TB – Epidemiology, Prevention, Control

Tuberculosis (TB) is bacterial disease caused by the bacillus (Mycobacterium tuberculosis) and propagated through airborne droplets from the infected person. TB can affect other organs and areas of the body (extrapulmonary TB) but lung infection is the most common (pulmonary TB). TB is spread from person to person through the air. When people with active lung TB cough, sneeze or spit, they propel the TB germs into the air. People ill with TB can infect up to 10-15 other people through close contact over the course of a year.

People with primary TB have no symptoms usually, unless if insult to the immune system which will activate the development of active disease. Bacteria are inhaled and deposited in the lungs then ingested by macrophages. Granulomas wall off the organisms and they remain dormant within it.

Only small percentage of people with primary TB will progress to active disease. It happens when the host’s immunity is compromised or weakened by infections e.g.: HIV or malignancy, malnutrition or usage of immunosuppressant. Symptoms include fever, chills, night sweats, weight loss, loss of appetite and malaise. Cough progresses from dry to productive (purulent sputum) . Coughing up blood (hemoptysis) suggests advanced TB. It may also leads to Miliary TB by hematogenous or lymphatic spread.

**Epidemiology**

Tuberculosis (TB) is second only to HIV/AIDS as the greatest killer worldwide due to a single infectious agent. Tuberculosis mostly affects young adults, in their most productive years. However, all age groups are at risk.

TB infects about one-third of the world's population. The World Health Organization declared TB a world emergency in 1993 there were almost 8.6 million developed TB and 1.3 million died from the disease in 2012. Its incidence has been increasing by around 1% per year to peak 2005, but since then the global incidence per capita has started to slowly decline. Around 65% of cases are seen in Africa and Asia (India and china).

Estimated TB incidence and prevalence

Most of the estimated number of cases in 2012 occurred in: Asia (58%), African Region (27%), Eastern Mediterranean Region (8), European Region (4%) , Americas (3%). The following table provides information on incidence and prevalence across various regions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Region** | **Number of prevalent tuberculosis cases** | **Prevalence of tuberculosis****(per 100 000 population)** | **Incidence****(per 100 000 population)** | **Number of deaths excluding HIV** |
| **Africa** | 2500000 | 293 | 262 | 220000 |
| **Americas** | 330000 | 35 | 28 | 21000 |
| **South-East Asia** | 5000000 | 271 | 189 | 480000 |
| **Europe** | 500000 | 56 | 42 | 45000 |
| **Eastern Mediterranean** | 1000000 | 170 | 109 | 99000 |
| **Western Pacific** | 2500000 | 138 | 92 | 130000 |
| **Global** | 12000000 | 170 | 125 | 990000 |

The incidence rate varies widely among countries (Figure-1). The lowest rates are found predominantly in high-income countries including most countries in Western Europe, Canada, the United States of America, Japan, Australia and New Zealand. In 2012, about 80% of reported TB cases occurred in 22 countries. India has about 2 to 2.4 million cases, China has about 1 million, South Africa has about 05 million, Indonesia about 0.5 and Pakistan about 0.4 million. Some countries are experiencing a major decline in cases, while cases are dropping very slowly in others. For example, over the past 20 years Brazil and China show a sustained decline in TB cases while in Cambodia the TB prevalence fell by almost 45%.

Tuberculosis and Gender

Worldwide, more men than women are diagnosed with tuberculosis (TB) and die from it, but TB remains among the top three killers of women worldwide. There are 8.6 million new TB cases worldwide in 2012, 2.9 million were women. In 2012, there were 410 000 TB deaths among women. 50% of HIV-positive people who died from TB were women.

Tuberculosis and Age

TB incidence varies with age. In Africa, TB primarily affects adolescents and young adults. However, in countries where TB has low incidence, such as the United States, TB is mainly a disease of older people, or of the immunocompromised patient.

HIV and TB:

In the countries where the HIV prevalence is high the extra-pulmonary prevalence is high, too as immune-compromised patients are highly susceptible to extra-pulmonary TB. Mortality among HIV infected person is high.

TB in the Middle East & Saudi Arabia

 In the Middle East, the prevalence rate of the disease was as low as 6.2 per 100 000 people in 2010 in the United Arab Emirates; however, in Yemen the rate was 71 per 100 000 people in 2010.

The composition of the population of Saudi Arabia is unique for two reasons: nearly one-third of its 27 million inhabitants are immigrant workers. The incidence rate of tuberculosis in Saudi Arabia varies between Saudis and non-Saudis. There were a total of 64,345 TB cases reported to the Ministry of Health during 1991-2010. Of these, there were 46,827 (73%) pulmonary TB cases and 17,518 (27%) extra-pulmonary TB. There were 33,468 (52%) Saudi patients and 30,837 (48%) non-Saudis. The majority (62%) were males. Over 70% of the cases were reported from the Central and Makkah regions. These two regions have 52% of the population of the kingdom. A study conducted to identify the epidemiology of tuberculosis in Saudi Arabia during the period from 2000 to 2009, showed that the incidence rate in the Saudis was 11 cases per 100 000 population, while in the non-Saudis, the incidence rate was almost 35 cases per 100 000 population. The mortality rate of tuberculosis patients in Saudi Arabia is 4 deaths per 100 000 population.

 **Risk factors:**

The risk of falling ill with an active disease after a Tuberculosis Bacilli exposure can be divided into two categories:

* Recent infection with TB could be due to contact with an infectious TB patient, people who immigrated from countries with high TB rate might be affected, Homeless people, drug users and alcoholic, and People who work or live in places with high risk of TB infection (such as hospitals, homeless shelters, nursing homes, prison etc)
* Weak immune system due to other medical conditions and risks include factors such as HIV infection, Tobacco Smoke, Diabetes mellitus, Severe Renal disease, Organ transplants, Elderly people and neonates, treatment with corticosteroids etc
* **Factors affecting the epidemiology of TB in Saudi Arabia:**

As mentioned earlier, the incidence and prevalence are different for the Saudi nationals and immigrant workers in Saudi Arabia. Other factors include Hajj and Omra. For Hajj and Omra a large number of visitors come from countries where TB is endemic. In Hajj people are exposed to many risks factors mentioned previously i.e. old age, existing other diseases etc

**Cycle of infection:**

Infectious Agent: A group of rod-shaped bacteria known as: Mycobacterium tuberculosis complex.

Reservoir: Any human infected with tuberculosis in his respiratory system, whether he has signs and symptoms of active TB disease or not.

If the TB infection is latent, TB bacteria cannot spread to others, but if it becomes active, then it can spread and infect others.

Portal of exit: mouth and nose.

Mode of Transmission: TB bacilli spread from person to person in tiny microscopic droplets when a TB infected person coughs, sneezes, speaks, sings, or laughs. Because the TB bacilli are resistant to environmental conditions, indirect droplet transmission is more effective in TB transmission than direct droplet modes.

 Portal of Entry**:** portal of entry is the same as portal of exit. Susceptible Host:Everyone is at risk of getting pulmonary tuberculosis infection but the chance that someone could be infected raise in people with high risk factors as mentioned above.

**Prevention & Treatment:**

Globally by 2012, though TB mortality rate had been reduced by 45% since 1990, still it is among the major public health problem across many countries and regions. TB is often diagnosed and treated late. In order to reach the unreached and to find TB patients early in the course of their illness, a wider range of stakeholders (health care providers, community groups, community, public health departments infection control) need to be engaged.

WHO has developed a new six point “Stop TB Strategy” which aims to reduce the global burden of TB by 2015. The six Points are as follows:

1. Pursue high-quality DOTS expansion and enhancement.
2. Address TB-HIV, Multi Drug Resistant -TB, and the needs of poor and vulnerable populations.
3. Contribute to health system strengthening based on primary health care.
4. Engage all care providers.
5. Empower people with TB, and communities through partnership.
6. Enable and promote research.

DOTS (Direct Observation Treatment Short-course) remains at the heart of the “Stop TB Strategy”. DOTS require political commitment and sustained financing, case detection through quality bacteriology, standardized treatment with supervision and patient support, effective drug supply, and monitoring and evaluation system. TB treatment involves four drug (INH, Rifampin, Pyrazinamide, Ethambutol or Streptomycin) for two months and the next four months continue treatment with INH and Rifampin

Primary Prevention: involves targeting asymptomatic people in order to determine risk factors that might cause the disease and aim to prevent the developing of symptoms by arresting the pathologic process before it starts. Primary prevention is achieved by health education and awareness, and BCG vaccination for children. Secondary Prevention aims to improve the situation in terms of early identification, treatment, prognosis. Secondary prevention requires effective treatment. Tertiary prevention is to provide effective treatment and avoid complications due to advanced stage. Tertiary may require surgery and rehabilitation.