

rise in body temperature (characteristically an evening mild fever in case of *tuberculosis*), headache and shortness of breath, haemoptysis, body aches and weakness. Patients with comorbid conditions are more prone to develop severe COVID-19, which are characterized by the presence of breathlessness, chest pain [5]. Coronavirus disease and *tuberculosis* both are infectious illness and primarily affect respiratory system. Both the diseases have some similar manifestations like fever, coughing and difficulty in breathing. But the onset and incubation period of the disease are different *Tuberculosis* (TB) has longer incubation period compare to COVID-19.

The WHO global *tuberculosis* programme's vision is of a *tuberculosis* free world, devoid of deaths, sickness or pain caused by the deadly illness. India accounts for around a one fourth of all incidence cases and *tuberculosis* fatalities globally or about 2.6 million cases out of a total of 10 million cases [6]. The Indian government has decided to put into immediate effect the Revised National TB Control Programme (RNTCP), embracing the globally approved Directly Observed Treatment Short course (DOTS). The DOTS program is based on five elements which are the political and administrative commitment, good quality diagnosis, uninterrupted supply of quality drugs, Directly Observed Treatment (DOT), systematic monitoring and accountability [7,8].

COVID-19 is the current big worldwide health concern, as we all know. However, while health workers and other organizations are primarily focused on pandemic control, it is equally critical to continue TB services [9]. Even in the COVID-19 pandemic, surveillance, clinical evaluation, testing, systematic monitoring, confirmation of diagnosis and directly observed treatment should remain a public health priority since *tuberculosis* is India's most common infectious illness [10,11].

LITERATURE REVIEW

Search strategy: We searched Google scholar, Scopus, Research gate, Medline, PubMed and WHO and NTEP sites to understand the current TB services and management in the era of COVID-19. We limited our search to relevant English language publications from recent years. For medline the search terms used were COVID-19, TB, MDR TB, RNTCP, contact tracing, DOTS and pandemic etc. and found numerous articles related to the topic.

DISCUSSION

Current and potential TB management techniques in the era of COVID-19.

Tuberculosis diagnosis coupled with Coronavirus testing: Although COVID-19 and *tuberculosis* have comparable clinical manifestations and presentations, such as fever, difficulty in breathing and cough. However the incubation period of TB is much more, having approximately 2-12 weeks but comparatively having a much slower inception of the disease. There is a slight distinction of *tuberculosis* against COVID-19. Due to the

global epidemic, there was a significant decrease in TB notification by 26% from January till June 2020 in comparison to last year. BI directed TB COVID-19 screening, according to the MOHFW, is the greatest technique to lower control TB during the pandemic. According to these findings, the COVID-19 screening for all the clinically diagnosed patients and vice versa, must be performed [12]. The tools used for the microbiological confirmation and diagnosis are sputum smear microscopy, culture, drug sensitivity testing and rapid molecular diagnostic tests.

The sputum smear microscopy includes ZN staining (Ziehl-Neelsen) and fluorescence staining. Culture media is done by means of solid media (e.g. Lowenstein Jensen) and automated liquid culture systems (e.g. BACTEC MGIT 960, bract alert or versa trek). Drug sensitivity testing is done by modified Proportionate Sensitivity Testing (PST) for MGIT 960 system and the economic variant of proportion sensitivity testing using LJ media. Rapid molecular diagnostic test such as Line Probe Assay (LPA) for MTB complex can be used. It is the test used for the detection of isoniazid and rifampicin. Nucleic Acid Amplification Test (CBNAAT) is also used widely [13].

The true Nat system is now a comprehensive assay for screening and confirmation of COVID-19 cases. The three nations with the largest tuberculosis burden are India, Philippines and Indonesia. Studies suggest that tuberculosis notification has decreased to 30% from January to June 2020, in comparison to the same time as of last year (2020). This owes to the system of health care being disrupted due to the result of the Coronavirus pandemic [14,15]. The ICMR has granted the utilization of the true Nat TM Bata CoV-2 test on the true lab TM workplace as a COVID-19 screening test for drug resistant tuberculosis [16].

Contact tracing and aarogya setu app: The national informatics centre has set up the Aarogya Setu mobile application. It is a user friendly application developed that can be used for contract tracing, self-assessment and syndromic mapping. Contact screening is a component of the *Tuberculosis* (TB) elimination plan and it is used to detect people who have recently been infected. It follows risk classification based on the index patient's infectiousness, closeness and the duration of exposure, also contact's susceptibility [17,18]. Contact screening includes a symptom questionnaire (e.g. fever, breathing discomfort, coughing, night sweats, weight loss or loss of appetite) and x-ray chest to assess for suspected *tuberculosis* illness. After 8-10 weeks, if the first test was negative, a re-evaluation should be conducted [19].

In the community, contact tracing and tracking are critical components of TB and COVID-19 control. Aarogya Setu is a digital contact tracing and self-assessment application for COVID-19 in India [20]. The primary priority on containing the COVID-19 pandemic should not jeopardize the vital contact tracing application utilized by TB patients [21].

Anti-tuberculosis medications and monitoring of TB patients: In the era of COVID-19 and the concomitant

lockdown and social distance, monitoring the illness process in patients remains a challenge. A contact centre or tele consultation can be used to track adverse drug reactions. Using nikshay aushadi, improve supply chain monitoring and assure continuous medicine supplies, including enough buffer stock [22]. Treatment assistance might be remotely practical, leveraging e-medicine and internet based techniques like 99 directly observed treatment, short course, smart pill dispenser and VDOT. VDOT is a mobile application that allows patients to use a smartphone to capture videos of their daily drug ingestion without having to deal with health care providers face to face [23].

99 DOTS is another mobile application. It is a pharmacoeconomics approach to improve adherence and facilitate monitoring of the intake of antitubercular medication. It could be worth experimenting with medication vending machines and e-pharmacies to supply medicine to patients' residence 20 community based organizations, such as TB survivors are more familiar with patients than government employees and might be enlisted to give patient assistance through online platforms [24]. Due to insufficient supply and restocking of medicine to patients at home, providing medication for TB patients is a tough undertaking during the pandemic. Various solutions have been proposed, such as the utilization of providing services to reach out to TB cases and the supply of antituberculosis drugs by mail [25]. The World Health Organization's (WHO) new policy for managing multi drug resistant tuberculosis includes reducing tuberculosis preventive regimens to a daily regimen of isoniazid and rifampicin in individuals who have regular interaction with active TB cases.

The Government of India has given guidance by the means of publishing the administration of *tuberculosis* drugs to the patients in OPD settings, stressing the fact that they have to be monitored closely. To limit clinical visits and hence the danger of disease transmission, provide at least a monthly supply of medications with the option of home delivery and in exceptional instances, two month supplies.

There are two phases in the management of *tuberculosis*:

The first is a short and intense phase, early in the management, lasting for 1-3 months. During this phase, three or more drugs are introduced to eliminate as much as acid fast *bacilli* as possible. This results in decreased 'persisters' resulting in the great reduction of the risk of relapse. The second is a continuation phase which aims at sterilizing the smaller number of the remaining dormant or persisting *bacilli*. The anti-tubercular first line medications used during the intensive phase are isoniazid, rifampicin, pyrazinamide and ethambutol. This lasts for 2 months. The second line medications used for the continuation phase are isoniazid, rifampicin and ethambutol.

Prevention of MDR TB during COVID-19 pandemic: To minimize the worldwide burden of MDR-TB, it is crucial to shed light on the growth of drug resistant *tuberculosis* cases [26]. The current unexpected Coronavirus disease

is having considerable, both direct and indirect, detrimental influences on healthcare, with *tuberculosis* services along with its programme resources dramatically declining [27]. All TB patients, whether in COVID-19 quarantine or with COVID positive status, must get anti-*tuberculosis* medication, according to the newest WHO guidelines, for MDR-TB, the WHO six month all oral regimen is more comfortable, with greater treatment success rates and reduced mortality. Fluoroquinolone (ciprofloxacin, ofloxacin and levofloxacin), bedaquiline and linezolid along with clofazimine or cycloserine are among the World Health Organization recommended MDR-TB therapy regimens [28].

Best practise modalities of community based ambulatory MDR-TB care, as well as community based and home care are highly favoured over hospital therapy for TB cases, since it would avoid hospitalisation and allow for monitoring of anti TB medication absorption. Drug resistance in *tuberculosis* will be reduced as a result of this [29]. Due to *tuberculosis* cases being more susceptible to contract the SARS-CoV-2 virus, they are recommended to continue their treatment and take precautions which include social distance, wear a mask and also practice proper hygiene to protect themselves from the virus. According to a latest study, certain cases of MDR TB that were detected according to SARS-CoV-2 were not treated [30].

Safety measures of health care workers during the pandemic: The main causes of TB service interruptions are the redeployment of critical resources and personnel to respond to the global health crisis, as well as limited or low resource settings and a lack of personal protective equipment, among other things. This creates unsafe work environments, which can negatively impact frontline staff morale and mental health [31].

The challenges that healthcare professionals have in completing COVID-19 tasks under lockdown have impeded India's response to the COVID-19 pandemic, putting non COVID-19 health services at risk. The health care workers should accustom themselves and transform in this epidemic period. In this situation, professionals in the health care field must safeguard themselves also their co-workers, families and their patients. They must be safeguarded and supported.

The constant fear and threat of acquiring COVID-19 from their patients have resulted in the increased usage of PPE kits, face masks, face shields and gloves by the frontline healthcare workers. This has resulted in a diminished stock of the main safety gear needed to combat the pandemic. Despite working extra hours, combined with the scarce availability of PPE kits, face shields etc. and the mandatory isolation from their family members have resulted in increased stress causing a mental toll on healthcare workers. To assure them the Government of India had promised to give incentives such as treatment from COVID-19 and providing isolation rooms to ensure safe inhibition [32,33].

The following measures can be implemented to maximize PPE utilization in places where PPE is in short supply

[34]. It would be better to consider online consultation, like telecommunication, as a substitute for outpatient visits hence extending medical help eliminating the need for direct interactions with the patient [35]. Screening is critical in the diagnosis of COVID-19. When screening, use acrylic or polycarbonate partitions or barriers such as plexi glasses to offer a physical space between individuals, assisting with the need for both physical and social distancing. The best solutions in critical care settings include observation windows or antimicrobial curtains, as well as fluid and intrinsically flame resistant drapes that may be utilized to segregate patients on regular wards [36].

CONCLUSION

It is estimated that about one third of the global population is infected asymptotically with *tuberculosis* of which 5-10% develop the clinical symptoms during their lifetime. Globally, an estimated 10 million people had *tuberculosis* in the year of 2019 and the number has been steadily decreasing. The national *tuberculosis* elimination programme has been steadfastly eliminating cases of *tuberculosis* across the nation when the COVID-19 pandemic struck. It has dealt a hard blow to the ground works laid down to negate the disease and continues to hamper the efforts done to curb the spread of *tuberculosis*. COVID-19 may have a substantial influence on surveillance strategies for *Tuberculosis* (TB) on a national and global scale. Patients with *tuberculosis* are concerned that delaying treatment would worsen their condition, necessitating more intensive management. Furthermore, these *tuberculosis* patients may acquire antibiotic resistance and Coronavirus super infection. We consider that a coordinated and effective response to SARS-CoV-2 and *tuberculosis* surveillance, close monitoring and medical management must be implemented. Diagnosing and managing TB cases are still the cornerstones of *tuberculosis* treatment or prevention. Patients with *tuberculosis* might benefit from remote tele consultation to track and supervise their therapy, mobile applications such as VDOT allows patients to use a smartphone to capture videos of their daily drug ingestion without having to deal with health care providers face to face. During the COVID-19 pandemic, vital services for those afflicted by TB should not be interrupted and it must not be overrun in view of SARS-COV-2 virus.

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