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Impact of COVID-19 and TB co-infection on global patients in the pandemic situation: an update review

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Abstract

COVID-19 has been emerged as a deadly disease due to its immense severity to human beings around the world. The World Health Organization (WHO) has declared this prevalence as pandemic because of the diversified natures of corona virus. People of all ages, mainly elderly people having various medical conditions and pregnant women are the most vulnerable groups for SARS-CoV-2 infection. This epidemic condition has made serious consequences for global health and socio-economic condition. Tuberculosis (TB) is another life threatening chronic disease that affects patients severely in their lungs. Synergistic effects of TB and COVID-19 aggravate the mortality rate of co-infected patients as both of the diseases manifest in the respiratory systems and show very similar signs and symptoms. Even, the modes of transmission of these diseases occur via spreading of droplets from infected persons to healthy persons. Therefore, the aim of this review is to describe update information on co-infection relation, diagnosis, prevention and control measures associated with TB and COVID-19 in order to manage this pandemic situation early and effectively.

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Introduction

The entire world is in great trouble and handicapped by an unseen malady which is namely COVID-19 (Coronavirus Disease 2019) caused by SARS-CoV-2 (Severe Acute Respiratory Syndrome (Coronavirus 2), a rapidly spreading contagious disease resulting a huge deaths throughout the world for its excessive virulence (Lu *et al.* 2020). Based on the report of WHO (world health organization), this deadly virus first moved out from a sea food market located in Wuhan, China and continued spreading rest of the countries in the world from early December 2019 (Yang and Lu 2020). This catastrophic disease is becoming very fatal and started affecting 218 countries as well as regions throughout the globe and as of 3rd January 2021, 84,147,473 people have been confirmed COVID-19 positive and 1,831,546 infected patients died worldwide due to this baneful disease (Yang and Lu 2020). Because of its very fast dissemination and mortality rate, World Health Organization (WHO) declared COVID-19 as a pandemic disease on 30th January, 2020 (Organization 2020j). People of all ages are suffering from this lethal disease but the middle-aged and elderly men are clinically in a vulnerable position mostly (Weiyong Liu *et al.* 2020). Transmission of SARS-CoV-2 generally occurs via different modes including through saliva, respiratory droplets, direct or indirect physical contacts with infected persons (Organization 2020j). It affects people in several ways and manifests different signs and symptoms including fever, dry cough, shortness of breath, loss of taste or smell, weakness, headache and so on (Tenforde *et al.* 2020). Co-morbid patients those are having different associated diseases suffer a lot and death may occur due to the immense severity of this particular virus.

Tuberculosis (TB) is another potential chronic bacterial disease caused by *Mycobacterium tuberculosis* that predominately affects lungs, a vital respiratory organ (Organization 2013). The basic mode of transmission occurs mainly through very small droplets liberated from infected patient's coughs and sneezes and released into the environment (Bandyopadhyay *et al.* 2020). Consequently, healthy people get infected via aerial dispatch of TB germs when they come closer to the infected patients. In this horrible pandemic condition, TB should be considered as a vital context because it expresses similar signs and symptoms in the patients that corona virus infected patients show usually. According to the information given by WHO, more than 10 million people around the world become infected with TB every year and it is considered as one of the top ten diseases that are very deadly for humans (Nathavitharana and Friedland 2015).

The WHO also reported that only *Mycobacterium tuberculosis* is responsible for infecting around 1.7 billion people throughout the globe and the male: female ratio remains 2:1 (Organization 2013). Therefore, there is an urgent need in the development of new novel drug targets and anti-TB drugs to improve the current TB treatment and to prevent the increasing of drug resistance in *M. tuberculosis* (Hameed *et al.* 2018; Islam *et al.* 2017). In this review article, we tried to formulate the correlations between COVID-19 and TB and their diagnosis, treatment, prevention and control measures by focusing several action points to mitigate the unbearable global burden caused by COVID-19 and TB.

Objectives

The main goal of this review article is to suggest the regulatory bodies of human health and community services to take an earnest and prompt response against this pandemic situation and also want to make a hint for proper assessment of TB and COVID-19 co-infection through faultless diagnosis, accurate treatment, longer prevention and control measures.

Methods

All the published articles used to write-up this review paper was downloaded from PubMed and Google Scholar Websites. Some were collected using Google search engine. The reference articles were up-to-date and published in 2020. TB or Tuberculosis, SARS-CoV-2 and COVID-19 were the keywords used to search the articles.

Co-infection relation between COVID-19 and TB

Pathogenic infections in the respiratory system cause major complications in humans and make a shorter life span. It is very pathetic that lots of people globally sacrifice their invaluable lives due to some fatal respiratory infectious diseases (Tadolini *et al.* 2020). The way of invasion of TB and SARS-CoV-2 in the respiratory system exhibits many similarities as patients of both cases show identical signs and symptoms. People become infected through aerial transmission of droplets released from patients into the air and it is common incidence of being infected with these pathogens (Wei Liu *et al.* 2006). In the time of SARS outbreak in China in 2003, 83 viral infected patients were diagnosed and their chest radiographs showed that 3 patients out of 83 were TB infected and subsequently, this TB infection number got increased amongst the SARS infected patients (Yao *et al.* 2020). In Singapore, 12 out of 236 COVID-19 patients showed severe TB although they had not any previous TB records and also absent in the family history (Mendy *et al.* 2019). Some patients after recovery from SARS demonstrated TB cases while they were diagnosed later. Researchers think that this may happen because, immune system sometimes suppress the expression of pathogenic activities and after a while, it starts showing the symptoms of co-infections (Walaza *et al.* 2015).

Based on the report of Center for Disease Control and Prevention, the elderly TB patients those are over 65 years old and having other associated medical conditions including HIV or other immunocompromised conditions, are at higher risk of COVID-19 (Bandyopadhyay *et al.* 2020). Another study reported that host-pathogen interactions for TB and COVID-19 revealed similar phenotypic expressions as their 26 proteins directly interact with 332 human proteins (Gordon *et al.* 2020). Studies also demonstrated that the severity of SARS-CoV-2 to humans is higher than the past SARS virus and also assumed that the chances of causing TB is immensely higher in patients those are suffering from COVID-19 than the other SARS viral infected patients (Tadolini *et al.* 2020).

Suggested diagnosis for TB and COVID-19

Diagnosis of TB and COVID-19 simultaneously can reduce time for initiating an appropriate treatment regime as both diseases exhibit similar signs and symptoms in the patients (Organization 2020c). Even if the exposed symptoms do not resemble with TB and COVID-19, it is well suggested to diagnose for both conditions. In case of COVID-19, symptoms appear rapidly and then latent period continues but onset of symptoms for TB takes a longer time. That is why, it is strongly recommended to follow up the COVID-19 patients and diagnose them as soon as possible for better treatment (Organization 2020i). Screening of sputum, cough and even blood ensure proper diagnosis of TB while, dry cough, nasopharyngeal or oropharyngeal swab and mainly use to test COVID-19 and breathing problem is major issue here to consider (Caruana *et al.* 2020). Earlier studies suggest that Ground-Glass Opacities (GGO) can be used for checking TB in the patients with COVID-19 (Organization 2020h). Those COVID-19 patients are having bilateral patchy shadow in the chest radiographs can be confirmed for TB; chest CT is another technique for TB identification (Albert *et al.* 2020). Two types of testing methods have been suggested for TB identification including skin test and blood test but any one of the two tests is highly recommended due to their availability and expenses (Organization 2011). Again, skin tests are of two types such as positive and negative skin tests. Evaluation of medical history, x-ray of chest, physical tests and laboratory assessments also can be performed for better observation of TB in the infected patients (Gilpin *et al.* 2018). Besides, diagnosis of COVID-19 can be conducted with several ways. Food and Drug Administration (FDA) provides an approval for using home testing kit on 21st April 2020 for fastest identification of COVID-19 (Organization 2020h). Another testing device namely point-of-care (POC) got approved by FDA in United States (US) for corona detection whereas, the test can be done followed by Polymerase chain reaction (PCR) that was performed for diagnosis of SARS in 2002 in US (Organization 2020a). During this pandemic situation, WHO recommended to use molecular technique like reverse

transcription-polymerase chain reaction (RT-PCR) as a gold standard method for COVID-19 detection (Vandenberg *et al.* 2020).

It is advised to all countries to follow the WHO recommended guidelines for diagnosis of TB and COVID-19 on the basis of the clinical characteristics and history of the patients. The WHO also strongly stated not to ignore the patients of COVID-19 who are also having TB (Tang *et al.* 2020).

Prevention and control measures associated with TB and COVID-19

Patients with COVID-19 who are subsequently diagnosed and confirmed TB infection, treatment regimens should not be stopped for both cases.

If TB is not controlled properly, the synergistic effects of two diseases may develop a weaken immune system and consequently, the infected patients may be vulnerable for death (Organization 2020d). Necessary and urgent steps must be taken to resist the TB and COVID-19 prevalence by providing health care services according to the WHO guidelines and advices (Organization 2020g). It is also suggested to conduct numerous personal safeties, environmental and administrative measures for durable and better prevention and control of both diseases (Prevention 2017). Previous study reported that; to mitigate the horrific pandemic situation caused by COVID-19 and TB co-infection, some infection prevention and control (IPC) approaches need to be carried out for ensuring safety of patients, health workers and hospital environments and hence, pathogenic transmissions may be controlled. Studies also suggested that to maintain the IPC practices some inevitable facilities must be provided including the availability of proper ventilation support and personal protective equipments (PPE) (Organization 2019). As these two diseases are very contagious, infectious and hazardous for humans and their symptoms are almost similar this is why, it is highly recommended to maintain physical distancing of about 6 feet between person to person for following the WHO guidelines (Christof, Nussbaumer-Streit, and Gartlehner 2020).

Treatment and care suggested for patients having TB and COVID-19

The healthcare workers must have enough knowledge, capacity and expertise about infectious diseases for providing technical and logistic support to the TB and corona infected patients (Organization 2020f).

They have to perform various technical activities after confirming a positive case including location tracing, collection of family history, isolation of patients, maintenance of quarantine period and hospitalization (if needed) for reduction of community transmission of these diseases (Prevention 2020). Treatment of TB patients in the hospital setting is not necessary rather; they are suggested to stay at home with proper medication unless serious condition appears. Several medicines are recommended by the WHO for TB treatment and also advised not to go to hospital frequently for avoiding community transmission (Organization 2019).

Those patients who are in quarantine for corona infection but having TB; they are strongly advised to collect adequate TB medicines besides COVID-19 treatment during isolation period (Organization 2020e). During the simultaneous treatment of TB and COVID-19, no notable side effects or drug-drug negative interactions and cardiotoxicity were found in the patients (Soares *et al.* 2020). A lot of services including digital communication, counseling, regular care and information sharing must be provided to the isolated patients based on the WHO guidelines for their early recovery. Electronic communication like video-based therapy may help the caregivers a successful follow up of patients and it is suggested to collect data for further investigation and study purpose (Organization 2020b). Infrastructural advancements, sufficient man powers, adequate funding, political flexibility and strong leadership may turn the all service related difficulties into light and thus, TB and corona infected patients may get the best treatments and cares (Filgueiras and Stults-Kolehmainen 2020).

Some important directions to be followed for TB and COVID-19 co-infection.

Demographic data, number of samples tested, molecular data of global patients, family history must be stored for subsequent investigation and evaluation of this co-infection in the pandemic condition.

Immunity of patients varies from one geographical area to other area. People of under developing countries show higher immunity to TB and lower chances of COVID-19 infection. So, these data must be collected for further analysis.

Patients who do not express all symptoms but suspected for COVID-19 must be separated them into isolated condition for quarantine. During this period, proper medications and cares should be provided to the TB infected patients.

To avoid community transmission through droplets or other ways, patients must have to maintain social distancing, wearing masks, using disinfectants, washing hands etc. Both types of patients should follow these instructions for prompt remedy.

The patients who are newly tested for TB also should be diagnosed for COVID-19 for avoiding mistreatments. Regular follow-up process should be available either physically or virtually. It is very essential thing to be noted for all that never treat them inhumanly, break down the social stigma of insulting the co-infected patients and raise public awareness.

Conclusion

From the current review, it is truly expected that if necessary steps provided by the WHO and other regulatory authorities can be followed in the right way then we optimistic that patients co-infected with TB and COVID-19 may get a prompt recovery in this pandemic condition. Another important thing must be taken under consideration that regular follow-up of the co-infected patients should be continued for better prevention and control of TB along with COVID-19.

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