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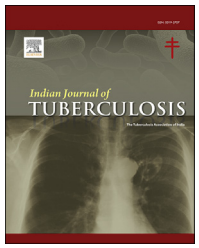

Review article

Fuelling the tuberculosis epidemic: The role of tobacco control in ending the TB emergency

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ABSTRACT

Background: Ending the TB epidemic by 2030 is among the key targets for countries to achieve Sustainable Development Goals. In current times we are grappling with dual burden of tuberculosis as well as tobacco use.

Methods: There is sufficient evidence to establish that tobacco smoking significantly spikes up the risk of acquiring, developing and death among tuberculosis patients. Active or passive exposure to tobacco smoke is significantly associated with tuberculosis infection and tuberculosis disease, independent of a large number of other potential confounders.

Results: Despite having substantial evidence about the impact of tobacco control measures, particularly tobacco cessation, on TB outcomes, the integration of TB and tobacco control still remains far-off.

Conclusion: It is high time when TB control programs must begin to address tobacco control as a potential preventive intervention to combat colliding epidemics of tobacco and tuberculosis. This white paper discusses about the role of tobacco control in reaching the ambitious goal of ending TB epidemic by 2030.

1. Executive summary

Ending the TB epidemic by 2030 is among the key targets for countries to achieve Sustainable Development Goals. In current times we are grappling with dual burden of tuberculosis as well as tobacco use and there is sufficient evidence to establish that tobacco smoking significantly spikes up the risk of acquiring, developing and death among tuberculosis patients. Despite having substantial evidence about the impact of tobacco control measures, particularly tobacco cessation, on TB outcomes, the integration of TB and tobacco control still remains far-off. This white paper discusses about the role of tobacco control in reaching the ambitious goal of ending TB epidemic by 2030.

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2. Tuberculosis

Tuberculosis is still the leading cause of death from a single infectious pathogen attributing directly to around 1.5 million deaths annually. Additionally, about a quarter of population is infected with *M. tuberculosis* and thus at risk of developing TB disease.[1] Though the disease burden caused by TB is falling in all WHO regions, but it is not fast enough to reach the first (2020) milestone of the End TB Strategy.[2] As compared to the desired (2020) fall in TB incidence rate (new cases per 100 000 population per year) at 4–5% per year, and the case fatality ratio (proportion of people with TB who die from the disease) at 10% per year, the current rate of decline are 2% and 3% per year respectively. For most countries (especially lower-middle income), however, the "end" of TB as an epidemic and major public health problem in the foreseeable future remains an aspiration rather than a reality.[2,3]

3. Tobacco use

Tobacco use kills over 8 million people each year globally, out of which, more than 7 million are the result of direct tobacco use while around 1.2 million are the result of non-smokers being exposed to second-hand smoke. It is estimated that around 100 million died prematurely by tobacco in 20th Century.[4] The total economic cost of smoking (from health expenditures and productivity losses together) globally are estimated to be around USD 1.4 trillion per year, equivalent in magnitude to 1.8% of the world's annual GDP. Almost 40% of this cost was incurred in developing countries, highlighting it's substantial burden these countries.[5,6]

4. Association betweenTB andTobacco

Systematic reviews and meta-analysis have produced significant evidence that active smoking increases the likelihood of acquiring, developing and dying from a TB infection and developing recurrent tuberculosis.[7–9] Active or passive exposure to tobacco smoke is significantly associated with tuberculosis infection and tuberculosis disease, independent of the effects of alcohol use, socioeconomic status and a large number of other potential confounders.[10] Smoking increases the risk of TB disease by more than two-and-a-half times. More than 20% of global TB incidence may be attributable to smoking, accounting for around 3 million new TB cases.[9,11] Smokers with tuberculosis had a more severe clinical and radiological presentation, more frequent sputum positivity at presentation and after 2 months of treatment, a lower rate of success, and higher relapse rate. Further, exposure to tobacco smoke increases the risk of latent TB infection, culture conversion, cavitary disease, and transmission of disease.[12] Smoking can mask TB related symptoms and thus lead to delayed diagnosis, more critical TB conditions and high mortality rates.[13,14] Further, Second Hand Smoke (SHS) also increases the risk of acquiring infection (RR-1.19) and progression to TB disease (RR-1.59), with high TB burden reported in the countries with increasing SHS exposure.[15,16]

Research has also shown that 50% of deaths from TB among Indian men were attributed to smoking,[17] which costs India's economy three times its tuberculosis budget. Also, surplus deaths occur among smokers due to tuberculosis as compared with nonsmokers, among both men (risk ratio, 2.3; 99% CI, 2.1 to 2.6) and women (risk ratio, 3.0; 99% CI, 2.4 to 3.9).[18] Smoking is predicted to cause an excess of 18 million TB cases and 40 million deaths from tuberculosis between 2010 and 2050, if the current smoking trends continue.[19–22] Smokers who quit reduce both their risk of becoming infected with TB and thereafter dying from it.[23] World Health Organization reported that TB rates could decline by as much as 20% if smoking was eliminated.[24] Vigorous tobacco control that results in a 1 percent drop annually in a country's smoking rates could substantially reduce the toll of TB deaths by almost 27 million by 2050.[22] Despite the strong evidence of the effect of tobacco control measures and tobacco cessation, the integration of TB and tobacco control remains elusive.

Exposure to tobacco smoke impairs the phagocytic function of alveolar macrophages and damages cilia in the airways, which might increase host susceptibility to TB infection. It also causes altered immune response and multiple defects in immune cells such as macrophages, monocytes and CD4 lymphocytes, which predispose the individual to high risk of TB infection (establishing biological plausibility).[37]

5. Global policies for jointTB-Tobacco activities

- In 2005, WHO Tobacco Free Initiative and WHO Stop TB program, in collaboration with The Union, developed a policy paper for successful integration of tobacco control into TB control program through a practical approach to lung health, a component of Stop TB strategy.[25]
- A WHO-The Union monograph on TB and Tobacco (2007) recommends assessment of tobacco use and tobacco cessation services routinely for all diagnosed TB patients for improving clinical outcomes.
- In 2008 and then in 2010, The Union published guidelines on "Smoking Cessation and Smoke free environments for tuberculosis patients" which addresses the association between tobacco smoke and tuberculosis and offers recommendations for health service providers who want to help their patients with TB to stop using tobacco.[17]
- In 2013, the World Health Assembly passed a resolution to approve the End TB Strategy, which was based upon three pillars, one of which calls for integrated, patient-centred care and prevention. This provides an opportune platform to align the efforts against two global epidemics simultaneously, tobacco and TB.[26]
- Pilot studies integrating brief advice for tobacco cessation in TB patients that have been implemented in Bangladesh, India and Indonesia, which demonstrated that this intervention can be effective (refer to Case Study-1 & 2). India has since developed a Joint TB-Tobacco Collaborative Framework, and is implementing the same through its NationalTB and Tobacco Control Programs.[27]
- TB and Tobacco Consortium in South Asia used "capability, opportunity, and motivation as determinants of behaviour"

(COM-B) framework to understand any issues facing health worker delivery of behaviour support, and subsequently developed a training package for health workers of LMICs for tobacco cessation support among tuberculosis patients.[28]

- South-East Asia's Regional Response Plan for Integration of TB and Tobacco 2017–2021 reiterates its Member States to implement cost-effective cessation services through TB programs and screen tobacco users for TB.[29] All 11 countries in the South- East Asia Region have a national TB program integrated into primary health care delivery systems to which a cessation service component could be added.
- Through Framework Convention on Tobacco Control (FCTC) 2030, the convention secretariat has partnered with the United Nations Development Programme (UNDP) to incorporate tobacco cessation activities into grants from The Global Fund to Fight AIDS, Tuberculosis and Malaria.[30] The partnership is based upon the successful case studies about how tobacco consumption worsens tuberculosis and HIV outcomes, and how the integration of tobacco control into these grants could increase health benefits and efficiencies.

6. Case study- 1

Health system changes for integration of tobacco cessation within routine TB services: achievements in Pakistan, Bangladesh and Nepal(TB and Tobacco Consortium, August 2019) TB and Tobacco Consortium, in close collaboration with the national TB programs (NTP) in Pakistan, Nepal and Bangladesh identified key health system barriers to the integration of behaviour support for tobacco cessation within NTP In all three countries, they found there was little mention of tobacco within policies and supervision guidelines, health workers did not see tobacco cessation as part of their job and with no training, did not feel confident to support their patients to quit. The team identified strategic health system changes to overcome the identified barriers, namely: a) policy change; b)training of NTP officers as trainers and then rolling out of a brief training for health workers using videos freely available from tbandtobacco.org along with all the tobacco cessation behaviour support materials c) revision of training manuals and supervision guidelines to include monitoring of provision of cessation and importantly, d) the inclusion of three key indicators within existing, routineTB recording and reporting forms: i) tobacco status at registration,ii) advice given andiii) stats/quit at the 6 months at the end of treatment In Pakistan, the National Guideline for the Control of Tuberculosis (August 2019) has been revised to include tobacco cessation as a core part of the service to be delivered to TB patients. They were able to train 17 trainers in a short 6-hour training session who then went on to train 115 TB health workers from 59 TB clinics and distribute the behaviour support materials. In similar fashion, a training of trainers event was held to develop a cadre of NTP officers inNepal and Bangladesh which were able to train TB health workers in their districts. NTP Nepal has now included the component of TB and Tobacco in its Basic TB Management Training Manual with revised indicators for tobacco. Following training, consortium researchers assessed the health workers' confidence to deliver cessation in each country using a validated questionnaire. They found that health worker confidence increased in all three countries to an average of 86% confident to deliver cessation behaviour support in Pakistan, 99% in Bangladesh and 81% in Nepal. The valuable lessons learnt were:

- Recording and reporting is key: including the three tobacco indicators within the existing TB forms serves two important purposes: i) it reminds health workers to ask about tobacco use and ii) allows managers to monitor implementation. Integration of the three tobacco indicators within new TB electronic patient records such as HMIS/DHIS2 will be an important step forward.
- Keep it simple: from an initial 30-minute behaviour support consultation, the Consortium has reduced the flipbook-led consultation to only 8 minutes, including key TB management messages as well as simple support for tobacco cessation.
- A brief session of a couple of hours delivered by the TB program's own staff can increase confidence to deliver cessation.
- Incorporating a tobacco cessation guide for health workers in NTP training manuals and supervision checklist helps institutionalization and scale-up of tobacco cessation practices in routine NTP services.

7. Case study- 2

Effect of a brief smoking cessation intervention on adult tobacco smokers with pulmonary tuberculosis (Goel S. et al, 2017).[38]

A 2- arm parallel cluster, randomized controlled trial with an objective to assess the effectiveness of a brief Smoking Cessation Intervention (SCI) the Ask, Brief, Cessation support (ABC) package, on treatment outcomes and smoking cessation in smear positive adult pulmonary TB patients was conducted at 17 designated microscopic centers of Chandigarh, India. These microscopic centres were randomly assigned using a computer generated randomization sequence to receive SCI within directly observed treatment, short (DOTS) services, or existing standard of care. Eligible and consenting smokers (15 + years) registered as smear positive pulmonary TB for DOTS (n = 156) between January and June 2013 were enrolled. Smoking cessation (self reported) was assessed at intervals till the end of treatment. End TB treatment outcomes were extracted from patient records. This trial concluded that smoking cessation intervention is effective in inducing smoking cessation among TB patients (adjusted incidence risk ratio = 1.56; 95% confidence interval = 1.24–1.93; $P < 0.0001$).

8. Suggestive strategies of integration

Several integration options can be considered between TB and tobacco control programs. They can be further divided into policy level and implementation level.

8.1. *Policy level*

At the level of policy development, there should be a joint effort for:

- Developing joint legislation and strategies for tacking both diseases under a broader umbrella like Universal Health Coverage.
- Developing technical and operational guidelines for TB-tobacco integration.
- Setting joint planning and monitoring indicators within both programs.
- Establishing a joint coordinating mechanism between tuberculosis control and tobacco control activities at various levels of implementation for alignment of strategies and service delivery. For example- A coordination committee consisting of TB and tobacco control program officers should be formed at each level to ensure implementation of joint collaborative activities. Similarly, TB Officer should be included as a member in the existing Coordination Committee of NTCP and vice-versa.
- Advocating for high taxation on tobacco products for financing tobacco and TB control programs

8.2. *Implementation level*

At implementation level, there should be an effective coordination for:

1. Establishing a continuum of care and support for TB patients (in TB clinics) who wish to quit smoking by providing enabling and supportive environment, where health workers and specialists record history of tobacco use (and any exposure to secondhand smoke) on routine TB reporting forms along with provision of brief customized advice on quitting and ensuring that health care facilities are strictly smoke-free. Further, pharmacological interventions may support patients to quit in settings where they are affordable. DOTS care providers should be trained on "Brief Advice" to TB patients who are tobacco users. The cured patients should be warned that starting smoking again would pose a risk of re-infection and disease[31]
2. Formulating a bi-directional screening mechanism where TB patients are screened for tobacco use and visa versa (screening tobacco users for TB symptoms) which shall be followed with appropriate referral mechanism.
3. Conduction of joint training programs for capacity building of personals under RNTCP and NTCP where, they will be sensitized through a standard common curriculum, about the importance of collective management of both TB and tobacco cessation.
4. Joint IEC activities including designing of IEC material, campaigns that support both men and women to quit all forms of tobacco should be planned.
5. Standardized common and integrated reporting mechanism for both programs should be formulated with tobacco indicators in TB report forms, and TB indicators or tobacco program forms.
6. Public private partnership through active involvement of all stakeholders should be advocated for increased penetration in the community.

9. Concluding statement

There is a huge untapped opportunity for greater integration between two national programs for mutual benefit and resource optimization.[39] Considering very few smoking cessation interventions for pulmonary TB treatment outcome globally, more research should be conducted in this area.[40] It is high time when TB control programs must begin to address tobacco control as a potential preventive intervention to combat colliding epidemics of tobacco and tuberculosis.

[32] A successful trialing of tobacco cessation treatments in conjunction with TB and respiratory health programs[33] will provide a basis for extending them to other health programs like NCD programs, oral health programs,[34] HIV/AIDS programs,[35] mental health programs, and programs addressing the needs of women's, children's and adolescents' health.[36] Incorporating brief advice into existing health care programs has the potential to reach more than 80% of all tobacco users in a country each year if delivered routinely and widely across a health care system.[36]

Given the evidence base, this integration can pave the way for ending TB emergency and attaining ambitious goal of ending TB by 2030.

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