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VIEWPOINT

Post-tuberculosis lung health: perspectives from the First International Symposium

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SUMMARY

ALTHOUGH CURABLE, TB frequently leaves the individual with chronic physical and psycho-social impairment, but these consequences have been largely neglected. The 1st International Post-Tuberculosis Symposium (Stellenbosch, South Africa) was held to discuss priorities and gaps in addressing this issue. A barrier to progress has been the varied terminology and nomenclature, so the Delphi process was used to achieve consensus on definitions. Lack of sufficient evidence hampered definitive recommendations in most domains, including prevention and treatment of post-TB lung disease (PTLD), but the discussions clarified the research needed. A consensus was reached on a toolkit for future PTLD measurement and on PTLD patterns to be considered. The importance of extra-pulmonary consequences and progressive impairment throughout the life-course was identified, including TB recurrence and increased mortality. Patient advocates emphasised the need to address the psychological and social impacts post TB and called for clinical guidance. More generally, there is an urgent need for increased awareness and research into post-TB complications.

KEY WORDS: post-tuberculosis; impairment; sequelae; lung health; lung disease

TUBERCULOSIS (TB) IS THE LEADING cause of death worldwide from an infectious disease, with an estimated 10 million cases and 1.5 million deaths in 2018.[1] On the positive side, the World Health Organization estimates that more than 58 million people have survived TB in this century alone.[1] However, unlike many other respiratory infections, TB has the propensity to leave host tissues permanently damaged or destroyed. It thereby transitions from being a treatable communicable disease, into a chronic morbidity in both adults and children. The fate of TB

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Table 1 Aims of the 1st Post-Tuberculosis Symposium

Aim 1	To advocate for patients suffering with post-TB complications
Aim 2	To facilitate face-to-face networking between leaders in the field
Aim 3	To define the current state of knowledge surrounding post-TB diseases
Aim 4	To discuss and achieve consensus on important aspects of post-TB lung diseases
Aim 5	To produce a reference document for researchers and workers in the field

TB = tuberculosis.

survivors is uncertain, and the long-term outcomes and drivers of morbidity and mortality after TB cure have historically been neglected areas of research.

Post-TB morbidities include both physical impairments, such as chronic lung and other organ impairments, and psychosocial morbidities, including ongoing stigma, anxiety/depression, social isolation and persistent socioeconomic impairment.[2] The true burden of each of these remains poorly described, although a growing literature describes shortened survival post-TB. Mortality rates for TB survivors may be as high as three times controls,[3] while prevalence estimates for lung impairment after pulmonary TB vary from 18–87% depending on the population studied.[4]

Even if these disease burden estimates are inflated, given the 10 million annual new cases of TB each year,[1] post-TB morbidity is likely to be one of the most important causes of chronic lung disease globally. However, its impact is presently hidden in the low and middle-income countries where clinical services, research and advocacy remain inadequate. Additionally, people completing TB treatment remain at increased risk of developing TB again.[5,6] Importantly, TB affects not just the individual, but also their households and communities, and these broader impacts have not been fully evaluated. Catastrophic costs can be incurred by 32–83% of TB-affected households related to TB care, and it is unknown if families ever fully recover.[7]

The problems encountered after TB are not new, but have yet to be addressed by national TB programs or funding agencies. Only a small fraction of the estimated US$6.8 billion expended by countries on TB control, or the estimated US$ 772 million spent on TB research has been directed to life and wellness after 'cure'.[8] Here we present a summary of the outcomes of the various workshops held at the symposium (http://www.post-tuberculosis.com).

STRUCTURE AND AIMS

Conceptualised and implemented by an international steering committee, the symposium had the five aims presented in Table 1. The symposium was structured as a working meeting with presentations and workshops covering a range of overlapping aspects of life and illness after TB (Figure). The workshops provided a forum for discussion of existing data and knowledge gaps. The steering committee made use of the Delphi Technique to reach consensus.[9] In brief, the Delphi Technique is a structured systematic communication method which relies on a panel of experts. It uses a list of questions that is developed and refined in

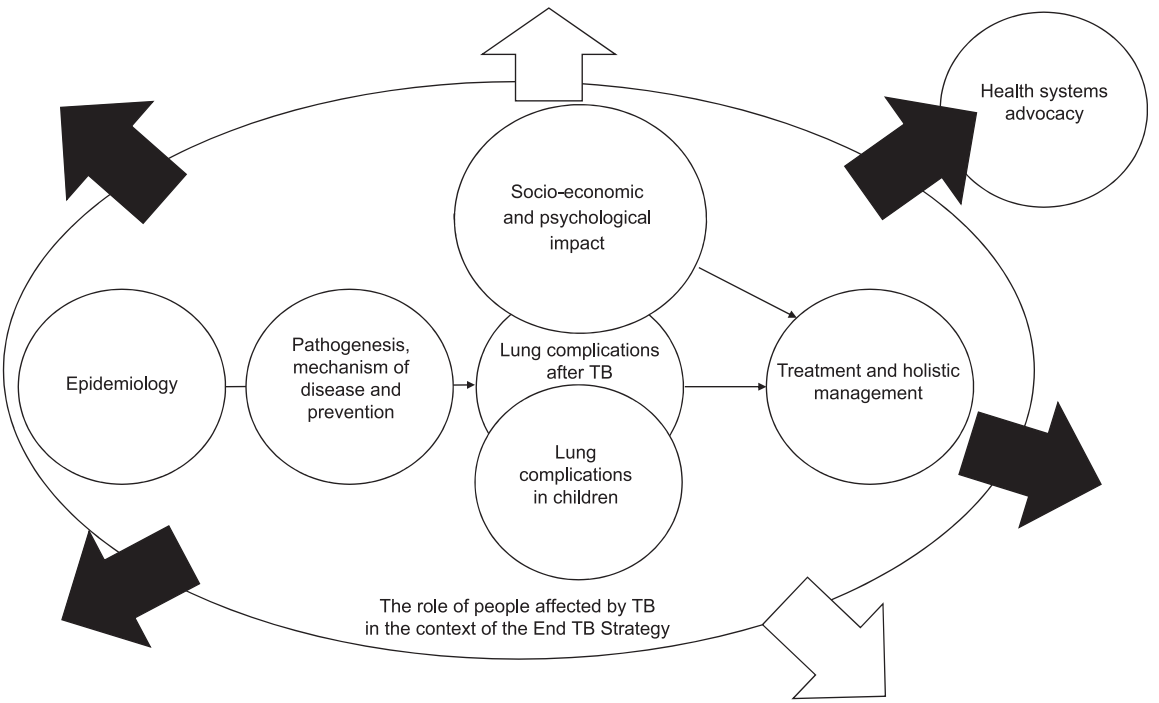

Figure Overview and relationship of the workshops held during the 1st Post-Tuberculosis Symposium. TB = tuberculosis.

several rounds. The process is iterative, where anonymously obtained information is recorded and reported to delegates regularly. By 'confronting' the delegates with each other's ideas and insights in each new round, consensus opinion is built. The process was repeated until the threshold for agreement, set at 66%, was reached.

Consensus on terminology

A major barrier to progress in this emerging field has been a lack of consensus in terminology and nomenclature.[10] Priority was given to achieving consensus in terminology, to effectively categorise and easily identify relevant literature. Existing terminology used to describe the long-term effects of TB following treatment completion, were identified from the literature.[4,10] Using three rounds of the Delphi process, all delegates voted with a majority vote of 84% to embrace the term 'post-tuberculosis'. This term is proposed as a prefix or adjective to describe residual morbidity after TB and may be used within publications or as a key word for manuscript search terms.

Additionally, delegates within workshops reached consensus on the specific terms of 'lung disease/s' to describe the lung complications after TB ('post-tuberculosis lung disease/s (PTLD)'), and 'economic, social and psychological (ESP) well-being' to describe the psycho-social complications after TB ('post-tuberculosis economic, social and psychological well-being' (Post-TB ESP)'). This nomenclature will be re-assessed and reviewed as new data emerge.

Epidemiology of post-tuberculosis lung disease

The aims of the workshop were to discuss 1) current knowledge on disease burden due to PTLD, 2) relevant PTLD-outcomes including how they are measured and reported in epidemiological and clinical studies and 3) current evidence on risk factors for PTLD.

The workshop participants agreed that whilst there is strong evidence for the existence of PTLD,[4,10,11] estimating its precise burden remains challenging. Reasons for this include 1) diversity in clinical phenotypes, 2) heterogeneity of outcome measures, and 3) variable methodology for estimating the fraction of post-TB lung abnormalities directly attributable to TB and a lack of adequate control for confounders. The risk factors for the development of PTLD are also poorly established.

Apart from concrete PTLD case definitions, a common methodological framework describing the relevant diagnostic tools and interpretation strategies for the measurement of PTLD and associated risk factors was called for, with specific guidelines on the interpretation and grading of results from each PTLD assessment tool (see below). Where adapted guidelines for PTLD are missing, existing guidelines and standardised testing instructions, including questionnaires, showing the best fit to the studied population should be chosen. Reports on PTLD-outcomes should include a detailed description of the methodology used and provide explanation on reasons for selection.

Additionally, potential research gaps related to PTLD were identified and how to address these in future clinical or epidemiological studies was discussed. There was agreement that next to proper case definitions, the different phenotypes of PTLD should be better characterised. Further follow up studies are needed to define the clinical outcomes that are meaningful for PTLD-related morbidity and mortality. Finally, the role of the long list of potential risk factors, such as environmental, occupational, clinical and behavioural exposures, affecting the development of PTLD deserve further investigation.

Minimum case definition of post-tuberculosis lung disease

Participants highlighted the need for a PTLD case definition to be: broad and inclusive with sensitivity prioritised over specificity; be suitable for use in low and high resource settings; allow for dual-pathology with both PTLD and other respiratory pathologies occurring together; allow for patients to have both PTLD from an old episode of TB disease and a recurrent episode of active TB disease. It was acknowledged that lung damage can be asymptomatic, but may still be relevant to patient outcomes, and that individuals who may have had a previously undocumented or untreated episode of pulmonary TB may still have PTLD. Finally, it was noted that dual pathologies are widely seen, and it can be challenging to identify the primary contributor of a patient's symptoms.

After three Delphi rounds, participants agreed on the following minimum case definition:

> Evidence of chronic respiratory abnormality, with or without symptoms, attributable at least in part to previous tuberculosis.

Measurement toolbox

There are multiple approaches to measuring PTLD, and there was recognition that standardisation of approaches and tools is preferable but is limited by variable access to resources between settings, and lack of prospective data to inform which 'core' aspects of disease or measurements best predict long-term outcomes.

Delegates generated a list of potential approaches (or a 'toolbox'), from which professionals can choose an approach to measure PTLD according to their available resources (Table 2). Although it is not possible to standardise measurement tools at present, the need for standardisation and quality control was highlighted. The importance of measuring co-exposures or co-morbidities was discussed and a potential list included.

Table 2 Post-TB lung disease measurement toolbox, including aspects of disease and comorbidities/co-exposures which may be measured in clinical and research practice, according to available resources

Category	Parameter	Measurement tool/item
Post-TB lung disease measurement	Self-reported symptoms	Shortness of breath (MRC/mMRC score), cough, sputum, wheeze, chest pain, haemoptysis, fatigue
	Clinical measures	Observations: respiratory rate, oxygen saturation, heart rate, BMI Investigations: arterial blood gas
	Lung function	Pre- and post-bronchodilator spirometry: FEV_1, FVC, $FEV_{25–75}$ Lung volumes: RV and TLC Gas transfer *Measurement, quality control and interpretation as per international norms strongly recommended
	Radiology	CXR parameters CT parameters *No validated scoring tools as yet available
	Functional capacity	Submaximal tests: 6-minute walk (distance, nadir saturations, time to recovery), sit to stand Maximal tests: incremental shuttle, cardiopulmonary exercise testing *Measurement, quality control and interpretation as per international norms strongly recommended
	Health-related quality of life	Respiratory focused: St George's Respiratory Questionnaire General tools: Short-Form Health Survey (SF12/SF36), Karnofsky Performance Scale, COPD Assessment Test For economic analyses: WHO TB patient cost surveys *Local translation, modification and validation strongly recommended
	Disease behaviour	Evidence of cor pulmonale: pedal oedema, echocardiography (pulmonary artery pressures) Evidence of exacerbations: exacerbation rate, hospitalisation rate Microbiology: colonising/infecting organisms, including bacteria/mycobacteria/viruses/fungi
	Socio-economic consequences	Mental health symptom screen (WHO self-reporting questionnaire-20 or Kessler psychological distress scale); TB-related stigma (Stigma Scale for Chronic Illness or Van Rie TB-related stigma tool); self-reported disability related to TB (Sheehan Disability Scale) Socio-economic information and patient costs (direct and indirect): WHO TB patient cost surveys
Factors influencing disease or outcomes	Co-exposures	Respiratory exposures: smoking, substance abuse, biomass exposure, occupational exposures Environmental exposures: alcohol use, socio-economic situation
	Comorbidities	Preceding/concurrent respiratory disease: silicosis, COPD, other Immunosuppression: HIV, diabetes mellitus, other Other comorbidities: cardiovascular disease, other

TB = tuberculosis; MRC = Medical Research Council; mMRC = modified MRC; BMI = body mass index; FEV_1 = forced expiratory volume in 1 sec; FVC = forced vital capacity; RV = residual volume; TLC = total lung capacity; CXR = chest X-ray; CT = computed tomography; COPD = chronic obstructive pulmonary disease; WHO = World Health Organization; HIV = human immunodeficiency virus.

Severity scores

There was unanimous agreement that a validated severity scoring system for PTLD, would be of great value to identify patients at highest risk of adverse outcome, for both clinical and research purposes. Agreement was reached that a single, simple, easy to use scoring tool should be developed for use in both high- and low-resource settings, with flexibility according to available tests. Potential outcome measures against which this score could be derived included: mortality; health related quality of life; rate of lung function decline; rates of exacerbations/hospitalisations; as well as rates of TB recurrence. There was no consensus around a single outcome to be prioritised, and although mortality is likely the most important, all were felt to be meaningful. The challenge of deriving severity scores using a composite outcome, was highlighted and more prospective data are required to derive such scores.

Clinical patterns

The patterns of lung damage caused by TB are diverse and vary both between and within individuals. A 'core' list of patterns of PTLD seen in clinical practice was developed (Table 3). These patterns may occur with or without symptoms, and that an individual patient may have multiple patterns. Definitions were not discussed in the workshop, but suggestions have been provided for future review. It is anticipated that the PTLD management strategies developed can be targeted towards these core clinical patterns of disease, and these will evolve over time.

Pathogenesis and prevention of damage

This workshop examined mechanisms and basic science of TB disease, focusing on the interaction between host, pathogen and environment in the pathophysiology of tissue damage and the potential for host-directed therapies (HDT) to prevent damage. Key objectives were: 1) to identify pathophysiological

Table 3 Suggested PTLD clinical patterns with preliminary definitions (all categories are assumed to meet basic PTLD minimum case definition)

Compartment	Clinical patterns	Suggested definition*
Airways	TB-associated obstructive lung disease	Airway obstruction (FEV_1/FVC ratio $<$ 0.7 OR $<$ LLN) thought to be primarily related to small airway disease
	Bronchiectasis	CT definition (evidence of airway dilatation) $>$ diameter of adjacent vessel, or non-tapering, OR CXR definition (evidence of ring and tramlines)
Parenchyma	Cavitation	A gas-filled space either within an area of pulmonary consolidation, or surrounded by a thin wall
	Parenchymal destruction	Extensive destruction of lung tissue, with a gas-filled space occupying the volume of $\geq$1 lobe
	Fibrotic change	Areas of parenchymal scarring, with associated volume loss
	Aspergillus-related lung disease	Evidence of aspergilloma on imaging OR chronic pulmonary aspergillosis on imaging and blood testing
Pleural	Chronic pleural disease	Evidence of pleural thickening on CXR or CT imaging
Pulmonary vascular	Pulmonary hypertension	Elevated pulmonary artery pressures as estimated using doppler echocardiography or measured at right heart catheterisation
Other	Other	Other pathology, not meeting the criteria above

* These definitions were not discussed at the Symposium, but are included as suggestions, and are expected to evolve as new data emerge.
PTLD = post-TB lung disease; TB = tuberculosis; FEV_1 = forced expiratory volume in 1 s; FVC = forced vital capacity; LLN = lower limit of normal; CT = computed tomography; CXR = chest X-ray.

pathways for investigation; 2) to review the current landscape of HDT trials; 3) develop consensus on appropriate endpoints for HDT trials; and 4) to prioritise knowledge gaps, highlighting areas for further research.

Talks highlighted evidence from cellular, ex-vivo, animal and human observational studies indicating a key role for host immune responses in pulmonary tissue damage during active TB, including: host-derived matrix metalloproteinase activity; neutrophil fate (apoptosis, necrosis or netosis); the balance of arachidonic acid derivatives in the release of pro- and anti-inflammatory cytokines; macrophage fate (necrosis) affecting *M. tuberculosis* survival and the extent of the subsequent host inflammatory response that ensues.[12] There is a need to develop HDT which interrupt specific pathways, focusing on preventing and resolving cell death, matrix destruction and fibrosis, which are considered the primary drivers of morbidity. Two broad categories of HDT were described: those that primarily reduce inflammation or interrupt specific mechanisms for tissue damage, and those that primarily induce antimicrobial activity in phagocytic cells. A wide range of anti-inflammatory candidates have been tested to date, including corticosteroids, anti-TNF-alpha agents, phosphodiesterase inhibitors, anti-oxidants, and mTOR inhibitors. Ongoing or planned trials of antimicrobial HDT include vitamin D, auranofin (an oral gold salt), metformin (an AMPK activator), and imatinib (a tyrosine kinase inhibitor).[13] The majority of these trials are designed to test drugs already licensed for other indications.

During the workshop, priority was given to the most suitable endpoint for HDT trials, as the majority of trials have focused on time to culture conversion as the sole primary endpoint. There was general agreement that microbiological endpoints should no longer be the sole primary endpoint of HDT trials. However, there was no agreement on whether microbiological endpoints should be part of a co-primary endpoint. Those in favour of including a microbiological endpoint argued that it is important in establishing that there is 'no harm' by possible HDT; those opposed argued that this outcome in itself should not dictate whether a possible HDT is successful in improving lung damage (e.g. inflammation) or other long-term outcomes. Other endpoints discussed were similar to the toolkit presented above (Table 2) but additionally included PET/CT scanning; TB relapse and other biomarkers.

The following recommendations on clinical trial design and candidate agents for evaluation were agreed (Table 4): 1) There is a need to develop a pathway from basic science to HDT clinical trials. 2) More clarity is required on PTLD definitions, as discussed above, and outcomes to inform HDT clinical study design. 3) It is unlikely that there will be a 'one size fits all' preventative or HDT approach. 4) HDTs may adversely affect microbiological outcomes (i.e. promote discordant microbiological and lung health outcomes) and thus may have the potential to worsen lung damage. 5) All future HDT trials should include post-TB endpoints. 6) HDT trials should include people living with HIV infection.

Lung complications in children

Despite increasing awareness of PTLD in adults, there are no data available in children. It is well documented that early life lung function 'tracks' throughout life,[14,15] pulmonary TB early in life could therefore have long-lasting and devastating consequences on lung health. A better understanding of the impact of PTB on long-term respiratory morbidity in children is urgently needed.

There are challenges to the diagnosis of PTLD in children, including that TB diagnosis is made on

Table 4 Post-TB priority areas and research priorities

Topic	Priority areas and research priorities
Epidemiology of PTLD	Common methodological framework across studies Follow-up studies defining meaningful clinical outcomes Investigation of factors affecting development of PTLD (e.g., environmental, occupation, clinical and behavioural factors)
Lung complications after TB	Validation of tools used in PTLD Evaluation of clinically meaningful phenotypes and predictors of morbidity and mortality Development of validated severity scoring system
Pathogenesis and prevention	Development of pathways from basic science to HDT trials Assessment of most meaningful endpoints in HDT trials Clinical trials of HDTs
Pulmonary consequences of TB in children	Obtain disease estimates of burden of disease Obtain estimates of spectrum of disease Retrospective analysis of existing diagnostic, observational and treatment data
Social, economic and psychological impact	For the individual: report disability (e.g., quality of health, mental health, pain, TB-related stigma), economic consequences and proportion facing catastrophic total costs For the community: quantify the economic and social impact of social and family networks For the health system: determine the cost of residual disability to the health system
Treatment and holistic management	Optimal timing of assessment for post-TB complications Non-pharmacological studies: pulmonary rehabilitation, education on self-management, airway clearance techniques Pharmacological studies: bronchodilators (e.g., long-acting beta-agonists, long-acting anti-muscarinic agents)
Health care systems	Prioritisation of advocacy for research funding to generate needed evidence Development of guidelines for clinicians using available evidence and expert opinion Engagement of international organisations, professional bodies and pharmaceutical industries
Role of people affected by TB	Peer group support and community interventions to reduce stigma Sustainable funding for affected community-driven advocacy and support for their involvement in research, policy and programmatic decisions Former patient engagement to address recurrent TB

TB = tuberculosis; PTLD = post-TB lung disease; HDT = host-directed therapy.

clinical grounds in the majority of children.[16] There was agreement that the 'clinically diagnosed or unconfirmed' TB cases should be included when investigating PTLD. In addition, the participants identified the need to advocate for PTLD as a clinical diagnosis in children with suspected TB and a history of TB, while carefully excluding active TB disease. The group proposed the following minimum case definition for PTLD in children:

> Evidence of chronic respiratory impairment in an individual previously adequately treated for pulmonary tuberculosis in whom active tuberculosis is excluded, and in whom no other cause of chronic lung disease is the predominant cause.

The case definition may require adaptation as more evidence becomes available.

There is a lack of awareness and funding in this field and long-term follow-up cannot be recommended as standard of care in routine services where the healthcare system is already overburdened. Studies are currently underway determining the long-term burden of TB on lung health in children. This data is required to obtain first estimates of the burden and spectrum of PTLD in children, especially since we expect PTLD to be heterogenous between the different age groups.

Finally, the working group strongly recommended that TB and its consequences should be viewed as a life course disease and incidents that happen in early childhood should be included and probed when reviewing disease later in life.

Social, economic and psychological impact

There is little evidence available on social, economic and psychological consequences of TB after treatment completion.[10] We do know that a substantial proportion of TB survivors have chronic respiratory disorders impairing quality of life (QoL), which are likely to place a continued financial burden on them, their families, their communities, and their health systems.[17] The global impact of TB-disease is most likely underestimated because measures of disease burden (such as disability-adjusted life year) do not consider residual disability after treatment completion. The main aim of this workshop was to map existing evidence, identify main research gaps and generate research questions on the social, economic and psychological impact of TB after cure.

Very little data and literature exists in this area, and there is an urgent need to both quantify and qualify TB patient experiences beyond TB cure. The highest priority gaps identified (Table 4) were 1) at the individual level: longitudinal data on clinical symptoms and lung impairment after TB together with

other indicators such as mental health, disability, QoL, TB-related stigma etc.; 2) at the individual, household and family level: data on the magnitude and main drivers of different types of costs (direct and indirect) incurred by TB patients and their households after TB cure; economic impact of TB (e.g. work productivity, proportion facing catastrophic total costs etc.)[8]; social impact of TB and post-TB morbidity on family and social networks; coping strategies and resilience of TB survivors; 3) at the health care system level: guidance to ensure continuation and integration of health, social and psychological care; evidence on cost-effective interventions to reduce post-TB disability; best practices on how to provide health education and information about 'after cure life' during treatment. While tools are available (Table 1) or can be adapted address these research gaps, there is a need for robust epidemiological studies and large multi-country cohort studies.

Treatment and holistic management

Only 56 studies addressing treatment and management of PTLD have been published, with the majority assessing lung surgery and ventilation techniques, and almost no studies specific to PTLD.[5] Only a few small studies assessing pulmonary rehabilitation and medication are available and were discussed. There was agreement that existing TB treatment guidelines are inadequate for the diagnosis, prevention and treatment of PTLD, for which no guidelines exist. Although specific guidelines are urgently needed, it is challenging due to lack of evidence for treatment specific to PTLD, and the diversity and spectrum of PTLD outcomes. Additionally, there is no evidence to either support or refute the use of the majority of existing respiratory treatments used in other chronic lung diseases (e.g. COPD, bronchiectasis etc.) being extrapolated to PTLD patients.

There was consensus on the need for follow-up after TB treatment as evidence emerges for increased mortality, morbidity and recurrence risk in the post-TB period.[3–5,11,18] At a minimum, lung function evaluation should be performed in order to detect and better specify possible lung function impairment. This assessment should help to identify patients suitable for pulmonary rehabilitation. There is not yet universal agreement on the setting (in- or outpatient) and characteristics of pulmonary rehabilitation (e.g., psychological support, education, exercise, pharmaceutical treatment and oxygen) in patients with PTLD, however, local and economical resources need to be taken into consideration when developing guidelines.[19–23]

A list of health outcomes to measure success of PTLD management strategies in clinical settings was proposed similar to the 'Post-TB toolbox' (Table 2) and included mortality. More research is urgently needed on the effectiveness and comparative cost of PTLD treatment options including: pulmonary rehabilitation; education about self-management; airway clearance and bronchodilators.

Health care systems

This workshop discussed health systems as the foundation for post-TB care and explored opportunities to impact health systems through advocacy to improve quality of care at every step in the TB care cascade. The workshop drew from presentations on health systems bottlenecks of care, personal testimonies and experiences of survivors, a human centered design approach where participants debated prioritisation of barriers in the TB care cascade.

Two priority areas for advocacy were identified: 1) evidence gaps in post-TB health and wellbeing; 2) lack of clinical guidelines and algorithms for the management of PTLD including the counselling of TB patients. The workshop therefore recommended 1) Prioritisation of advocacy for funding of research needed to generate evidence. Such research must address cost effectiveness of interventions and QoL; 2) Development of a guideline for clinicians, drawing on the current evidence base and expert opinion where necessary, and made available in collaboration with The Union. This will be reviewed as more evidence becomes available; 3) Development of integrated counselling services for TB patients in health systems.

The workshop recommended engagement of several groups including international organisations, professional bodies, pharmaceutical and other healthcare technology industries, TB affected communities and former TB patients as advocacy partners.

The role of people affected by TB

The aim of this workshop was to reflect on the role of former TB patients, their families and communities in the context of the End TB Strategy and its first pillar: 'Integrated, patient-centred tuberculosis care and prevention'.[24] Two central topics were addressed. First, how to involve former patients in TB advocacy, mentoring and support of new patients and communities. Second, to reduce the burden of recurrent TB, we explored potential challenges to providing targeted health-care solutions to former patients.

Research has shown how former patients have assisted in finding missing people with TB,[25] increasing the uptake of screening for latent infection[26] and preventive therapy among household contacts, and improving treatment completion.[27]

There was also a discussion of the detrimental effect of stigma in communities, its impact on diagnostic delays and treatment non-completion.[28] This emphasised the importance of clinic and workplace sensitivity to unique patient experiences as being central to prevent enacted stigma from health workers and discriminatory practices from employers, both infringements on human rights. The

importance of peer group support and interventions improving community knowledge to reduce internalised and anticipated stigma were emphasised.[29]

The group identified the need for sustainable funding of advocacy work by former patients, to ensure better access to new innovations, person-centred research, and the community involvement in policy and programmatic decisions.[30] Former patients remain at high risk of TB even after completion of adequate treatment[5] and therefore require solutions to prevent recurrence and reduce transmission within communities.[6,31] The group recommended that former patients be engaged in the design of new integrated solutions of post-treatment health-care programs to address the prevention and management of both recurrent TB and PTLD. Finally, patient advocates called for the urgent development of clinical guidelines for the management of patients PTLD, which can be updated as evidence emerges.

CONCLUSION

Despite major global advances in the diagnosis and treatment of TB, it is unlikely to be eradicated within the next few decades, and the long-term complications are largely not addressed. This symposium was an important step towards highlighting the physical, psychological and socio-economic suffering that continues long after treatment completion. The difficulty in making definitive recommendations in many domains was determined by the astounding lack of data, emphasising the fact that this area has largely been overlooked by TB programs, funders, clinicians and researchers.

There is an urgent need for advocacy, increased awareness, and funding of research to provide the evidence base needed to develop robust guidelines. Advocacy should be multi-disciplinary and involve individuals affected by TB. Prevention of TB (and therefore post-TB complications) should remain a primary goal, but there may already be millions of adults and children with post-TB sequelae for whom prevention is too late. Urgent solutions are needed to relieve suffering and prolong life amongst former patients, and to mitigate the impact of post-TB disability on the households and communities in which they live. There is a need for guidelines to assist health care providers managing these individuals in the field, which will need to be frequently updated as better evidence unfolds (Table 4).

Only by working together – and in strong collaborative networks – will we be able to rapidly address this previously unspoken epidemic emerging from the shadows of TB.

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RÉSUMÉ

La TB, bien que curable, laisse fréquemment les individus avec un handicap chronique physique et psychosocial, mais ces conséquences ont à ce jour été largement négligées. Le 1e symposium international post TB a été entièrement consacré au handicap après la TB et a couvert de nombreux sujets multidisciplinaires. Avec la processus Delphi, un consensus a été atteint sur les termes "post-TB", "maladie pulmonaire post-TB (PTLD)", et "bien être économique, social et psychologique post TB", pour surmonter le défi historique des variations de la terminologie dans la littérature. Une définition de cas minimale a été proposée par consensus pour la PTLD chez les adultes et les enfants. Le manque de preuves suffisantes a entravé des recommandations définitives dans la majorité des domaines, notamment dans la prévention et le traitement de la PTLD, mais a mis en lumière le grand besoin de recherche et des priorités ont été identifiées. L'hétérogénéité de l'évolution respiratoire et les méthodes de recherche précédemment utilisées compliquent l'estimation précise du poids de la maladie. Un consensus a cependant été atteint proposant une boîte à outils pour la mesure future de la PTLD et sur les profils de PTLD à envisager. L'importance des conséquences extra pulmonaires et d'un handicap progressif tout au long de la vie a été identifiée, dont la récurrence de la TB et l'augmentation de la mortalité. Les porte-parole des patients ont mis l'accent sur le besoin d'aborder l'impact psychologique et social post TB et appelé à une guidance clinique. Il y a un besoin urgent de davantage de sensibilisation et de recherche consacrée aux complications post TB.

RESUMEN

La TB es una enfermedad curable, pero con frecuencia las personas conservan discapacidades crónicas físicas y psicosociales; hasta la fecha, no obstante, se ha prestado poca atención a estas consecuencias. El Primer Simposio Internacional Postuberculosis se dedicó exclusivamente a las discapacidades posteriores a la TB y abordó una diversidad de temas multidisciplinarios. Mediante el método Delphi se logró la unanimidad alrededor de los términos «postuberculosis», «enfermedad pulmonar postuberculosis» (PTLD) y «bienestar económico, social y psicosocial postuberculosis», con el fin de superar la dificultad histórica de una terminología variable en las publicaciones científicas. Se propuso por consenso una definición de caso mínima para la PTLD en los adultos y los niños. La falta de evidencia suficiente obstaculizó la formulación de recomendaciones definitivas en la mayoría de las esferas, incluida la prevención y el tratamiento de la PTLD, pero se puso de manifiesto la urgente necesidad de nuevas investigaciones y se definieron las prioridades. La heterogeneidad de los resultados respiratorios y los métodos de investigación utilizados anteriormente complicó la estimación exacta de la carga de la enfermedad. Sin embargo, se pudo proponer de manera unánime un conjunto de herramientas para la medición de la PTLD en el futuro y los tipos de PTLD que se tendrían en cuenta. Se estableció la importancia de las consecuencias extrapulmonares y la discapacidad progresiva a lo largo de la vida, incluida la recaída de la TB y el aumento de la mortalidad. Los portavoces de los pacientes destacaron la necesidad de abordar las repercusiones psicológicas y sociales postuberculosis y solicitaron la elaboración de directrices clínicas. Se precisa con urgencia una mayor sensibilización a las complicaciones posteriores a la TB y nuevas investigaciones que estudien este problema.