.

The second effect of the programme is a reduction in the prevalence of TB. Effective treatment rapidly makes people with smear positive TB non-infectious, and at least 80% will become smear negative within two months of treatment. This reduction in the pools of infectious cases in the population results in a decline in transmission of TB, which will ultimately lead to a fall in the incidence of TB.

The third benefit is from ensuring that drug supplies are never interrupted and treatment is always supervised. Because of this the opportunities for inadequate treatment are considerably reduced and drug resistance develops less frequently.

Finally, effective and uninterrupted treatment will also lead to decrease in the proportion of people relapsing with active disease in the future. The reduction in relapses and drug resistant also means savings in drug costs for governments in the long term.

TUBERCULOSIS IN THE DISTRICT PLAN

Given the fact that the tuberculosis programme has such a detailed and rigid set of instructions to follow, what would be the role of the district plan? If we consider the fact that many districts are not doing too well on the control of tuberculosis, then we see the need for better efforts. These efforts could take a number of directions:

A) Operational: Look at the process indicators of the RNTCP programme and find out where the indicators are below expected levels and take corrective action.
B) Systems Related: Look at the systems that need to be in place for achieving full coverage, and address the systemic gaps.
C) Integration Issues: Look at inter-sectoral convergences.
D) Design Issues: Reaching the Sickest: Where there is an area that the RNTCP would not be able to focus on – but which at the district level you may decide to focus on – in addition to ensuring the routine operational steps.

Operational Planning

RNTCP Indicators to Monitor

Improving the operational dimensions of RNTCP implementation is the first priority. Indeed given the current structure of the health system, it would be completely unacceptable to attempt any further dimensions of tuberculosis control unless all aspects of the DOTS- RNTCP strategy are fully met. The following indicators help us understand and act on the critical processes:

OUTCOME INDICATORS	
Case Cure Rate	**Case Detection Rate**
The objective of this indicator is to measure the efficacy of the programme in achieving its main goal, the cure of tuberculosis patients, thus removing the possible sources of infection from the population.	The objective of case detection is to detect at least 70% of the estimated load brought in. It is estimated that the case detection rate increases over a period of time, for as word spreads in the community about the effectiveness of RNTCP, more individuals start coming for treatment.

Case Cure Rate:	Case Detection Rate:
Total number of cases that are declared as cured as a proportion of total number of cases detected. *Expected Level:* 85% of cases of new smear positive case, and preferably 95%. *Possible Action:* If this rate is not being achieved, we must check the process indicators (sputum conversion ratio, sputum conversion rate, default, transfer and death rates)	No. of new smear-positive cases registered during the year Estimated number of new smear-positive cases (figure based on all-India prevalence figures) *Expected Level:* 70% *Possible Action:* i. Check whether in each centre, there are enough cases subject to smear examination and whether there is adequate quality of microscopy centre. ii. Check whether there are no wrong cases getting included, painting a falsely high picture of case detection achievement. iii. Check whether the number of participating centre is adequate (the total number of out-patient in participating centres should be adequate) Also see the Case Notification Rate for New Smear-positive Cases. This is the number of new smear-positive cases registered for treatment per 100,000 population. Usually calculated once a year, the Case Notification Rate is important for observing trends over the year. It can also be calculated for various age groups and by sex.

Intermediate/Process Indicators	
Is the treatment regimen being correctly applied? **Sputum Conversion Ratio** *Indicator:* % of smear-positive treated patients who remain smear-positive at 5 months *Expected Levels:* Not more than 4% of new smear-positive patients continue to be smear-positive at 5 months or later from the start of treatment. If more than 5% of new smear-positive patients fail treatment, then further action is required. *Possible Action:* Patients must be asked carefully about prior treatment for tuberculosis from any source. If previously treated patients are not given the re-treatment regimen, they may not respond well to treatment. Make sure that definitions and categories are applied correctly. Any smear-positive patient treated for more than one month in the past, with default of more than 2 months, should receive the re-treatment (CAT II) regimen. Ensure that every dose of medication is observed during the intensive phase of treatment and at least one dose per week in the continuation phase. Ensure return of empty blister packs during weekly collection of drugs in the continuation phase. Observation sites should be convenient to the patient. Ensure that health workers are dispensing medication properly as per technical guidelines.	**Are the Public Health Institutions looking for tuberculosis adequately?** **Adequacy of Microscopy** *Check for:* i. Is microscopy done often enough? Indicator: Total number of chest symptomatic as proportion of total number of patients. ii. Is microscopy done well enough? Indicator: Total number of smear-positive persons as a percentage of total number of chest symptomatic. *Expected Levels:* i. Usually 2-3% of new adult out patients in any general health facility will have a cough for 3 weeks or more. All cough symptomatic of over 3 weeks should have their sputum examined – thrice. If a health facility is subjecting less than 2% of their new adult outpatients for sputum examination, a good number of TB patients may be left undetected. ii. On an average, 10% of persons who have tuberculosis on clinical suspicion, are expected to have sputum smear-positive pulmonary TB. *Possible Action:* i. Ensure that all chest symptomatics of more than 3 weeks get a sputum examination done. ii. Improve Quality of Microscopy. Technical Problems (Reasons for False Negative Smear Results):

Ensure that drugs are of acceptable quality, stored in appropriate conditions and are used before the expiry period.

Inspite of all the above, if the failure rate remains higher than 5%, consider evaluation of the level of primary drug resistance in the community.

Sputum Conversion Rate

Indicator:
% of smear-positive treated patients who become sputum negative at 3 months.

Conversion Expected:
Conversion rate is more than 90% of new smear-positive patients of Category I at 3 months. More than 85% of all smear-positive patients are documented to become sputum smear-negative at 3 months.

Possible Action:
If conversion rates are less than expected,

- Follow-up sputum examinations are the best measure of patient response to treatment. Conversion of sputum at the end of the intensive phase increases patient confidence and is critical to programme evaluation.
- Visit all centres with low sputum conversion rate and resolve any problem with the help of the staff. Make sure default rates in the first 2 months are <5%, and the number of patients who die or transferred out is minimal.
- Ensure that sputum microscopy is accurate. Ensure review of slides of patients who remained smear-positive at the end of the intensive phase.
- Ensure that every dose of medication is observed during the intensive phase of treatment.

- Improper storage of sputum specimens· Inadequate sputum collection
- Too thin or thick smears
- Overheating the slide while fixing
- Insufficient fixing
- Boiling carbol fuchsin
- Over decolourisation with sulphuric acid· Improper storage of stained slides
- Inadequate examination
- Using saliva for smear
- Reading and reporting errors
- Re-using slides for preparing smears.

Therefore, improving quality of microscopy requires:

i. Quality Control Measures and Supervision: For one patient, there is only one Laboratory Form for Sputum Examination and only one Laboratory Number even though there are 3 sputum examinations for diagnosis and 2 sputum examinations for follow-up. These forms and records are the systems that enable supervision. Grading of smears increases the accuracy of results and reduces the possibility of errors by the laboratory technician, and facilitates supervision.

ii. Good Problem Diagnosis: Find out why the laboratory technician is getting it wrong if the expected percentage of smear-positive cases is not happening. This is monitoring quality issues, but needs emphasis as traditional 'disciplinary approach' to monitoring only.

iii. Good Training and Re-training.

• The quality of DOTS should be checked at the time of supervision, including checking of entries in the Treatment Cards with the drugs available in patient-wise boxes.	
Are poor cure rates or pure conversion rates due to factors of access which lead to high drop outs? **Default Rate** *Indicator*: % of patients put on treatment, who drop out of treatment. *Expected Levels:* Default rate is less than 5%; Default rate of smear-positive CAT I patients is more than 8%. *Possible Actions:* Visit centres which have reported the highest default rates and interview staff and patients to determine the efforts made to retrieve patients, the reasons for default and possible solutions. Make sure that centres are aware of their default rate so that they can take steps to reduce it. Ensure that patient history is carefully ascertained, including the address. A visit to patients' home should be made to verify address and landmarks near the house should be recorded in the Treatment Card. Services should be convenient to the patient in terms of distance, time and staff attitudes. If needed change the DOTS provider. During the visit to the house for verification of address, note the name and address of a person who can be contacted in the event the patient defaults. Ensure that directly observed treatment is given to patients in the intensive phase and at least one dose per week is directly observed during the continuation phase.	**Are cases being correctly detected and labeled as pulmonary TB?** **Proportion of smear-positive cases out of new pulmonary TB cases** *Measured as:* $\frac{\text{No. of new smear-positive cases registered in a quarter}}{\text{No. of new pulmonary TB registered in the same quarter (NSP+NSN)}}$ *Expected Levels:* This is usually reflective of sputum examination quality and case detection processes. There should ideally be 50% smear-positive cases out of the total new pulmonary TB cases. This proportion however should not be less than 45%. *Possible Actions:* Ensure that over-diagnosis of sputum smear-negative patients is not happening due to over reliance on radiography. No patient should begin treatment without the mandatory three sputum smear examinations. Ensure that repeat sputum smear examinations are done for patients who continue to have symptoms after a course of antibiotics. Ensure that sputum smear microscopy is done correctly. Review slides of smear-negative patients placed on treatment. There is little point in achieving case diction rates if this is done by wrong inclusion of patients. Proportion of smear-positive cases out of new pulmonary TB cases is a useful indicator to prevent this.

Are poor drop rates or poor cure rates because a number of patients are being shown as being transferred out? *(Sometimes this is done to cover up poor cure rates.)* **Transfer Rate** *Indicator*: % of persons put on treatment who are noted as transferred out. *Expected Levels:* Transferred-out is usually at less than 3%. If percentage of patients who are transferred-out is more than 5%, there is need for immediate action. *Possible Action:* Transferring-out may be a way of disguising default. Patients should be categorised as 'transferred-out' only if they have been given a transfer form to be taken to the facility where they are transferred to. Ensure the receipts of result of follow-up sputum examinations and treatment.	**False high case detection rates may result from a number of old cases being re-diagnosed as fresh cases. Could this be happening?** **Percent of re-treatment smear-positive cases** *Indicator*: Total number of re-treatment cases as a proportion of total number of all smear-positive cases. *Expected Levels:* RE-treatment smear-positive cases are about 30% of all smear-positive cases in the initial years of RNTCP. *Possible Action:* If re-treatment cases are more than 40% of all smear-positive cases, ensure that active case-finding is not distorting the picture. With active case-finding, many 'old' TB cases are reported. Ensure that history-taking is accurate and definitions are correctly applied. Ensure that new symptomatic patients undergo three sputum smear examinations for acid-fast bacilli (AFB).
High death rates are an indicator of poor treatment outcomes but may not be seen if only cure rates are being measured. Is this confounding the picture? **Death Rate** *Indicator*: % of smear-positive TB patients who die during treatment.	**Not all cases of pulmonary TB test smear – positive. But if too many cases of smear-negative are being diagnosed then there could be a problem.** **Percent of smear-negative patients placed under CAT I** *Indicator:* % of smear negative cases as proportion of total number of cases placed under CAT I.

Expected Levels:
Not more than 4% of new smear-positive patients who die during treatment. If percentage of new smear-positive patients who die during treatment is more than 5%, then there is need for action.

Possible Action:

- Ensure that every dose of medication is observed during the intensive phase of treatment, and at least one dose per week in the continuation phase.
- Observation sites should be convenient to the patient.
- Review information on patients who died, to determine the reasons.
- If patients are presenting for treatment when already moribund, consider ways and means to encourage more prompt referral and diagnosis so that patients can be treated earlier in the course of their TB illness.Inspite of all the above, if the death rate is more than 5%, consider evaluation of the prevalence of HIV infection of MDR-TB among TB patients, to be done strictly as per policy with confidentiality safeguards.

Expected Levels:
Not more than 20% of smear-negative and extra-pulmonary patients are considered seriously ill and placed under CAT I. If the proportion of smear-negative or extra-pulmonary TB patients being given CAT I regimen in more than 25%, ensure that only seriously ill patients are given CAT I treatment. Non-seriously ill new smear-negative patients should receive CAT III treatment. Esnure that sputum microscopy is done correctly.

Case Detection Rates may be low because the total numbers of centers detecting cases are not established or functional. Is this the problem?

Indicator:
Total number of centers functional as proportion to total number of centers needed.

Expected Level: 100%

What is the minimum number of participating centres and TUs and DMCs needed in the district? Are they achieved? Are they of sufficient quality? Given geography and other constraints, is this norm adequate? Are there some areas where there are higher population coverages per unit because of clustering of some TUs/DMCs close together? In a map/GIS platform, can we mark out the areas where the concentration is insufficient?

SUPPORTING SYSTEMS INVESTIGATION

This is needed for both improving cure rates and for improving case detection. After we have identified why case detection or cure rates are low, we still need to know what failed in the process of support and supervision that allowed it to happen. Also mistakes always happen, but we need a supervisory system to correct it. Basic steps like lack of staff and lack of training would also impede achievement. Therefore the next level of investigation should look at the supporting systems of the RNTCP programme and how operational these are.

Process Indicators

Proportion of Supervisory Visits

For each level (national, state, district, sub-district), compare the number of supervisory visits conducted quarterly to the number of supervisory visits planned.

Measured as:

$$\frac{\text{Total number of supervisory visits conducted by the staff at a given level}}{\text{Total number of supervisory visits planned at that level}}$$

Possible Action:

Plan out tour visits and ensure tour diaries are maintained and the level of supervision for each staff are maintained.

Proportion of Quarterly Reports Properly Completed and Received

Measured as:

$$\frac{\text{Number of Quarterly RNTCP Reports received and complete in all respects}}{\text{Total number of Quarterly RNTCP Reports Expected}}$$

Expected Level: 100%

Possible Action:

Analyse the bottle-neck. Is the report not made because the work is not being done, or is it that records are not maintained at the peripheral institution, or do they fail to make the report on a scheduled date, or do they fail to send it, or do they fail to aggregate it at intermediate level and transmit it? Accurate information enables supportive monitoring and correction.

Proportion of Programme Staff in Position

Measured as:

$$\frac{\text{Staff in position in the particular category}}{\text{Sanctioned strength in that category}}$$

Expected Level: 100%

Possible Action:

- Regular advertisement and filling up
- Contractual appointments, preferably done locally with funds given to local Hospital Management Committee
- Multi-skilling existing staff to play this role

Proportion of Staff Trained in RNTCP

Measured as:

$$\frac{\text{Staff trained in RNTCP of a Particular Category}}{\text{Staff in Position in the Respective category}}$$

Proportion of Equipment in Working Condition

Measured as:

$$\frac{\text{Number of equipment in working condition}}{\text{Total number of Equipment}}$$

Planning for Systemic Issues

The entire range of indicators above assume there are adequate number of facilities and most of the population is accessing these facilities and that these facilities are functional at minimum quality levels. However we know that access to centers relates to both distance from the health facility and severity of symptoms.

Gaps in Public Health System

If there is a PHC in every sector or 30,000 population, which is functional and which has a microscopy center, then the entire case detection would be adequate. If on the other hand the PHC is not in place and only the CHC is functional, it would mean one center for over one lakh population, and a poor person may have to pay Rs. 50 to reach there other than the loss of wages, and to come twice for sputum examination and subsequent follow up sputum and referrals would be far beyond her/his capacity.

Again it would be difficult to improve BCC programmes, drug supplies logistics or outreach of supplies or laboratory work for this programme in isolation from programmes on malaria control, RCH etc. Such improvements when done for a single programme are usually done with special project staff or other staff having to prioritise this effort alone. After a few years the project ends as the incidence goes down and a new priority takes over- at which time the entire monitoring structure fails.

It therefore becomes important to integrate the programme with the development of district level health systems.

Involving the Private Sector

Currently in most states over 70 to 80% of the population seeks health care in the private sector. A few available studies on the health-seeking behaviour of TB symptomatic individuals and patients have shown that more than 50% of patients first approach private providers. In many districts however such private care providers are not enrolled or even sensitised into the RNTCP programme. The treatment they provide is not as standardised, and there are high rates of drop outs and treatment failures. There is a need to therefore bring them all into the RNTCP, and aim for an epidemiological impact through standard management of TB. They can be accredited as peripheral health institutions providing care and where they fulfill the criteria as microscopy centers also. They also play a role in hospitalisation of the sickest cases. Many centers do not even want to be PHIs and are willing to refer the patients to the government center.

One complex issue is on how to manage the informal and unqualified private sectors. One mandatory step is to sensitise them and make them refer all suspect cases. But do we use them as DOTS providers, do we use their nursing homes as PHIs etc are questions that need to be answered locally.

One caution is that in whichever district there is no private sector involvement a district report of 80% case detection

or above, is likely to be misleading. The district plan needs to work out an effective way of ensuring all private sector providers are incorporated into the district plan and this would be one test of the adequacy of district level planning.

Integration Issues: Planning for inter-sectoral Convergence

The need is to link the control of tuberculosis with the following Departments:

a) Department of Food and Food Security Programmes.
b) Department of Urban Development and Housing, with special reference to slums.
c) Department of Tribal Welfare, due to high incidence of tuberculosis in these populations.
d) Department of Labour, with reference to occupational health especially where there are mines and quarries.
e) Department of Social Welfare, for special concern regarding vulnerable sections.

The issue is to support vulnerable sections through appropriate programmes so that they are less susceptible to the disease and more likely to respond to the disease. In some of these situations, the incidence of tuberculosis would be an indicator of the huge dimensions of poverty and related deprivations, and the presence of so much tuberculosis could help prioritise action by other departments as well.

Design Issues: Planning to Reach the Sickest

Where there is programme like the RNTCP – which is a national programme – its guidelines define what is best for the entire nation. This has many advantages– but one disadvantage is that it is not able to look at the differing pattern of vulnerable groups. The main vulnerable groups with reported high incidences of tuberculosis who may fall outside the net are geriatric age groups, remote tribal areas, migrant communities, street children and homeless children and women outside family protection. In some places, particular occupations like beedi rollers or slate industry could be full of tuberculosis cases. The district plan needs to be able to look at vulnerability by such sub-sections and plan for them. The problems may be compounded by the fact that given the conditions of their life and their access to health care services many of these sections would be unable to access health care facilities. A district may then have to create a special structure of a PHI and DMC and DOTS provider to reach to these sections or it may even have to consider a non-DOTS approach.

The importance of such sections for spread must however not minimised. Thus migrant and certain groups of homeless may travel widely and disperse the germs, and yet are very poor cases for ensuring regular follow up. Geriatric cases contribute to childhood tuberculosis and yet the system can remain insensitive to referring them or examining them. Thus systemic/social exclusion of some categories of cases presents a challenge to district planning. One has to find the flexibility to attend to such issues and in practice one would can win the space only if the programme is doing well by all its basic process and outcome indicators.

References and Sources: World Health Organisation (2004): *TB/HIV: A Clinical Manual*, Second edition, WHO, Geneva.

SPECIAL ISSUES IN TB CONTROL : TUBERCULOSIS IN CHILDREN

In children disease patterns are different. Manifestations involving more than one system are common in children, extra-pulmonary form of tuberculosis being as common as pulmonary ones. Tuberculosis ranks among the ten major causes of mortality among children. Estimates indicate that childhood TB constitutes about 10% of all cases of TB. Most of these were smear negative. Every day, nearly 500 children die of TB.

The most common form of Extra pulmonary tuberculosis is lymphadenitis which forms about 70% of children with Extra pulmonary tuberculosis. The next common and indeed the most feared form of tuberculosis is tubercular meningitis (an infection of the membranes covering the brain) and this constitutes about 7% to 10% of extra pulmonary TB. It is dangerous because it is almost always fatal. It usually affects young children between three months and three years of age. A delayed or late diagnosis could spell death for child or at the very least, serious debility.

Childhood TB is a reflection of the prevalence of sputum positive pulmonary TB and extent of transmission of infrection the community. It had hitherto been accorded low priority since it is less infectious. The serious forms of TB are more common in children and they are more likely to die if not reacted properly.

Suspect TB in any Child:

- Who is ill, with a history of contact with a suspect or confirmed case of pulmonary TB.
- Who does not return to normal after measles or whooping cough.
- With loss of weight, cough and fever who does not respond to antibiotic therapy for acute respiratory disease.
- With abdominal swelling; hard painless mass and fluid.
- With painless firm or soft swelling in a group of superficial lymph nodes.
- With any bone and joint lesion of slow onset
- With signs suggesting meningitis or disease in the central nervous system.

A case of probable TB is a suspected case with any of the following :

- Positive tuberculin test
- Suggestive radiological appearances on films of chest, bones, or joints.
- Suggestive histological findings in biopsy materials.
- Favorable response to specific anti-tuberculosis therapy

A case of confirmed TB is a probable case in whom:

- TB bacilli may be detected by microscopy or culture of secretions or tissues.
- Typical findings are evident on histo-pathology.

Often in children treatment is started in a probable case and sometimes even in a suspected case– and continued based on clinical response.

Tuberculin Test

The tuberculin skin test is most commonly used to identify TB in children, irrespective of the manifestation TB. The size of the reaction that can be taken a positive depends on the population studied and the tuberculin used. In most areas with high prevalence of tuberculosis it is 10mm. The tuberculin test is confounded by the prevalence of non specific sensitivity in an area and by previous BCG vaccination. Thus, with increased coverage due to BCG, the tuberculin test is losing its value both as diagnostic test.

SPECIAL ISSUES IN TB CONTROL : MULTI DRUG RESISTANT TB (MDR-TB)

Drug resistant tuberculosis is tuberculosis in which resistance to one or more anti-tuberculosis drugs has been demonstrated in competent laboratory. Resistance to an antibiotic is defined as growth of a bacterial culture even in the presence of a particular concentration of the drug in the culture media. MDR-TB is the laboratory documented resistance of TB bacilli to isoniazid and refampicin, the most active anti –tuberculosis drugs. This is because if a patient has an isolate that is susceptible to either isoniazid or rifampicin (particularly rifampicin), treatment can still be 95% successful if given for one year or less. However if the resistance to both isoniazaid and rifampicin is present, treatment must be continued for at least 18 months to be effective.

Diagnosis of MDR-TB

Drug resistance can only be diagnosed in an accredited laboratory experienced in conducting drug susceptibility testing for M. tuberculosis. Doctors sometimes erroneously label patients as having "clinical drug resistance" when in fact they have not been provided treatment in a programme which ensure that they actually take a curative course of medicine as prescribed. Laboratory errors are also common. Consequently, patients may not receive effective drugs and some may be unnecessarily treated with expensive and toxic drugs.

Causes of Drug resistance

The emergence of drug resistant strains of the TB bacillus is attributable to:

- The widespread prescription of insufficient TB regimens, such as a regimen of only 2-3 drugs in the intensive phase.
- Failure to ensure a regular and uninterrupted supply of good quality drugs and treatment supervision, at least during the intensive phase of treatment.
- Resistance due to faulty prescription and /or faulty consumption may lead to the development of resistance to all first line anti-tubercular drugs.

Even relatively low proportions of drug resistance are of concern, primarily for four reasons.

1. In areas where immuno-compromise and crowding are common (such as hospital AIDS wards), such strains can spread rapidly.
2. The small proportion of patients who are not cured represent failures of the programme. More than the epidemiological impact of such patients, which is relatively limited, is the loss of credibility the programme suffers when patients who have adhered to treatment faithfully, remain ill.
3. Such patients often receive partial course of rescue drugs in the private sector, resulting in increasing the number of drugs that strain of tuberculosis would be resistant to. Some of which will become, for all practical purposes, incurable.
4. It is the ethical responsibility of the government to provide curative care to all patients with infectious disease both for this patent's own protection a not to prevent spread to others.

The top priority is to prevent the emergence of MDR-TB by ensuring a low default rate of cases treated with first line anti-TB drugs . A poorly functioning program can create MDR-TB. In a context where MDR-TB has merged, it should be treated, in addition to improvement of basic treatment. And for this accurate and reliable drug susceptibility testing methods needs to be available along with measures to observe and support patients to ensure complete duration of treatment with use of maximally effective regimens. Patients with MDR-TB have at a fair chance of cure with second line drugs. This would be so if second line drugs are be kept in reserve for diagnosed resistance and treatment observation is ensured .

Extent of MDR-TB in India

MDR-TB is a concern for tuberculosis control in many countries. Currently the prevalence of MDR-TB among new smear-positive cases is relatively low in the country. Studies carried out in six districts during 1999-2002 as per the WHO guidelines on drug resistance surveillance, showed that 0.5% to 3% of new cases were found to harbor multi-drug resistance bacilli. Studies amongst previously treated patients showed MDR levels of 12%.

Drug resistance surveillance

In order to monitor the level of drug resistance in the country, drug resistance surveillance is being conducted among both new and previously treated cases in selected states in a phased manner using the national and state level RNTCP laboratory network. The laboratory network consists of 3 designated National Reference Laboratories (NRL), namely, The Tuberculosis Research Centre, Chennai, The National Tuberculosis Institute, Bangalore, and LRS institute of Tuberculosis and Respiratory diseases, New Delhi. State TB Demonstration Centre (STDC) of the respective states are designated as Intermediate Reference Laboratories (IRLs).

RNTCP microscopy centers in each district are assigned the role of identification and enrolment of smear-positive cases for the survey. IRLs perform culture and drug susceptibility tests and NRLs provide technical support. TRC, which is also a WHO Supra-national Reference Laboratory (SRL), will also be responsible for quality assurance.

Prevention of MDR-TB

The management of MDR-TB being very complex and its occurrence must be prevented by effective implementation of the DOTS strategy- essentially ensuring that there is adequate supervision to complete the course.

Proper categorisation of patients by medical officer for treatment, by eliciting history of previous treatment, is very important. The diagnosed patients should be explained / educated, why it is essential to know about previous anti-TB treatment and to take drugs under direct observation.

SPECIAL ISSUES IN TB CONTROL : TB AND HIV

TB and HIV are inextricably linked: HIV progressively weakens the immune system making people vulnerable to a host of "opportunistic infections" such as tuberculosis. Moreover the large majority of people with HIV/AIDS live in countries where the prevalence of tuberculosis is high. Not surprisingly, TB is the earliest manifestation of AIDS in over half of all cases in developing countries and accounts for the about a third of AIDS deaths, and therefore is the leading killer of people living with HIV in developing world,

Last but not the least, TB and HIV are both driven by poverty, homelessness, poor nutritional status and crowded living conditions. So to confront the twin challenges of TB and HIV is to confront issues fundamental to both health and human rights.

The main strategies to successfully combat this deadly association are:

1. Preventing HIV through behaviour change in terms of responsible sexual behaviour and use of intravenous drugs.
2. Preventing progression to clinical tuberculosis through tuberculosis preventive measures and anti retroviral therapy for HIV patients.
3. Effective case management of patients with TB to prevent further TB transmission and ensuring effective therapy.

In order to mount a more meaningful response to the TB/HIV co-epidemic many countries in the region have initiated efforts by establishing collaboration between TB and AIDS programmes. However the first and foremost priority should be to strengthen the National AIDS and TB programmes. It would be tragic if TB, particularly MDR-TB, were to spin out of control, when we can use proven strategies and inexpensive efficacious drugs to contain the TB/HIV epidemic.

I. Review Questions:

1. What are the factors that facilitate progression from infection to disease.
2. What are the advantages of sputum microscopy that make it the main diagnostic tool? When would Xrays be essential for diagnosis.
3. What are the factors that could lead to poor case detection rates? Which indicators help assess the contribution of each of these factors?
4. What are the systems issues that affect tuberculosis control programme outcomes.
5. Which vulnerable sections are in danger of getting excluded in mainstream programmes.

II. Application Questions

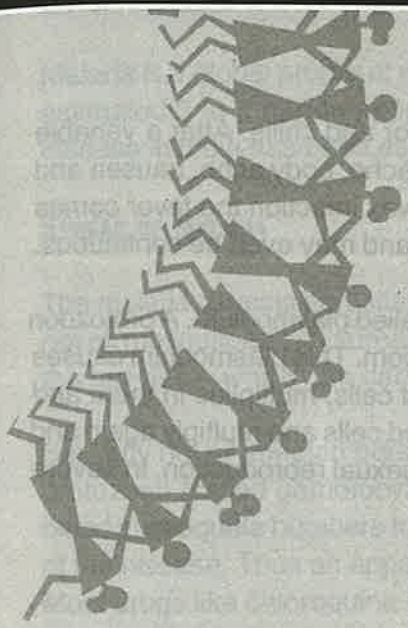
1. What would be the criteria of a good DOTS provider? Where the patient is literate and very cooperative can we not do away with this?
2. In many district facilities TB laboratory technicians do not do other work - including other laboratory work like for example blood smear examination for malaria etc. Some officers think this should be encouraged so that we can be assured of outcomes. Others disagree? What would be your position?

III. Project Work

1. Find out the situation as regards the process and outcome indicators in your district/ block?
2. Based on the above information and a sense of the district priorities what would be the key components in the district plan?

Lesson TWO

Basics of Malaria Control



In this lesson we shall discuss:

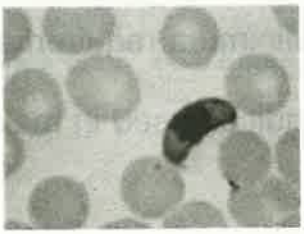
- Causation of malaria and the way it spreads.
- Vector dynamics and its importance for malaria control.
- Basic strategies for prevention of malaria.
- Minimum requirements for cure of malaria.
- Indices used in malaria control programmes.

(This chapter is meant for relative newcomers to this field. Those already having experience of working with malaria control programmes may skip this. But check that you can answer the questions at the end before you do so.)

MALARIA THE DISEASE

Malaria is a disease characterised by sudden onset of high fever with rigor and chills. After a variable febrile period there is sweating and the fever disappears or reduces. Headache, body ache, nausea and vomiting may be associated with these episodes of fever. Typically in P.vivax infection the fever comes on alternate days, whereas in P.falciparum infection the fever spikes daily and may even be continuous.

Malaria is a disease caused by a tiny parasite. This parasite is a protozoon called plasmodium. A protozoon is a one-celled organism – the simplest type of organism of the animal kingdom. This plasmodium causes malaria disease by infecting the blood – where it enters into the red blood cells, multiplies in them and ruptures them. Then these multiplied parasites go into many more red blood cells and multiply again and rupture them again. This multiplication that occurs in the human blood is a sexual reproduction. In severe forms of malaria the organism affects many other organs too.



Malarial Parasite seen in a microscopic examination of blood

In India there are mainly two types of plasmodia responsible for most human malaria. They are Plasmodium vivax (P. vivax) and Plasmodium falciparum (P. falciparum). There are two other plasmodia (Plasmodium malariae and Plasmodium ovale) that cause malaria but these are very rare and therefore of little public health importance in India. Of these two prevalent malaria species, P.falciparum is the dangerous variety which is responsible for almost all the deaths due to malaria. P. vivax causes debilitating illness, but by itself the disease is rarely fatal, unless accompanied by some other complication like severe malnutrition. In many states P.vivax accounts for 70 % or more of infections. But in high prevalence areas like the North-east and tribal parts of Orissa and Chhattisgarh, the pattern changes and P.falciparum infections could account for as much as 90 % of all infections due to malaria.

Falciparum malaria involves the brain, and the patient may develop in addition to life-threatening complications including kidney or liver failure. If untreated, case fatality rate among children and non Indian adults exceeds 10 %. Even if treated the disease always has a case fatality rate of 3 to 5 % -

implying that out of 100 cases of P.falciparum infection, 3 to 5 would be dying of these complications. *(Case fatality rate is the proportion of people who die due to this disease in a given year in comparison to the total number of persons infected in that year.)* Thus if there are 10,000 cases of malaria detected in a district in a year and 60% known to be falciparum infections, then expected deaths would be 180 to 300.

Malaria is a global problem; worldwide 300-500 million people develop malaria every year. There are an estimated 3 to 5 million people with malaria every year in India. Malaria's share in the total burden of disease in India has been estimated as 1.6 %.

Spread of Malaria

The malaria causing parasite spreads from person to person by the bite of an infected mosquito. However, not all mosquitoes can spread this disease. It is only the anopheles mosquito – and that too the female of the species – which can carry the parasite and infect.

Similarly not all infected persons are infectious. The blood of the person has to have sexual forms of the protozoan (called gametocytes) to be infective. These gametocytes take over a week to appear in the blood in adequate numbers to be infective. Persons with gametocytes may or may not be having symptoms of the disease. Thus an apparently normal person may harbour the disease and contribute to its spread. Most drugs like chloroquine kill the asexual forms that cause the fever but leave intact the sexual forms that are infective.

The female anopheles mosquito needs a blood meal before she can lay her eggs. When she takes the blood meal from an infected person- the parasite enters the mosquito's stomach. The parasite has to be in its sexual stage to be infective. Within the stomach the parasite reproduces and develops. It penetrates the mosquito's stomach wall and subsequently travels to its salivary glands. This usually takes 6 to 12 days. When the mosquito takes its next blood meal for her next batch of eggs, the parasites which are now infective enter into the blood stream of the person who is bitten. Thus part of the life cycle of the parasite can be completed only in the stomach of the female anopheles mosquito.

Therefore all efforts at control of this disease need to understand the mosquito and its life cycle, just as much or even more than they need to understand how the plasmodium causes disease.

Success and Failure of Malaria-related Public Health Programmes in India

Malaria has been a problem in India for centuries. Details of this disease can be found in the ancient Indian Medical Literature like the "Charaka Samhita". In the 1930s, there was no aspect of life in the country that was not affected by malaria. The annual incidence of malaria was estimated at around 75 million cases in 1953 with about 8 lakhs deaths annually. To combat this menace, the Government of India launched the National Malaria Control Programme (NMCP) in April 1953. The programme was highly successful and within 5 years the incidence dropped to 2 million cases Encouraged by this, the programme was changed to a more ambitious National Malaria Eradication Programme (NMEP) in 1958. By 1961 the incidence dropped to a mere 50,000 cases a year. But since then the programme suffered repeated setbacks due to technical, operational and administrative reasons, cases started rising again. In the late 1960s malaria cases in urban areas started to multiply and upsurge of malaria in rural areas was also widespread. As a result in 1976, 6.45 million cases were recorded by the malaria control programme, the highest since resurgence began. In 1995, the Malaria Action Programme (MAP) was taken up in high risk areas and this programme was renamed as National Anti Malaria Programme (NAMP) in 1999 covering the concept of effective control. In 1998 the Enhanced Malaria Control Programme (EMCP) was launched. In 2004 this was integrated with other vector borne diseases control and the programme was renamed the National Vector Borne Disease Control Programme (NVBDCP). Malaria incidence now remains at about 2 million cases per year. Further the percentage of falciparum malaria has increased and drug resistance of falciparum and insecticide resistance threaten to lead to further setbacks. Malaria therefore remains one of the most important public health problems of India, despite 60 years of continuous efforts at its control.

THE CONTROL OF MALARIA[1]

The intensity of malaria transmission in an area is the rate at which people are inoculated with malaria parasites by mosquitoes. It is expressed as the annual Entomological Innoculation Rate (EIR) i.e. the average number of infectious bites by malaria-infested mosquitoes delivered to an individual human resident in that area in the period of one year. EIRs range from 500 to 1000 in parts of Africa to about 10 to 100 in places where there are seasonal peaks. At about 0.01 malaria transmission is barely sustained.

Estimating EIR requires suitable professional help. However the concept is essential to understand for all those in control of malaria.

The transmission of malaria can go down if:

a) there are less infected people available, who have sexual forms of protozoa in their blood, for mosquitoes to get malaria infested.
b) there are not enough mosquitoes that are malaria-infested because the total population of mosquitoes have decreased.
c) there are not enough infectious bites delivered because people have taken measures to prevent themselves from being bitten by mosquitoes.

1. World Health Organisation (2006): Guidelines for the Treatment of Malaria, WHO, Geneva.

REDUCING THE POOL OF INFECTED/INFECTIVE PEOPLE

Early Diagnosis and Prompt/Complete Treatment

a) Lowering the infectivity of infected persons to the mosquito vector will contribute to lowering malaria transmission, and eventually to reduce the incidence and prevalence of disease in that locality. The central strategies of achieving this are early diagnosis and prompt (complete) treatment of malaria cases.

b) Early diagnosis is important because in the early stages the infected persons have only asexual forms of plasmodia in his blood – which are not infective to mosquitoes. If the blood is cleared of the parasites in time then the transmission from that person is reduced. It takes about 4 to 5 days after the person has developed fever to develop the sexual forms of P. vivax in the blood. For P. falciparum infections it takes 10 to 12 days before the blood becomes infective. The aim of this strategy is to suspect and treat cases of malaria as early as possible. Chloroquine is the most commonly used drug for this role.

c) In low transmission areas, i.e. where EIR is low, there is a much greater effect of early diagnosis and prompt treatment. Since most infective people are also symptomatic for the disease, i.e. they have fever, treating all cases of fever within the first week would be able to cut transmission dramatically. In high transmission areas however, many of the persons who are carrying the sexual forms of plasmodia in their blood are not having fever or any other symptoms of disease and therefore if this is the only measure used – it would not be as effective.

d) In addition to chloroquine, primaquine is essential in high transmission areas. This is because chloroquine has no action on the sexual infective forms of the protozoa, whereas primaquine can effectively destroy them. Thus in areas of high falciparum prevalence, it is required to treat every case of suspected malaria with chloroquine and primaquine. This would not be essential if it is the first or second day of fever, but as in practice most people take longer time to report for fever and as many are recurrent cases with perhaps sexual forms already in the blood it is essential to add primaquine also.

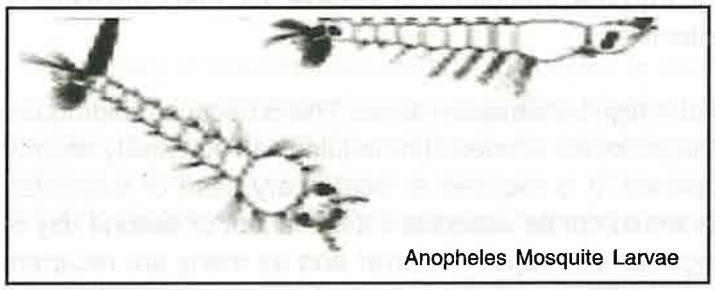
e) One key question is when to declare a case as a suspected case of malaria and start these drugs. By definition only a patient whose blood smear examination shows the parasite is a confirmed case of malaria. Thus the aim is to get a blood smear done promptly and reported within the same day. Those who show up positive for the malarial parasite alone would be treated with chloroquine and then primaquine as well. However in most areas of the country getting a prompt report – within 24 hours – is not happening. Therefore in areas where the disease prevalence is high the teaching is that every case must be assumed to be malaria and given "presumptive treatment" for malaria. Again the question is whether to give only chloroquine or to give chloroquine and primaquine for every case of suspected malaria. The practice now is to give chloroquine – full course without waiting for the blood report – and if the report is positive, to follow up and give primaquine if it is plasmodium falciparum.

This way, chloroquine acts to prevent death and suffering and if given early enough it also prevents spread. And primaquine acts to prevent spread by destroying the sexual forms that would be in the blood, even after the fever is gone and the patient looks normal.

f) Rapid Diagnostic Tests – a strip which shows positive immediately can be used as a substitute to the blood smear examination. The NVBDCP program also introduced Rapid Diagnostic Kits (RDKs) in remote and inaccessible areas reporting more than 30% P.falciparum cases among all cases diagnosed by the government health services. Though a valuable technological development, this is costly (over Rs. 30 per test) and hence the need to limit it to remote areas where there is no laboratory technician available. Unfortunately often this is used only in those areas where such services are available. High ambient temperatures (over 30 degrees Celsius) affect the efficacy of RDKs. Hence, there is need for proper cooling at lower levels to maintain the quality of RDKs, especially in summer and rainy seasons.

REDUCING THE ANOPHELES MOSQUITO POPULATION

The key to reduction of the mosquito population is a good understanding of vector dynamics. It is a fascinating world – and quite interesting to know. Those who ignore such an understanding as academic and just proceed with some mechanical steps – come to grief and indeed this is what has happened in the process of malaria control in the nation over the last four decades.



Anopheles Mosquite Larvae

Vector dynamics

There are more than 4000 species of mosquitoes in the world of which more than 300 species of mosquitoes belong to Anopheline group. In India there are about 53 species of anopheline mosquitoes and of these only ten are vectors for malaria. And of these 10 only six are important primary vectors. (The other four can contribute to spread but by themselves cannot initiate or sustain transmission and that is why are of very limited public health importance except to some extent Anopheles annularis.)

These six important primary vectors are:

a. Anopheles culicifacies: the most common vector.
b. Anopheles fluviatilis: important vector in hilly and forested areas.
c. Anopheles stephensi: almost all urban malaria is due to this.
d. Anopheles sundaicus: typical of seashores: relatively low importance.
e. Anopheles minimus: of some importance in the North-east area.
f. Anopheles dirus: vector in forested and forest fringe area.

The important secondary vector which is the second most frequent in collections in central India is Anopheles annularis.

In most areas it is enough to know about the first three of the vectors. We need to know considerable amount about each of their behaviours if we are to plan effectively. Knowledge of vector behaviour and its breeding patterns and its different responses to human activity, including efforts to control it, is referred to as vector dynamics.

Knowledge of vector dynamics is needed to:

a) Choose the right mix of methods for effective control (effective)
b) Convince people of the vector control plans (acceptable)
c) Ensure that the methods are also effective in the long term and with no long term adverse environmental consequence (sustainable)
d) Help in local planning for vector control (participatory)

Case Studies

Many tribals are not convinced of bed–nets because they suffer their most painful mosquito bites when they go into the forest to collect forest produce. And bed-nets are of no use then. However, they need to know that most of these day time mosquitoes are not vectors for malaria. The anopheles vector very specifically bites only in the night between a fixed time period of three to five hours. Usually since they are fast asleep they neither hear the buzzing nor feel the pain of the vector mosquito when it bites.

When spraying DDT the families may request their cattle sheds to be sprayed – since there are maximal number of mosquitoes in the cattle sheds. However, they need to know that the most common vector An. culicifacies is predominantly a feeder of cattle and only when its population rises very high, does its biting of humans become significant. The cattle thus act as protection drawing away the mosquitoes from humans. If the cattle shed is sprayed and not the house, the mosquitoes will get repelled from there and bites of humans would increase.

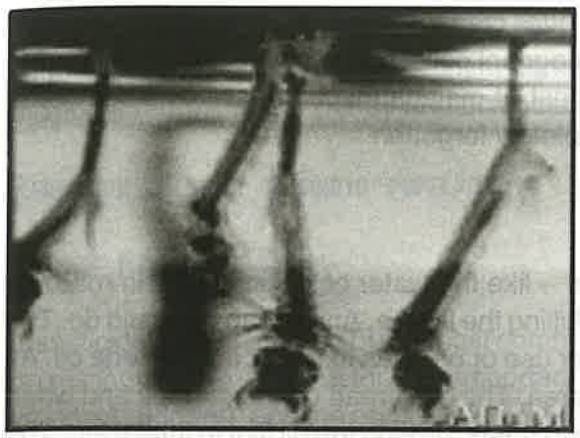
The above examples illustrate some common misunderstandings. But these are not the mistakes of the village folk alone. Often even senior administrators can be heard making such remarks and thereby ignoring major control measures and just focussing on driving home one or two simplistic steps. **Vector dynamics must be communicated to all health decision makers.**

Table 2.1 Details of Vector Behaviour

	An. culicifacies	An. fluviatilis	An. stephensi
Site of breeding	Water in paddy fields, wells, irrigation wells, step wells, ponds. Also found in cattle water storages and foot prints left behind cattle	Rock pools, hilly streams, ponds	Clean water in water tanks, water logged in trenches, large clean water puddles and sumps, upturned cans, etc.
Life cycle length- egg to adult (i.e. aquatic stage)	7 to 10 days	7 to 10 days	7 to 10 days
Zoophilic/anthropophilic	Zoophilic predominantly on cattle- occasionally human	Anthropophilic– predominantly human blood.	Anthropophilic
Seasonality	Peaks during monsoon months	Peaks in late monsoons and early winter months	Rainy months
Peak Time of biting	Early night (8 pm. to 10 pm.) or around midnight (11.00 pm. to 3.00 am.)	Late night (11.00 pm. to 3.00 am.)	Varies, but in night.
Preferred place of biting (exophagic/endophagic)	Inside the house	Inside/outside the house	Inside the house
Resting behaviour (exophilic/endophilic)	Endophilic Before and After biting rests on walls above one meter	(endophagic/exophagic) Endophilic/Exophilic: After biting rests on walls above	Before and after biting rests inside the house in dark cool places.
Biological efficiency as vector	Low efficiency – high vector density – of over 4 to 5 bites per night per person is required to be infective	one meter height High efficiency – low density of mosquito – even at 0.5 bites per night per person is adequate	

Vector dynamics and its relationship to vector control strategies

The effect of different control measures on the transmission of vector borne disease is based on the fact that at every feeding cycle the vector mosquito feeds and rests and then it lays eggs. These eggs give forth larvae and after 7 days of growth the mosquito emerges as an adult. In 5 days it is mature enough to take its blood meal and lay its first batch of eggs. This entire stage from egg to first egg laying takes 15 days. Then the mosquito goes through another 5 or 6 cycles of egg laying about 2 to 3 days apart and then dies i.e. a total life cycle of about 40 days, when it would have 5 to 7 blood meals and lays over 1000 eggs.



Larva stage of Vector Mosquito

Anti-larval Measures

The aim is to reduce places and opportunities for breeding. This is either done by ensuring there are no collections of water where the eggs can be laid and where the larvae multiplies or by using different methods to destroy the larvae in the water.

Invariably the water in which the anopheles mosquito breeds is clean water – in the sense that if nitrogenous matter found in wastes rise above a particular level it stops breeding. This is in sharp contrast to the culex mosquitoes (vectors of filariasis) which prefer dirty water – the water in the septic tank with such a high nitrogenous load being a typical example of a preferred breeding site.

For source reduction it is essential to understand breeding characteristics. The time required for development of aquatic stages is an important characteristic. It is different for each species but it is also affected by temperature. Knowledge of this time is needed for setting the frequency of larvicides application or the pattern of intermittent irrigation.

Other important factors are the relative contribution of different types of breeding places and their spatial distribution, in terms of distance from human settlement, for example anopheles mosquitoes normally do not travel for more than 3 to 5 kilometres from a human habitation. So one need not worry about the ponds in the deep forests where there are no human habitations- it is enough to focus the measures in the 3 km radius of the village. Accessibility and amenability to various methods of larval control of different water collections also need to be known.

Source Reduction

Filling up ditches, ensuring there are no upturned cans or bins collecting water, draining out the water in water coolers, ensuring that the over head tanks in houses are mosquito proof are some other well known measures – but all of these need enormous public cooperation and involvement of community organisations.

Drainage and better engineering in development works

Breeding sites can be reduced by ensuring stagnant pools of rain water do not collect. For example, wherever there is any development work done- buildings, dams, canals, or even mud is cut out for civil works (burrow pits) it is mandatory for the engineers to ensure that there is adequate drainage provided

so that water does not pool up. The post of malaria inspector was created even before independence and his main task was to see that engineering rules to prevent stagnant collections of water were adhered to wherever there was development work undertaken. The post of malaria inspector still exists in some states – but this is the one task that they have almost completely forgotten.

Oil (and beads) on troubled waters

Putting oil on small temporary stagnant collections of water – like the water collections on the roads or road side puddles, or hoof marks is also an effective way of killing the larvae. Any cheap oil would do. The commonest in use is the waste engine oil which has no other use or one has to invest in kerosene oil. As little as 10 ml (2 spoons) may suffice for about 1 sq. meter area. The oil spread on the surface and when the larvae come up to the surface to breathe they are unable to break through the oil film to intake air. This however has to be repeated once a week to be effective.

Larvicidal fish

Another effective method in use is the use of fish that eat up the larvae. There are many such larvivorous fish – the most common in use being the gambusia fish (Gambusia affinis), followed by guppies (Poecilia reticulate). Both of these are imported varieties. In addition India has over 9 common indigenous larvivorous fish that could be used if there is local knowledge about them.

All such fish used for mosquito control should be small, surface feeding and carnivorous, eating larvae preferentially but able to survive without it, should itself not be too attractive diet for other carnivorous fish. Moreover they should be easy to rear, able to withstand changes in temperature, transport and handling.

The male gambusia fish is about 3.5 cm long and the female is about 5 to 6 cm. long, which matures in 3 to 4 months and has a life span of four to five years. A single female fish may produce up to 1000 offspring in its life span. It eats over 100 to 200 larvae per day and it frequents the shore line except where it is very grassy or vegetated. Guppy is very similar but somewhat less efficient in clearing larvae.

The guidelines issued by the Ministry give clear instructions on how to build and maintain hatcheries – and if the fish are not surviving it is better to see whether the guidelines on hatcheries, handling and transportation were followed before declaring it as impractical. (DO No. 14-5/2004-05/NVBDCP / dated March 3, 2005)

Fish are ideally released at a density of 5 to 10 fish per meter of the perimeter of the water body. The dense vegetation on the edge should be cleared and the temperature of the water should be similar to that in which the fish have been maintained.

Fish should be preferably introduced in all unused wells before the high mosquito breeding season. They should be released into small stagnant ponds, borrow pits, quarry pits, but they are less efficient in slow moving streams, larger ponds and rice fields.

Reduction of Adult Mosquito Population

Indoor Residual Spray

Insecticide sprays are one of the most commonly used measure. The use of insecticides largely depends on resting behaviour of vector. The important characteristics are the degree of endophily/exophily (resting indoors/outdoors), and the precise identification of resting places both indoors and outdoors. With respect to indoor resting it is useful to know the distribution between human and animal shelters, and also the distribution of resting mosquitoes in the shelter, for example in relation to height on the wall.

The general guideline is to spray all houses in areas with API over 2, twice in the year – about three months apart. Sprays used are DDT 50% in a dose of 1 gram/500 sq.m., Malathion 25% in a dose of 2 gram/250 sq.m. (used very rarely due to costs), and Deltametrin (a synthetic pyretheroid) 2.5% in a dose of 20 mg./500 sq.m., sprayed in two rounds/year.

The major problems with insecticide spraying are:

a) Need to deliver an adequate dosage, which requires training and monitoring
b) Danger of long term environmental hazards due to these very toxic chemicals
c) Development of resistance of the vector to the insecticide in use
d) Increasing costs of such chemicals
e) Personal protection of the spray squad

Given these problems there is a need to limit the use of these sprays to where the problem is maximal and to ensure that where it is used adequate doses are applied with the proper technique.

Thus the general guidelines are modified by special selection criteria for sprayable population. The Ministry has therefore in an order issued clear guidelines for the prioritisation of spraying:[2]

a) To spray all areas with suitable insecticides on a priority basis taking Sub-centre as a unit with API more than 5 where ABER is more than 10%.
b) To spray on priority basis with suitable insecticides all areas reporting more than 5% SPR (based on passive collection of blood slides) if the ABER is below 10%.
c) Spray priority if PF infected population is more than 50%.

2. DO No. 5-5/2005-NVBDCP (I&E)/Spray dated March 9, 2006.

d) Spray priority even if less than above, in case of drug resistance foci, project areas with population migration and aggregation of other vulnerable factors including peri-cantonment areas.
e) Spray provision for epidemic situations.
f) Rotation of insecticides to prolong their effectiveness.
g) Other parameters like entomological and ecological parameters may also be considered while prioritisation of areas for spraying.

There are also clear guidelines issued for the safe handling, storage, application and disposal of these insecticides and their containers.

Use of insecticide treated bed-nets

Conventional bed nets are the most well known way of personal protection. But with the introduction of insecticide treated bed nets they become in addition a method of anti adult mosquito operations. Though the area of the bed net is small there is a high probability of prolonged mosquito contact specifically with vector mosquitoes. Mosquitoes are attracted to the net by the odour and carbon-dioxide emitted by the persons sleeping within them, essentially turning the bed net into a baited trap for mosquitoes. In addition to kill mosquitoes with which it comes to contact has an irritatant action and prevent them from finding openings in the nets, enhancing their protective role.

Pyrethroid insecticide treated nets also make mosquitoes that survive the contacts with insecticide, so disturbed that they are unlikely to attack again. They offer protection to people who sleep inside the net, also to other members who sleep outside but nearer to the treated net.

Bed nets are of great value in protecting the vulnerable groups like pregnant women or children. They also kill other biting insects-bedbugs, head lice, chicken tics, and houseflies.

Achieving universal coverage with bed nets

Ideally the entire population in an endemic area should be covered by the use of bed nets. In high transmission areas they act as the major protection because asymptomatic carriers are also shielded from mosquitoes. An API of 5 with an ABER of 10% is a working criterion for attempting universal bed net coverage. At an API of about 20, the system would be hard pressed to justify not having achieved such coverage already.

Since supply of free treated bed nets for everyone is not possible – the best option is to make them available at reasonable rates in the major markets and to arrange to treat with insecticides bed nets that people are already using or are promoted into using. The major investments therefore go into communication for promoting the use of bed nets and into organising supply side initiatives – perhaps linked to self help groups so that families can get the bed nets on easy instalments with credit arrangements.

Also bed nets have a life span – a polyester bed net can last three to five years. And this would need replacement. Doing this again and again would be a problem- unless it is linked to market mechanisms.

Criteria for selection for limited distribution programmes

Since universal coverage takes effort and resources, the district also has to plan to make optimum use of available resources. The Government of India has issued guidelines for this, as follows:[3]

General criteria:

a) Difficult terrain and scattered houses
b) Villages at foot hills and forest/forest fringe
c) Where traditional clothing maximises vector biting
d) Non immune population moving into endemic areas
e) Population workforce engaged in development works – construction, industrial activities

(The first three are largely tribal population and the last two relate to development works.)

Epidemiological criteria:

a) High morbidity and mortality trend
b) High falciparum dominance
c) Drug resistance

Entomological:

a) Anthropophilic vectors
b) Endophagic vectors
c) Insecticide resistant areas

Operational:

a) High risk sectors/sections – too remote for spraying or refusal of spraying – coverage less than 50% in last three years
b) Tribal villages where house design or frequent mud plastering makes spraying ineffective.
c) Shifting cultivation areas where they stay on fields and get exposed to exophagic vectors

Thus to implement one would need:

1. Well planned survey, assessment to prioritise areas and to assess requirements
2. Plan for at least two nets per family
3. Plan for complete coverage of all pregnant women and young children

3. DO no.14-1/2004-05/NVBDCP/EMCP/Bednet Guidelines dated April 7, 2005.

4. Effective behaviour change communication to ensure that there is utilisation and demand for this and to give adequate popular understanding of vector dynamics needed to convince people of much counter-intuitive information that they need to accept its role. Bed net safety measures also need to be incorporated.
5. Plan for re-treatment of the bed nets every six months. This in itself is a mammoth task. It requires:
   i. Training persons in the community and amongst staff to be able to do this safely and effectively.
   ii. Providing them with the chemicals (synthetic pyrethroid), equipment and other supplies needed (measuring jar, container to dip nets, rubber gloves, face mask, plastic sheets and ropes for drying).
   iii. Organisation of bed net re-treatment camps. (about 100 bed nets per camp per day – if there are two persons deployed).
6. Arrangement for stocking, storage and transportation
7. Proper disposal of left over and waste insecticides
8. Widespread awareness of safety measures in bed net usage
9. Entomological surveillance to observe changes in vector behaviour consequent to bed net introduction

In conclusion on vector control (reducing the mosquito population)

Vector control is difficult – but eventually its advantages make it well worth it. These are:

1. It is the most reliable way of interrupting transmission- especially when combined with parasite control in high transmission areas.

2. Vector control will have long term benefits – more sustainable form of control if environment-friendly methods are adopted. Where control is dependent on drugs, resistance is sure to develop.

3. Gives relief to people suffering and increases the community acceptance.

4. Cost effective if carried out in right time and at right place as well as with adequate community participation.

5. Also controls other vector borne diseases.

The above general principles of vector control are applicable to all mosquito vectors of other diseases also – after adaptation for the specific vector dynamics of the vector species concerned.

Personal protection

Another strategy of reducing malaria transmission is personal protection – reducing the chances of delivery of a bite by an infected mosquito. Bed net is of course the most efficient way of doing so.

Other useful approaches are the use of repellent vapours (commercial and indigenous), which offer some advantages. Most tribal areas use smoke of some plant products to drive away mosquitoes. Unfortunately they are not effective for long and later in the night at peak feeding times they are by then often consumed and ineffective. However, as a supplementary measure they are useful.

Since reduction of infectious bites delivered is a goal in itself even the wearing of long sleeves and keeping the body covered or the use of repellent oils and creams could be very effective. The use of mosquito screens with or without insecticide treatment would also be one way of reducing risk of exposure to biting.

Malaria surveillance

Malaria surveillance is another key element for the control of malaria. Malaria surveillance is an essential prerequisite to the rational design and evaluation of a malaria control programme. The sole purpose of surveillance is to detect changes in trends or distribution of malaria in order to initiate, investigate or control measures.

Malaria surveillance is based on blood smear examinations. There are two forms in which blood smears are collected – active case detection and passive case detection. In a given year at least 10% of the population should have had a blood smear examination done- this is known as the ABER (Annual Blood Examination Rate).Thus we say that the ABER should be at least 10% of which at least 40% should be by active case detection. This is the minimum criteria for adequacy of surveillance.

Active Case Detection

When the health worker goes out in the community actively identifying malaria cases, this is called active case detection. Active case detection with blood slide examination of febrile patients is essential to have parasite confirmation, especially in areas having predominant infection with P.falciparum. This actively should be supported by establishment of Fever Treatment Depots (FTD), so that those identified with fever are promptly treated and a treatment facility is established even when a health worker is not visiting.

Passive Case Detection

Malaria cases diagnosed when patients report to health centre for sickness is called passive case detection. All fever cases who report in the hospital are screened for malaria and given presumptive treatment. All allopathic, homeo, ayurvedic, siddha medicine dispensaries in the health sector should be identified and involved in passive case detection.

Examination of Blood Smears

All blood smears collected should be examined meticulously. One aspect of examination is to reduce the time lag between collection and examination of blood smear and between examination and reporting back- so that prompt measure can be taken in the field. The second aspect of blood smear examination is to generate section wise data on the key indices of malaria – API, SPR and SFR. A third aspect of effective blood smear examination is quality control – to have a percentage of all slides reported at the peripheral centre rechecked at the next higher level- so that the quality of reporting can be maintained. When so many decisions are centred around the microscopists, it is sensible to invest in improving and maintaining its quality. In remote areas where falciparum is reported at more than 30%, the use of RDKs (Rapid Diagnostic Kits) is an acceptable alternative.

Domiciliary Fortnightly Visits

Active case detection is carried out by health workers under the primary health care system. By fortnightly visits a large number of secondary cases can be avoided in the community where malaria transmission is seasonal. Moreover, the incubation interval in case of P.vivax is approximately 22 days, while for P.falciparum it is 35 days. Thus the surveillance cycle of less than one incubation interval will catch most of the secondary cases before the commencement of next cycle. In areas where community health workers are functional (ASHA/Mitanin etc) this collection of blood smears and prompt treatment of cases should occur with much greater frequency- it should become available as a daily service. They would however be part of active case detection.

Fever Treatment Depot (FTD)

Establishment of Fever Treatment Depots in villages, manned by a volunteer identified for every 1000 population, especially in remote and inaccessible areas is a supplementation to avoid delay in detection of cases, where MPW cannot visit regularly for collection of smear slides and replenishing glass slide and chloroquine tablets. FTDs are given one day training at PHC headquarters for collection of blood slides, administration of presumptive treatment, impregnation of bed nets, and promotion of larvivorous fish. Every ASHA or community health worker should be suitably trained to perform this function.

Drug Distribution Centre (DDC)

DDCs are community based volunteers stocking chloroquine tablets to be administered as presumptive dose to anyone coming with complaints of fever. One DDC holder/volunteer is identified for every thousand population. This is the same as the fever treatment depot except that no blood slides are made. The aim should be to ensure that all of these DDCs are upgraded to at least playing the role identified as FTDs – otherwise the danger is of increasing chloroquine resistance in the community.

Rapid Fever Survey

In case of an outbreak of malaria, a house-to-house survey is done for detecting fever cases in an affected area in a short duration (one or two days) by using additional human resources. All fever cases detected are screened by taking blood slides and given presumptive treatment. Blood slides should be examined and positive cases are to be given primaquine. One can include primaquine in the presumptive treatment regimen if it is certain that it is a malarial outbreak. This has been called fever radical treatment.

Mass Survey

Mass survey is carried out in a suspected epidemic zone where there is rising mortality. All the population including children irrespective of sex, age or fever status are screened by taking blood smears. The survey should be over in 7-10 days. All blood samples collected should be examined and presumptive treatment including primaquine given for all fever cases and full treatment including primaquine wherever the blood smears are positive irrespective of presence of fever (this has been called mass radical treatment).

The key bottleneck in both the above surveys is that though much time and attention goes into mobilising volunteers for the survey, not enough effort goes into arrangements for managing such a huge microscopy load.

Where ASHAs and FTDs are functional it is relatively easy to get hands for the mass survey – but it takes a lot of organisational effort to get more microscopists in position and get out a quick report on the surveys after examination of all the slides and follow up with treatment on the ground.

Malaria Surveillance Indicators

Malaria surveillance and blood smear examination give the information to compile the following indicators of malaria as a public health issue:

1. Annual Parasite Incidence (API)

$$API = \frac{\text{Total no. of blood smears + ve for malaria parasite in a year}}{\text{Total population}} \times 1000$$

Epidemiological significance

This parameter depends upon the adequacy of case detection mechanism i.e. Annual Blood Examination Rate (ABER). If ABER is adequate, this parameter is the most important criterion to assess the progress of the programme. At present this parameter is used for determining the areas to be brought under spray operations. Although any sub-centre with API more than 2 is eligible for spray operation, however, in high malaria states many sub-centres show API more than 40. In which case, especially since availability of control measures like DDT or bed nets is limited the API becomes the criteria for prioritising interventions (in effect very often sub-centres even with API more than 20 do not receive residual spray due to lack of resources). Hence in some states like Orissa API>5 has been taken as the criterion for spray.

2. Annual Blood Examination Rate (ABER)

$$ABER = \frac{\text{No. of blood smears examined for malaria parasite in a year}}{\text{Total population}} \times 100$$

Epidemiological significance

This parameter reflects the efficiency and adequacy of case detection mechanisms. Monthly blood examination rate (MBER) should not be less than 1% per month during the transmission period. A minimum ABER of 10% per year is the criterion for adequacy of surveillance. If ABER is less than 10% then calculation of other malaria indicators may not be valid. However, when ABER is less than 10% one can use the correction factor as follows:

Correction formula for API when ABER is low:

ABER becomes low due to poor surveillance/absence of staff
When ABER is d" 6 % we can use the correction factor to overcome this lacuna

For example:

Population is 10,000
Blood slides collected was 600
Malaria positives were 18 during the year
Hence,

ABER was 600 /10,000 x 100	= 6 %
API was 18 / 10,000 x 1000	= 1.8
SPR was 18 /600 x 100	= 3 %

Correction factor incorporated as if ABER were 10% (recommended norm under NMEP)

$$\text{Corrected API} = \frac{1.8 \times 10}{6} = 3$$

Thus the corrected API of 3 is 66.7 % more than the actual API of 1.8.
We can notice that the corrected API of 3 is exactly equal to SPR of the area.

3. P. falciparum percentage (Pf %)

$$\frac{\text{Total no. of blood smears found +ve for P. falciparum (Pf \%)}}{\text{Total no. of blood smears +ve for any malarial parasite}} \times 100$$

Epidemiological significance

This parameter gives the relative proportion of P. falciparum infection and identifies trends of Pf incidence in relation to total caseload of malaria parasite in the community. When it crosses 30% or even when it shows a rising trend there is cause for alarm. It is also one of the indicators to decide on taking an area under residual spray or prioritising other interventions.

4. Slide Positivity Rate (SPR)

$$\text{SPR} = \frac{\text{Total no. of blood smears found + ve for malaria parasite}}{\text{Total no. of blood smears examined}} \times 100$$

Epidemiological significance

This parameter is less dependent on ABER. Whenever the case detection mechanism (ABER) is adequate, this is a dependable parameter for determining the progress of containment measures through the year and gives information of parasitic load in the community. Where the ABER is inadequate, the SPR may have to be used as a substitute to API for critical decisions.

5. Slide falciparum Rate (SfR)

$$SfR = \frac{\text{Total No. of blood smears found +ve for P. falciparum}}{\text{Total No. of blood smears examined}} \times 100$$

Epidemiological Significance

This parameter also depends less on the ABER and is similar to the SPR except that it pinpoints areas of P.falciparum preponderance and indicates the necessity for intensification of intervention measures on priority basis to control P.falciparum infection, which is responsible for malaria mortality in India. It is also a good indicator for performance of EDPT in a given region

Surveillance Constraints

Malaria surveillance faces a number of constraints. Some of the important constraints are discussed below.

- *Delay in blood smear examination and reporting*: This has been discussed earlier.
- *Low yield of cases from active surveillance*. Often we find that nearly two-thirds of the reported malaria cases are from passive surveillance. Ideally the cases reported from active surveillance should be more. The active surveillance, which poses a huge load on the state health systems, is actually contributing less than a third of the total reported malaria cases. In many cases, active surveillance carried out only to meet Annual Blood Examination Rate (ABER) quota. This is against the purpose, and as long as reports do not distinguish active from passive surveillance data, it blurs the picture rather than enhancing it.
- *Data limited to public sector*: Currently data from the private sector, including both formal and informal providers, an important source of ambulatory health care, is not being captured by the malaria surveillance system.
- *Limited use of data for local program decisions*: The surveillance system generates voluminous data which are to be used for program decisions such as early recognition of malaria outbreaks, identifying the high risk areas, planning indoor residual spraying (IRS), and selection of areas for drug resistance studies. However, the capacity to use surveillance data for local program decisions in endemic districts appears to be limited, especially where there is no dedicated district malaria officer.

BEHAVIOUR CHANGE COMMUNICATION ON MALARIA

The purpose of BCC on Malaria is to:

- Inculcate individuals or communities on protective and preventive habits.
- Create awareness on the reduction of the contact between man and mosquitoes.
- Dispel commonly held misperceptions and myths about malaria
- Bring in behaviour change in individuals and community.

BCC should cover the following topics:

- Basics of what malaria is and how it is caused.
- Different approaches to malaria control.
- What as an individual and as a family they must do to reduce their risk of infection.
- What must be done collectively to reduce the rate of malaria transmission in the community.
- Basics of vector dynamics (needed to understand the logic of the above control measures and dispel common sense notions which may be wrong).
- Special emphasis on the protection of the child and the pregnant woman from malaria.
- Need to take prompt treatment and the cautions of treatment for malaria.
- Ensure that treatment for malaria conforms to standard treatment guidelines and is not arbitrary and unnecessarily costly.

TREATMENT OF MALARIA

No malaria control programme would have much credibility or effectiveness if treatment for malaria is also not available. Treatment modalities of malaria are now increasing based on standard treatment protocols. Most of these are based on guidelines from the Government of India though with their concurrence they may be modified in states. In districts they would need to be focussed on a choice between alternatives.

Separate treatment protocols for the following are required to be in place. Check to see whether they are in place and known to the health care providers, and whether they are following it.

1. Treatment of a presumptive uncomplicated malaria case during a survey.
2. Treatment of a presumptive uncomplicated malaria case in a health facility.
3. Treatment of a presumptive case during a fever survey or mass survey consequent to an epidemic or threat of an epidemic.
4. Treatment to be given in each of the above situations if blood smear examination confirms it to be malaria.
5. Treatment to be given in each of the above situations if there is drug resistance in more than 10% of cases.
6. Treatment in an uncomplicated case not responding to presumptive/ first line treatment but where blood smear has confirmed the disease.
7. Protocol for assessing drug resistance.
8. Treatment in an uncomplicated proven case where there is drug resistance documented/ suspected.
9. Treatment in complicated cases where drug resistance is not suspected.
10. Treatment in a complicated case where drug resistance is suspected or where it has not responded to first line of treatment.
11. Treatment for malaria in a pregnant woman (in above situations).
12. Treatment for malaria in a child (in above situations).
13. Chemoprophylaxis against malaria for an occasional visitor to a highly malarious area.

Once such protocols are in place, efforts must be made to communicate these to both private and public health care providers and monitor their appropriate use. Also the drugs needed for implementing these protocols should be in place.

DRUG RESISTANCE IN MALARIA

Before 2002, the policy for malaria treatment was to use chloroquine as first-line drug for both P. vivax and P. falciparum, except in places where it had been ascertained that there was chloroquine resistance related to P. falciparum cases (no chloroquine resistance to P. vivax has been detected), where Sulpha-pyrimethamine (SP) was used as first-line drug instead. SP was also used as second-line drug for patients who had been administered chloroquine but had not responded to the treatment.

From 2002, India has been following the WHO protocol for monitoring therapeutic efficacy of anti-malarial drugs. As a consequence, treatment policy has also been changed upon the recommendation of the Technical Advisory Committee. Currently, for primary health centres (i.e. blocks/sectors) reporting 25% or more treatment failure when using chloroquine as first-line treatment, artemisin-based combination therapy (Artesunate + Sulpha Pyrimethamine) is to be used as first-line treatment. The revised policy is currently being followed in 237 PHCs located in 52 districts spread over 19 states.

Current (2006) WHO's recommendation is generally to use a cut-off point of 10% treatment failure for initiating the process leading to the switch to using artemisinin-based combination therapy as first-line treatment. The process leading to the switch normally consists of obtaining technical clearance (from the Technical Advisory Committee), issuing the corresponding administrative directive and procuring and distributing the drugs.

MANAGEMENT OF THE MALARIA PROGRAMME

ROLE OF THE PRIMARY HEALTH CENTRE

It is a well known fact that the distribution, intensity, prevalence of different parasites and control strategy is area specific. The case detection is the direct responsibility of PHC medical officer and she/he is the focal point of such activities. As the efficiency of case detection determines the control strategy, the PHC Medical Officer has a great responsibility on her/his shoulders in the revised strategy of decentralised planning of malaria control. She/he plans and supervises the activities of MPW (male and female), health supervisor (male and female) and FTD, DDC etc. Intervention measures are planned and executed based on his/her reports about monitoring and assessment on malaria detection in the area. She/he is also responsible for the treatment and management of serious cases of malaria with P. falciparum infection. Her/his responsibility as a clinician lies on early diagnosis and prompt treatment of cases at the PHC. In case proper facilities are not available, she/he should refer the cases to proper health facilities to prevent mortality due to malaria.

Thus the primary health centre was made the nodal point for malaria case detection and treatment activities. However, given the fact that the medical officer at the primary health centre is not always available or reliable, often the health workers are supervised directly from the block level.

DISTRICT AND BLOCK LEVEL ADMINISTRATION

For administrative and technical supervision at the district level, the District Malaria Officer was made in charge of malaria control. The District Malaria Officer has a team and with this there is supervision of the activities at the block level and the primary health centre level.

The block level male health supervisors in effect become the main arm of the district malaria office in taking through its programmes to the field level. The supervisors in effect rely largely on the male multipurpose workers to deliver the programme components in the village level. Since most posts of male workers are vacant and since the female workers have other priorities, there are considerable constraints in programme delivery at the local level. A cadre of part-time malaria link workers paid about Rs. 500 per month was evolved to close this gap – but the ability to monitor and support and get results out of such a part voluntary and part irregularly paid workforce has been limited. The existing male workers thus get limited to organise the spraying, and all other work - meeting and supplying the FTDs, domiciliary visits, blood smear examination, bed net distributions, larval control measures all occur sporadically, randomly – if at all.

This gives rise to a perception that the only problems of malaria control are operational – neither technical nor over all problems of approach. However, these operational issues have defied solutions over the last four decades and we would understand this further in the next lesson.

MALARIA AND GENDER

(This section describes the ways in which socially constructed roles, norms, behaviours, activities, and attributes influence the vulnerability, health seeking behaviour, outcome and consequences of malaria differentially for men and women.)

Vulnerability: It is believed that since women spend the early evening hours around cooking fires and since they wear long dresses, they get less mosquito bite compared to men. Probably, that is why men are at a higher risk of acquiring malaria than women.

Health seeking behaviour: Women are more likely to delay visits to qualified health care providers and more likely to visit traditional healers for their sickness and for their children because of their lesser control over resources and decision-making process in the household. Where there is a preference for the male child, parents or in-laws may take their male infants and children with malaria more often to formal health facilities. Studies have shown that women who lack either short or long-term economic support from male relatives, or disagree with their husbands or family elders about appropriate treatment-seeking, face difficulties in accessing health care for children with malaria.

Outcome: In the 0-4 and 5-14 year age groups mortality due to malaria is higher in men than women. But from 15 years onwards it shows the reverse trend, i.e. more women than men die of malaria. High mortality rates are reported in pregnant women.

Consequences: When men have malaria the household becomes severely affected economically. Women's work days become longer, the work load becomes heavier as they have to take care of the ill apart from their routine chores. At times they may have to go for work to compensate for the wage loss of the male members. In women headed households with only one earning member and that too it is a woman, the economic consequence is much higher on the entire family.

The way ahead: There is a need to promote men's financial contributions to health care, and women's active participation in leadership and decision-making. Fathers and household elders (especially mothers-in-law) need to be explicitly targeted in malaria education strategies. It is critical that people at every level come together to create awareness of the magnitude of the problem and on the way gender inequalities lead to a greater impact on women in case of sickness due to malaria.

I. Review Questions

1. What are the three commonest malarial vectors in India and what are the differences in vector dynamics between them?
2. What is the main difference between rapid fever survey and mass blood survey? And what is fever radical treatment? When would these be used? What would be the other set of measures that one would advocate in a malaria epidemic?
3. In assessing the progress of malaria control activities, which epidemiological indicator is better - API or SPR? If both ABER and API show a decline over the last three years, is that good or bad?
4. What are the criteria you would use to decide which areas to spray first with indoor residual spray – if the entire district has an API above two and you have received insecticide only adequate to spray 400 villages twice whereas there are 1200 villages in the district?
5. What would be the strategy for deploying insecticide treated bed nets if there are a limited number of bed nets available from the government to cover the large population at risk?

II. Application Questions

1. At one time the malaria control programme was focussed on just insecticide spraying. At another time the focus was on mass use of presumptive treatment of every fever with chloroquine. Now there is a similar emphasis developing on bed nets. This has been called the magic bullet approach – where one technological fix applied universally is expected to make the problem go away. Do you think that there has been such a fix?
2. How would the approach to control of urban malaria differ from that of rural malaria?

III. Project Exercises

1. Gather information about the situation in implementation of each of the above components of the programme in your district. Broad numerical data would be adequate- what are the indices showing, how many bed nets distributed, how many houses sprayed etc.?
2. How many microscopy centres are functional in the district and roughly how many blood smear examinations do they reach? Visit a few of them to understand their problems and write a note on their functioning and quality aspects.

Lesson THREE

Malaria in the District Plan

In this lesson we shall discuss:

- Need and scope of district level planning.
- Key processes of district level planning.
- Technical support for district level programme management.
- Development of village health plans.
- Process of monitoring programme implementation.

NEED FOR A DISTRICT PLAN

When district planning begins, persons in charge of malaria control are often at a loss to understand what they need to do. Actually, everything that needs to be done has been very clearly given in the guidelines. When the question is asked of why then malaria control is not happening, the answer is either of straight denial or it points out to operational problems about which not much can be done at the district level. For example, vacancies in male workers, inadequate supply of insecticides or bed nets etc.

However, such a simple explanation is not the whole truth. There are many reasons for the failure. Many of these problems that have led to poor control of malaria can be overcome only by district level planning and even more specifically by local level plans.

A district plan helps in control of malaria by:

1. **Optimal use of resources :** Management of the programme requires optimal use of available human, material and financial resources. There is every reason to believe that with good planning and programme management, one could get far better outcomes than the current situation. Without district planning optimal use of available resources cannot be planned for.

2. **Deciding the technology (on operational and managerial grounds) :** The control of malaria has many distinct technical components that would need to be delivered. We list the ten major ones below:

a. Facility level treatment of cases- both uncomplicated and complicated
b. Community level early diagnosis and prompt treatment
c. Behaviour change communication
d. Insecticide sprays
e. Introduction of larvivorous fish
f. Source reduction through engineering/drainage mechanisms
g. Source reduction through manual clearance of collection sites
h. Introduction of insecticide treated bed nets
i. Other personal prophylactics like repellent creams and oils
j. Surveillance systems

Each of these requires considerable knowledge, very specific skills, as well as specific work allocation, monitoring and management mechanisms. Further each of these components has 10 to 15 subcomponents which need to be specifically monitored. It would not be possible to do all of this everywhere and monitor some 150 points of action centrally from the state level- unless a

very large workforce dedicated only to this programme is created – and even then it would be a very inefficient way of doing it. One would necessarily have to prioritise one set of interventions and the combination of interventions that is prioritised would vary from district to district and even within the district.

3. **Ensuring community participation:** Given the large number of activities to be carried out and the highly decentralised nature of the activities and the considerable skill requirement for each activity, it would be impossible to carry out these activities without active, informed and skilled participation of the community. For example, without people contributing source reduction at the habitation level is just not conceivable. Even spraying requires enormous active cooperation. Indeed lack of community participation has been one of the serious bottlenecks in the malaria control operations. District planning which is accompanied by village level planning sets up the processes that enable community participation.

4. **Local adaptation and area specificity:** Malaria is known as a local and focal disease. Its distribution is never even. For example, see the Situational Analysis of Malaria in Korba District, Chhattisgarh (which is available on the PHRN/SHRC website at www.shsrc.org). It showed that within the 5 blocks of the Korba district the percentage of falciparum infection ranged from 91.5 in Pali block to 27.3% % Pf in Korba block. Moreover, across districts the vector dynamics change, resistance patterns change, and people's practices and cultures vary. Operational constraints also vary widely. A single plan for all districts would thus be sub-optimal for all districts. District specific plans are mandatory.

5. **Deciding the technology mix (technical considerations):** A single intervention applied all over is inherently bound to fail. There are sound technical reasons to support such a contention. We give below a few examples to explain this further. The learning is that one has to choose a right combination of techniques and adapt it to the context of the district and apply it differentially across the district. The exact combination would change according to epidemiological, entomological and operational factors from year to year.

Case Studies

1. **Intensive residual spraying** as the main thrust: In a study in Orissa, indoor residual spraying was used extensively. However, 32% of mosquitoes were found to be exophilic, i.e. they rested outside. Only use of indoor residual sprays missed them. Over time as the programme was focussed only on indoor residual spraying it led to a sharp increase in the exophilic vectors. Soon the vectors would be largely exophilic and spraying would miss them all.

2. **Intensive EDPT (early diagnosis and prompt treatment)** was chosen as sole mode of malaria control in a high transmission area. But in such areas the cases of infective but asymptomatic persons were high and these are missed in the EDPT approach. Indeed, it is known that treated cases, especially children, have the highest densities of gametocytes in their blood and are therefore much more infective. Even the addition of presumptive radical treatment would have failed to clear the gametocytes adequately. Also given the nature of the EIR (Entomological inoculation rate) curve, a large decrease in transmission rate is needed for a small decrease in prevalence. (WHO Guidelines for Management of Malaria Pg 134 has a sufficient explanation of why this is so. For reasons of complexity and space we do not attempt to explain it here).[1] Thus EDPT by itself would have little effect. However if indoor residual spraying or the use of bed nets is simultaneously added in with the use of EDPT, there would be a synergistic effect with much more reduction.

3. In another case study in the Gambia, **insecticide-treated bed nets** were used extensively and whole villages were being covered. It was seen that there was a change in vector behaviour with alternations in peak biting times – so that the protection that these nets were giving dropped significantly.

KEY COMPONENTS OF DISTRICT PLANNING IN VECTOR BORNE DISEASE CONTROL

There are some steps specific to district level planning for malaria – in addition to the steps outlined for the district health plan as such.

Situational Analysis

In situational analysis the special features would be:

Mapping Malaria and Falciparum Malaria Prevalence

Mapping the key indices of malaria prevalence and falciparum prevalence with section as the unit. The best way to do it is to check the surveillance data of the previous year. This data is almost always available at the section level – but it may take some effort to get it. The data needs to be presented in two ways – one as a graph (or at least as table) showing the month wise incidence. The other is a shaded map (or at least as table) showing the API levels or if that is not available, the SPR in the peak malarial month. This information is the basis of all prioritisation of activities and use of resources. Without this a district plan for malaria cannot even be considered an adequate plan.

1. World Health Organisation (2006) : *Guidelines for the Treatment of Malaria*, WHO, Geneva.

Entomological Appraisal

An appraisal of the entomological situation – the vectors contributing, their current dynamics, their resistance patterns – is considerably more difficult to do. An appraisal of the entomological situation- the vectors contributing, their current dynamics, their resistance patterns. This is considerably more difficult to do. One such study done for Korba district, Chhattisgarh was outsourced. However, states which have been effective in malaria control have always recognised and used medical entomologists who should have the capacity to do such a study. If not, such a capacity can be built up with the help of the key institutions. Though this is desirable – if this is not available we would have to assume that the last study done from the nearest area with a similar ecology is still valid and will be valid for this district.

Drug Resistance Appraisal

There are standard protocols for assessing the drug resistance situation. Training is provided for Medical Officers in designated centres to monitor for resistance. The report from these centres should be part of the plan – not just a bland statement of resistance present or absent.

Village level Participatory Plans

This is needed to assess people's awareness, acceptability and feasibility of certain options as well to assess the magnitude of certain interventions needed. Such planning may be done using participatory rural appraisal (PRA) techniques or even a transect walk to plan for vector control. The district plan need not wait for every village to be planned for. A small purposive sample of villages planned from different topographies and social situations would be adequate to have the information needed for the district plan. Of course every village would need to make its plan for effective implementation at the village level.

Specific Components for Action Planning

Village level action

This is ideally done in each village, but since building up the requisite capacities is a long term process, three standard village level action plans could be developed, leaving one or two elements to be done at the village level. The following steps are based on such an understanding:

1. **Categorising Situation:** Decide on three types of plans. One each for high, moderate and low API sections. (Note that the low API village may be much higher than the state or national average.) The point is only to make some adhoc prioritisation of severity so that resources can be focussed on areas where the risk is maximal.

2. Further, one may categorise within these three types further based on type of breeding sites.

3. Deciding on village level activities:
   a. What would be the activities prioritised and how would they be combined?
   b. Who would carry out these activities?
   c. When these activities would be carried out?

4. Deciding what capacity building is needed: Training plus equipment plus organisation etc. needed to implement the village level action plan.

5. Deciding how community participation would be built up.

6. Deciding on BCC plans to support the activities.

At the sector (village cluster) level

- Where village level planning did not occur – to plan on behalf of the village using the general pattern as seen in other villages.
- To build up support systems that would enable the planned activities at the village level.
- Monitor progress of work at village level, support the work and where necessary, intervene.
- Training/capacity building of community volunteers and groups.

At the block level

- Where sector level planning did not occur – to plan on behalf of the sector with their participation.
- Build up necessary support systems at the block level that would enable the planned activities at the village and sector level.
- Monitor progress in each sector and support and intervene where needed.
- Training of government staff involved in the programme and training of trainers for community volunteer training.

At the district level

- Where block level planning did not occur – to plan on behalf of the block with their participation.
- Build up necessary support systems of the district level that would enable the planned functions of the block team.
- Monitor progress in each block and support and intervene where needed.
- Training of block teams and trainers.

- Preparation of BCC material.
- Printing of training material which also functions as clear village level guidelines on how fish are hatched, transported, introduced and monitored, and re-introduced where necessary.
- Evaluation of programme and formative studies to help in the planning process.
- Resource allocation to blocks.

Examples for a few Components of Action Planning

Example 1: Introduction of larvivorous fish

At the village level:

- The village in a participatory manner makes a plan to decide on where different water bodies are located and preferred methods of anti larval measures in these. In all wells and into small ponds they decide to use larvivorous fish. The estimated requirement is 200 fish seedlings initially and another 200 later.
- The preferred time would be just before monsoons in the wells and just after the heavy rains are over in the ponds. (for local reasons – as much of pond water overflows and runs off during the rains).
- The local youth club undertakes to do this and nominates one youth member as coordinator.
- At the village meeting, people have been explained the plan. But a small poster is requested from the district to be put up near each well about the fish. The ASHA of the village agrees to remind the people about the cautions to be observed during her house visits once the fish are introduced.

At the sector level:

- The sector supervisor male would visit each village to ensure the plans are made well and would be there as part of the process. Since there are 15 villages, he has been asked to take one month to achieve this.
- A hatchery is set up in the sector which should be able to yield about 10,000 fish before the monsoon to supply all the 15 villages – and their estimated requirements.
- The community organisation coordinators who have undertaken this task are given a one-day training programme on this.
- According to the schedule, dispatch the fishes to the villages.
- The sector Medical Officer has to supervise that all of this happens.

At the block level:

- The block extension educator would visit each sector to help in the sector level planning and

again to ensure that hatcheries are built up as per specifications and later to ensure that introduction has been done on schedule.

- A large hatchery is built up – not only to provide fish to sector level hatcheries – but also to act as a backup in case the sector level hatchery fails. It is aimed to deliver 50,000 fish in a year.

- The sector supervisors and all MPWs are provided a one-day training on all aspects of this programme as part of a three-day planning and training workshop.

- Supplies and resources needed to execute this work – money, materials, posters, etc. are distributed to the villages through the sectors.

At the district level:

- The district malaria team monitors the programme.
- Guidelines are prepared and issued.
- Training material is prepared and issued.
- Trainers are identified for details of hatchery management and their schedule to visit the training camps are planned for.
- A district level hatchery at same size as the block level is also built up and maintained.

Example 2: Early Detection and Prompt Treatment

At the village level:

- ASHAs are trained to act as *Fever Treatment Depots*. They would have drugs to give every case of fever— as also glass slides, lancets, cotton and spirit to make blood smears before they give the drugs.

- *BCC*: In village level meetings and using posters the importance of prompt treatment and the need for making blood smears is explained. The sarpanch or panch gets a blood smear made as a demonstration.

- *Collecting the Smear Slides*: Community Health workers (ASHAs) may make the blood slides. However, since the ANM comes only once or twice a month and the ASHA cannot leave her work and go to the Sub-centre - it was decided to send the slides packed in a box every morning to the high school on the main road through the students who go to class daily. From the school at 9.00 am. the slides are picked up and sent to the sector PHC/CHC by the local bus – the driver agrees to do this. The school thus becomes a collection point for 20 villages.

- *Sending the Reports Back*: In the evening when the reports are ready they are sent back by one person designated by the village who goes to the town to work and return in the evening bus at 6 p.m. Some places that have a phone ring up and find out the positive cases on phone itself.

At the sector level:

The main functions here are timely microscopic reporting and good supply of drugs to the village fever treatment depots/ASHAs.

Both of these are not simple tasks. In a day the microscopist can do about 60 slides and there are days especially in the fever season when he could get 100 slides. Therefore at peak season more than one microscopist may be required. Also often the post of laboratory technician is vacant or not sanctioned or he is on leave etc. For all these reasons it was decided to train at least two if not three paramedicals posted in the sector to be able to examine the blood smear and do other simple laboratory tests. Multi-skilling paramedicals of the sector level thus becomes a key component to make this happen.

Ensuring that every fever treatment depot and every Sub-centre has the necessary drugs and supplies requires a good stock inventory management and distribution system here.

Training of fever treatment depot in charge – usually ASHAs and of community representatives also needs to happen at this level.

Also monitoring to see that in all villages the fever treatment depot is functional (i.e. slides are coming in and drugs are going out).

At the block level:

- Ensuring that all the activities listed for the sector level are happening.
- Where there is no sector PHC, the block level CHC may have to perform that role.
- The shortage of microscopists can be critical. At the block level using funds from the Rogi Kalyan Samiti (or equivalent body) to hire contractual microscopists for peak periods, or if workload is high, may be required throughout the year in addition to the regular lab technician posted there.
- Training of trainers for community level fever treatment depots.
- Monitoring to ensure optimal functioning of all sectors.
- Ensuring efficient distribution of supplies.
- Collecting and analysing the data from the microscopy centres to study the changing pattern of disease and trigger necessary action (epidemic alert, movement of supplies, need for an entomological study etc.)

At the district level:

- Monitoring the blocks
- Multiskilling paramedicals.
- Preparing and training all concerned staff of programme guidelines.
- Preparation of BCC material.
- Cross-checking to ensure quality of microscopy in the microscopy centres.
- Collecting and analysing the data from the microscopy centres to study the changing patterns of disease, trigger immediate action where needed and help plan for next year.
- Studies to evaluate progress of implementation this year and to plan for next year.

INCORPORATING THE COMPONENTS INTO THE DISTRICT PLAN

a) Aggregate the activities of each component to form a set of activities that would happen at the district level. This leads to considerable sharing of manpower and resources between the activities. Do a similar aggregation at the block level. In village level for each category of villages draw up the set of activities that would be carried out.

b) Draw up a time-table for the activities at the district level, at the block level and at the village level.

c) Draw up a common monitoring plan for the district level supervisors, for the block level supervisors and for the sector level staff.

Note all villages and all components need not be planned for; only those which are part of the mix that is chosen should be planned for.

TECHNICAL SUPPORT FOR DISTRICT PLANNING AND PROGRAMME MANAGEMENT

Such planning requires considerable support. There are also specific technical human resources requirements in planning and implementation.

IN-HOUSE TECHNICAL STAFF REQUIREMENTS

1. Entomologists: Many states have sanctioned entomologist posts. However, many are not being filled up. This is often due to a poor understanding of their role. With an entemologist in place, a situational analysis and plan for implementation should be available every year for every high malarial district. If their skills have been lost, they could work with national teams to learn to do such situation analysis by themselves.

Role of Entomologist in a District

1. Carry out a thorough entomological study in those villages by looking into:
   a. Insecticide susceptibility of vectors: (Entomologists are given WHO kits to carry out insecticide susceptibility tests using insecticide impregnated papers).
   b. Seasonal prevalence of vectors: Collection of adult mosquitoes depending on biting behaviour, morning, evening and night collection of mosquitoes. Protocols for this are available. Once collected they need to be identified.
   c. Monitor IRS spray operation: Quantity and quality test: Bio-assays need to be done to decide on dosages. Also where needed random checking should be done.
   d. Vector Density Estimations. There is critical density for transmission of the disease – culificacies-5 mosquitoes per man hour, fluvitalis-0.5 per man hour.
   e. Study of behaviour patterns to guide spraying and bed nets use: Total catch indoors/outdoors: - either mosquito is exo or endophilic, and exo or endophagic or may have peculiar resting places where insecticide does not reach, e.g. crevices on mud wall and thatched roofs, anthropophilic and zoophilic etc.
   f. Larva survey: to understand breeding habits.
   g. Sporozoite positivity to investigate new vector and confirm that species caught is acting as vector in that area.
   h. Developing health education guidelines based on his findings.
2. Outbreak investigation
3. Overall supervision of surveillance programme

An entomologist should keep 15 days for field work and 15 days for data processing and analysis of his field findings. He is assisted by two insect collectors who are group D workers trained under him. One entomologist with two assistants is needed per high malaria district – as a start at least one such team to be shared between two or three such districts.

2. Malaria Inspectors: There is a need to maintain the tradition of one malaria inspector in every block in all high malarial areas or wherever a specific vector is a problem. They primarily identify breeding sites and take remedial and preventive action to reduce the number of breeding sites. Where such posts have been abolished there is need to multi-skill one or more of the male supervisory staff and put them to the task under the direct supervision of the District Malaria Officer. In today's context, measures like introduction of fish and bed nets could be supervised in addition to his usual concerns - the management of irrigation channels, the engineering of burrow pits and other construction sites to prevent collections of water, de-grassing and slicing of pond edges, the closing of access to septic tanks (for the culex mosquito) etc. Also they should be inspecting for breeding sites of all vectors.

Outsourcing and Insourcing

Since there are many technical tasks those cannot be performed by persons within the district or state it is useful to call for the help of teams from a number of vector control and communicable disease control research centres that are functional. The district enters into a contract or MOU with such an agency. They come, do the study and present the report. This is the typical outsourcing arrangement.

Another type of contractual arrangement is for the technical centre/team to work with a local team such that their experience/skills are transferred to the local team. Such an arrangement has its strengths.

Monitoring the District Plan

Disease surveillance systems are the tools of monitoring the implementation of the district plan for the control of vector borne diseases. These are outcome measures of the programme. This needs to be combined with good process indicators that help correlate outcomes with the inputs and processes so that one can continuously learn what the programme weaknesses are and address these.

I. Review Questions :

1. What are the considerations that go into deciding the mix of methods or technologies that would be used to control malaria in a certain district?
2. Why it is not advisable to emphasise on only one technology universally applied to control vectors?
3. What are the district level activity components for early diagnosis and prompt treatment strategy component of a district malaria control programme?
4. If we were to categorise villages for the purposes of planning, on what basis can they be so categorised?
5. What are the tasks for an entomologist and for a malaria inspector in a disease control programme?

II. Application Questions :

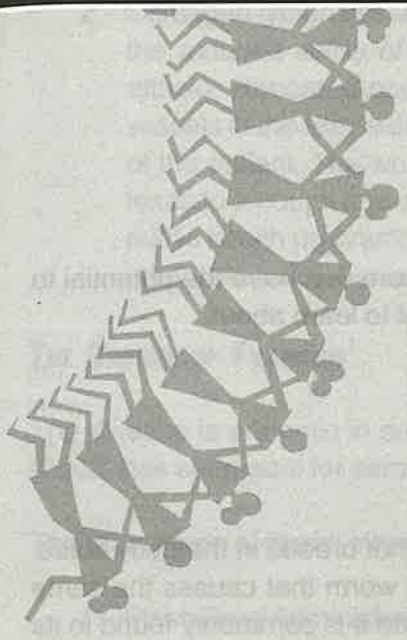
1. What would be the key components of a district level plan for kala-azar control?
2. What would be activities at the village, block and district level for the elimination of filariasis in a district?

III. Project Assignment

1. Which is the most important vector borne disease in your district? Write out a district level plan for the same.
2. How would you budget for such a plan?

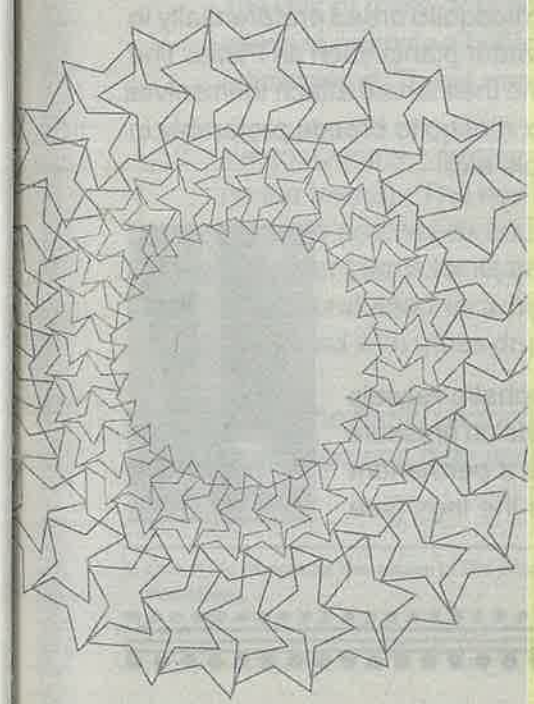
Lesson FOUR

Control of Other Vector-Borne Diseases



In this lesson we shall discuss:

- Causes, spread and control of filariasis.
- Causes, spread and control of Kala-azar.
- The issue of Japanese encephalitis.
- Control of Dengue and chikungunya.
- A general model towards vector borne disease.



INTRODUCTION

The list of other vector borne diseases is large and increasing. These include, in the least, the following:

a) Filariasis
b) Kala-azar
c) Japanese encephalitis
d) Dengue
e) Chikungunya

There are other diseases that are problems in specific areas and many more that have the potential to become public health problems. But for the present, this is an adequate list to learn about.

FILARIASIS

The Germ

This disease is caused by a worm that is transmitted by mosquitoes and that breeds in the body fluids. The scientific name of the worm is Wucheraria bancrofti. Another similar worm that causes the same disease is *Brugia malayi*. Its common name is the filarial worm. In the blood it is commonly found in its young stage called microfilaria.

The Vector

The disease is spread by the bite of *Culex quinquefasciatus* mosquito, the vector of Wuchereria bancrofti and the *Mansonia* mosquito – the vector of Brugia malayi. The Mansonia mosquito breed preferentially in ponds, canals, and channels – all of which support the growth of dense water plants such as Pistia. The mosquitoes lay their eggs on the under-surface of leaves of these plants and their larvae attach themselves here. In the absence of these plants, the vector cannot breed. The Culex mosquito breeds preferably in dirty and polluted water such as in street drains, cess pits and cess pools etc.

The Disease

The disease affects human beings in three main forms:

1. The adult worm lodges in the lymph canals – and damage the lymphatic vessels and the lymphatic flow. This leads to a swelling of that part which pits on pressure and which reduces with lying down. Later the swelling becomes a permanent disfiguring swelling of that body part- elephantiasis. Usually it is the legs (see

the picture) and in the male the scrotum that gets swollen up like this – but sometimes it could even be in the arms. The commonest manifestation is the swelling of the scrotum – hydrocele.

2. Damaged lymph vessels will have large number of bacteria on the skin, slow lymph movement and the reduced ability of the lymph nodes to filter bacteria which cause redness and fever (acute attack). Repeated bacterial infections precipitate frequent attacks, further damage to lymphatic vessels in the skin reducing their ability to drain fluid. The cycle continues aggravating the condition of the patient. The worm often reaches the fluids in the lung and sets up an allergic reaction that leads to a cough and slowly worsening lung disease. This is called tropical lung eosinophilia. Most public health programmes do not address this component and this lessens with the decrease in the other two components. The term lymphatic filariasis excludes this manifestation of the worm.

The Control of Filariasis[1]

The disease is endemic in several districts in 20 states/UTs of the country. The National Health Policy (2002) has set a goal for elimination of lymphatic filariasis by 2015.

The main steps of filarial elimination are:

1. Mass Drug Administration (MDA): Anti-filarial drug- diethylcarbamazine citrate (DEC) is given to all persons living in all the areas declared as affected and endemic for this disease. The tablets have to be swallowed in the presence of the distributor. The dose varies according to the age. It is estimated that if this is done once a year, the young worms in the blood of infected individuals would come down to levels where significant spread of the disease would become reduced to negligible levels.

   The day of mass drug administration is called the National Filarial Day and is accompanied by many efforts to promote a better understanding of the disease and therefore a better acceptance of the drugs administered. Thus a massive BCC is or ought to be a part of the mass drug administration programme.

2. Vector Control – largely aimed at source reduction, at to a much lesser extent at preventing bites (in the towns). The key to the reduction of *Mansonia* mosquitoes is the clearing of water bodies of plants and weeds and composite fish culture in the ponds and water bodies. The vector needs the water plants for its breeding and is controlled if they are removed. Mass campaigns that have been conducted in a high prevalence area have shown good results. This is more so when combined with mass drug administration.

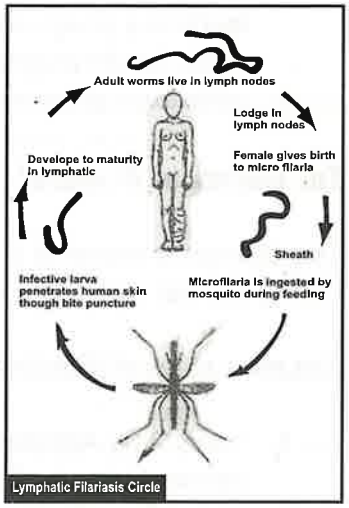
   Culex the filarial vector of Wuchereria, in marked contrast to the anopheles mosquito is a breeder in sewage and dirty water. Thus villages with accumulated sewage and septic tanks which are

1. One of the sources for this section is The Chertala Project (1998): *Control of Brugian Filariasis through Integrated Methods*, Vector Control Research centre, Pondicherry.

poorly constructed allowing access and egress of mosquitoes becomes the most common breeding sites. Adequate drainage in the villages and towns and proper construction and protection of septic tanks and clearing vegetation of ponds becomes the key to vector control.

3. Treatment for persons with symptoms: Management of lymphoedema cases at the doorstep and hydrocoelectomy at hospitals/Community Health Centres (CHCs) are to be augmented to alleviate the sufferings of the filariasis patients.

Mapping Lymphatic Filariasis



To identify the affected area and plan the implementation of the above strategies one needs to map the disease prevalence. Even within a district declared to have a high prevalence, we do not want to waste time and effort taking these very intensive measures to all blocks or even all villages inside a block. Also if there is no prevalence there would be poor community cooperation. So mapping becomes critical to plan the district's efforts.

Mapping can be done by line listing of lymphoedema/hydrocele cases; by night blood survey in sentinel sites and also may be supplemented by the use of special diagnostic tool called the Immunochrokatographic Test (ICT) cards.

This needs to be carried out in all rural areas and with even greater emphasis on all urban and semi-urban areas where the prevalence is often more.

The mapping to line list Lymphatic filariasis (LF) disease manifestations is to be carried out in all the villages and urban areas. There is some understanding of which are the districts with high prevalence but one needs to use standardised sampling methods to assess the current status of filariasis problem. This can be done in five steps.

1. **Rapid qualitative assessment of LF:** A sample questionnaire circulated to key informants such as health workers and medical practitioners is a preliminary step. It is important to find out health seeking behaviour and identify the persons to whom people are willing to go for such problems.
2. **Direct physical examination by health worker:** In some areas where we do not have a good quality of information from the first step a physical examination by a team of health workers can be used.
3. **Detection of microfilariae in the blood:** For epidemiological screening, 20cmm of finger-prick blood can be dried on a slide, stained and examined under a microscope in accordance with standard procedure. A large number of people need to be so examined.

4. **Line listing of filarial cases and analysis of data:** A list of cases got from the first and second steps can be made. Then their houses should be visited for confirmation. Household card will be provided to the health workers to make a record of persons having manifestations of filariasis. Given below is the model for such cards:

Household Card			
Elimination of Lymphatic Filariasis			
Family Card			
State	District	PHC:	Sub-centre:
Village			
Name of household			
Name of the patient			
Address			
Age			
Duration of Lymphedema			
Sex			
Other family members affected			

On the back of the card write some key messages on morbidity management and prevention of filariasis.

These are then consolidated and submitted to the Medical Officer in the PHC in the two forms shown below.

Form 1: Health workers survey findings

Sr. No.	Name of the household	Name of the patient	Age of the patient	Sex	Affected part of the body	Duration of the disease
1.						
2.						
3.						
4.						
5.						

Age-wise and Sex-wise Classification of Cases in Sub-centre

Age	<2Yrs		2-4		5-8		9-14		15-25		26-40		41-60		60>		Total		
Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	T
No. of Patient																			

M=Male, F=Female, T=Total

KALA-AZAR

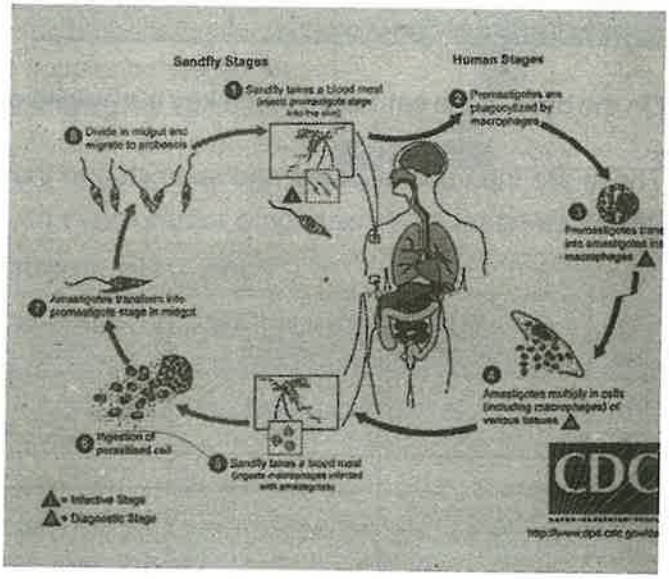
The Disease

The disease incubation period is usually 3 to 6 months after the sand fly bite but can be as long as two years or as short as 10 days.

This is a disease that causes long standing fever and enlargement of liver and spleen which appears as a distension of the abdomen. There is severe anemia. There could be a darkening of the skin of the face, hands and feet and abdomen – giving it the name. There is marked malnutrition and a marked reduction in immunity making the person easily victim to pneumonia, dysentery, or tuberculosis. Untreated it is usually fatal and like in HIV due to other infections to which they become very susceptible. Recovery is rapid, but in many cases some of the parasites are not eliminated and they give rise to a skin disease called post Kala-azar leishmaniasis (PKDL), where there are multiple nodular infiltration of the skin, without any ulceration. The disease usually develops about one to two years after the apparent cure and these lesions are very infective.

The Germ

The disease Kala-azar is caused by a one-celled animal called the protozoa. The name of the protozoa is *Leishmania donovani.*



The Spread

Kala-azar is a disease transmitted by sand fly vector called *Phlebotomus argentipes.* Knowledge of vector dynamics is therefore essential for control. Untreated patients, inadequately treated patients and the Post Kala-azar Dermal (skin) lesions are the sources of the infection.

Vector Dynamics

The sand-fly is a small fly about 1.5 to 4 mm long. It is smaller than the mosquito. They thus pass through the usual mosquito net – especially the males and unfed females. One fact that helps identify the sand fly is the wings which are always held erect when it is at rest.

Like the mosquito, only the female sucks blood, needing it for laying eggs. The males live on plant juices.

The sand fly is associated with warm wet climates, in areas of alluvial soil and high sub-soil water, with heavy rainfall and abundant vegetation and altitude below 600 meters. Its eggs are laid in shady damp places which have lot of organic matter- like under stones or in cracks and holes in soft soil.

Since it favours a temperature between 7.2 degrees C and 37 degrees C, it is much reduced in the winter months and in the peak of summer, reaching the maximum just after the monsoon rains. There is a minor peak in March-April and a major one in August-September.

They fly little – largely by large hops of about half a meter at a time. They rest in soil cracks, burrows, trees holes, caves, in earthen mounds, under vegetation and under stones. They also rest indoors – preferring cattle-sheds to human dwellings. They are active feeders at night. The adult probably live for about 20 days.

The eggs take 3 to 4 days to hatch. Their larva feeds on organic matter available in the soil. It has four larval stages lasting about 11 to 30 days in all. The non feeding pupa stage lasts 6 to 10 days. The life cycle of the parasite in the fly varies from 4 to 18 days depending on the species of Leishmania.

The Control of Kala-azar[2]

Kala-azar is responsible for high morbidity and mortality in Bihar, Jharkhand, Uttar Pradesh and West Bengal.

The National Health Policy (2002) had set the goal for elimination of Kala-azar by year 2010. However both in Jharkhand and in Bihar there are reports that incidence is increasing. Since the disease is a very focal disease admitting of specific local strategies and it is limited to only about 54 districts in the country, there is a major case for including this as a major task within the district plans of these districts.

The strategy for Kala-azar control consists of three major activities:

1. Vector Control
2. Early Diagnosis and Complete Treatment, and
3. IEC and Community Mobilisation

Vector Control

- Interruption of transmission through vector control by undertaking **indoor residual insecticide spraying** in affected areas. Using high quality DDT spraying is still an effective vector control mechanism for Kala-azar bites at night. The sand-fly rests on the lower part of walls in cool places- up to a height of 6 feet inside the dwelling and it is very sensitive to DDT spraying and

2. Source: Sehgal, P.H. (2003): *Kala-azar Control*, Voluntary Health Association of India.

effective indoor residual spraying should be effective against this. Similarly, sleeping on a cot or in the fields on a macchan will itself reduce bites because the sand-flies habitat is close the floor. Two rounds of spraying are mandatory. Most areas where Kala-azar has made a come-back are areas where spraying was particularly poor. The importance of effective spraying in endemic districts cannot be understated. The problems and constraints in this hold good for Kala-azar also.

- **Insecticide-treated Bed Nets** are also effective against the Kala-azar vector. However the holes should be smaller – about 40 holes per sq. inch as the sand-fly is much smaller than the mosquito. Insecticide treatment also helps for control where the sand fly gets through- for it would come into contact with the net.
- **Environmental management** for source reduction requires to reducing the organic rubbish accumulation in and around houses – especially cow dung. All possible breeding and resting places could be plastered. Well lighted and ventilated rooms are less attractive for the sand-fly.

Early Diagnosis and Complete Treatment

- *Early diagnosis of the Kala-azar cases and complete treatment* using a standard treatment protocol are vital to contain the transmission of the disease. In a clinical setting of fever of more than two weeks, not responding to anti-malarials and an enlarged spleen, Kala-azar has to be suspected and referred for confirmation in a hospital. Currently the programme is still based on the Aldehyde test as a method of screening, despite it being known to be non-specific. In most cases therefore a bone marrow examination or splenic aspirate which are difficult procedures become mandatory. Fortunately a dip stick rapid test – rk39 – has been approved and this is more sensitive and specific. However, rk39 is yet to be provided by the programme.

- *Active search and Effective Treatment*: Currently a lot of effort is going into active search of cases through campaigns. The criticality of ensuring treatment completion of all identified Kala-azar cases for the elimination programme is not adequately understood by programme staff.

- *Treatment Policy and Practices:* Currently, injection Sodium Stibo Gluconate (SSG) is used as first line drug and Amphotericin B (as intravenous infusion) as the second line of treatment. The National Policy specifies Inj. Pentamidine Isethionate as second line too. At present, SSG essentially remains the main drug for Kala-azar under the NBVDCP and for treatment completion injections of SSG are to be given for 28 consecutive days. SSG still remains one of the most effective drugs for treatment of Kala-azar. The current practice of handing over the SSG vial to the patient for one week treatment has the potential risk of leading to incomplete and irregular treatment even if the first injection is given at the Block PHC and the client is mandated to return empty vials. This could lead to development of resistance to the drug. Availability and correct use of this drug still remains a challenge.

- *Introduction of Miltefosine:* This drug has been recommended by the Regional Technical Advisory Group of WHO and the Government is in the process of introducing it. A safe and effective oral drug, this could become the first line of treatment in the programme as this drug has been registered for use in India and is currently available in the private sector. Although Miltefosine is a cheap, safe and effective drug, concerns about teratogenecity limits its use in women of reproductive age. Paromomycin (a 21 dose injectable) as an alternate first line drug is still in the pipeline, and could be promoted if found suitable especially for women.

- *Detection and management of Post Kala-azar Dermal Lesions (PKDL) cases*: PKDL cases, which could act as a source of transmission of the disease, have been reported in Jharkhand. However, the treatment of cases of PKDL is not yet standardised. Consequently, guidelines for treatment of PKDL are not available.

IEC and Community Mobilisation

In addition to supporting the above two measure, community mobilisation is required for:

- Participation of community and household members in spraying initiatives, especially in areas where case clustering is reported. Also to promote use of bed nets with more than 40 holes per sq. inch, personal protection methods like not sleeping on the floor, closing the crevices in walls and floors with plaster or other means and other methods of environmental management.
- Improve early reporting of Kala-azar cases by training ASHAs in identifying Kala-azar suspected cases by the use of standard definition. One may consider providing them with funds to ensure prompt referral to nearest designated diagnostic centre. Periodic house to house searches for those with potential disease.
- Actively involve private practitioners (formal and informal) in reporting suspected cases and providing incentives and support to ensure that this happens.

Problem of HIV Co-infection

This is emerging as a serious problem. In HIV positive patients there is a much higher likelihood of an infected bite leading to the disease and a much shorter incubation period. HIV infection is thus estimated to increase the spread of Kala-azar by 100 to 1000 times in an endemic area.

Co-infection then produces a cumulative immunodeficiency – increases disease severity and worsens outcomes. Thus HIV and Kala-azar are both more fatal when they come together. Serological diagnosis for Kala-azar could be falsely negative due to HIV infection, thus needing better tests than the aldehyde test.

The scope of well planned district level efforts may yield immediate results given the nature of the disease

and its spread and the availability of technical tools to combat it. However without the sort of attention to detail that a district plan entails- identifying disease affected villages, getting preventive measure intensified there, providing for special efforts to reach treatment the affected – a number of widespread unfocussed measures would fail to eliminate the disease.

JAPANESE ENCEPHALITIS

Japanese encephalitis (JE) is a mosquito-borne arbo-viral disease of major public health importance in several parts of India. Since only limited mouse brain vaccine is produced and available for JE control, the strategy included strengthening of surveillance activities and integrated vector control along with awareness campaigns.

The Disease

Typically most people infected with the germ do not have symptoms or at best they may have some mild fever and malaise. In about 1 in 100 of those infected, the germ affects the substance of the brain leading to the patient becoming drowsy and then comatose and finally dying. If they recover, about half of those who do recover will have some neurological deficit – ranging from weakness or distortion in limbs to mental retardation. Children tend to be much more commonly affected.

The Germ

The disease is caused by the Japanese Encephalitis virus, which belongs to a group of viruses called arbo viruses that are spread by insect vectors.

The Vector

The virus is spread by the bite of the Culex mosquito – of the group known as the Culex vishnui group. This breeds in rice fields and larger water body collections. Typically these mosquitoes bite birds and the virus circulates between mosquitoes and birds. Then when the population of the mosquito rises it bites some of the farm animals of which the pig is the most common. In the pig the virus is amplified – that is the concentration of the virus rises very high.

Then when the mosquito population rises even further, some of the mosquitoes start biting humans. Humans are not a regular part of the mosquitos' life – only an occasional event when there are too many mosquitoes. Of every 100 humans who so get infected with the virus, one or two would get the disease. Thus the disease does not spread from man to mosquito to man. It spreads only from infected pig or bird to the mosquito to the man.

The Control of Japanese Encephalitis

Reduction of mortality on account of Japanese Encephalitis by 50% by year 2010 has been envisaged under the National Health Policy (2002).

Hopes of control now are centred around a vaccine whose effectiveness is considered as established. This is now the major option for control and the recommendation is to immunise all children in high risk areas.

The second point of control is the reduction in the amplifier host – the pig. This is also difficult to achieve especially as it is an important food source for very poor sections.

The third option is source reduction of the vector. This largely requires changes in the crop irrigation and rearing practices.

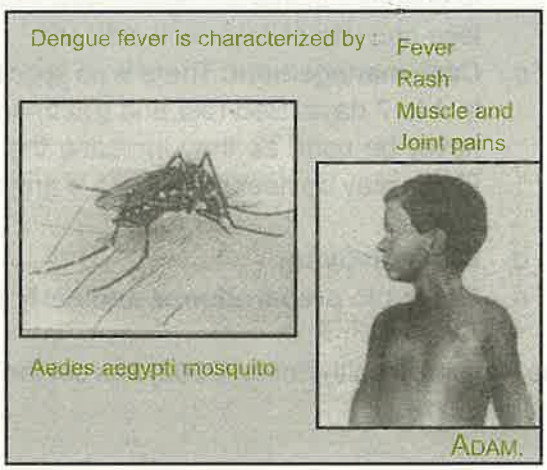
There is also no treatment available for this virus. However hospitalisation of the sick person and providing supportive care during the period when the person is unconscious and perhaps having fits can be life saving. This is one thrust of the programme – though it is not a control programme.

DENGUE FEVER

Dengue fever (DF) is an acute viral infection with the potential of causing large outbreaks. Death can occur in dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS), which are severe forms of the disease.

The Disease

This is marked by fever with severe body aches and severe headache. Fever usually lasts 4 to 7 days and there may be some period when it goes down and then rises again. Sometimes there may be a mild rash. In a small percentage of patients the platelet count decreases and when it falls below 50,000 they may start oozing blood from nose, mouth etc. Usually this develops in the 5th to 7th day of the fever. This is then labelled Dengue Hemorrhagic Fever (DHF). If it worsens further there may be widespread bleeding and the patient would go into shock and it could be fatal.



The Germ

It is caused by the dengue virus (DEN viruses).

The Vector

This is spread mainly by the *Aedes aegypti* mosquito. The characteristics of the mosquito are as follows. The vector rests indoor, in dark cool places. It can also rest outside in shady cool places. The mosquito lays eggs and the larva breeds in water collections in and around homes and offices- room coolers, overhead water tanks, upturned vessels or containers or tyres left in the open, flower pots, hollows of trees etc. After biting the patient it takes 8 to 10 days to become infective. Once a mosquito becomes infected it remains so for the rest of its life. The mosquitos can bite during the day especially in the late afternoons and sometimes in the early morning. Mosquito repellents and creams used at these times help.

The Control of Dengue Fever[3]

The strategies for prevention and control of DF/DHF include:

a. **Disease and vector surveillance:** Blood examination is needed in a sample of fever cases for identifying the dengue virus. If there is a dengue incidence then an entomological profile on the vectors and their dynamics is a must.
b. **Vector management through source reduction with community participation:** Most measures aim at preventing water collections that last more than a few days in any place. This task is so widespread that community cooperation and initiative is a must. Door-to-door inspections to ensure that this is followed, are a must. During outbreaks wearing clothes that cover arms and legs and use of creams is advised.
c. **Case management:** There is no specific treatment and the disease is usually self limiting, resolving in 4 to 7 days. Bed rest and treatment with anti –fever medications is adequate. Aspirin should never be used as they increase the chances of bleeding. Paracetomol is the drug of choice. Fluids may be needed. If there is any evidence of bleeding, hospitalisation and supportive care is a must.
d. **IEC initiatives**
e. **Epidemic preparedness and early response**

The National Health Policy (2002) has set the goal of reduction of mortality on account of Dengue by 50% by year 2010.

3. Source: Sehgal, P.N. (2000): *Dengue and Dengue Haemorrhagic Fever: Prevention and Control*, Voluntary Health Association of India.

A General Model of Vector Borne Disease Control

Some common learning emerge from the study of the control measures of each of the above vector borne diseases.

a) Clinical features vary widely between the vector borne diseases. Good epidemiological work based on effective use of surveillance data is essential to know the extent and nature of the diseases in a given area.
b) Most of the diseases are best addressed by a combination of approaches – not merely one of them- in isolation.
c) Vector control measures are included in all of them and would have a major role for appropriate source reduction. All control measures would vary widely according to vector dynamics. For example there is little role for indoor residual spraying in Japanese Encephalitis, dengue and filariasis.
d) Behaviour change communication is also a common feature of all strategies of control for all vectors but the content of such communication would change from district to district and within districts.
e) Source reduction is not the most efficient or feasible form of control in any of the diseases but given the fact that it is the only common element of control much more effort and resource investment in this is called for. Also because quality of life would be much higher in a mosquito reduced environment and because of the dangers of new diseases emerging in the vector – man- animal - ecological niche.
f) Source reduction and vector control require high levels of entomological inputs and entomological surveillance and these inputs need to feed in to interventions that a number of departments would have to take in coordination.

Given the very local and focal nature of most of these diseases – local planning and focussed interventions made with appropriate technological choices would give much better results for much lower costs than one or two methods applied indiscriminately over the entire state or nation. Even within a district this sense of which area to prioritise with what intervention must dominate control strategies. This calls for technically competent, culturally appropriate and effective district planning.

I. Review Questions

1. What are the forms of infection by the filarial parasite?
2. What are the main effective strategies to eliminate filariasis as a public health problem?
3. What are the three key strategies of the control of Kala-azar?
4. What is the role of pigs in the spread of Japanese encephalitis? Does slaughtering pigs help in control? What is now considered the optimal way to achieve control?
5. What are the vectors of dengue and how does its vector dynamics differ from the anopheles species?

II. Application Questions:

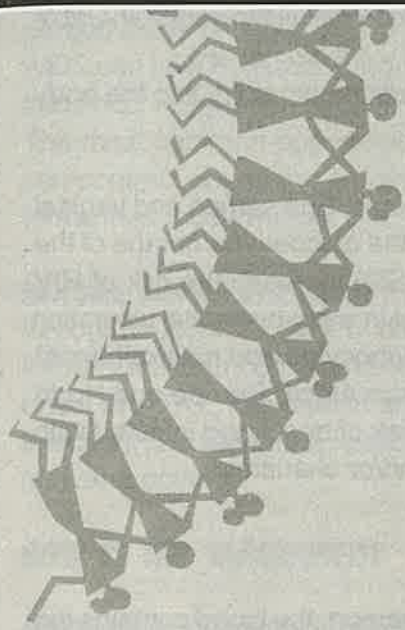
1. Considering the general principles of the control of vector borne diseases can you write up a plan for the control of chikungunya – for which there is no curative intervention available?
2. Kala-azar is a highly local and focal disease which on theoretical grounds should have been easy to eradicate. Yet such a goal eludes us. Why? What are the constraints in the control of Kala-azar?

III. Project Work

1. Take a locality where a vector borne disease is known to be widespread? With or without the help of the entomologist identify the most likely vector breeding sites?
2. What are the most effective control measures in that situation? List the key strategies that would help in that situation and suggest how you would measure outcomes of each strategy separately so as to know whether it is effective?

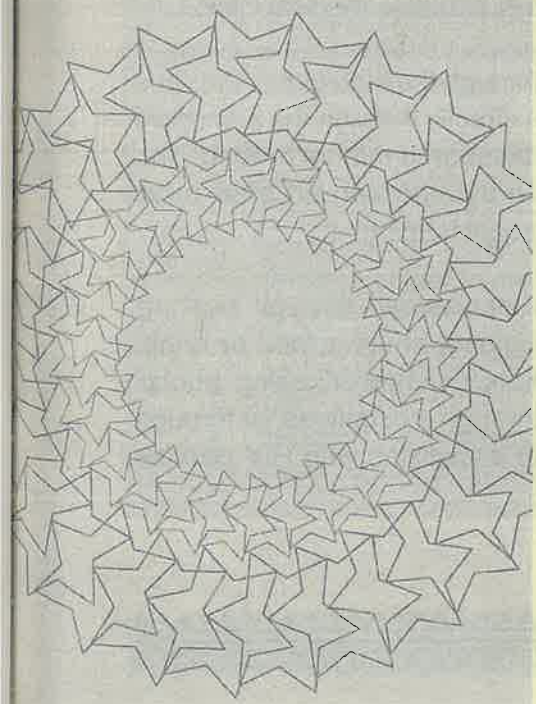
Lesson FIVE

The Control of HIV and AIDS



In this lesson we shall discuss:

- What the HIV infection is and how it spreads.
- What the main approaches to control of HIV are.
- What the key constraints in HIV control are.
- How one can incorporate HIV control into the district plan.



What is HIV infection and How does it Spread?

HIV infection is caused by a virus. The term HIV stands for Human Immunodeficiency Virus. These viruses destroy the normal defense mechanism of the body to infections making the victim very vulnerable to infections. Since the virus makes the person's immune system deficient – it is so named.
The virus spreads when infected blood and body fluids from an infected person gain entry into the body of an uninfected person.

The most common way this happens is through unprotected sexual intercourse. The semen and vaginal fluid of the infected person has the virus and this easily penetrates through the mucous membrane of the genital area to infect the sexual partner. Sexually transmitted infections (STI) increase the risk of HIV transmission and infection because they cause the disruption of the normal skin lining by genital ulceration and by accumulation of pools of HIV-susceptible or HIV-infected cells (lymphocytes and macrophages) in semen and vaginal secretions. Epidemiological studies from sub-Saharan Africa, Europe and North America have suggested that there is approximately a four times greater risk of becoming infected with HIV in the presence of a genital ulcer such as those caused by syphilis and/or chancroid.

Other common ways are by:

Blood transfusion and transfer of infected blood : If the donor is an infected person, the blood contains the virus and when it is transfused it goes to the other person.

Sharing of injection needles : The needle picks up the virus from the blood of the infected person, and the virus gets transmitted when it is used again without sterilisation with another person. Such transmission occurs most commonly in intravenous drug using addicts. However it can happen in accidental needle prick from an infected needle or in poor sterile conditions during injection in a routine medical clinic.

Mother to child transmission: When the child is being born and as it goes through the birth canal, the virus passes from mother to child – but it also can pass when it is in the uterus directly through the admixture of child's blood with mother's blood. The infection may also spread after birth through breast feeding.

Risk & transmission categories according to NACO till August 2006

Risk and transmission categories	Percentage
Sexual	85.34
Perinatal transmission	3.80
Blood and blood products	2.05
Injecting Drug users	2.34
Others (not specified)	6.46
Total	**100.00**

HIV does not spread through shaking hands, hugging, sharing food or drink, using toilets or shower, using public phones, through mosquitoes, or through working or socialising with HIV positive persons.

WHAT IS AIDS?

AIDS stands for Acquired Immunodeficiency Syndrome and refers to the stage when an HIV positive person starts falling ill due to lowering of the immunity. The gap between infection and development of AIDS can take from many months to many years, typically ranging between 2 to 12 years. Such infections that occur in a person because his or her immunity is compromised are called **opportunistic infections**. The most common opportunistic infections are tuberculosis and diarrhoea, but HIV positive individuals can contract any of the common infections or even a number of rare germs, easier and in more severe forms than those without HIV.

Mortality due to HIV/AIDS is a result of the complete collapse of immunity and the opportunistic infections. In poor households, lack of nutritious food, lack of access to health care and medicines, and unsanitary living conditions compromises the health condition of a HIV positive person further, and expedites the onset of AIDS. The patient and the family are often caught in a vicious cycle of poor health due to the infection, and therefore, loss of livelihood, productivity and ability to work, which in turn increases income loss and poverty.

HOW IS HIV DIAGNOSED?

HIV can be diagnosed by testing the blood of the person. It may take many months or years for a person to become HIV positive from the time the HIV enters the body. This time period is called the window period. During this window period the blood test for HIV will be negative.

NACOs policy on HIV Testing

There is no public health rationale for mandatory HIV testing of a person. NACO's policy promotes voluntary testing with pre-test and post-test counseling. In order to promote voluntary testing, HIV testing facilities are being expanded to cover all districts in a phased manner.

Some key points from NACO's policy on HIV testing are:

1. **Blood transfusion safety:** A single ERS (ELISA/Rapid/Simple) test is sufficient to ensure transfusion safety. The objective does not require the identification of the donor.
2. **Surveillance:** The objective of surveillance is achieved by unlinked anonymous testing with 2 ERS tests on different principles or antigen preparation.
3. **Diagnosis of HIV/AIDS:** For diagnosis of HIV infection in asymptomatic individuals who voluntary like to undergo an HIV test, 3 ERS must be performed for confirmation of diagnosis and should be accompanied with pretest and post test counseling. However, for the diagnosis of suspected AID cases with any AIDS defining illness, 2 ERS is sufficient.
4. **Research:** HIV testing for research purposes should follow the ethical standards which primarily involves full explicit consent of the patient.

PARTNER NOTIFICATION

In accordance to the decision of the Supreme Court, the National AIDS Committee decided to include partner notification as a policy. In this regard, all HIV positive individuals should be encouraged to disclose the HIV status to their sexual partner. However, it is imperative for the attending physician to disclose the status to the spouse or sexual partner with proper counseling.

WINDOW PERIOD

The window period is described as the time it takes for a person who has been infected with HIV to "seroconvert" (test positive) for HIV antibodies. A person who tests during the window period may receive a negative test result even though he may be HIV positive. Prior to testing, it is important to determine risks and possible exposure to HIV in the window period, and any potential exposure must be followed by a re-testing at the end of the window period (usually after three months).

WHAT ARE THE RISK FACTORS THAT PREDISPOSE TO ACQUIRING INFECTION?

The major risk factors in the Indian context are:

Unsafe Sex and Low Condom Use: In India, as in most places in the world, sexual transmission is responsible for 85.8 percent of reported AIDS cases. HIV prevalence rates are highest among sex workers and their clients, injecting drug users, and men who have sex with men. This would include adolescent boys who are at a stage of exploring sexuality and sexual orientation, and also married men. The risk of HIV infection for 'men having sex with men' is higher due to the practice of anal sex which results in abrasions and cuts leading to exchange of blood and fluids. In the case of sex workers it was found that 70 percent of commercial sex workers in India reported that their main reason for not using condoms was because their customers objected. The lack of awareness about safe sex, lack of access to condoms, and perceptions about reduction in sexual pleasure due to such usage lead to very low prevalence of condom-use, and therefore the practice of unsafe sex.

Migration and Mobility: Migration has added another dimension to the epidemic in India. The country has seen and continues to see significant migration, both between states and between the country and neighbouring countries. Limited employment opportunities and the consequent poverty force many to move away from underdeveloped areas in search of livelihoods – often from rural areas to the big cities. There are over 180 million migrant workers in India, many of whom are single or who live apart from their wives and families. Mobility and migration create conditions in which people become vulnerable. Many migrants work in low paid, unskilled jobs and in hostile conditions. Being away from home and familiar socio-cultural norms are in themselves major causes of vulnerability. This is compounded by isolation, poor living conditions, exploitation and deprivation of dignity and human rights, often lead them towards

drug dependency, substance abuse, and to seek company for solace and emotional support. This state of mind and lack of knowledge potentially manifests into high-risk behavior, increasing the chances of getting a sexually transmitted infection. Migrants who are infected and who have left the partners back home would necessarily infect others in their community, including other workers.

Concerted efforts are needed to address the vulnerabilities of the large migrant population. Truck drivers are a group known for the highest risk levels due to patterns of sexual practice linked to their mobility and long periods away from home and the sub-culture of this group.

Injecting Drug Use (IDU) : Studies indicate that many drug users are switching from inhaling to injecting drugs. This phenomenon is more localised in a state like Manipur where there is very high correlation between injectable drug use and high incidence of HIV. Forty-one percent of IDUs in a national survey reported injecting with used needles or syringes. Of those who cleaned their needles and syringes, only three percent used an effective method such as alcohol, bleach, or boiling water. Appropriate strategies are also needed to address the double impact of drug use and unsafe sexual practices.

Low Status of Women : Infection rates have been on the increase among women and infants in some states. Patriarchy and the low status of women contribute to this, as does the biological increased susceptibility of women to infection from even a single exposure. The main way by which unequal gender relations act is the inability of women to be able to decide on the sexual partners and negotiate the nature of the sexual experience so as to be able to make for safer sex. Also, the contraceptive methods available to women do not protect her from contracting HIV, and they often do not have the power to negotiate condom-use and safe sex by their partners. The availability of the female condom is quite limited, and so is the level of awareness about this method. This is as much culturally determined as it is by their weaker financial and asset position that makes them vulnerable to others control over their bodies. Poverty, low literacy and low awareness level are other factors responsible for spread of infection among women. Worldwide, approximately 30% of women report that their first sexual experience was forced or coerced, making sexual violence a key driver of the HIV/AIDS pandemic. Sexual assault greatly increases the risk of HIV transmission as protection is rarely employed and physical trauma to the vaginal cavity frequently occurs which facilitates the transmission of HIV.

Widespread Stigma : HIV/AIDS related stigma and discrimination is a major problem. In every country and every social setting since the disease was first identified, individuals who are or who are assumed to be HIV positive have been subjected to a variety of negative reaction, including physical and verbal abuse, loss of homes and employment, rejection by families , spouses and friends, and violation of basic human rights and fundamental freedoms. Stigma towards people infected with HIV/AIDS is widespread. The misconception that AIDS only affects men who have sex with men, sex workers, and injecting drug users strengthens and perpetuates existing discrimination. There are also unreasonable fears about its infectivity due to lack of basic information about the disease. Even at sites of medical care, people living with HIV could get discriminated against. The

most affected groups, often marginalised, have little or no access to legal protection of their basic human rights. Addressing the issue of human rights violations and creating an enabling environment that increases knowledge and encourages behavior change are thus extremely important to the fight against AIDS.

HOW IS PREVALENCE ESTIMATED?

There are three methods used:

a. *Sentinel HIV surveillance in Ante-natal Clinics*: In a few chosen sites of ante-natal care, all pregnant women who come for a blood check-up have their blood tested for HIV. The percentage of such women who test positive for HIV is used as an indicator of the level of spread. We are assuming that the women who come to that particular clinic are representative of all women in the reproductive age group. Above 1% it is an epidemic situation. Above 0.5% prevalence is high. Below 0.25% it would be a low prevalence area. A 0.25% prevalence in a sentinel source would mean about 250 cases of HIV positive persons per lakh population. Or about 50,000 cases per 2 crore population. Ideally there should be one such site per block– the aim now is to have one such center per district. This is not an accurate estimate- there are errors that make it an over-estimate and others that make it an under estimate – but it is the nearest we have to a population prevalence indicator. 94 districts across 12 states have more than 1% prevalence of HIV among ante-natal women.

b. *Sentinel HIV surveillance in STD clinics:* In a few chosen STD clinics everyone who presents for a consultation irrespective of whether she/he is proven to have another STD problem have their blood taken and tested. The number of cases that test positive expressed as a percentage is another proxy indicator of prevalence. Above 5% is seen as a cause for alarm.

c. *Reported HIV positive and AIDS cases*: This is used most often and can be very misleading. Most cases of AIDS present as tuberculosis or diarrhoea and are never diagnosed as AIDS. Often diagnostic testing for AIDS even in suspect cases is very poor due to poor availability of diagnostics in many health facilities. However this figure indicates the number who would be requiring treatment facilities at present. One should NOT use this figure as an expression of disease prevalence.

Categorising HIV Prevalence

High prevalence state means prevalence among antenatal mother is >1% and >5% among STD clinic attendees.

Moderate prevalence state means prevalence rate among antenatal mother is >1% and <5% among STD clinic attendees.

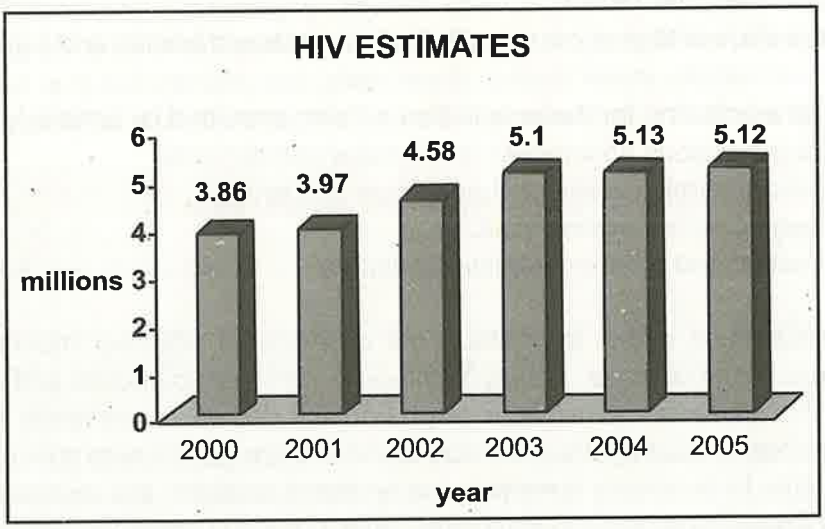
Low prevalence state means prevalence rate among antenatal mother is <1% and <5% among STD clinic attendees.

Burden of Disease

The NACO website (page on facts and figures) offers this succinct summary of the estimated burden of HIV in India.

"HIV infections for the year 2002 were estimated at 4.98 million, and for the year 2005 at 5.206 million giving an adult prevalence rate of 0.91% in the country."

Even the slightest increase in percentage means a large increase in actual number of people who are infected. 38.4% of the estimates are expected to be among women, 57% of the infection is estimated to be in rural area and over 59,000 children are estimated to be affected. These estimates were calculated based on the data collected from 703 surveillance sites (antenatal clinics, STD clinics, female sex workers, injecting drug users, men having sex with men, TB patients and migrants).



Source: National AIDS Control Organisation (2005), Ministry of Health and Family Welfare, Government of India (http://www.nacoonline.org/facts_overview.htm)

The estimates also show that 88% of the infected people are in the age group 15-49 years. The HIV transmission is fast spreading from the high risk population to the general population. Only 14% of the population in the country have tested themselves and know whether they are HIV positive or not.

HIV CONTROL STRATEGY

The strategy for AIDS control and prevention is being implemented according to the plan broad framework of the National AIDS Control Plan. This plan may be considered as having five major components.[1]

COMPONENT I: PREVENTION OF HIV INFECTION IN HIGH RISK POPULATIONS

Targeted Intervention (TI) is the set of the activities taken to reach out to high-risk groups. These programmes are largely implemented through NGOs since it has to reach high risk groups who are marginalised and would have difficulty in accessing routine public or private health services. Such high risk groups include:

1. Adapted from the National AIDS Control Organisation (NACO) website (http://www.nacoonline.org) and the Andhra Pradesh State AIDS Control Society (APSACS) website (http://www.apsacs.org)

a) Migrant workers in the slums
b) Street children
c) Sex workers
d) Truckers on the National and State highways
e) Transgender persons
f) Men having sex with men (MSM)
g) Prison inmates and inmates of other institutions like remand homes and juvenile homes.

Technical support and monitoring for these activities is being provided by a state level TRU (Technical Resource Unit). The interventions encompass three major components:

i. Syndromic management – access to health care and drugs
ii. Behavior Change Communication (BCC)
iii. Condom Promotion and other preventive measures

Stigma and denial undermine efforts to increase the coverage of effective interventions amongst all these high risk groups. Many of these groups also face harassment by police and ostracism by family and community and this drives the epidemic underground and decreases the reach and effectiveness of prevention efforts. Unless special efforts are made and there are groups with special concern for these sections or who are able to develop a team to focus on these sections, the routine system is unable to reach till them. Other areas of intervention that come under TI are STD care and STD counseling, creating enabling environment through advocacy and establishing linkages with other agencies/organisations.

COMPONENT -II: PREVENTION OF HIV INFECTION IN LOW-RISK POPULATION

To prevent HIV infection in low risk population, the following activities are to be taken up

1. Information Education and Communication (IEC):

- The media especially television and radio are extensively utilised. Key messages on HIV-related issues are given to the public through newspapers and magazines. Hoardings and billboards are erected on the highways with messages on STIs and HIV/AIDS.
- Mobile van campaigns, kalajathas, local meetings and camps help in social mobilisation and a readiness to question existing behaviours and attitudes. These can be focussed on specific audience segments.
- Nukadd nataks (street plays) and puppet shows are most acceptable/effective communication mode to disseminate information or bring awareness on HIV among remote village dwellers particularly among women and adolescents girls those are not literate.
- Inter-personal communication through health workers at the household and community level, counseling at sites of health care provision are key to achieve behaviour change in an environment rendered facilitatory by other media interventions.
- The content of communication is for promoting safe sex and responsible sexual behaviour, for condom use, for improving health seeking behaviour in RTI/STI treatment, and for the use of

voluntary confidential counselling and testing centres (VCCTC) and prevention of parent to child transmission (PPTCT) programme.

- Stigma and discrimination against people living with HIV/AIDS and those considered to be at high risk remain entrenched. A lot of this is a result of inadequate knowledge. Though there is significant increase in awareness, due to efforts by the government, there is much room for improvement.

2. Family Health Awareness Campaigns (FHAC) are conducted every year to create awareness among the age group of 15-49 years and to identify and treat sexually transmitted infections. These are camps held in villages or in sub-centers and urban health centers where eligible couples and young adults are encouraged to attend for a discussion and counseling as well as check ups to those who need it.

Family Health Awareness Camp (FHACs)

The specific objectives of FHACs are:

- To raise awareness on RTI/STD and HIV/AIDS in rural areas and other vulnerable groups of the population.
- To encourage health seeking behaviour in the general population for RTI/STD.
- To make people aware about the services available in the Public health system for the management of RTI/STD.
- To facilitate early detection and prompt treatment of RTI/STD by mainstreaming the program.
- To implement a focused IEC strategy for the male population.

Preparatory Activity:

- *Mass Awareness and Social Mobilisation:* Two rounds of house to house contact by health workers have been envisaged prior to the observance of FHAC. The objective of the household contact is to inform target group in age range of 15-49 years about reproductive health problems, facilities available for treatment and ways and means to prevent sexually transmitted infections. It is proposed to have sentisisation workshops for community opinion leaders, NGOs and representative of Panchayats at district and block levels to seek their active participation in this campaign. Approporiate steering committees and mass media committees may also be needed at each level.
- *Capacity building in management of STDs:* A massive training program is undertaken in the district for training of Medical Officers with booklets on Syndromic management of STD. Flip charts are being used for the training of paramedical workers.
- *Procurement and reach of STD drugs:* Every PHC should have the necessary drugs to treat STDs.

Holding camps in each village during campaign:

Camps are held separately for male and female target groups in each village. Each camp is attended by male and female health workers separately and assisted by community volunteers. The health workers will discuss the problems of RTI/STI with the target group in reference to cases, symptoms and complications. They will also make them aware about HIV/AIDS transmission and its prevention and control. Attendees of the camps will also be informed about the facilities available for treatment and referral slips will be issued to those who need treatment. Health care workers would also keep a record for those who are referred for treatment so that they can make follow-up visits to ensure complete cure of the patients.

Monitoring and Evaluation:
Supervisory visits by central and state level observers using a standardised check list devised for the purpose. The state will identify the agency for conducting concurrent evaluation.

Process & Impact Evaluation:
India Clinical Epidemiology Network (INCLEN), a professional organisation was assigned the responsibility for conducting process and impact evaluation.

Results
A pilot round of this campaign was observed from April 26 - May 1, 1999 in 100 districts across the country. The second round of the campaign was launched in 266 districts during December 1-15, 1999. This campaign was observed in most states. About 175 million people were identified in the target age group of 15-49 years. Of these, 45 million (25.6%) attended the village level camps organised for awareness. The number of persons referred to PHCs/CHCs was 1.7 million and 1 million were treated. The turnout of females was very good (77.7%) as compared to male attendance (22.3%) for RTI/STD syndromic management. Encouraged with the response of the previous rounds, it was decided to conduct this campaign twice a year.

Note: It is not clear on what was the experience on further years. It is likely that after the first two or three years this degree of coverage may have been difficult to achieve.

3. School AIDS education: Young people in the age group of 15-24 years are most vulnerable to HIV infection. Keeping this in view, AIDS prevention education programme is to be taken up in all high schools and higher secondary schools. In many schools there may be resistance from public or conservative decision makers to introduce frank discussions on sex, more so on the need for protection from infection in non-marital sexual relations. The sex education programme is usually made part of a life skills education programme where a number of topics of interest to adolescents and adolescent health are introduced. Good advocacy work is needed before and during to facilitate this process.

4. College AIDS awareness programme (CAAP)/Universities Talk AIDS Programme : Under College AIDS awareness programme and in universities students are being covered through the active involvement of National Service Scheme (NSS).

5. AIDS prevention among youth groups outside of educational institutions is also to be taken up to create awareness among the youth about condom use, STI identification and treatment, behaviour change etc. Different approaches are used to reach such youth – including meeting them at places where youth hang out, special programmes that attract youth etc.

6. Blood Safety: This is aimed at lowering HIV infection through blood transfusion. Licensed blood banks are to be set up – at least one in each district – where possible more and these blood banks should be certified as following all safety norms. In addition voluntary blood donation is promoted through active

involvement of Indian Red Cross Society and National Service Scheme and by various motivational programmes and blood donation camps. All the Government and charitable blood banks are being encouraged to conduct voluntary blood donation camps. A voluntary blood donation day is to be observed throughout the State on a fixed day to realise the importance of voluntary blood donation.

7. Integrated counselling and testing centres (ICTCs): HIV counseling and testing facilities are to be provided in all the district and area hospitals. ICTCs (general and for ante natal cases screening) have been set up and they are providing good counseling services to the clients. ICTCs also promote good health-seeking behaviour among the vulnerable groups. They are primarily meant for people who are voluntarily seeking advice or who are referred from STD clinics and other outpatient services on suspicion of having HIV. A critical question is – how many must be established in a district and where so that they can be accessed, and whether special arrangements are needed for high risk groups to access them?

8. Prevention of parent to child transmission (PPTCT) programme: To prevent transmission from mother to child these facilities are being set up in all teaching hospitals, maternity hospitals, district hospitals. HIV testing is done free of cost for all the pregnant women in these centres. Anti retroviral drugs to the pregnant women are also supplied free of cost as part of this intervention for prevention of vertical transmission from the mother to the child.

9. STD Clinics: STD clinics are to be made operational in all general hospitals, district hospitals and area hospitals. The STD clinics are established to provide STD treatment facility to a large number of people for curing STD infections.

10. Condom promotion: One of the most successful and practical ways to prevent the transmission is the use of condoms. Indeed in a number of situations, condoms are the only option available. Condoms are affordable and effective.

However, building a country wide programme to enable universal access and utilisation of condoms is a huge challenge of planning and implementation. It requires at least four steps:

1. Sensitise people for using condoms not only for the sake of family planning but also as the best preventive step against HIV and STD. Where it is not being used for limiting family size two perceptions need to change:
   a. It is not only for use in non-marital contexts – but needs to be used even within marriage.
   b. It is not a form of abstinence or even a form of denial – it is part of being able to find pleasure in the sexual experience and the necessity of finding such pleasure in it.

2. Convince all high risk population groups about the importance of use of condoms, on every single occasion, as an essential means for preventing the HIV transmission.

3. Make available low cost and good quality condoms to the people all over the country easily at the time and place when they need it. Quality requires technical assistance, and adherence to international specifications, and a good quality assurance system to monitor this. Access requires use of all public systems for distribution and outlets as well as social marketing on a very intensive scale. In targeted interventions condoms are made available at subsidised costs.

4. Foster an enabling environment among the highly marginalised group those are at risk like sex workers, men having sex with men and injecting drug users for condom promotion to minimise risk practice.

Component - III : Programme Strengthening

Sentinel Surveillance: Sentinel Surveillance sites are to be set up in all districts. There are two types of sentinel surveillance – for ante-natal care clinics and in STD clinics. Sentinel surveillance is also to cover Hepatitis B, Hepatitis C and VDRL (for syphilis).

Monitoring: Computerised Management Information System (CMIS) is to be established and performance indicators targets have been worked out. Progress of all the activities of APSACS is being monitored every month.

Training: Capacity building at different levels is undertaken to strengthen the different components of service delivery and programme management. Nodal Training Centers are identified for conduct of these trainings. An important training content is on standard treatment protocols for different complications seen in HIV infections.

Component IV: Care and Support Centers

Care and support centres are to be established by the involvement of non governmental organisations (NGOs) to support the people living with HIV/AIDS. These centres are provided with infrastructure, doctors, counselors, staff nurses and other ancillary staff to extend best services to the HIV/AIDS people. They extend care and concern towards people living with HIV/AIDS by providing food, shelter and treatment facilities.

Component V: Inter - sectoral Collaboration

To mainstream HIV/AIDS, Governments need to make it compulsory for all Departments to incorporate HIV/AIDS as part of all training and extension programmes. Departments of School Education, Higher Education, Police, Youth Services, Transport, Women and Child Development, Watershed Associations, ICDS and SHGs are some such sections who can be approached and sensitised. All Panchayati Raj

members should be sensitised and they would be actively involved in HIV/AIDS related issues.

KEY CONSTRAINTS IN HIV CONTROL AND THE ROLE OF DISTRICT PLANNING

Despite the considerable investment going into HIV control programme, results are constrained by a number of bottlenecks. District planning is an opportunity to address many of these bottlenecks. These constraints can be discussed under the following heads:

1. Scale of efforts
2. ABCD approach and the need to address human sexuality
3. Poor quality of support systems in place
4. Sectoral weaknesses that impact on HIV control. – access to facilities, lack of tertiary care support
5. Standalone approach and the need for mainstreaming AIDS control
6. Lack of effective district and local planning

1. Scale of Efforts

One general problem in many HIV control efforts is that though there is a plan for all the necessary activities, the scale of every activity is grossly inadequate. This often occurs because a state level resource allocation and activity plan is disaggregated to districts – leaving each district sub-critical with respect to inputs. Thus for example, school education would take place in 5 schools out of 30, adolescent health camps in 20 villages out of 600, family awareness camps in 20 villages, many of them the same as the earlier camps, condom distribution would presumably have been arranged for all areas though in fact it would be available in only about two thirds of them, VCTCs would have been organised at the district hospital and not in all the CHCs, and targeted interventions would have started for truck drivers in one of the two highways in the district but not for all other high risk groups. When asked the district officials would perceive that the programme is in full swing and all activities are going on – and indeed they are – but at such scales that there would be negligible impact at all on the rising epidemic.

Thus district plans always need to show what it takes to do the activities 'to full scale' within a defined time period. Scaling up is not just a matter of multiplication by a larger factor- it would mean the creation of intermediate management structures, changes in monitoring strategies, the recruitment and support to many more agencies and partners, and may even entail change of the overall strategy and programme design.

2. ABC of HIV Control

One message that is very popular in HIV control is what is called the ABC of HIV control.

A- Abstinence
B- Being Faithful
C- Condoms

The message told to the audience, often youth in their biologically most sexually active age, is that the aim is for abstinence, but if you have sex, you had better be faithful to one partner and if for some reason you are not–then at least use condoms. These reflect a set of values that many think are the values to be promoted.

A more useful step has been to add a D as Drugs. Drugs are available now and though they do not cure HIV/AIDS, they can definitely improve quality of life. All HIV positive people must be motivated to go for testing called CD4 testing. Based on the level of CD4 test the drugs are given. This treatment is known as ART (Anti Retroviral Treatment). Over 50,000 people are on ART in country now.

Problems with the ABC Approach

a. The message goes down well with those who are already within safe sexual practices, but is of no help to those who because of many circumstances are not following them. Given below are a few examples of such situations:

   i. Women in families are unable to tell their husbands to use condoms- even where the husband is a migrant worker or is known to have multiple partners and is known to be in a high risk situation.
   ii. Many men would believe that they should use a condom when they have sexual intercourse with a commercial sex worker – but not with their wife.

b. As the age of marriage is pushed back (which per se is a good thing) society invariably has to settle for much higher levels of premarital sex. In many countries this is the norm and not having sex prior to marriage is almost akin to deviant/abnormal behaviour. Even in the Indian context such mores are changing and the message of abstinence not only fails to evoke a response – it may actually create a further confusion as regarding the perception of what is healthy sexual behaviour. This requires acceptance of the nature of human sexuality, and that pleasure of sexual relationship is a necessary and welcome part of good health. Abstinence per se is not a virtue- though it may become necessary due to social and family circumstances and is something that one has to "help youth to cope with" where it has become necessary. Nations with more successful youth and adolescent health programmes teach youth the skills to negotiate the man women inter-personal relationship into a healthy one.

c. The condom or for that matter sexual intercourse itself must not be linked to the fear of pregnancy and the fear of disease. The condom should cease to be the "next best thing to abstinence" and needs to be re-positioned as something that is needed even within the monogamous couple/the family as part of making the sexual experience more pleasurable. And the latter should be one cornerstone of promoting responsible sexual behaviour. The altogether negative messages on

perception of sex which the HIV and population control programmes send out- tend to be self defeating. These campaigns would need to position themselves as promoting more active sexual lives as part of promoting good health- and safe sex as being essential to pleasure in sex.

d. There is a close linkage between "pleasure in sex as the cornerstone of safe sex" and the need to make "the relationship between man and woman into an equal relationship and not an exploitative one." This is true within marriage and outside it- within sexual relationships and outside it. This is particularly important for sexual relationships within marriage – which too often is taken for granted as a right of the male and a duty of the female. Even within marriage, women are not expected to talk about sex, their consent is not considered as required, and the concept of it being pleasurable for both as being necessary for it being pleasurable for either is not understood. The whole range of similar stereotypes associated with sexual behaviour within the marriage are unhelpful for the promotion of sexual relationship within marriage as pleasurable, and therefore act as drivers of unsafe behaviors. Societies that have gender equity and women's empowerment are likely to be able to control HIV epidemics – and population growth better than those which have high levels of gender inequity and lower levels of women's education.

e. Given the fact that many of those who have to provide education and skills on sexual behaviour are steeped in one sense of values and practices and completely out of sympathy for any other- addressing these issues of sexuality above become almost impossible. This requires very special programmes to develop counseling skills on sexuality related issues in health care providers and even better quality of training of trainers of health care providers and community health workers. While good training of trainers can help improve the quality of communication by health care providers, the focus would need to be on peer educators. Peer education strategies require much thinking into choice of peer educators, into access to communities to help select peer educators, into training of peer educators on these issues, into deployment and support of peer educators etc.

f. Health communication in a district would also need careful research inputs to define- audience segments, current patterns of behaviours, their determinants in each segment, the acceptability of different messages within the current cultural and social context, the possibility of negotiating more space and acceptability for issues related to sexuality. Such formative research for aiding district planning is neither costly nor time consuming, but it requires skills and professional support to develop such skills.

3. Health Systems Gaps

a. **Support systems gaps**: HIV control strategy requires a number of support systems. Thus for example, the procurement and distribution of condoms is one challenge. The procurement and distribution of ART drugs to meet requirements is another type of challenge. These need logistic

systems in place. It is neither efficient nor desirable to build a drug procurement and distribution system only for HIV. It would have to be integrated with the logistics of the entire public health sector.

Other similar support system needs relate to:

i. Laboratory services
ii. Blood transfusion services
iii. Research and planning capacities

b. **Facilities gaps**: HIV control strategies assume that a number of health facilities and health care providers are available with a certain minimum distribution throughout the country. Yet in large areas there are inadequate number of facilities created and even where they are created they are poorly functional due to staff or equipment or supplies shortages. Obviously HIV control activities would not reach these areas. The situation can be critical in urban slums which are high risk areas and there are no urban health care facilities which can take on this task.

c. **Governance and administration**: Even governance and administration problems of the health sector would affect directly and indirectly (through poor functioning of health care facilities) adversely affect the HIV control strategy.

4. HIV CONTROL AS VERTICAL AND FRAGMENTED PROGRAMME

To give emphasis to HIV control and for a better management of its funds there have been separate institutional and organisational structures created at national, state and district levels. The problem with this is poor coordination with the main stream health sector and the relegation of AIDS control work to the AIDS control organisations. The mainstream organisations and staff do not participate or take initiative and without it HIV control neither has outreach nor effectiveness.

The need is therefore for using the district plan to mainstream HIV control.

5. MAINSTREAMING AIDS CONTROL

i. Home and neighbourhood

Community health volunteers (ASHAs) and Anganwadi workers and their helpers with basic health care supplies, like ORS and vitamin A are the most basic requirements at the peripheral levels. They should be trained for working with peer educators. Home based and family members have also to be trained for a community based care and basic treatment and palliative, physical and social support and education. The specific tasks of the community health worker would be:

- Increase awareness of what AIDS is and how it is acquired.
- Play the role themselves or support peer educators to discuss behaviour change communication strategies.
- Identify families within village with higher degrees of marginalisation and vulnerability especially migrants, cultural sub-groups etc and assist families in protection, facilitating their access to counseling and to diagnostic and therapeutic facilities.

ii. Sub-centres

Male and female health workers in the Sub-centres should be trained for:

- Counseling families with high degree of vulnerability.
- Management of common day-to-day problems of HIV/AIDS.
- Counseling on sexuality related behaviors as part of approach to all couples in the reproductive age group (the eligible couple).
- Assisting families to access diagnostic and therapeutic facilities where needed
- Ensuring checking for HIV as part of ante-natal check up especially where vulnerability is suspected. If any case is positive, active responsibility to ensure family's access to a facility equipped to treat for prevention of transmission from parent to child.

iii. Primary Health Centres

- All the activities as specified for the Sub-centre
- Adolescent clinic especially for health check up and awareness work once a week. This may be combined with the family planning clinic.
- RTI/STI clinics once a week – not on same days as the above. One nurse practitioner (in the absence of a trained lady doctor) who can manage RTI/STI care and safe abortion services and provide counseling for women and adolescent girls.
- Basic screening tests for HIV.
- Standard treatment protocols in place and used for all health staff.

iv. Community Health Centres and District Hospitals

All functions as described for PHCs and in addition:

- Diagnostic aids for all STDs and HIV testing.
- STD clinic at least once a week. Ability to treat all STDs.
- Safe blood banking at the district hospital and blood storage facilities at the CHC.
- They should coordinate with NGOs and community based health and development programmes.

- Clinical, nursing and specialist care will be made available by providing proper training.
- Data management as relevant to HIV control – from the periphery and from the hospital itself.

v. Tertiary care hospitals and designated regional hospitals

Tertiary care institutions, and where these are insufficient, such colleges, regional hospitals and general urban hospitals to serve as referral institutions and also provide care to all who attend. These include:

- Ability to treat HIV infection adequately
- Major clinical specialties which manage complications are available and can recognise and manage HIV infections.
- Linkage to national referral and academic hospitals to keep abreast of latest developments in treatment and diagnostics.
- Develop in line with national policy guidelines and train staff at district and sub-district level on standard treatment guidelines.

vi. Management and governance

- HIV control becomes part of the district plan.
- District Health Societies and district HIV societies work as one or in close collaboration and have joint plan of action.
- Sharing of facilities and support systems

6. District Planning and HIV Control

Integration of HIV control into a district plan requires attention to all the strategies and issues raised above. In addition we need good data for planning and this can be a major constraint. Both program related data and epidemiological data is needed. Even the data that is already generated is seldom used to manage the programme and link to decision making. District planning also requires integration or close coordination of management structures.

The data we need should be able to answer in the least the following questions:

- What is the prevalence from the usual three sources of prevalence data?
- What are the total number of high schools and higher secondary schools and the student population in these?
- What would be the out of school adolescent number who are in the school going age?
- What would be the number of VCCTCs required to provide testing services for the district?
- What is the estimated number of people living with HIV/AIDS?

Linkages between VCCTC and HIV prevention, care and support services

- Community support to mainstream HIV/AIDS
- Additional counseling to promote behaviour change and to accept and cope with serostatus
- Peer support, including access to HIV support groups
- STI prevention and treatment
- Early access to medical care
- Preventive therapy for TB, other opportunistic infections and their early management and even ARV treatment
- MCH services
- PPTCT
- Access to condoms
- Access to family planning services
- Material and financial assistance
- Legal services for children and family, making will etc.
- Spiritual Support

I. Review Questions

1. How does AIDS spread?
2. What are groups that need targeted intervention and what strategies can reach out to these groups?
3. What are the VCCTCs?
4. How does one limit transmission from mother to child?
5. What does it mean to say "mainstreaming HIV into the health sector?" What are the roles in HIV control that is played by the systems at each level?

II. Application Questions

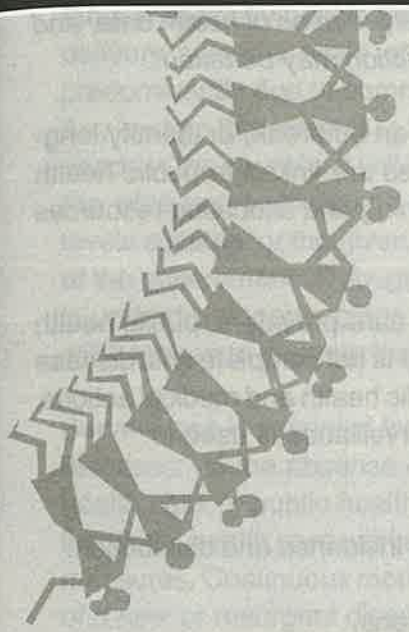
1. Is the ABCD approach the center of BCC messages in the district? How far do you think it is possible for us to be able to open a discussion on issues of sexuality at different levels?
2. What would be vulnerable high risk groups in the district?

III. Project Work

1. Locate the nearest surveillance sites in or near your district. From its figures what is the estimated prevalence of HIV in the district.
2. In each component listed in the text what would be the requirements in the district for a full coverage- how many VCCTCs, how many family health and awareness camps etc etc. How much of these activities can be done?

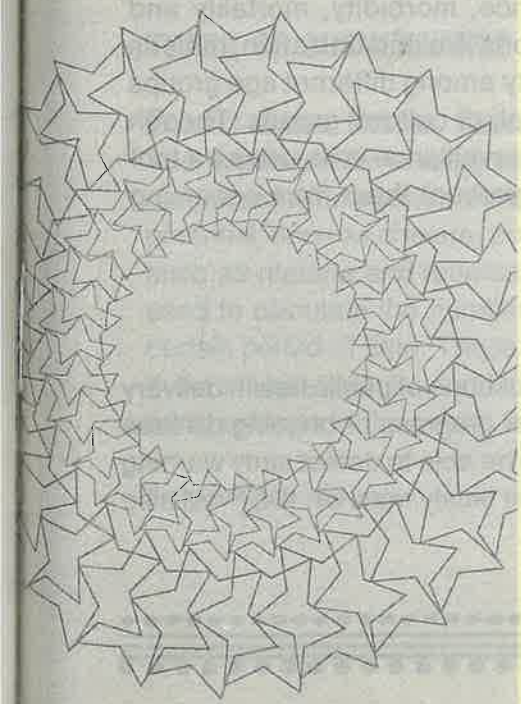
Lesson SIX

Integrated Disease Surveillance Programme



In this lesson we shall discuss:

- What disease surveillance is.
- What the importance of disease surveillance is.
- What the types of surveillance are.
- Deficiencies and constraints in the earlier system..
- Objectives, components and structure of the proposed IDSP.
- Challenges in integrating and using the IDSP.



WHAT IS DISEASE SURVEILLANCE ?

Surveillance of a communicable disease is fundamental for disease prevention and control. Surveillance is defined as the "*ongoing systematic collection, collation, analysis and interpretation of health data; and the dissemination of information to those who need to know in order that action may be taken*".

Surveillance can detect sudden changes in disease occurrence, such as an outbreak, or identify long-term disease trends or new and emerging diseases. Surveillance activities are linked to public health actions, such as investigation, control and prevention, evaluation, or planning and allocating resources to address the diseases affecting the population.

An important component of surveillance is sharing data back with health care providers, public health agencies, policy makers, and the general population. The surveillance cycle is not complete until disease information is relayed to those who have responsibilities for the various public health and medical actions. Surveillance assessment reports should serve to inform and motivate. Surveillance is used to:

1. Identify cases for investigation and follow-up.
2. Estimate the magnitude of a health problem and follow trends in its incidence and distribution.
3. Formulate and evaluate control and prevention measures.
4. Detect outbreaks or epidemics and generate appropriate interventions.
5. Monitor changes in infectious agents (e.g., antibiotic resistance, emerging infections).
6. Facilitate epidemiologic and laboratory research.
7. Detect changes in health practice (e.g., impact of use of new diagnostic methods on case counts).
8. Facilitate planning (e.g. allocation of program resources, policy development).

Disease surveillance provides information such as disease incidence, morbidity, mortality and progress in achieving disease control goals through various interventions like immunisation, malaria control programmes etc., changes in patterns of morbidity and mortality among different age groups in different demographical areas and among different economic, social, or cultural groups. Though surveillance is useful for all diseases the overriding value of disease surveillance is its use as a tool to identify the presence of infectious diseases and guide actions to prevent them from becoming threats to public health.

WHY IS A SURVEILLANCE SYSTEM ESSENTIAL?

Integrated Disease Surveillance Program (IDSP) is intended to be the backbone of public health delivery system in the country. It is expected to provide essential data to monitor progress of ongoing disease control programs and help in optimising the allocation of resources. It will be able to detect early warning signals of impending outbreaks and help initiate an effective response in a timely manner. IDSP will also

facilitate the study of disease patterns in the country and identify new emerging diseases. It will play a crucial role in obtaining political and public support for the health programs in the country.

India is currently passing through an epidemiological transition. Many states in India have good health delivery systems while other states are lagging far behind. Health problems of some states are predominantly due to communicable diseases, while in others it is due to non-communicable diseases. Any system that intends to be futuristic will need to take into account the variability and cater to different needs in the country. It will need to be decentralised and state specific. The program will need to cater to the wide geo-political and socio-economic differences in the country and tailor its implementation to levels suitable for the given region in the country. Equity in health delivery is one of the primary concerns of the government. Through an effective disease surveillance program, health of vulnerable populations in underdeveloped regions and tribal populations in India will be better understood and corrective steps will be taken to improve their conditions.

Surveillance is essential for the early detection of emerging (new) or re-emerging (resurgent) infectious diseases. In the absence of surveillance, disease may spread unrecognised by those responsible for health care or public health agencies, because sick people would be seen in small numbers by many individual health care workers. By the time the outbreak is recognised, it may be too late for intervention measures. Continuous monitoring is essential for detecting the 'early signals' of outbreak of any epidemic of a new or resurgent disease. For disease surveillance to prevent emerging epidemics, the time taken for effective action should be short.

Empowering the public to be responsible is an important function. Surveillance data can be effectively used for the purpose of social mobilisation to help the public participate actively in controlling important diseases. This is an important step in reducing the burden of disease in the community.

TYPES OF SURVEILLANCE

Facility-Based Routine Surveillance

The health facility is required to report on the number of individuals that come to their facility and are diagnosed with reportable diseases. These reportable diseases are usually diseases that have outbreak potential, such as cholera, polio, and measles, or diseases that are targets of national control programs, such as malaria and tetanus. Data on individual patients, which are recorded in patient registers, are used to calculate the number of cases of reportable diseases diagnosed by health facility staff over a certain period of time. These data are periodically reported to district authorities who compile and send them to higher administrative levels. This process of detecting and reporting information on diseases that bring patients to the health facility is known as passive surveillance.

Passive surveillance yields only limited data because many sick people do not visit a health facility and

because those cases that do show up may not be correctly classified, recorded, or reported. If managers fail to fully understand and account for these limitations, they may incorrectly interpret trends and patterns of infectious diseases.

One way to overcome the limitations of passive surveillance and get a better picture of disease burden in the community is for health workers to visit health facilities and communities to seek out cases. This is known as active surveillance.

Since passive surveillance has limitations due to its lack of access to some groups within the population, active surveillance is often used to enhance the completeness of a passive surveillance system. Active surveillance is also more expensive than a passive system and requires considerable additional effort to organise. This means that active surveillance is usually conducted on a limited segment of the population and for only a brief period. Active surveillance is, therefore, used to gain targeted insight into a situation and not collect routine data over a long period of time.

Routine surveillance by health facilities, whether passive or active, is often hampered by the difficulty of making accurate diagnoses. Health workers may lack the proper equipment or training for diagnosis in the health facility, and laboratory services are often not available to confirm clinical diagnoses.

In certain instances, health workers conduct case-based investigations to learn more about a specific illness pattern, for example, when there is a suspected case of a disease targeted for eradication, such as polio, or during suspected outbreaks of epidemic- prone diseases such as yellow fever. In case-based investigations, health workers record information such as the patient's name, age, vaccination status, location, date of disease onset, suspected diagnosis, and laboratory results (when available).

Community - Based Surveillance

With training, members of the community can expand facility-based surveillance by detecting and reporting cases that may go undetected by the health facility. A good example of this is the use of community members to detect cases of guinea worm (Dracunculiasis). In villages where the disease is endemic, volunteers are trained to detect and report cases using a standard diagnostic criterion, e.g., painful legs that have skin ulcers with worms protruding. They then may undertake treatment, referral, and containment measures such as bandaging the ulcer, instructing infected persons not to bathe in water from ponds and streams, and promoting the use of filtered drinking water.

Community-based surveillance needs the support of trained health care workers who in turn provide training to the community on how to recognise the disease and how to respond when people are ill. While the focus of community surveillance may be on a specific disease, community members may also be trained to detect an array of health problems. Community members and health workers can work together

to organise transport, childcare, and other assistance and, sometimes, provide medical supplies, treatment, and vaccinations. Reports by community members should be incorporated into the overall surveillance data managed by health personnel. Health systems should also provide feedback to the community about disease patterns in their own and surrounding areas.

Community-based surveillance can be very useful in detecting and treating some illnesses. However, it generally has a high error rate and should be used carefully. Case definitions need to be very simple and specific for community identification and this means that diagnoses need to be confirmed by someone with more advanced training. While it is always wise to involve the community as much as possible in health initiatives, community-based surveillance is not appropriate for all conditions and situations. Health workers should carefully test the community-based approach before initiating it and should be prepared to regularly monitor activities to ensure that definitions are being applied correctly and that the health of the community members is being served well by this approach to surveillance

Sentinel Surveillance

Sentinel surveillance is the collection and analysis of data by designated institutions selected for their geographic location, medical specialty, and ability to accurately diagnose and report high quality data. For example, district hospitals may be required to report specific conditions such as bacterial meningitis in order to quantify the burden of disease due to Haemophilus influenza type b.

Sentinel surveillance means a limited number of sites are used for collecting surveillance data mainly to monitor trends or significant changes in occurrence of disease. The sites may or may not be representative of a broader, defined population. For example, the sentinel surveillance of HIV/AIDS in our country tries to track the trends in HIV prevalence in two distinct groups – the antenatal women represent the so called general population and the STD patients represent the population sub group at high risk of HIV infection in the rural and urban segments of any given state. Sometimes large hospitals are used as sentinel surveillance centres for rare diseases but may not be truly representative of the entire population.

Generally, sentinel surveillance is useful for answering specific epidemiologic questions, but, because sentinel sites may not represent the general population or the general incidence of disease, they may have limited usefulness in analysing national disease patterns and trends.

Comprehensive Surveillance : based on extent of population covered

Comprehensive surveillance covers all the people within the geographic area under consideration. This kind of coverage is only possible when all health facilities used by the people in a given area act as reporting units, and thus become part of the surveillance system.

Surveillance can also be categorised by whether they are disease based (based on clinical diagnosis) or

laboratory-based surveillance (based on laboratory investigation data – e.g. influenza virus surveillance, antibiotic resistance surveillance) or entomological (based on insect vector data e.g. malaria vector surveillance) or whether they monitor determinants like water and air quality surveillance, or nutrition surveillance etc.

CURRENT SYSTEM OF SURVEILLANCE IN THE COUNTRY

Each of the National Disease Control Programmes have their own monitoring of disease incidence and prevalence. The main programmes are on the control of malaria, filarial, leprosy, tuberculosis, the six vaccine preventable diseases, National Polio Surveillance Project and AIDS. Amongst non communicable diseases – rheumatic fever and rheumatic heart disease; cancer registries and diabetes have been three programme areas.

The Family Welfare Department carries out surveillance activities for family planning, child and maternal morbidity and mortality. Important agencies in this work are UNICEF which sanctions coverage evaluation surveys and the International Institute of Population Studies (IIPS) which carries out the National Family Health Surveys (NFHS) and the District Level Household Surveys. With regard to nutrition, the Department of Women and Child Development monitors child malnutrition through the nutritional surveillance systems designed by the National Institute of Nutrition. However, this is limited to a few states. The Integrated Child Development Services (ICDS) program also monitors nutritional status of children at the village level.

The National Institute for Communicable Diseases, Indian Council for Medical Research (ICMR) and the Central Bureau of Health Intelligence (CBHI) are national level resources for disease surveillance efforts. There are also Public Health Laboratories in most states. More recently the State Health Systems Development Projects have strengthened disease surveillance activities to varying degrees in seven states.

The central constraint of this system is its fragmented disease specific nature. Further the current system of surveillance is largely manual, and is not adequate to handle both communicable and non-communicable disease in urban and rural areas. And with the exception of malnutrition, the current system does not provide information on any non-communicable diseases.

The system has significant deficiencies in meeting the surveillance requirements at the periphery/block/district as it is not designed as a tool of local planning. Most of the disease information collected at the periphery is at the behest of the center. In addition, some states also collect some disease information for their own purposes. (i.e. 95 in Tamil Nadu and 50-65 in most other States). This leaves out the most frequent diseases like pneumonia or diarrhoea.

The existing infrastructure and the lack of connectivity and integration at various levels do not support adequate collection and transfer of data to the next level for timely decisions, proper feedback or analysis for supporting central planning either. Moreover, the lack of central standardised reporting, monitoring, and feedback mechanisms results in duplicated information involving manual reports being sent under various national programs to different authorities. Data management, analysis, reporting and dissemination makes only limited use of computer-based technology and modem communications. These deficiencies result in flows of information to states and districts which often arrive too late for the corresponding authorities to take effective action. This is a major problem, since often time is of the essence – especially in cases of epidemic outbreaks.

The laboratories in the system are also not modernised. The most important aspects of laboratory support that will need to be strengthened are testing for typhoid, cholera and water quality. In addition to provision of equipment, reagents and test kits, the project will also support training and quality assurance activities for laboratory information - the quality assurance activities will also include the diagnostic tests for TB and malaria, the actual equipment and reagents for which are supported under existing World Bank projects.

Moreover it is difficult to get data from private practitioners- formal and informal and they provide the major part of curative care services.

Most important of all, the present surveillance system is not action oriented and it is not able to prompt effective and timely responses to disease outbreaks. Currently, some states have epidemic investigation teams to respond to disease outbreaks established under the National Surveillance Project for Communicable Disease (NSPCD) which is piloted in 100 districts throughout India. The teams have not been effective as there is a delay between information collection at the local level, data entry and analysis, and decision to take action. In addition, as there is no structure at any level within which the surveillance activities are carried out there is no one responsible for organising, maintaining and implementing response mechanisms. A timely response needs local analysis of information, clear decision rules and the ability to respond at the local and district levels - someone needs to be responsible for assessing the information that comes in and, when necessary, initiating a response; this mechanism does not exist at any level at the moment.

An Understanding of "Control of Epidemics"

Successive epidemics of plague in the middle ages contributed to the definition of an epidemic as **the propagation of a single, well-defined disease.** The meaning of the term continued to evolve, but in common usage it still means the same.

In public health science, ***epidemic control involves all the measures designed to prevent, or reduce as much as possible, the incidence, prevalence and consequences of a disease***.

Control of epidemics requires a technical intervention, but further it is also equally essential to have **community participation, political support and intersectoral coordination** to be successful.

The technical interventions, given below, for epidemic control and prevention of disease are included in the components of Primary Health Care.

Controlling the reservoir of infection.
Eg: rats in Plague, pigs in Japanese Encephalitis. If reservoir of infection is an animal this is an easier step. But it is complicated when the reservoir is another human being like an "open case of Koch's". Isolation and quarantine of a diagnosed case and treatment of the case itself becomes inevitable.

Interruption of transmission.
Breaking the chain of transmission like (a) water treatment / chlorination, safe excreta disposal and hand-washing for waterborne diseases, (b) hand washing, safe excreta disposal and fly control for food borne diseases, (c) mosquito control for malaria and other vector control for other vector control diseases, (d) safe sexual practices for sexually transmitted diseases - are examples of some time tested measures to interrupt disease transmission.

Protecting the susceptible host.
Eg: Active Immunisation (Primary Immunisation for children), Passive Immunisation (antiserum for Tetanus, Diphtheria, gas gangrene etc.), Chemo prophylaxis (Tetracycline for household contacts in Cholera, Plague, Rifampicin in Meningitis for siblings etc.) are the measures advocated.

Choice of Technology during an Epidemic:
Depending on the nature of the disease and agent/host factors the intervention strategies differ. Whatever measures undertaken it must be based on sound public health principles, feasibility and cost benefit analysis and the context. In case of a rapid propagation of disease, the common understanding of epidemics, these measures have to be executed with no loss of time and the choice of technology may in such circumstances vary. Thus whereas vector control measures may be the mainstay of malaria control in a district, the response to a malaria epidemic may be a mass fever survey and treatment with chloroquine and primaquine - in some situations presumptively.

For each functionary level for each disease there should be a well planned epidemic response protocol, which is put into action when the incidence of the disease crosses the threshold level or trigger level as identified by adequate disease surveillance.

INTEGRATED DISEASE SURVEILLANCE PROJECT

Objectives

The project development objective is to improve the information available to the government health services and private health care providers on a set of high-priority diseases and risk factors, with a view to improving the on-the-ground responses to such diseases and risk factors. Specifically, the project aims:

- To establish a decentralised state based system of surveillance for communicable and non-communicable diseases, so that timely and effective public health actions can be initiated in response to health challenges in the country at the state and national level.

- To improve the efficiency of the existing surveillance activities of disease control programs and facilitate sharing of relevant information with the health administration, community and other stakeholders so as to detect disease trends over time and evaluate control strategies.

The project will assist the Government of India and the states and union territories to:

- keep under surveillance a limited number of health conditions and risk factors
- strengthen data quality, analysis and links to action
- improve laboratory support
- train stakeholders in disease surveillance and action
- coordinate and decentralise surveillance activities
- integrate disease surveillance at the state and district levels, and involve communities and other stakeholders, particularly the private sector

Components

1. Establish and operate a central-level Disease Surveillance Unit.
2. Integrate and strengthen disease surveillance at the state and district levels.
3. Improve laboratory support at state and district levels
4. Training for disease surveillance and action - the training needed to implement the three above components

Project Principles

- The IDSP will monitor a limited number of conditions based on state perceptions including 13 core and 5 state priority conditions for which pubic health response is available.
- District, state and central surveillance units will be set up so that the program is able to respond

in a timely manner to surveillance challenges in the country including emerging epidemics.

- It will integrate surveillance activities in the country under various programs and use existing infrastructure for its function.
- Private practitioners / private hospitals / private laboratories will be inducted into the program as sentinel units.
- Active participation of medical colleges in the surveillance activities.
- The project will ensure uniform high quality surveillance activities at all levels by:
  (i) Limiting the total number of diseases under surveillance and reducing overload at the periphery
  (ii) Developing standard case definitions
  (iii) Developing formats for reporting
  (iv) Developing user friendly manuals
  (v) Providing training to all essential personnel, and
  (vi) Setting a system of regular feed back to the participants on the quality of surveillance activity.
- District public health laboratory will be strengthened to enhance capacity for diagnosis and investigations of epidemics and confirmation of disease conditions.
- Use of information technology for communication, data entry, analysis, reporting, feedback and actions. A national level surveillance network will be established up to the district level.

Diseases conditions under the surveillance program

(i) Regular Surveillance:

Vector Borne Disease	: 1. Malaria
Water Borne Disease	: 2. Acute Diarrhoeal Disease (Cholera)
	: 3. Typhoid
Respiratory Diseases	: 4. Tuberculosis
Vaccine Preventable Diseases	: 5. Measles
Diseases under eradication	: 6. Polio
Other Conditions	: 7. Road Traffic Accidents (Linkup with police computers)
Other International commitments	: 8. Plague
Unusual clinical syndromes	: 9. Meningoencephalitis/Respiratory Distress Causing death/ hospitalisation/Hemorragic fevers, other undiagnosed conditions

(ii) Sentinel Surveillance:

Sexually transmitted diseases	: 10. HIV/HBV, HCV
/Blood borne Other Conditions	: 11. Water Quality
	: 12. Outdoor Air Quality (Large Urban centers)

(iii) Regular periodic surveys:

NCD Risk Factors : 13. Anthropometry, Physical activity, Blood Pressure, Tobacco, Nutrition, Blindness

(iv) Additional state Priorities: Each state may identify up to four additional conditions for surveillance.

KEY PERFORMANCE INDICATORS

Key aspects of overall performance of the surveillance system will be assessed using the following indicators:

- Number and percentage of districts providing monthly surveillance reports on time - by state and overall
- Number and percentage of responses to disease-specific triggers on time - by state and overall
- Number and percentage of responses to disease-specific triggers assessed to be adequate - by state and overall
- Number and percentage of laboratories providing adequate quality of information - by state and center
- Number of districts in which private providers are contributing to disease information
- Number of reports derived from private health care providers
- Number of reports derived from private laboratories
- Number and % of states in which surveillance information relating to various vertical disease control programs have been integrated
- Number and % of project districts and states publishing annual surveillance reports within three months of the end of the fiscal year
- Publication by CSU of consolidated annual surveillance report (print, electronic, including posting on the websites) within three months of the end of fiscal year

METHODS OF DATA COLLECTION IN IDSP

Quality of data collection is of crucial importance. Hence, overloading the peripheral health worker will be avoided. The following three main sources of data will be tapped within the system for collection of surveillance data.

Routine reporting will be conducted at the PHC by the ANMs and HWs. State specific diseases will be added to this, to a total of not more than 15 disease conditions including the state list. Information related to geographical changes in prevalence can be obtained by the system by sentinel surveillance. This form of surveillance will be used for HIV, HBV, HCV, Water Quality, Air Quality etc. Special teams will be developed to assess NCD risk factor surveillance.

The table below specifies the details and type of surveillance for various diseases identified in the above list.

	Disease Conditions	Unit	Surveillance	Method	Recording	Confirming/ Reporting	Lab Confirmation
1	Tuberculosis	PHC SPPs/PH DH Micro C P-Lab DPHLab	Regular	Passive	Daily Weekly Daily Daily Weekly Daily	Weekly MO Weekly Weekly DTO Weekly DTO Weekly Weekly LD	Peripheral Lab
2.	Malaria	PHC SPPs/PH DH Micro C P-Lab DPHLab Other	Regular	Active and Passive	Daily by HW Weekly Daily Daily Weekly Daily Weekly	Weekly MO Weekly Weekly DMO Weekly (ADPH) Weekly Weekly LD Weekly MO/DMO	Peripheral Lab
3.	Cholera	PHC PHC SPPs/PH DH DPHLab Other	Regular	Passive	Daily by HW Weekly Weekly Daily Daily Weekly	Weekly MO Weekly MO Weekly Weekly DMO Weekly LD Weekly MO/DMO	Peripheral Lab
4.	Typhoid	PHC SPPs/PH P-Lab DH DPH Lab	Regular	Passive	Weekly Weekly Weekly Daily Daily	Weekly MO Weekly Weekly Weekly DMO Weekly LD	Peripheral Lab and District Lab
5.	Measles	PHC PHC SPPs/PH DH Other	Regular	Active Passive Passive	Daily by HW Weekly Weekly Daily Weekly	Weekly by MO Weekly by MO Weekly Weekly DMO Weekly MO/DMO	District Lab.
6.	Polio	PHC DH SPPs/PH Other	Regular	Active Passive	Daily Follow current system Follow current system Follow current system Weekly	Weekly MO Weekly MO Weekly DMO Weekly DMO Weekly	State and Reference Labs
7.	Unusual clinical syndromes / Diseases with international commitments	PHC PHC DH Other	Regular	Active Passive	Daily Weekly Daily Weekly	Weekly DMO Weekly DMO Weekly DMO Weekly	Peripheral, District and State Labs
8.	State Specific Diseases (Refer Section 10.2 for Details)	PHC	Regular	Passive	Daily by HW	Weekly by MO	District and State Labs
9.	Road Traffic Accident	S.Police	Regular	-	Weekly	Weekly	NA
10.	HIV–ANC data	SACS	Sentinel	Active	Once in a month	Once in 3 months	District Lab
11.	Water Quality	PHC WB	Sentinel	Active Active	Monthly Monthly	Monthly MO Monthly DSO	Peripheral and District Labs
12.	Out door Air Pollution	PCB	Sentinel	Active	Twice weekly	Twice weekly	State Lab
13.	NCD Risk Factors	DSO	Sentinel	Active	Once in 1 year	1 Years DSO	State Lab

Persons responsible for data collection at the various levels of the reporting system:

REPORTING UNITS	PRIMARY PERSON RESPONSIBLE	ALTERNATIVE PERSON RESPONSIBLE
Community nodal persons	Any person in the community motivated enough to report a rise in the number of cases in the community to the health sub-centre, as for example, government officials, NGO workers, Panchayat members, self-help groups.	
Health sub centres	Health Worker (Female)	Health Worker (Male)
OPD of PHC (New)	Pharmacist	Health Supervisor
OPD/IPD of PHC/CHC	Pharmacist	Health Supervisor
OPD including emergency departments of Medicine and Paediatrics departments of SDH, DHH, Municipal Hospitals	Pharmacist I/C of OPD	Staff Nurse Records clerks
IPD of Medicine and Paediatrics departments of SDH, DHH, Municipal Hospitals	Staff Nurse	Pharmacist
OPD/ IPD of Medicine and Paediatrics departments at Medical College Hospitals	Senior Pharmacist/ Medical Records personnel	Staff Nurse

STRUCTURAL FRAMEWORK FOR IDSP

Consistent with the philosophy of IDSP and to meet its objectives, the focal point of all surveillance related activities at the periphery will be the District Surveillance Unit (DSU). DSU will receive surveillance data from both rural and urban reporting units. To increase the sensitivity of data, additional reporting will be identified in both urban and rural areas. It will be particularly critical for urban areas where current surveillance efforts are grossly inadequate.

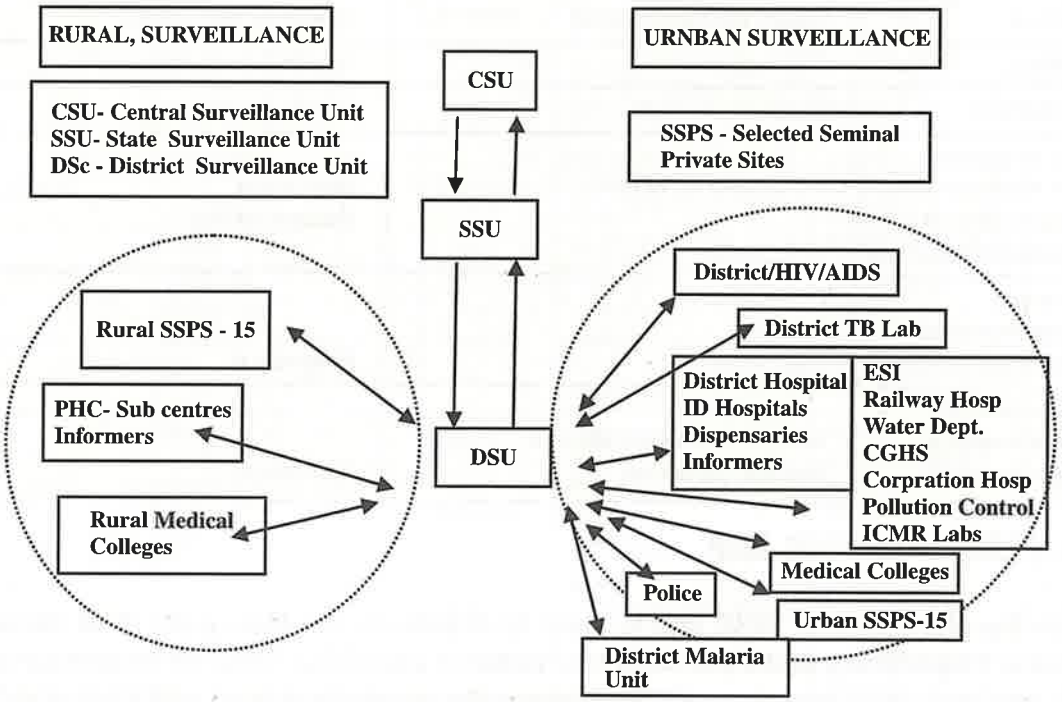
For the first time private sentinel sites from both urban and rural areas will be identified as partners. Further, in urban regions ESI, Railway Hospitals and Dispensaries, Medical Colleges, Private Hospitals, Army Hospitals will also contribute to urban surveillance. Information on Road Traffic Accidents will be obtained from the police department. Analysis, response and feedback from these sources will be coordinated by the DSU.

DSU will be in communication with the state and central surveillance units through the district surveillance network in vertical integration.

At the periphery, public sector reporting units especially, the CHCs will be directly entering data through the

computer network supplied as part of the program. If facilities are available the sentinel private practitioners and other reporting units will directly transfer data to these units. Alternatively, data entry operators will need to input approximately 40 reports per week from rural and urban sentinel sites at the DSU.

STRUCTURAL FRAMEWORK OF INTEGRATED DISEASE SURVEILLANCE PROJECT



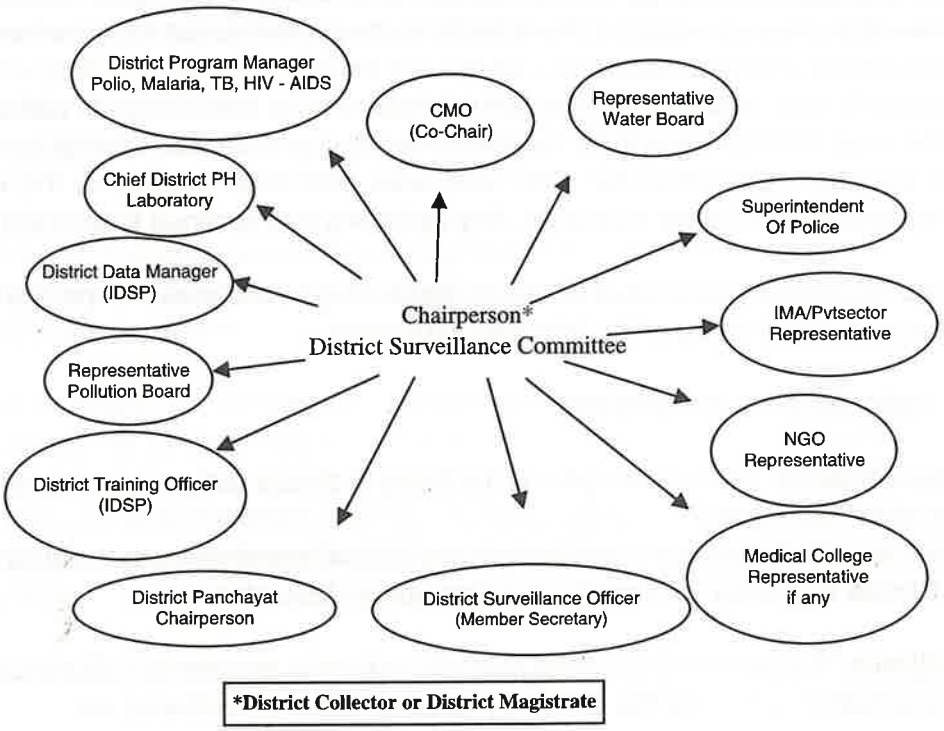
ADMINISTRATIVE STRUCTURE AT DISTRICT LEVEL

The District Surveillance Committee will be responsible for the regular running of the program. The district surveillance unit will be chaired by the District Collector / District Magistrate. The members of the DSU will include:

i. District Collector (Chairperson)
ii. Chief Medical Officer District (Co-Chair)
iii. Program officers of PH, TB, Malaria, HIV, Polio
iv. Representative of Medical College
v. Representative of SSPs in the district
vi. Police Superintendent
vii. Representative from the Water Board

viii. NGO representative
ix. Chairman District Panchayat Board
x. Head of the District Public Health Laboratory
xi. The District Surveillance Officer (DDPH) (Member Secretary)

The Committee will meet once a month regularly and as often as needed during an epidemic. A routine report of this meeting should be forwarded to the State Surveillance office once a month to understand the progress and problems in various districts. Reports of these meeting will be forwarded to the National Surveillance cell once in three months.



*District Collector or District Magistrate

RESPONSE TO SURVEILLANCE INFORMATION

The IDSP manuals set out the following:

CASE DEFINITION OF ALL DISEASES UNDER SURVEILLANCE

This is the definition of a disease which is to be used to make a decision as to whether the symptoms and signs of a patient qualify for it being called a case or not. Case detection in our context is usually based on the clinical definition of cases of disease or syndrome.

Case definition should be:

Simple, so that it is easy for paramedical personnel, who form the backbone of the system, to make a diagnosis.
Precise, so that there is no confusion while making diagnosis.
Uniform, across the whole state, so that data can be compared, and interpreted in a similar manner anywhere.
Highly sensitive, to catch all the cases of the disease/syndrome under consideration.

The clinical case definitions have to be strictly followed at all levels of the health system by all health personnel involved in disease surveillance. Participants in the system do not have the freedom to modify the case definition or use their own definitions, as this will result in the loss of validity of the data being generated. Participants may, however, convey their comments to the districts health authorities or SDSC, used on which the case definitions could be modified if necessary. A serious attempt has been made to match the case definitions prescribed for IDSP with case definitions followed in the various vertical disease control programmes to avoid confusion. Any variations that continue to exist are deliberate.

The standard case definition of diseases is available. Depending on the level of expertise and specificity, disease surveillance in IDSP will be of the following categories:

Types of Case definitions for surveillance:

1. **Syndromic surveillance:** Diagnosis made on the basis of clinical pattern by paramedical personnel and members of the community.
2. **Presumptive:** Diagnosis made on typical history and clinical examination by medical officer
3. **Confirmed:** Clinical diagnosis confirmed by an appropriate laboratory

Syndromic Surveillance: The paramedical health staff will undertake disease surveillance based on broad categories of presentation. Currently the clinical syndromes under surveillance are:

i. Fever
   a) less than seven days duration without any localising signs
   b) with rash
   c) with altered sensorium or convulsions
   d) bleeding from skin or mucous membrane
   e) more than seven days with or without localising signs
ii. Cough more than three weeks duration
iii. Acute Flaccid paralysis
iv. Diarrhoea

v. Jaundice
vi. Unusual events causing death or hospitalisation.

These syndromes are intended to pick up all priority diseases listed under IDSP for surveillance.

Presumptive and confirmed disease surveillance: Though it is ideal to have all the diseases under surveillance confirmed by laboratory tests this is often not feasible. During routine surveillance the diagnosis made by the medical officer is considered presumptive in nature. The validity of presumptive diagnosis of surveillance will be higher than that of syndromic one undertaken by the health worker.

Under IDSP the MOs of the PHC, CHC, Medical colleges and sentinel surveillance will conduct the presumptive surveillance routinely. This will be supplemented confirmation of diseases by laboratory reporting.

Trigger levels: This is the number of suspected cases in a specified time and location for each of the diseases/health conditions under surveillance. Once a disease incidence crosses a trigger level, action has to be initiated.

Response protocols: The responses to be made when each of these trigger levels is crossed for one of the communicable diseases under surveillance are also specified in the manuals together with the reporting and follow-up actions to be taken:

- A general summary of these actions is shown in the table below.
- Details for each of the diseases are given in the District Operations Manuals for the project.

Software Use: Software to be developed for this project will alert district level staff when the triggers have been crossed and will also send information to the state if appropriate action by the districts is not notified within a specific time.

Non-Communicable Diseases

For non-communicable diseases the situation is different - the frequency of collecting information is lower, the response time is longer and the interventions of a different nature. The surveillance information is collected through periodic surveys, on a three-year cycle and the information will then be used to plan interventions to be carried out by the state and districts.

Levels of response

The program will specify response levels for each of the target diseases under surveillance. Different trigger levels will be described for the surveillance conditions, so that specific surveillance related

action can be predetermined based on the levels set for the condition. The trigger levels will be modified based on incidence of the disease in the region, by the local health authority according to the needs of the program.

Trigger Level – 1	Local response by health worker and medical officer
Trigger Level – 2	District level response by district surveillance officer and rapid response team
Trigger Level – 3	State level response to an established outbreak
Trigger Level – 4	State level response to established epidemic
Trigger Level – 5	Disaster response

Trigger levels will depend on the type of disease, number of evolving cases. These will be region specific depending on incidence of disease and previous reporting trends. E.g.: Single case of flaccid paralysis or plague will call for a trigger level of four or five and initiate a response at state/national level. For diarrhoea, the number of cases will trigger a variable response.

Popular Response versus Proper Response: A case study of a response to a Measles Epidemic

It was the newspapers that first reported the outbreak of measles in a tribal population and few resultant deaths. The Health Minister talked to Secretary to task who rushed the Director Health Services/Family Welfare and to the spot. There was a demand for action against the chief medical officer, who on the other hand demanded action against the district immunisation officer who was holding the block medical officer responsible who for his part blamed the section medical officer who had by then filed a complaint against the ANM in that area.

Simultaneously a special investigation team had been sent to file a report but no one was willing to wait for the assessment or technical opinion of the professional team.
Immediate Measles Immunisation was ordered in the out break villages. When the outbreak has already happened and more than half of the children in the village had rashes already appeared or subsiding, undertaking Measles immunisation in the village under the plea of protecting the rest of the children does not make sense. Any immunisation to have adequate sero- conversion and immune response, a minimum of three to four weeks are required. So the protective effect is not immediate and it has only a preventive value for future. Probably most of the children are already exposed and will develop rashes soon.

It is needed as a preventive measure in the future in this village for children who escaped the attack and in surrounding villages which are also likely to have had poor coverage. But that can wait right now till the crisis period is over.

The prime focus must now be on mortality reduction.

Mortality in Measles are mainly due to two Post measles complications.
1. Post measles diarrhoea/dehydration along with Malnutrition
2. Post measles Bronchopneumonia leading to fast death unless vigorously treated.

Prevention and management of both these complications must be the priority actions in measles outbreak.

The correct response that the protocol specifies is:

1. Make sure enough ANMs/Male Health workers are posted from other areas to take care of the epidemic control activities in the villages. The PHC must have a doctor (if post vacant depute somebody on special duty) oriented to treat Measles complications.
2. All children having rashes or having had rashes, but now subsided must be given one dose of Vitamin –A concentrate (1ml-100,000 IU- for age less than one and 2ml-200,000 IU- for ages more than 1 year) initially. This is to prevent Vitamin-A deficiency and to replenish Vitamin-A stores in the liver. Vitamin-A is very important for prevention of secondary infection, boosting of immunity and for maintaining integrity of respiratory and intestinal mucosal epithelium.
3. All villages must have adequate ORS packets at Anganwadi Centre, ASHA worker level . This is for free distribution to families with children having diarrhoea after measles.
4. All village level functionaries must be oriented to give correct advice regarding preparation and administration of ORS during diarrhoea, continued breast feeding, complimentary feeding etc. They must be taught symptoms/ signs of dehydration and to recognise two cardinal signs of Pnuemonia-i.e. fast breathing and chest in drawing.
5. All post measles cases must be visited periodically for onset of symptoms/signs of other complications like ear discharge(otitis media), pustules and skin infections, convulsions, onset of malnutrition (detected by weighing and plotting of weights in growth chart.) They should know when and where to refer for complications. In case there is no one resident in the village who is trained to do this – find a person and train her at once
6. Co-trimoxazole tablet must be stocked at sub centre level and with ASHA /anganwadi center for use in cases of suspected pneumonia and bloody diarrhoea.
7. At PHC level Injectable antibiotics like Procaine Penicillin, Gentamycin, and Kloxacillin must be stocked. Staphylococcus which is a common organism invading the child with post measles bronchopneumonia Gentamycin-Kloxacillin is the preferred drug of choice in the periphery.
8. At PHC level there must be functioning Oxygen cylinder to take care of the Pneumonia child. Also required is the adequate stocking of Intravenous fluids Ringer Lactate and 5% Dextrose for both fatal complications.
9. Once the mortality reduction due to post measles complications is achieved, then staff could be deployed for undertaking Routine Immunisation including Measles immunisations and to reduce the immunity gap among the under five population.

This is to illustrate one example of why one needs to construct and make available at evey level protocols that specify the correct approach and at what level of disease reporting such action must be initiated.

Other examples :

There are many examples of such popular but misdirected response to epidemics. Another example of irrationality is throwing bleaching powder along the roadside in case of a diarrhoea outbreak in a village. How does it help in controlling a waterborne disease if dry areas by the side of a road is sprinkled with bleaching powder other than leaving

the good smell of chlorine for neighbourhood and creating a visual evidence of something being done by health authorities? On the other hand if the available bleaching powder is economically utilised for chlorination of only the drinking water source it is more sensible. Prevention of faecal contamination of water source and mobilising community participation for that is another strategic intervention.

There is an authentic story of a District Magistrate who ordered throwing of bleaching powder by the riverside where women wash clothes in order to control a "mysterious" fever outbreak suspected to be "Leptospirosis" The District Health Officer did not have the courage/space to convince the DM that putting bleaching powder in flowing waters do not achieve anything for Epidemic control other than wasting the resources.

This again testifies to the importance of developing protocols linked to triggers. Action for non response should be taken only if such protocols are not followed by those who are clearly allocated such a responsibility.

INTEGRATION IN THE DISTRICT PLAN : CHALLENGES AHEAD

Unlike many national programmes this programme is built around district level planning and requires little efforts for integration. However, it would be a struggle to integrate other vertical programmes into the surveillance effort at the district, used as they are to vertical systems of command and control.

One concern and challenge would be to adapt at the district level to disease patterns of that district. The priority of disease changes from state to state and even within states based on where it is in the changing pattern of disease. Overall, communicable diseases, maternal and prenatal conditions and nutritional deficiencies now account for only half of the disability adjusted life years lost in India (down from 56 percent in 1990) and non-communicable disease accounts for 33 percent (up from 29 percent in 1990). As a consequence of this change in disease pattern, the surveillance system would not cover some of the important health conditions in an area where communicable diseases are no longer the major problem and as the approach to non communicable diseases is different the structuring of the system would have to adapt to this.

The second concern would be to recruit and support enough centers from which reports flow in – maximising this and maintaining quality at the same time. The very large private sector and the informal health care providers functioning in an almost completely unregulated atmosphere need to be negotiated into providing support to this effort- for there will be few commercial returns for them from such cooperation.

Another concern would be integrating use of resources (computers, communications infrastructure, personnel - especially at the district level), and integrate data analysis and reporting and dissemination (especially at the state and national levels).

It would be a great challenge to develop the IDSP as the major data source of regular annual district health planning. The collection and collation of reports would only secondarily be for transmitting upwards. Primarily it would be to inform district planning and all analyses and interpretation would be governed by this necessity.

The final challenge is to be build in a monitoring system– both by a mix of indicators and by systems of cross checking and supportive supervision so as to ensure that the entire data flows captures the true picture and false over reporting of programme achievement and under reporting of disease prevalence is minimised.

Any health system that intends to be futuristic will need to take into account the variability and cater to differential needs in the country and be decentralised and state specific. The programme will need to cater to the wide geo-political and socio-economic differences in the country and tailor its implementation to levels suitable for the given region in the country. Through an effective disease surveillance program, health of vulnerable populations in underdeveloped regions and tribal populations in India will be better understood and corrective steps will be taken to improve their conditions.

I. Review Questions:

1. What are the types of surveillance?
2. What has been the nature of disease surveillance efforts before the IDSP began?
3. What are the key performance indicators for knowing whether the district surveillance programme is functioning well?
4. What are the case definitions, triggers and response protocols for a measles outbreak?
5. Though the surveillance system is already a district based plan – there are some more challenges that it would face in integrating into a district plan. What would these be?

II. Application Questions

1. What are the diseases under surveillance in your district? If you were given the opportunity to modify the list is there any disease that you would leave out and any that you would bring in, not for transmitting to the state and national levels- but for district planning?

III. Project Assignment

1. What does the district surveillance system say about the disease status for the last month and the last year for the 15 diseases on priority? How many of these are based on passive surveillance, how many on active surveillance and how many on sentinel surveillance? Find out modes and frequency of data transmission adopted by:
   - Sub-centre to sector PHC
   - Sector PHC to block PHC
   - Block PHC to district health office

   (If the IDSP is not yet operational go about collecting the information from the respective vertical programmes and see the problems thereof.)

2. If you were to draw up a minimum list of sites of passive surveillance, plan the extent of active surveillance and list the minimum needed sentinel sites for the list of 15 diseases that have been identified.

Annexure ONE

TB Treatment Categories[1]

Category I: All new cases who are sputum smear-positive or seriously ill patients with smear-negative or extra-pulmonary disease.

Treatment: Treatment is given in two phases. The intensive phase consists of isoniazid, rifampicin, pyrazinamide and ethambutol given under direct observation thrice a week on alternate days and lasts for 2 months (24 doses). This is immediately followed by the continuation phase, which consists of 4 months (18 weeks; 54 doses) of isoniazid and rifampicin given thrice a week on alternate days with at least the first dose of every week being directly observed. If the sputum smear is positive after 2 months of treatment, the 4 intensive phase drugs (H, R , Z and E) are continued for another one month (12 doses) before starting the 4- months (18 weeks) of continuation phase. If the sputum smear is positive after 5 or more months of treatment, the patient is declared as a Failure and is placed on CAT II treatment afresh.

Category II: All retreatment cases, viz., Relapse, Failure, Treatment After Default and others are included in this category.

Treatment: Treatment is given in two phases. The intensive phase consists of two months (24 doses) of isoniazid, rifampicin, pyrazinamide, ethambutol and streptomycin, all given under direct observation thrice a week on alternate days, followed by one month (12 doses) of isoniazid, rifampicin, pyrazinamide and ethambutol, all given under direct observation thrice a week on alternate days. This is immediately followed by the continuation phase, which consists of 5 months (22 weeks; 66 doses) of isoniazid, rifampicin and ethambutol given thrice a week on alternate days, with at least the first dose of every week being directly observed. If the sputum smear is positive after 3 months of treatment, the 4 oral intensive phase drugs (H, R , Z and E) are continued for another one month (12 doses) before starting the 5-month continuation phase.

Category III: New patients who are smear-negative, or who have extra-pulmonary TB and are not seriously ill.

Treatment: Treatment is given in two phases. The intensive phase consists of isoniazid, rifampicin and pyrazinamide given under direct observation thrice a week on alternate days and lasts for 2 months (24 doses). This is immediately followed by the continuation phase, which consists of 4 months (18 weeks; 54 doses) of isoniazid and rifampicin given thrice a week on alternate days, with at least the first dose of every week being directly observed. If the sputum smear is positive after 2 months of starting treatment, the patient is considered a treatment failure and begun afresh on CAT II treatment. Drugs are supplied in patient-wise boxes (PWB) containing the full course of treatment, and packaged in blister packs. The PWB have a color code indicating the category (Red for CAT I, Blue for CAT II and Green for CAT III). In each PWB, there are two pouches one for intensive phase (A) and one for continuous phase.

Seriously Ill category: The following forms of extra-pulmonary TB are classified as "seriously ill":

1) meningitis

1. See http://gujhealth.gov.in/health_programmes/tb/downloads.htm

2) pericarditis
3) peritonitis
4) bilateral or extensive pleural effusion
5) spinal TB with neurological involvement
6) intestinal
7) genito-urinary
8) co-infection with HIV

All forms of pediatric extra-pulmonary TB other than lymph node TB and unilateral pleural effusion are considered to be seriously ill. The following forms of smear-negative pulmonary TB are classified as seriously ill:

1) miliary TB
2) extensive parenchymal infiltration
3) co-infection with HIV
4) cavitary disease
5) All forms of pediatric sputum smear negative pulmonary TB except primary complex

Any patient, pulmonary or extra-pulmonary, who is known to be HIV positive based on voluntary sharing of results and / or history of anti-retroviral therapy, is considered as seriously ill. For the purpose of categorization, HIV testing should not be done. Also, HIV status should not be revealed / recorded in any RNTCP documents.

It is very important to elicit history of previous anti-tuberculosis treatment to help define a case; to identify patients with increased risk of acquired drug resistance; to prescribe appropriate treatment; and for epidemiological monitoring.

Non-DOTS Regimen 1 (ND1): 12-month conventional chemotherapy regimen, with streptomycin given in the first 2 months. This is given to patients who are:

1. New cases of sputum smear-positive pulmonary TB, and
2. Seriously ill cases of smear negative and extra-pulmonary TB

The treatment consists of 12-month conventional chemotherapy. The initial intensive phase lasts for 2 months and the continuation phase for 10 months. Isoniazid and ethambutol are self-administered by the patient daily for 12 months. Streptomycin is administered daily in the initial intensive phase. Dosage for adults is one tablet of isoniazid (300 mg) and one tablet ethambutol (800 mg) every day. The dosage for streptomycin injection is 0.75 g per day (0.5 g for those over 50 year of age). Those who weigh less than 30 kegs receive dosages calculated as per body-weight.

Non-DOTS Regimen 2 (ND2): 12-months conventional chemotherapy regimen, without streptomycin for:

All patients with smear-negative pulmonary TB who are not seriously ill; and All patients with extra-pulmonary TB who are not seriously ill The treatment consists of 12-month conventional chemotherapy. Isoniazid (300 mg) and ethambutol (800 mg) are self-administered by the patient daily for 12 months.

Side effects of Anti-TB drugs

Serious side effects of anti-TB drugs are less with intermittent chemotherapy. Drugs should not be administered on empty stomach. DOT providers should be aware of the common side effects so that they can identify these early and report to the medical officer. Patient should be informed that intake of rifampicin causes reddish-orange discoloration of urine and this should not cause any alarm. Any side effects reported during treatment should be recorded in the remarks column of the treatment card.

Action for patients who interrupt treatment

If a patient does not report as scheduled during treatment, visits should be made to the patient's home to bring her/him back under treatment. This should be done by the DOT-Provider no later than the day after the patient was due to come for treatment in the intensive phase, i.e. within 24 hours, and within 7 days in the continuation phase. It is very important to take action on patients who miss doses promptly after knowing that the patient has missed the doses. Delays in retrieval actions can lead to irretrievable loss of the patient. This action taken to retrieve such patients has to be recorded in the space provided at the back of the treatment card with details of the retriever, date/time of attempted retrieval and the outcome of such efforts.

If the DOT Provider is unsuccessful in retrieving such patients, it should be reported to next level of supervisors (e.g. MPW, MO-PHI, STS, MO-TC etc.). If the patient misses DOT on two occasions in the intensive phase, DOT Provider should arrange a visit by the MO-PHI to the patient's home, so that the MO-PHI can review the reasons for the same, give intensive counseling to the patient and, if required, ensure that DOT is made more convenient for the patient.

If the patient does not return for treatment within 2 months, despite all efforts, the outcome of treatment should be recorded as " defaulted" in the "remarks" column of the treatment card (along with proper reasons) and the medicine box should be returned to the PHI, and thereafter to the DTC for reconstitution.

The health worker should discuss problems with the patient and find ways of preventing from missing doses, convince the patient that cure from disease depends on regular drug intake and convey the same message to relatives so that they can take interest in ensuring regular intake of drugs by the patient. The patient should not be blamed. Try to understand her/his difficulties and then motivate accordingly. It is best to negotiate a plan for cure with the patient. Motivation and health education of the patient should be reinforced periodically during the course of treatment.

If a patient in the intensive phase (IP) does not take medication as scheduled, she/he should be traced and given the medication on the next day. The medication for the following day is then given as scheduled. For example, if a patient is receiving DOT on Mondays, Wednesdays and Fridays, but does not take medication on Wednesday, the patient should be found on Thursday and given medication (late dose), and should take the next dose of medication on Friday, returning to the previous schedule.

If a patient entirely misses any dose of medicine (doesn't come on two consecutive days in IP or 7 days in CP), these doses must be made up at the end of the scheduled period.

The category wise dose schedule for IP and CP is given in the table below: CAT I and III treatment consists of total 78 doses and CAT II treatment consists of 102 doses.

Category of Treatment / Type of Patient/ Quantity of Drugs

Category	Colour of box	IP Blisters and Dose	Prolongation of IP* (blister and dose)	CP	
				Blister	Doses
Cat I	Red	24	12	18	54
Cat II	Blue	36	12	22	66
Cat III	Green	24		18	54

* To be used if sputum remain positive after completion of IP and for indoor patient.

Drug Regimens in RNTCP

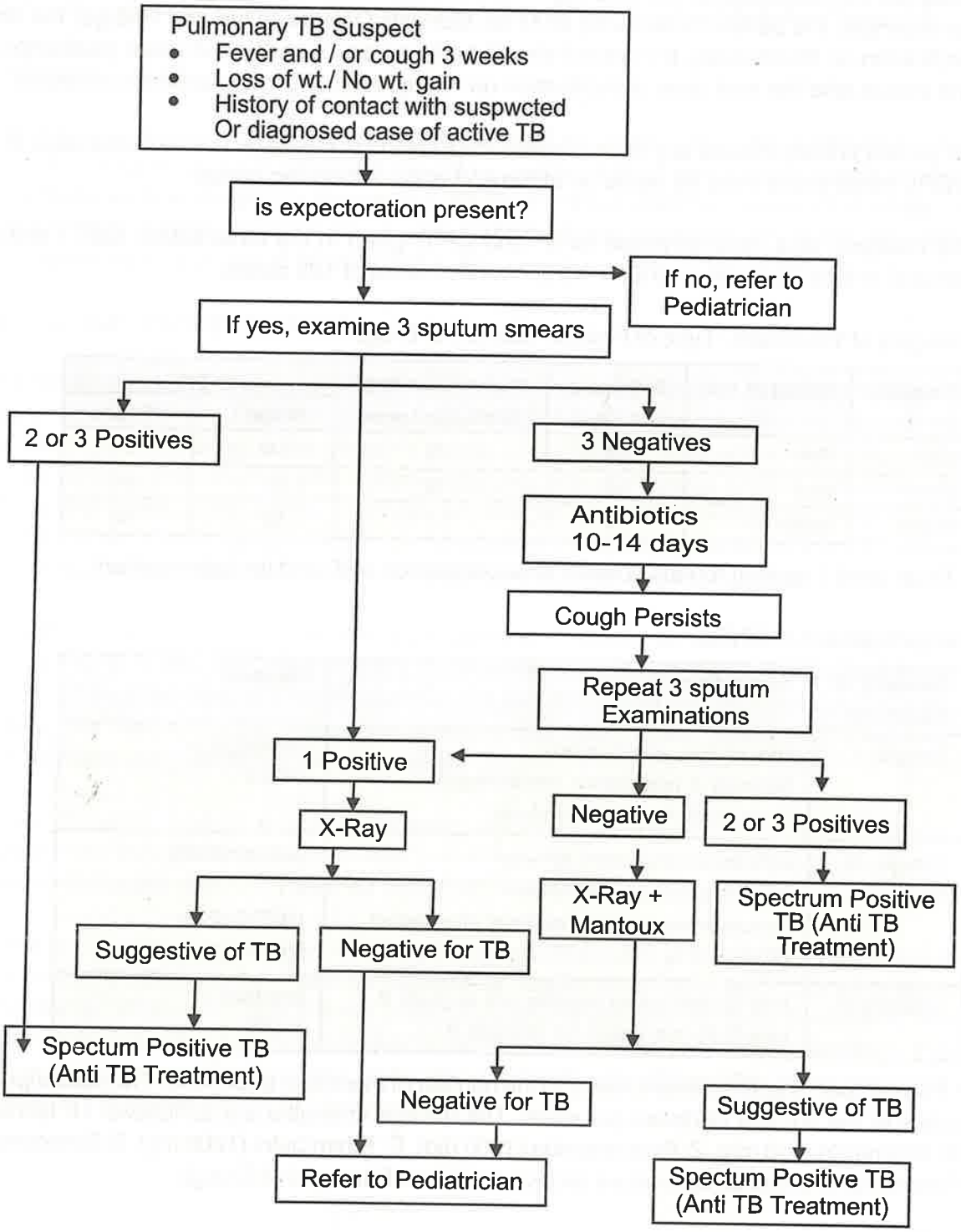
Category of Treatment	Type of Patient	Regimen*
Category I	New sputum smear-positive Seriously ill new sputum smear-Negative Seriously ill new extra-pulmonary	2H3R3Z3E3+ 4H3R3
Category II	Sputum smear-positive Relapse Sputum smear-positive Failure Sputum smear-positive Treatment After Default Others	2H3R3Z3E3S3 + 1H3R3Z3E3 + 5H3R3E3
Category III	New Sputum smear-negative, not seriously ill New Extra-pulmonary, not seriously ill	2H3R3Z3 + 4H3R3

* The number before the letters refers to the number of months of treatment. The subscript after theletters refers to the number of doses per week. The dosage strengths are as follows: H: Isoniazid(600 mg), R: Rifampicin (450 mg), Z: Pyrazinamide (1500 mg), E: Ethambutol (1200 mg), S:Streptomycin (750 mg). Patients who weigh 60 kg or more receive additional Rifampicin 150 mg).

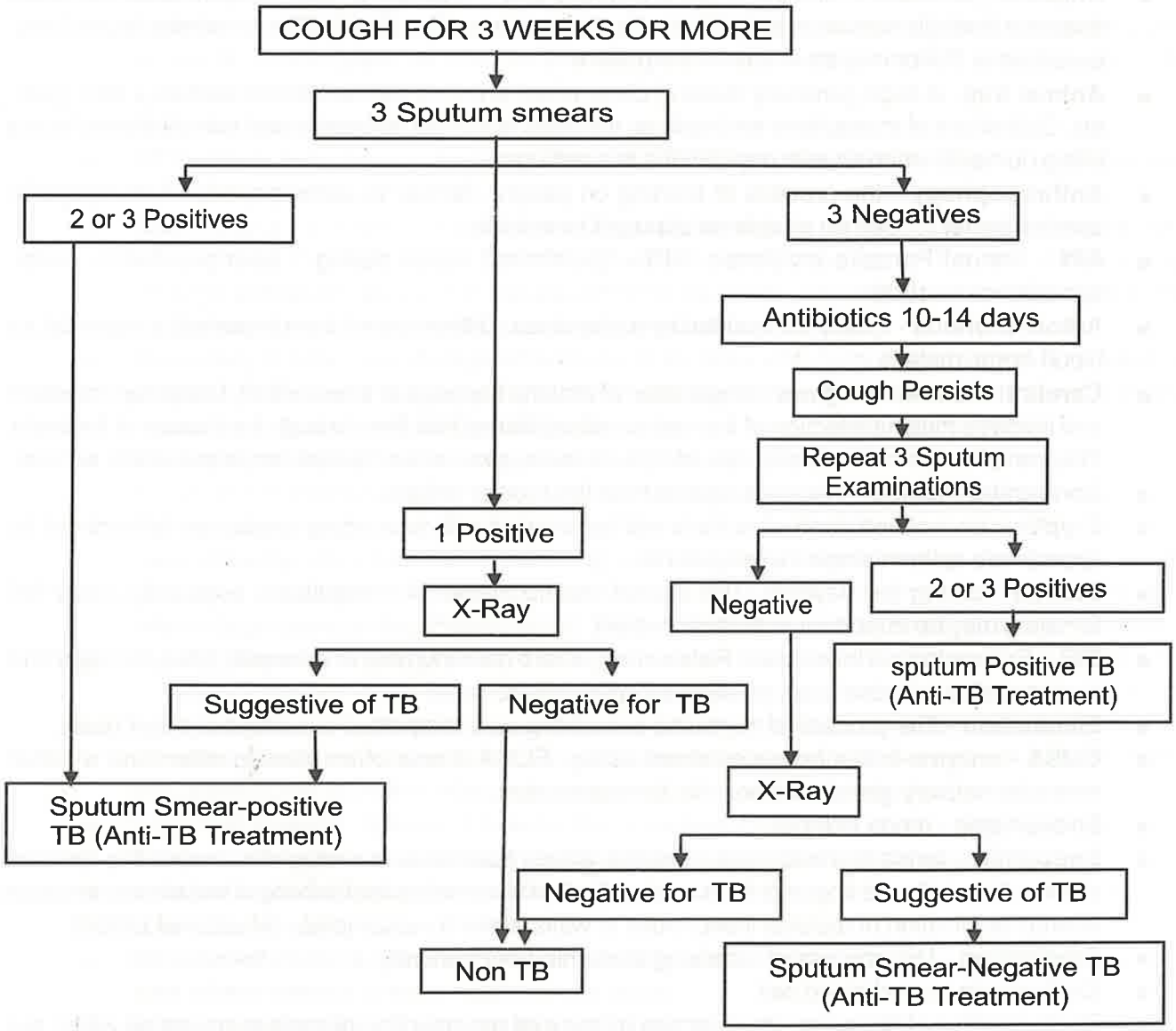
Annexure TWO

Diagnostic Algorithms for Pulmonary TB

Algorithm 1 :Diagnostic Algorithm For Pediatric Pulmonary TB



DIAGNOSTIC ALGORITHM FOR PULMONARY TB



Annexure THREE

Malaria Glossary[1]

- **ABER** - Annual Blood Examination Rate. Calculated as (number of slides examined/population) x 100. WHO recommendation for malarious areas is that the number of slides examined per month should equal at least 1% of the population.
- **Anaemia** - decrease in number of red blood cells and/or quantity of haemoglobin. Malaria causes anaemia through rupture of red blood cells during merozoite release. The anaemia caused may be extreme. Pallor may be visible in the patient.
- **Animal trap** - A cage generally made of cloth, which is baited with an animal such as a cow, goat, etc. Collections of mosquitoes are made on the walls of this trap to assess and compare populations biting domestic animals with populations in dwellings.
- **Anthropophagy** - the process of feeding on people. Similar to anthropophilic. Anthropophilic species prefer to feed on people as opposed to animals.
- **API** - Annual Parasite Incidence. API = (confirmed cases during 1 year/population under surveillance) x 1000.
- **Autochthonous** - locally transmitted by mosquitoes. Differentiated from imported, congenital, or blood-borne malaria.
- **Cerebral malaria**- this grave complication of malaria happens at times with P. falciparum infection and involves malaria infection of the very small capillaries that flow through the tissues of the brain. This complication has a fatality rate of 15% or more, even when treated and is extremely serious.
- **Congenital malaria** - malaria acquired from the mother at birth.
- **Cryptic** - an isolated case of malaria not associated with secondary cases, as determined by appropriate epidemiologic investigations.
- **Diurnal** - during the daytime. The diurnal resting places of mosquitoes, especially newly-fed females, may be important in malaria control.
- **EIR** = Entomological Inoculation Rate = mas, where ma = number of mosquito bites per night and s = proportion of those bites positive for sporozoites.
- **Elimination** - The process of removing something on a temporary or semipermanent basis.
- **ELISA** - enzyme-linked immunosorbent assay. ELISA is now often used to determine whether mosquito salivary glands are positive for sporozoites.
- **Endophagic** - feeds indoors.
- **Endophilic** - tends to inhabit/rest in indoor areas. Examples of endophilic anopheline species include *Anopheles darlingi* and An. funestus. Endophilism makes the blocking of malaria transmission through application of residual insecticides to walls easier to accomplish. (MacDonald 1956).
- **Eradication** - The process of removing something permanently.
- **Erythrocyte** - a red blood cell
- **Erythrocytic schizogony** - the process of asexual reproduction of malaria parasites within red blood cells
- **Exerythrocytic schizogony** - the process of asexual reproduction of malaria parasites outside of red blood cells, usually in the liver. This process is asymptomatic.

1. Source: Malaria Foundation International (http://www.malaria.org/malariaglossary.html)

- **Exit trap** - A trap constructed to capture mosquitoes that are exiting a house or structure. Exit traps are often used in studies that compare the tendency of mosquitoes to rest indoors after feeding versus to fly outside after feeding.
- **Exophagic** - feeds outdoors.
- **Exophilic** - tends to inhabit/rest in outdoor areas. After biting, an **exophilic** mosquito flies outside and rests woods, grass, or other outside areas. Exophilism makes use of residual insecticides in buildings less effective.
- **GIS** - Geographic Information System
- **GPS** - Global Positioning System. Common GPS systems receive data that is sensitive enough to map blocks of a city.
- **Gametocyte** - the sexual reproductive stage of the malaria parasite. Gametocytes [macro- and micro-gametocytes] circulate in the blood stream, are picked up by the *Anopheles* mosquito, undergo sexual reproduction in the midgut of the mosquito, and attaches to the mosquito's midgut, where they form an oocyst that eventually produces sporozoites.
- **Gametocyte rate** - percentage of persons in an area who carry gametocytes. Expressed as a percentage. The less the gametocyte rate of an area, the fewer infective humans are available for mosquitoes, and the less likely that transmission is to occur. (MacDonald 1956).
- **Gametocyte count** - number of gametocytes per mm^3 of blood. The lower the gametocyte count, the lower the infectivity of the human to the mosquito
- **Hypnozoite** - a stage of malaria parasites found in liver cells. After sporozoites invade liver cells, some develop into latent forms called hypnozoites. They become active months or years later, producing a recurrent malaria attack. Only P. vivax and P. ovale species that infect humans develop latent stage hypnozoites. Primaquine is the only available drug active against hypnozoites.
- **Hypoglycaemia** - hypoglycemia -blood glucose less than the lower value of normal (70-110 mg/dl [3.9-6.1 mmol/L in SI reference units]). Glucose levels of 40 and below constitute severe hypoglycemia, a life-threatening emergency. Hypoglycemia is common in malaria; as malaria parasitised red blood cells utilise glucose 75 times faster than uninfected cells. In addition, treatment with quinine and quinidine stimulate insulin secretion, reducing blood glucose.
- **Imported malaria** - A case of malaria that is brought into an area by someone who has become infected somewhere else. The person could be either a tourist or immigrant.
- **Induced malaria**- Malaria acquired through artificial means (e.g. blood transfusion, dirty syringes, or malariotherapy).
- **Introduced malaria** - malaria acquired by mosquito transmission from an imported case in an area where malaria is not a regular occurrence.
- **Infant parasite rate** - The percentage of infants below one year old who show parasites in their blood films. If the infant parasite rate is zero for three consecutive years in a locality, this is regarded as absence of local transmission, provided that the survey is done every year and enough slides have been examined.
- **Longevity** - The longevity or length of lifespan of the mosquito is of considerable importance in malaria control. There are two reasons for this. The first is that the reproductive cycle of malaria in

the mosquito takes 10-11 days, and the second is that if the mosquito lives a long time, it will be able to take several blood meals, and will have a higher chance of biting a human who has malaria parasites.

- **Macrogametocyte** - the female form of the gametocyte.
- **Malaise** - subjective feeling of being sick, ill, or not healthy. The feeling is generalised, varying from mild to severe in intensity. It may be the lone clinical manifestation of malaria, or may accompany other signs and symptoms, such as fever, headache, or nausea. This may be expressed as "feel achey all over," "flu-like symptoms," etc.
- **Microgametocyte** - the male form of the gametocyte.
- **Oocyst** - oocysts are Plasmodium cysts located in the outer stomach wall of mosquitoes, where sporozoite development takes place. When mature, the oocysts rupture and release sporozoites. Sporozoites subsequently migrate to the mosquito's salivary gland, and are injected into the host when the mosquito feeds.
- **Orthostatic hypotension** - decrease in blood pressure occurring when an individual arises from a seated or lying position. A small decrease in blood pressure is normal, but large decreases are abnormal, especially if accompanied by clinical manifestations such as faintness, light-headedness, dizziness, or increased pulse. Orthostatic hypotension is a common finding in patients with malaria infections. The patient may complain of notable tiredness after conducting light office work, etc.
- **Parasitaemia** - the status of having parasites. This term is often used to express the quantity of parasites in the blood. If no fever or other symptoms are present, the condition is referred to as 'asymptomatic parasitaemia.'
- **Paroxysm** - paroxysm - a sudden attack or increase in intensity of a symptom, usually occurring in intervals. Malaria is classically described as producing fever paroxysms; sudden severe temperature elevations accompanied by profuse sweating. Paroxysms occurring at 48-hr intervals are typical of *Plasmodium vivax* infection, particularly in semi-immune persons.
- **Proportional case rate** -The number of cases diagnosed as clinical malaria for every 100 patients attending hospitals and dispensaries [used in India].
- **Protozoan** - A member of the Kingdom Protista. Protozoa are single-celled organisms [eukaryotes]. The single cell performs all necessary functions of metabolism and reproduction. Some protozoa are free-living, while others, including malaria parasites, depend on other organisms for their nutrients and life cycle. Malaria parasites are members of the Phylum Apicomplexa.
- **Radical Cure** - treatment intended to achieve cure of P. vivax or *P. malariae* malaria. These two species have exoerythrocytic [outside of red blood cells i.e. in the liver] stages. Requires primaquine treatment, which destroys latent exoerythrocytic stage parasites (hypnozoites). Typical case patient: a returned traveller from Central America who has had a relapse of malaria.
- **Recrudescense** - a repeated attack of malaria (short term relapse or delayed), due to the survival of malaria parasites in red blood cells. Characteristic of *P. malariae* infections.
- **Recurrence** - a repeated attack weeks, months, or occasionally years, after initial malaria infection, also called a long-term relapse. Due to re-infection of red blood cells from malaria parasites (hypnozoites) that persisted in liver cells (hepatocytes).

- **Relapsing malaria**- Renewed manifestation (of clinical symptoms and/or parasitemia) of malaria infection that is separated from previous manifestations of the same infection by an interval greater than any interval resulting from the normal periodicity of the paroxysms.
- **Refractory malaria**- malaria that is not responsive to residual treatment. The cause of the lack of response to residual treatment is usually defined to be factors other than physiological insecticide resistance. Examples of causes of refractory malaria are vector exophily and zoophily with failure to enter houses. An example of refractory malaria occurred in the Jordan Valley during the early 1950s. *Anopheles sergenti* and *Anopheles superpictus* were evading residual treatment of dwellings by resting in caves and natural fissures in earth (Farid 1954).
- **Reproduction rate** - Reproduction rates > 1.0 indicate an expansion of infections in a population while those < 1.0 indicate a decline in infections in the population. The goal of malaria control is to decrease the reproduction rate. This can be accomplished by altering mosquito numbers, longevity of female anophelines, biting habits, and recovery rate of gametocytemic person. Reduction of mosquito numbers through larval control is less effective by itself than causing mosquito mortality through adult control. The reason is that not only does adult control cause a reduction in mosquito numbers, but it also causes reduction in longevity of female anophelines [larval control doesn't do that]. The fewer gonotrophic cycles that a female mosquito has, the less likely that it is to transmit sporozoites (MacDonald 1956, p. 620).
- **Residual treatment** - treatment of houses, animal sheds, and other buildings where people or animals spend night time hours with insecticide that has residual efficacy. The goal of residual treatment is to block transmission by stopping human-vector contact.
- **Splenomegaly** - an enlarged spleen. A common finding in malaria patients that sometimes can be detected by physical examination. May occur in otherwise asymptomatic patients and is of use in conducting malaria surveys of a community, although it should not be the only factor considered when counting cases.
- **Sporozoite** - the infective stage of the malaria parasite that is passed to the human host from the salivary glands of the mosquito. Sporozoites infect liver cells, disappearing from bloodstream within 30 minutes. The mechanism for this amazingly rapid disappearance from the bloodstream to the liver is still unknown. Sporozoites are delicate and spindle-shaped stages that are released into the haemocoel of the mosquito when the oocyst ruptures. Some eventually find their way to the salivary glands of the mosquito.
- **Sporozoite rate** - The percentage of female anopheline mosquitoes of a particular species that bear sporozoites in their salivary glands. Expressed as a percentage.
- **Temperature** - the optimal temperature for development of *P. falciparum* is 30°C [86°F], while the optimal temperature for development of *P. vivax* is 25°C [77°F]. The time required for development of the sexual phases of the malaria parasite in the mosquito is 10-11 days at these temperatures.
- **Tinnitus** - ringing sound in the ears, a common side effect of quinine treatment.
- **Vector competence** - the ability to transmit malaria. Said of *Anopheles* mosquitoes.
- **Zoophagy** - the process of feeding on animals (example: cattle).
- **Zoophilous** - prefers to feed on animals.

Acknowledgements

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