

TUBERCULOSIS

Cause- Mycobacterium tuberculosis

Parts affected- lungs, skin, intestines,
lymph nodes, meninges, genitalia

About the Problem

- Causative bacterium discovered 100 years ago
- Preventable and curable
- 80% patients are in the economically productive age group- 15-39 years
- One third of the global population has asymptomatic infection
- Of these, 5 to 10% will develop disease

Global statistics

“Within the next 10 years, 300 million people will become infected, and without treatment, each person will infect 10 to 15 other people each year. WHO wants governments to invest \$500 to fight the threat.” (J Int Assoc Physicians in AIDS Care)

- 9 million cases
- 2 million deaths
- “Tuberculosis is among the top 10 causes of death in the world.” (Bleed et al, Curr Opin Pulm Med. 2000)

What is DOTS?

- The best cost effective approach to TB control
- Launched in 1993
- Accuracy of diagnosis
- Success rate – 95%
- Prevents default, ensures compliance
- Prevents emergence of MDR TB
- Prevents dissemination
- Reduces duration of illness, prevents spread, improves productivity

Predisposing Factors

- Poverty
- Malnutrition
- Migration
- Overcrowding and ill- ventilated homes
- Vertical transmission
- Increasing incidence of HIV- a lethal combination

Situation in India

- Highest TB burden country
- Accounts for one third of all cases
- Approx 2 million new cases each year
- Two out of 5 Indians are infected with TB bacillus
- 5000 patients develop the disease each day
- 1000 people die each day
- Disrupts families, economy and society
- Causes one third of all infertility cases
- Creates more orphans than any other disease
- Effect on women- social stigma, abandoned or ostracised, not taken for treatment
- Impact on children- absence from school due to disease, or take up jobs to support families, worse for the girl child

Epidemiological Indices

- **Prevalence of infection** – as seen by tuberculin test, about 30%
- **Incidence of infection** -annual infection rate- during one year, new cases, previously non-infected, now showing infection with the bacillus
- **Prevalence of disease**- i.e. % of sputum positive individuals- a practical method- 4 cases per 1000 population
- **Incidence of new cases**- % of new sputum positive TB cases per year per 1000 pop. Reveals the 'trend' of disease and control
- **Prevalence of suspects**- based on X ray suspicion, not significant

The Vocabulary of TB

CASE- patient where TB is confirmed by a specialist or sputum test

SMEAR +veTB – 2+ve smears

- one +ve smear with +ve culture

- one -ve smear with x ray changes

SMEAR –ve TB i.e. symptoms with x ray changes or +ve culture, but 3 smears are –ve

COMPLIANCE = adherence

Relapse- a treated and cured pt, now smear +ve again

Failure case- one who is smear +ve after 5 months

Cured case -who has completed Tt , and 2 smears are –ve

Epidemiological Triad of Disease

AGENT Factors

- AGENT- M. tuberculosis, human strain (commonest), bovine (less common) and atypical Mycobacteria
- Source -Human or bovine
 - human- most common source is a sputum positive patient
 - Bovine- infected milk, not a problem where milk is boiled
 - Communicability- pts are infective as long as they are untreated.

HOST Factors

- Effects all ages, incidence increases from infancy to teenage
- Hereditary – not a factor
- Nutrition- indirect evidence supports
- Immunity- man has NO natural immunity
- Rest, diet fresh air- no longer as relevant as before chemo

Mode of Transmission

- Droplets and droplet nuclei generated by cough of sputum positive patient
- Frequency and vigor of cough
- Ventilation
- Not transmitted by fomites, i.e. sterilisation no use
- Extra-pulmonary TB and sputum -ve TB not infective

Incubation Period

- Could be weeks, months or years
- Takes 3-6 weeks from contact with infection to developing s positive skin test
- Takes any amount of time for disease to develop
- This depends on host and environmental factors

Control of TB

- Reduction in the incidence and prevalence of disease in a community
- WHO def of control- when the prevalence of natural infection in 0-14 years age group is less than 1%
- Figure in India- 40%
- Methods of control
 1. curative .i.e. case finding and treatment(a powerful tool)
 2. preventive i.e. vaccination (not so imp)

Case Finding

- This is the first step in TB control
- WHO – case is a sputum positive patient
- Intensive ongoing program
- Role of Tb education
- WHO suspect- sputum –ve, with X ray findings
- Target group-persistent cough and fever, other symptoms, contacts of known patients
- Sputum test is done if
 - Cough more than 3 to 4 weeks
 - Hemoptysis
 - Continuous fever
 - Chest pain

 - 3 sputum samples are taken preferably early morning
 - Sputum culture- not for routine screening, costly, time consuming, requires expertise
 - MMR – not for routine screening
 - Tuberculin skin tests no use for case finding
- Problems: Passive case finding: patient has to approach
- Education: Lacking

Treatment - Chemotherapy

- Given to all cases
- Cornerstone of chemo- regular and adequate drug intake
- Objective- to eliminate the bacteria, both slow as well as rapidly multiplying
- Pt compliance- of critical importance
- Default- incomplete tt, drug resistance, relapse, and spread of MDR TB in the community
- Combination of drugs- highly effective, less side effects, less chance of resistance, less doses required
- Domiciliary tt preferred to hospitalisation- no. of patients, cost of tt, same risk to contacts of pt.
- 2 phases of tt- intensive phase, 1-3 months, short, aggressive tt, 3 or more drugs used , kills all bacteria, prevents 'persisters'
 - continuation phase- 4-5 months, kills remaining and dormant bacteria
- No need for new drugs, use existing ones successfully
- 2 types of drugs
 1. bactericidal-kill the bacteria eg rifampicin, INH, streptomycin, pyrazinamide
 2. Bacteriostatic- prevent multiplication eg ethambutol, thioactazone
- Problems: Equipment: Weighing Machines

The five elements of DOTS

- Political commitment with increased and sustained financing
- Case detection through quality-assured bacteriology
- Standardized treatment, with supervision and patient support
- An effective drug supply and management system
- Monitoring and evaluation system, and impact measurement

DOTS

- Strategy has been documented to be successful world wide
- Pt come approx 60 times to the tt centre, over 6 months
- Intensive phase- 3 times a week, pt swallows drug in presence of an observer
- Continuation phase- given med for a week, has to return blister pack to govt agencies, ensures honest practice
- Need of the hour- Many more TT centres or DOTS centres, med available at a time /place convenient to pt, with minimum loss of time /money in commuting for medicines.
- Default tracking
- Patient education
- Testing of contacts and suspects
- ‘hammer and tongs’ approach needed i.e attack

Drug Resistance

- MDR- multi- drug resistant TB i.e. Resistance to INH or rifampicin, responds to second line drugs
- XDR- extensively drug resistant TB- resistant to second line drugs
- Cause- inadequate therapy, inadequate dose, default, incorrect prescription, irregular supply of drugs, lack of counselling , lack of supervision and follow up
- Accurate picture- not available
- Danger of MDR- difficult to treat, second line drugs not easily available, takes 2 years, poor results, cost is 30 to 150 times, may need hospitalisation and isolation to prevent transmission

DOTS Plus for MDR TB

- Goal- to prevent spread of MDR TB
- Use of second line drugs has started
- Prevention of MDR- simply by implementing DOTS
- XDR- usually fatal, poor response to existing drugs, not enough statistics

TB and HIV – A Lethal Combination

- HIV virus accelerates the spread of TB
- TB is the opportunistic disease that kills HIV patients
- 10% dormant cases become active TB in a year, if HIV co-exists
- Interaction of HIV and TB – 4 ways
 1. Reactivation of latent infection
 2. Primary infection, i.e. recent infection results quickly in active disease
 3. Recurring infection- because of relapse, or quick re-infection
 4. More active cases in the community, more spread, additional discrimination, more stigma, less treatment
- TT- DOTS, education, surveillance, counselling
- Diagnosis is difficult in advanced cases because tests come negative, even with active disease (i.e. skin test, sputum, X ray)
- If sputum smear is positive, give TT
- If negative, get culture/ x-ray, or judge on clinical basis.

Stop TB Strategy

- 1. Pursue high-quality DOTS expansion and enhancement**
- 2. Address TB/HIV, MDR/XDR-TB and other challenges**
- 3. Contribute to health system strengthening**
- 4. Engage all care providers**
- 5. Empower people with TB, and communities**
- 6. Enable and promote research**

MDG

- Millennium Development Goal 6, Target 8: Halt and begin to reverse the incidence of TB by 2015
- Targets linked to the MDGs and endorsed by the Stop TB Partnership:
 - by 2005: detect at least 70% of new sputum smear-positive TB cases and cure at least 85% of these cases
 - by 2015: reduce TB prevalence and death rates by 50% relative to 1990
 - by 2050: eliminate TB as a public health problem (1 case per million population)

Progress towards targets

- In 2005, an estimated 60% of new smear-positive cases were treated under DOTS – just short of the 70% target.
- Treatment success in the 2004 DOTS cohort of 2.1 million patients was 84% on average, close to the 85% target. However, cure rates in the African and European regions were only 74%.
- The 2007 WHO report Global TB Control concluded that both the 2005 targets were met by the Western Pacific Region, and by 26 individual countries (including 3 of the 22 high-burden countries: China, the Philippines and Viet Nam).
- The global TB incidence rate had probably peaked in 2005, and if the Stop TB Strategy is implemented as set out in the Global Plan, the resulting improvements in TB control should halve prevalence and death rates in all regions except Africa and Eastern Europe by 2015.

The Future of TB

- Will stay an imp communicable disease,
- Chronic nature
- Ability of the bacteria to survive for decades in the human body
- High prevalence rate
- High reactivation rate
- Emergence of MDR
- Association with HIV
- Social factors

The Writing on the Wall

- Intuition- not simply guesswork, but the result of experience
- World on the brink of a disaster, i.e. epidemic of MDR TB