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Review Article

Tuberculosis: An Overview and Review of Literature

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Abstract

Tuberculosis Is a major bluster to humanity resist to progress in health-care systems and the widespread weapon of TB control programs. The World Health Organization (WHO) estimated 10.4million individuals had TB, but only 6 million cases had been reported to the WHO [1]. Extra pulmonary tuberculosis (EPTB) has an increasing rate in Indian population. The reason remains largely unknown. To understanding of the demographic and microbial characteristics of EPTB in the Indian population would extend the knowledgebase of EPTB and allow us to develop better strategies to control tuberculosis (TB). EPTB is one of the major reasons for under diagnoses. Tuberculosis (TB) pandemics increase morbidity, mortality and frequency of opportunistic infections. According to the WHO Global tuberculosis report 2020, Extra pulmonary Involvement can occur in isolation or along with a pulmonary cases focus as in the case of patients with multiple tuberculosis (TB). The lately human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) has outcome in changing epidemiology pandemic.

Keywords: Tuberculosis (TB); PCR; Treatment; Pathogenesis

Introduction

Tuberculosis Is a major bluster to humanity resist to progress in health-care systems and the widespread weapon of TB control programs. The World Health Organization (WHO) estimated 10.4million individuals had TB, but only 6 million cases had been reported to the WHO [1]. Extra pulmonary tuberculosis (EPTB) has an increasing rate in Indian papulation. The reason remains largely unknown. To understanding of the demographic and microbial characteristics of EPTB in the Indian population would extend the knowledgebase of EPTB and allow us to develop better strategies to control tuberculosis (TB). EPTB is one of the major reasons for under diagnoses. Tuberculosis (TB) pandemics increase morbidity, mortality and frequency of opportunistic infections. According to the WHO Global tuberculosis report 2020, ten million newly diagnosed tuberculosis cases were reported worldwide in 2019, and 1.4 million lives succumbed to the infection (WHO 2019). Tuberculosis is preventable, and the WHO's End TB Strategy has targeted significant reductions in TB incidence and mortality by 2030. The highest incidence of TB cases occurred in the Southeast Asian region, with 44% cases, followed by the African region (25%) and the Western Pacific (18%). There are eight countries accounting for two-thirds of the new cases of TB in India Indonesia, China, Philip-

pines, Pakistan, Nigeria, Bangladesh and South Africa (WHO 2019). *Mycobacterium tuberculosis* (Mtb) is primarily located in the lungs (Pulmonary Tuberculosis; PTB); however, it affects the many other sites of organs such as lymph nodes, central nervous system, bones, genitourinary tract, skin, joints and gastrointestinal tract, known as extra-pulmonary tuberculosis (EPTB) (Dalvi., *et al*. 2012).

Cell wall structure

The cell wall fabrication of *Mycobacterium tuberculosis* is a key solidify of malevolence of the bacterium. The cell wall intricate lipids. Cell wall is lipid. Of *M. tuberculosis* cell wall it seem of three major components. Mycolic acids, cord factor, wax Mycolic acids is dictatorial alpha –divaricate lipids founds in cell walls of *Mycobacterium* and *Corynebacterium*. They embellishment 50% of the dry weight of the mycobacterial cell envelope. Acids is presumption to be a prominent determinant of virulence in *M. tuberculosis* Cord factor is most abundantly produced in virulent strains of Tuberculosis. Chains of cells in smears constituted form in vitro-grown colonies (parallel growth) frequently form Egregious of serpentine cords. cell counterpane is the key of component.

Optimum PH and temperature

Tuberculosis normally grows at 37c; growth stops below 25c and above 40c. The optimum PH range is 6.4 - 7.0 *M. tuberculosis* is more susceptible to acid PH than *M. magmatism* is as *M. magmatism* has more efficient internal PH homeostasis (Zhang., *et al*. 2003).

Effect of physical and chemical agents

Mycobacterium survive for 20-30 hours in sputum. These bacilli are killed at 80c in 15 - 20 minutes and instantly at instantly at 100 degree centigrade Cultures of *M. tuberculosis* may be killed by exposure at to direct sunlight for two hours. These bacilli are sensitive to UV but relatively resistant to chemical disinfectants, can survive exposure to 5% phenol, 15% sulphuric acid, 3% nitric acids, 5% oxalic acid and 4% sodium hydroxide. They are sensitive to formaldehyde and glutaraldehyde. They are destroyed by tincture of iodine in 5min, and 80% ethanol in 2-10 min.

The genome of tuberculosis

The *M. tuberculosis* H37Rv (Lab standard strain) genome has been sequenced. The characteristic features of this genome are: Size of genome 4,411,52bp No. of open reading frames 3,924 G+C content 65.6% No. of genes identified 3,974. The droplets may transmit the disease.

Figure 1

Pathogenesis

TB infection the mycobacteria reach the pulmonary alveoli, where they invade and replication within endosomes of alveolar macrophage. Macrophages Elucidate the bacterium as "foreign" to gesture the by deletion of phagocytosis. the growth of all bacteria is counterpane by the macrophage and provided in a membrane-bound vesicle called a phagosomes. The phagosomes assorted, with a lysosome to build a phagolysosome. TB is autophagy -inoculated with contagious sputum, outcome it from the coughing of bacteria that basis ourselves in the oral tissue along with line of discharge through the mouth it results from hematogenous spreading of. recognize a human mycobacterial disease.

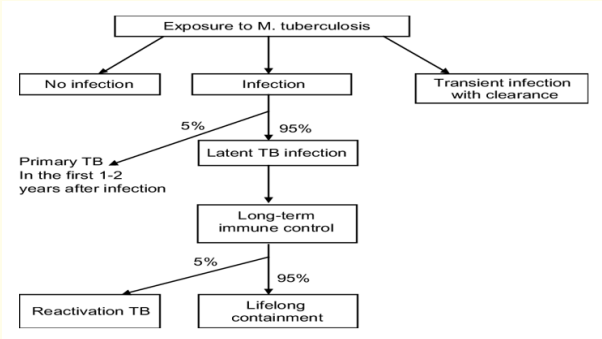

Figure 2

Clinical presentations

Patients of EPTB symptoms such as fever, weight loss, anorexia, and fatigue sweating. Disease is located at on obscure site, patients with EPTB manifest symptoms. Release of acid fast bacilli in the biopsy object prosecute to corroborate the diagnose. Drug susceptibility testing should be featured on the distinct of *M. tuberculosis* patients. Therapy of against TB occurs more successive in EPTB patients when similitude to those with PTB sample). It may unite to tuberculin skin test, scans and X-rays surgical biopsy and Pathogenesis. *M. tuberculosis* from all patients. (TB) must be attach with medical history, a physical examination, a chest X-ray and microbiological examination (of sputum or some other appropriate sample).

Tuberculin test

The tuberculin skin test is the Monteux test, is affix to injecting a small amount of protein from the TB bacilli into the forearm. A reddish and swollen of the area after 24to 72 hours signals the feature of TB. This is not a definitive diagnosis because persons with latent and active TB cannot be differentiated. It can be false positive in patients successfully treated for TB in past.

Smear microscopy

The main advantage of smear microscopy It is three penny simple, less easy to perform and read and find out transmitters of tubercle bacilli. Results can be reported epidemiological pointer needed for the evaluation of the National Tuberculosis Control Programmed. Acid-fast bacilli (AFB) in sputum samples using Ziehl-Nielsen stain Mentioned by two German doctors, Franz -Ziehl and Friedrich Nielsen. It is laboratory test detecting to TB bacilli. It is inexpensive and frezze, but the cases of non-pulmonary TB cannot be detected. Except AFB other than *M. tuberculosis* could also be stained and the specificity of sputum is not 100%. The aura mine fluorescence staining method that requires fluorescence microscopy is more sensitive than AFB staining as the fluorescence is easier to see. Smear microscopy has to long been the gold standard of TB diagnosis and is posted under the DOTS (direct observed therapy) for TB control, it is internationally advised by the WHO.

Chest X-ray and CT scan

Chest X-ray is used to check for any lung abnormalities in people who have symbol of TB. The outcome of chest X- ray are not exclusive as many other diseases can produce similar changes in the lungs. It is not useful if the disease is not found in the lungs, the chest X-ray is of no use. Computerized Tomography (CT Scan) and Magnetic Resonance Imaging (MRI) is to prove for useful for imaging tuberculosis lesions. particularly in the brain and spine. A variant of the chest X-Ray was a small radiographic image, also called miniature mass radio MR) or miniature chest radiograph. although its resolution is moderate. It is sufficiently accurate for diagnosis of tuberculosis.

Figure 3

Culture method

A gold standard manner for active TB, Culture based manner is extremely sensitive if TB bacilli are present in the sample. Many types of cultures are available. Traditionally, cultures have used the Lowenstein-Jensen (LJ), Kirchner, or Middle zbrook media (7H9, 7H10, and 7H11) etc. A culture of AFB can distinguish the various forms of Mtb, although results from take four to eight weeks for a conclusive answer. New automatic systems. is faster the MB/Bactec BACTEC-9000, and the Microbial growth Indicator Tube (MGIT). The observation of Microscopic in Drug Susceptibility assay culture may be a fast and more accurate method. The time of culture is taking –about 2 to 6 weeks. It need to good laboratory facilities require expensive equipment and high level maintenance. It vital factors for culture based techniques that is detect for TB, it does not suit resource poor settings.

Molecular-Methods

Global research efforts have the way for revolutionary, molecular based techniques for the diagnosis of TB that have opened the

door rapid. TB detection for start timely handling. During the departed several years, molecular mode have been elevated by direct detection, souvenir of species and drug susceptibility testing of mycobacteria. These methods of clinical time from weeks to hours.it observable to detection of PCR for clinical sample, and molecular assays are commercially making today. It have useful for the routine diagnostic laboratory test. Those are comprise the application of the major DNA probes, DNA amplification techniques (PCR) with subsequent DNA sequencing for species determination, and RFLP analysis, Line Probe Assay (LPA), Luciferase Reporter gene which is employed to handling with epidemiological problems. It referred to the Bactec-9000 scheme for culturing in a liquid medium which forms the basis of versatile modern verification of techniques. Molecular methods have also been consumed for the detection of drug resistance in mycobacteria. In future of clinical mycobacteriology appears to be caption toward direct detection.

Nucleic acid amplification (NAA) tests

These techniques comprise to polymerase chain reaction (PCR), Amplicon MTB Test (Roche Diagnostic Systems Inc. New Jersy, USA), and the amplified MTB Direct Test (MTD, Gen- Probe, California, USA). The PCR device is based on identifying the species- specific DNA segments of the TB bacillus from a given sample. The Amplicon is a DNA founded test that amplifies and expose the presence of a specific ribosomal RNA of TB bacilli in a colorimetric reaction. The MTD test is founded on the amplification of the same ribosomal RNA of the TB bacilli but its detection is with a DNA probe. These principal confirm the presence of M. TB within 1-3 days. These principal are being used to identify MDR-TB as mutations in the DNA of MTB, which confer the drug resistance, have been discovered.

Treatment of tuberculosis

Treatment of Tuberculosis of 6 months of anti-TB. Medical therapeutics is generally opine to adequate to most forms of EPTB, long treatment is suggested for TB meningitis, bone and joint TB. Microbiologic and clinical healing. Corticosteroids mostly have been used as an adjunctive in the diagnosis of EPTB it against antimicrobial drugs for Mtb. The two most widely used TB drugs such as rifampicin and isoniazid cannot respond their efficacy against (MDR-TB) [1-22].

Conclusion

Extra pulmonary Involvement can occur in isolation or along with a pulmonary cases focus as in the case of patients with multiple tuberculosis (TB). The lately human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) has outcome in changing epidemiology pandemic. So once again brought extra pulmonary tuberculosis (EPTB) in to umbilicus. EPTB constitutes about 15- 20% of all cases of tuberculosis in immunocompetent patients and accounts for more than 45% of the cases in HIV-positive individuals. Lymph nodes are the common site, than pleural effusion and every site of the body can be possess. Since the clinical presentation of EPTB is a typical, tissue samples for the corroborate of diagnosis. sometimes it to be difficult to procure, and the conventional diagnostic methods have a poor people, the diagnosis is delayed frequently. Availability of computerized tomographic scan, magnetic resonance imaging laparoscopy, endoscopy has tremendously helped in anatomical localization of EPTB. The disease responds usually to standard ant tuberculosis drug diagnose. Biopsy and/or surgery is required to edit tissue samples for diagnosis and managing the complications. So research is required for evolving the most suitable treatment for EPTB.

Type of TB cases	Intensive Phase	Continuation Phase
New	2 (EHRZ)	4 (HRE)
Previously treated	2(SHREZ) +1(HREZ)	5 (HRE)
MDR regimen	(6-9) Km ZE Eto cyclo levo	(18) E Eto cyclo levo

Table 1

Figure 4

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Volume 2 Issue 8 August 2021