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A REVIEW ON TUBERCULOSIS DISEASE.

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ABSTRACT:

From the morning, tuberculosis is one of the serious health problem and one of the biggest reason of death worldwide. There's the pivotal challenge to the control the active complaint similar as tuberculosis, multidrug- resistant tuberculosis, extremely medicine resistant tuberculosis & mortal immunodeficiency contagion. The commence of tuberculosis by inhalation of infected, a drop of airborne patches which contain Mycobacterium tuberculosis organisms. Hereafter, bacterial reduplication and proliferation postdate, and immunological constraint of the feasible bacteria. therefore, performing in the idle tuberculosis infection, it's state of obstinate bacterial viability, control of the vulnerable system, and shows no evidence of clinically active tuberculosis. presently, there are no any styles available for directly diagnosticate of M. tuberculosis infection in humans. Hereafter, idle tuberculosis infection is substantially diagnosed by using a system tuberculin skin test (TST) or interferon- γ release assays (GRAs) by the stimulation by Mycobacterium tuberculosis. This composition will review the epidemiology, transmission of tuberculosis, pathogenesis, clinical Features, opinion, and treatment of idle tuberculosis infection along with current advancement.

Keywords: Tuberculosis, multidrug-resistant tuberculosis, extremely drug resistant tuberculosis, tuberculin skin test (TST),

INTRODUCTION:

Epidemiology:

Preface Epidemiology Tuberculosis is one of the major health problems worldwide, according to the World Health Organisation(WHO); roughly death 5,000 people per day nowhere the world, the leading cause of death is Tuberculosis(TB) & it's a single treatable contagious complaint. The World Health Organisation (WHO) reported that1.4 million deaths in 2015 due to TB 1, 2. In the time 2011, 8.7 million people were infected with active tuberculosis each over the world, in which 13 of people were infected with the mortal immunodeficiency contagion (HIV) and total deaths due to HIV is roughly1.4 million, and cases infected with active tuberculosis and HIV the total death is 430,000. Whereupon 310,000 people circumstance matter of multidrug- resistant tuberculosis, caused by Mycobacterium tuberculosis get resistant to medicine isoniazid and rifampin. further than 60 of people were infected with active tuberculosis they from the Russian Federation, South Africa, Pakistan, China, and India 3,4.(figure 1 Chance of new Tuberculosis cases with Multidrug-resistance tuberculosis2). Where 84 countries reported that cases infected with considerably medicine- resistant tuberculosis, cases with multidrug- resistant tuberculosis and resistance to all three injectable (capreomycin, amikacin, & kanamycin) antituberculosis medicines with fluoroquinolones medicines 3,5. Tuberculosis is an airborne complaint which substantially carried some contagious capitals drop of Mycobacterium tuberculosis. For tuberculosis seven species are veritably nearly affiliated they are,(i) Mycobacterium Bovis,(ii) Mycobacterium Africanum,(iii) Mycobacterium Microti,(iv) Mycobacterium Caprae,(v) Mycobacterium Pinnipedii,(vi) Mycobacterium Canetti,(vii) Mycobacterium Mungi. In the mortal body,M. tuberculosis takes a long time to show any clinical symptoms, this phase is known as the idle tuberculosis bacterial infection. Once our vulnerable system becomes enervated, due to concurrent complaint or age, the bacteria get a turn to the active phase. In the mortal body, fluently reactivation of the tuberculosis bacteria because the mortal immunodeficiency contagion (HIV) enervate the vulnerable system. Co-infection with HIV and Tuberculosis enhance the progress of each other, this becomes a reason to death 6,7. During the active stage, TB is largely contagious complaint and it can be generating by gobbling the airborne patches ofM. tuberculosis. After gobbling, these bacteria are substantially entered and capture the alveolar macrophages, but they hesitate from the vulnerable system and they stay for a long time in the dormant stage. and

under the vulnerable compromised conditions of the host reactivated to malign. Treatment of active tuberculosis makes grueling due to slow as well as fast growing conditions

TRANSMISSION OF TB:

Tuberculosis mainly carried some airborne particles, which we knew as droplet nuclei, it is in diameter of 1-5 microns. The droplet of infectious nuclei is generally produced when persons have laryngeal or pulmonary TB disease by sneeze, cough, sing, or shout. The droplet of infectious nuclei of airborne particles in the environment remains suspended in the air for several hours. Tuberculosis is mainly transmitted by the air, not transmitted by the surface contact. Transmission of Mycobacterium tuberculosis occurs when a person inhales droplet of infectious nuclei which contain M. tuberculosis, and the droplet of infectious nuclei in the human body cross the mouth or nasal cavity, upper respiratory tract, & alveoli of the lungs through bronchial tubes.

PATHOGENESIS:

Cases who infected with active pulmonary tuberculosis the causing agent of active tuberculosis is the Mycobacterium tuberculosis. The persons those infected with active tuberculosis is further than 90 and the pathogen is included as asymptomatic idle infection. Recent studies explained that they raise the possibility of active tuberculosis if the people those infected with mycobacterium tuberculosis and the persons those admit and eject acute infection of mycobacterium tuberculosis11. The time needed for showing the symptom of original active pulmonary tuberculosis 5 in the 18 months and 5 in a remaining lifetime12. An roughly 2 billion people infected with idle infection and they've the threat for reactivation3. The persons those infected with a idle infection they reduce the chance of reinfection on ceaseless exposure, whereas the persons infected with active tuberculosis they enhanced the chance of reinfection an alternate occasion of tuberculosis on ceaseless exposure 12, 13. medicine resistant tuberculosis becomes apparent from unplanned chromosomal mutations.(Figure 2 threat of mycobacterium tuberculosis infection and disease56). Medicine- resistant tuberculosis is substantially caused by wrong use of antituberculosis medicines, similar as the addition of single medicines to fault rules or monotherapy, and that leads to the emergence of acquired resistance (resistant mutants). Transmission of similar infected mycobacterium tuberculosis to any other person may beget original infection and after some time primary resistance. Utmost deadly medicine- resistant infection have been proved, especially in those people spreading of HIV infection is high. The medicine resistance tuberculosis failure to descry due to increase in the mortality rate, treatment failure, unhappy tradition rules, and transmission of similar infected medicine- resistant conditions.

CLINICAL FEATURES:

The clinical symptom of pulmonary tuberculosis that shows in patients having a long-term cough, production of phlegm, lack of appetite, weight loss, continuously fever, sweating in the night, and hemoptysis (lung cancer related). Whereas that 10 to 42% of patients infected with active extra pulmonary tuberculosis, and it depends on age, existence or absence of underlying cause of disease, and immune response of the human body19 . Active extra pulmonary tuberculosis can influence any parts of the body, and it has different clinical manifestations, and therefore extra pulmonary tuberculosis requires a high clinical indication. Person those who infected with HIV, clinical management have to phase the special challenges in patients with active tuberculosis. The patients those infected with HIV, the opportunity of active tuberculosis increased20 and the persons those are HIV-negative at this stage they have a chance of active pulmonary diseases. The T lymphocytes (CD4 cell count or T cell count) if any persons those have less than 200 per cubic millimeter T cell counts, they increased the chance of active pulmonary tuberculosis, and 50% of patients found with extrapulmonary tuberculosis. If the CD4 cells counts found less than 75 per cubic millimeter, pulmonary tuberculosis may be absent, and outstretched tuberculosis, incurable illness with extensive organ participation and mycobacteremia, with a high rate of mortality21 . Asymptomatic tuberculosis with a negative result of a chest radiography and sputum smear and culture results found to be positive is a common symptom of HIVassociated tuberculosis and 10% of cases in which tuberculosis is spatial22, 23. Whereas up to 25% of HIV patients have unrecognized active tuberculosis3. Therefore, tuberculosis screening is strongly recommended for all patients with HIV infection to identify whether patients have active tuberculosis. The persons which any one of four symptoms weight loss, night sweats a cough and fever is strongly recommended for tuberculosis screening. Tuberculosis proactive screening is highly recommended in areas where the disease is highly spatial, since tuberculosis patients with noncommunicable diseases or HIV infection (example; tobacco related chronic lung disease and diabetes mellitus and) may be missed.

DIAGNOSIS

Conventional methods:

Opinion Conventional styles from the morning, Lowenstein- Jensen culture styles have been used for the diagnosticate ofM. tuberculosis medicine perceptivity. Generally, styles used for the opinion of tuberculosis they're(i) the absolute attention

system(ii) the resistance rate system(iii) the proportions system 26, 27. The conventional system needed 6-8- week time to know the result of medicine resistance tuberculosis. In this conventional absolute attention system, the minimum inhibitory attention (MIC) is determined by enduing the control medium culture and medicine containing medium culture with a precisely controlled terrain inoculum ofM. tuberculosis. The medium culture containing independently two times dilutions with each medicine. Medicine resistance is determined by the smallest attention of the medicine needed for inhibiting the growth of bacteria, at the end of four- week conformation of 20 or> 20 colonies. In resistance rate system, this fashion substantially developed to control for the variability in growing rate of bacteria conditions by adding a reference control strain. This resistance rate system is analogous to the absolute attention system. In this system, 2 mg inoculum Lowenstein- Jensen culture medium used. also 2 mg of inoculum is poured out in to0.4 ml of distilled water. The resistance rate of minimum attention inhibiting the growth of(test strain) is divided by the minimum attention inhibiting the growth of(control strain). still, also it's defined as sensitive, resistance rate is set up as 8 or further than 8 is resistant, If the resistance rate is set up as 2 or lower than 2. In this proportion system, the bacilli are dressed on two media, one with medicine- containing medium another bone without medicine containing a medium. The number of colonies attained during incubation is the proportion of resistant bacilli and incubation with medicine or without medicine- containing medium and that allowed to covering inoculum size and below a certain proportion, strain come sensitive also it's said to be resistant. This fashion uses the same LowensteinJensen growth medium. Idle Infection The cases infected with idle Mycobacterium tuberculosis their opinion and treatment, because the idle infection is largely circulated conditions, cases those are HIV infected they've a high threat of reactivation of conditions 28,29. A tuberculin skin test (TST) or an interferon- gamma release assay(IGRAs) is recommended for substantially diagnosticate latentM. tuberculosis infection. The National Institute for Health & Clinical Excellence(NICE), the European Centre for Disease Prevention & Control(ECDC), and the Centers for Disease Control & Prevention(CDC) has recommended the interferon- gamma release assay(IGRAs) or tuberculin skin test(TST) for diagnosticate the idle. tuberculosis infection. The interferon- gamma release assay(IGRAs) is precious, sensitive but it's less specific, whereas the tuberculin skin test(TST) is lower expensive33.(Figure 3 Indispensable strategies for screening for LTBI57)

Active Tuberculosis:

Active tuberculosis is diagnosticated by a standard method using sputum microscopy and culture in liquid medium accompanied by ensuing drug-susceptibility testing. The solid medium culture is used in the diagnosis of active tuberculosis more economical in the support poor countries. No, any method was developed for the diagnosis of active tuberculosis, latent tuberculosis infection is diagnosed by using tuberculin skin tests (TST) or Interferon gamma release assays30,34 . Active tuberculosis & HIV infection are the high proliferation diseases, approximately more than 90% patients infected with extensively drug-resistant tuberculosis (XDR-TB) & multidrug-resistant tuberculosis (MDR-TB) and 30% of patients infected with active tuberculosis3,5 . A new tool to diagnosticate tuberculosis called as the Expert MTB/RIF assay, it detects bacteria M. tuberculosis within 2 hours. The Expert MTB/RIF assay is highly sensitivity and much faster than sputum microscopy 35 . Therefore, the rate of detection is increased by 45%, when compared with sputum microscopy, for the patients those are infected by HIV36 .The Expert MTB/RIF assay has the possibilities to improve the performance of national tuberculosis programs and currently being implemented in 67 countries.

TREATMENT :

Latent Infection the persons infected latent M. tuberculosis infection they have the chance of active tuberculosis they required a deterrent treatment. The persons infected with HIV, the preferred dosages regimen is isoniazid for 9 months treatment and they have a high risk of spreading of tuberculosis43, 44. The directly observed weekly administration reported that isoniazid and rifapentine 12 weeks dosages regimen shows more effective than isoniazid alone without infected HIV. Isoniazid and rifapentine have some serious adverse effect than 9 months of isoniazid alone and the discontinuation of treatment shows more adverse effect45 . World Health Organisation (WHO) recommended that patients infected with HIV, with the positive or negative result of the tuberculin skin test (TST) & without active tuberculosis they must have to receive preventive dosages regimen with isoniazid for at least 6 months. Active tuberculosis with HIV-infected persons three dosages regimens are recommended (i) Daily dose of isoniazid for 6-9 months, (ii) Daily dose of rifampin and isoniazid for 3 months, (iii) Daily dose of rifampin and isoniazid twice weekly for 3 months43,44. Rifampin dosages regimens contain higher rates of drug toxicity. (Table 1: Daily recommend regimen for tuberculosis therapy). The active tuberculosis patients with HIV infected difficult to diagnosticate use of isoniazid dosages regimens is a protective treatment. Active tuberculosis patients and their test for tuberculin skin test (TST) result found to be positive, use of isoniazid have reduced rates of active tuberculosis and mortality rate. Few month isoniazid therapy wanes active tuberculosis and terminates diseases. Use of 36 months isoniazid therapy as compared with 6 months isoniazid therapy reduces the chance of active tuberculosis by 43%46 . A daily dosages regimen of rifapentine and isoniazid 1-month therapy reduces the chance active tuberculosis. being studied. The persons with active

tuberculosis & HIV- infected, use of isoniazid is recommended as protective therapy

Drug-Sensitive Active Tuberculosis:

For successful tuberculosis therapy requirement of early and accurate diagnosis, monitoring of drug resistance and HIV, under the guidance of doctor administration drug. The four first-line drugs used in the treatment of active tuberculosis (i) isoniazid, (ii) rifampin, (iii) pyrazinamide, (iv) ethambutol, in trail condition, the cure rates of this drug achieve more than 95%. Tuberculosis therapy done into two phases with 6 months dosages regimens, for intensive phase 2 months drug therapy required of all four drugs (isoniazid, rifampin, pyrazinamide, & ethambutol) and for continuation phase 4 months drug therapy required two drugs (isoniazid & rifampin). If deterioration of these risk factor does not happen they include, immunosuppression, vast disease, cavitation, and a sputum culture test result remains positive till 8 weeks then treatment may be extended up to 9 months. There are some challenges in the treatment of tuberculosis they are, lack of the drug quality, to the administration of a drug to a patient by directly observed therapy, the support provided to patients, toxic effects, the obstacle in therapy due to changes in dosage regimen & side effect, pharmacokinetic interactions with an antiretroviral drug. Tuberculosis and HIV Coinfection Tuberculosis resultant enhancement of HIV replication, boost the progress of HIV infection, and that leads to high mortality. Start up of antiretroviral therapy that reduces the mortality rate. The patients infected with active tuberculosis & HIV and still, they do not receive antiretroviral therapy, and the T-cell count is very less, have the perilous imperil of death. After initiation of tuberculosis treatment started within the first 8 weeks and it is recommended by World Health Organisation (WHO) and within 2 weeks patients infected with tuberculosis & HIV antiretroviral treatment begins for the patients, their T cell count < 50 per cubic millimeter. Patients those infected with tuberculous meningitis, start-up of antiretroviral treatment has increased the chance of adverse reaction. During the antiretroviral therapy, 10% of HIV infected patients endure the immune reconstitution inflammatory syndrome (IRIS) and it also called as unmasking IRIS and clinical depolarize during tuberculosis treatment started after antiretroviral therapy called paradoxical IRIS. Deteriorating respiratory system and enhancement of lymphadenopathy is the most common side effect of immune reconstitution inflammatory syndrome (IRIS). Persons with less number of T cell count immune reconstitution inflammatory syndrome (IRIS) is more common, during the course of tuberculosis beginning of antiretroviral therapy. From the beginning of tuberculosis, antiretroviral therapy should start within 4 weeks for the patients that have T cell count < 50 per cubic millimeter. Active tuberculosis with HIV-infected patients the preferred dosages regimens, efavirenz is the first drug of choice with non nucleoside reverse transcriptase inhibitors. The use of drug rifampin decreased blood serum concentrations of protease inhibitors. The replacement of rifambutin for rifampin enhancement of doses regimens for the boost up of protease inhibitors to avert the lack of blood serum concentration49, 50, 51. Active tuberculosis with HIVinfected patients recommended dose for preventive treatment with the combination of sulfamethoxazole & trimethoprim. Multidrug-Resistant Tuberculosis For the effective treatment of multidrug-resistant tuberculosis (MDR-TB) require a combination of five hierarchical group of first & second line antituberculosis drugs. (Table 2: MDR-TB treatment drugs and related toxicities). Such combination used in multidrug-resistant tuberculosis (MDR-TB) shows the intolerable and serious toxic effects. Such dosages regimens selected on a systemic or experiential basis and after drug susceptibility testing result become available, then it switched to individual treatment. Although, trustworthy drug-susceptibility testing is not available in the regions, where tuberculosis is spatial, especially for secondshould be at least 8 months. A fluoroquinolone and injectable drug should be administered with a combination with at least four second-line drugs and that will have same or similar effectiveness (example-pyrazinamide). For patients, they do not they receive the previous multidrug-resistant tuberculosis therapy drug administered for at least 20 months, and for the patients, they receive the previous multidrugresistant tuberculosis therapy drug administered for at least 30 months. One of the experimental results showed that administration of a dosages regimen for a shorter period of time 9 to 12 months, admissible effectiveness and some adverse reactions and this experiment was done with patients who does not receive previously the second line drug. This trail is done for shortening the dosages regimen for patients with multidrugresistant tuberculosis (MDR-TB).

STREAM:

Is a modified Bangladesh regimen, and it is comparing with the current WHO recommended a regimen for MDR-TB. The dosages regimen was replaced of gatifloxacin with moxifloxacin. The extensively drug-resistant tuberculosis is enormous to diagnosticate and treat in countries where tuberculosis is the endemic diseases. The patient with MDR-TB and HIV infection mortality rate is more than 98%. Various new drugs in the trial stage show the effectiveness against multidrug resistant tuberculosis and extensively drug-resistant tuberculosis

CONCLUSION

The commence of tuberculosis by inhalation of infected, a drop of airborne patches which contain Mycobacterium tuberculosis organisms. Hereafter, bacterial reduplication and proliferation

postdate, and immunological constraint of the feasible bacteria. The improvement and expansion of active tuberculosis and epidemic complaint mortal immunodeficiency contagion (HIV), are relatively delicate to control and treatment of active tuberculosis. ultramodern opinion system and technology made easier to diagnosticate active tuberculosis complaint. New antituberculosis medicines motes have reduced the active tuberculosis treatment rules for medicine sensitive tuberculosis and further effective treatment for idle bacterial infection tuberculosis & medicine- resistant tuberculosis. Several new antituberculosis vaccines and medicine motes are in the clinical trials, the expectation for control tuberculosis in future.

REFERENCES:

1. Sarkar S, Mavanur R. Suresh. An overview of tuberculosis chemotherapy-a literature review. Journal of Pharmacy and Pharmaceutical Sciences 2011; 14:148-161.

2. Global tuberculosis report 2016 [Internet]. World Health Organization. 2017 [cited 20 May 2017]. Available from: http://www.who.int/tb/publications/global_report/ en/

3. World Health Organization [Internet]. World Health Organization. 2017 [cited 20 May 2017]. Available from: http://www.who.int/en/

4. Zignol M, van Gemert W, Falzon D, Sismanidis C, Glaziou P, Floydet K, et al. Surveillance of antituberculosis drug resistance in the world: an updated analysis, 2007-2010. Bulletin of the World Health Organization 2012; 90:111-119.

5. Tuberculosis MDR-TB and XDR-TB: 2011 progress report. Geneva: World Health Organization, [Internet]. 2017 [cited 20 May 2017]. Available from: http://www.who.int/tb /challenges/made/factsheet_mdr_progress_march2 011.pdf

6. Goletti D, Weissman D, Jackson RW, Graham NM, Vlahov D, Klein RS, et al. Effect of Mycobacterium tuberculosis on HIV replication. Role of immune activation. The Journal of Immunology 1996; 157:1271-1278.

7. Mariani F, Goletti D, Ciaramella A, Martino A, Colizzi V, Fraziano M, et al. Macrophage response to Mycobacterium tuberculosis during HIV infection relationships between macrophage activation and apoptosis. Current Molecular Medicine 2001; 1:209216.

8. Stormier GR, Fenton JM. Roles of lipoarabinomannan in the pathogenesis of tuberculosis. Microbes and Infection 1999; 1:709717.

9. Prasad R. MDR TB: current status. Indian Journal of Tuberculosis 2005; 52:121-131.

10. Transmission and Pathogenesis of Tuberculosis - CDC, https://www.cdc.gov/tb/education/corecurr/pdf/ch apter2.pdf.

11. Ewer K, Millington KA, Deeks JJ, Alvarez L, Bryant G, Lalvani A, et al. Dynamic antigen-specific T-cell responses after point-source exposure to Mycobacterium tuberculosis. American Journal of Respiratory and Critical Care Medicine 2006; 174:831839.

12. Andrews JR, Noubary F, Walensky RP, Cerda R, Losina E, Horsburgh CR, et al. Risk of progression to active tuberculosis following reinfection with Mycobacterium tuberculosis. Clinical Infectious Diseases 2012; 54:784-91.

13. Lahey T, Mackenzie T, Arbeit RD, Bakari M, Mtei L, Mateeet M, et al. Recurrent tuberculosis risk among HIV infected adults in Tanzania with prior active tuberculosis. Clinical Infectious Diseases 2013; 56:151-158.

14. Frieden TR, Munsiff SS, Ahuja SD. Outcomes of multidrugresistant tuberculosis treatment in HIVpositive patients in New York City, 1990-1997. International Journal of Tuberculosis and Lung Disease 2007; 11:116.

15. Dheda K, Shean K, Zumla A, Badri M, Streicher EM, Willcox P, et al. Early treatment outcomes and HIV status of patients with extensively drug-resistant tuberculosis in South Africa: a retrospective cohort study. Lancet Respiratory Medicine 2010; 375:17981807.

16. Udwadia ZF, Amale RA, Ajbani KK, Rodrigues C. Totally drug-resistant tuberculosis in India. Clinical Infectious Diseases 2012; 54:579-581.

17. Totally Drug-Resistant TB: a WHO consultation on the diagnostic definition and treatment options. Geneva: World Health Organization (http://www.who.int/tb/challenges/ xdr/Report_Meeting_totallydrugresistantTB_032012 .pdf).

18. Nathanson E, Nunn P, Uplekar M, Floyd K, Jaramillo E, Lonnroth K, et al. MDR tuberculosiscritical steps for prevention and control. The New England Journal of Medicine 2010; 363:1050-1058.

19. Caws M, Thwaites G, Dunstan S, Hawn TR, Thi Ngoc Lan N, Thuong NTT, et al. The influence of host and bacterial genotype on the development of disseminated disease with Mycobacterium tuberculosis. PLOS Pathogens 2008; 4: e1000034.

20. Von Rey CF. Optimal treatment of codisease due to HIV and tuberculosis. The Journal of Infectious Diseases 2011; 204:817-819.

21. Von Reyn CF, Kimambo S, Mtei L. Disseminated tuberculosis in human immunodeficiency virus infection: ineffective immunity, polyclonal disease and high mortality. The International Journal of Tuberculosis and Lung Disease 2011; 15:1087-1092.

22. Mtei L, Matee M, Herfort O, Bakari M, Horsburgh CR, Waddell R, et al. High rates of clinical and subclinical tuberculosis among HIV-infected ambulatory subjects in Tanzania. Clinical Infectious Diseases 2005; 40:1500-1507.

23. Cain KP, McCarthy KD, Heilig CM, Monkongdee P, Tasaneeyapan T, Kanara N, et al. An algorithm for tuberculosis screening and diagnosis in people with HIV. The New England Journal of Medicine 2010; 362:707-716.

24. Getahun H, Kittikraisak W, Heilig CM, Corbett EL, Ayles H, Cain KP, et al. Development of a standardized screening rule for tuberculosis in people living with HIV in resourceconstrained settings: individual participant data metaanalysis of observational studies. PLOS Medicine 2011; 8: e1000391.

25. Bates M, O Grady J, Mwaba P, Chilukutu L, Mzyece J, Chaleo B, et al. Evaluation of the burden of unsuspected pulmonary tuberculosis and co-morbidity with noncommunicable diseases in sputum producing adult inpatients.
PLOS One 2012; 7: e40774.