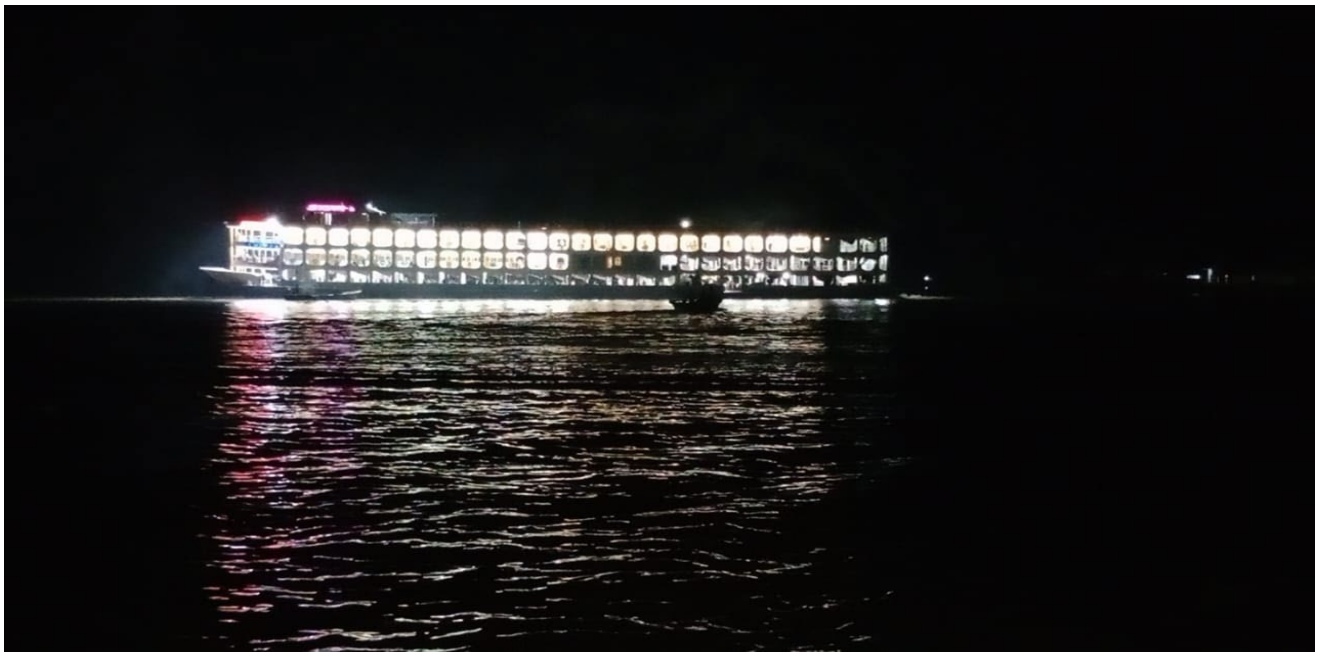
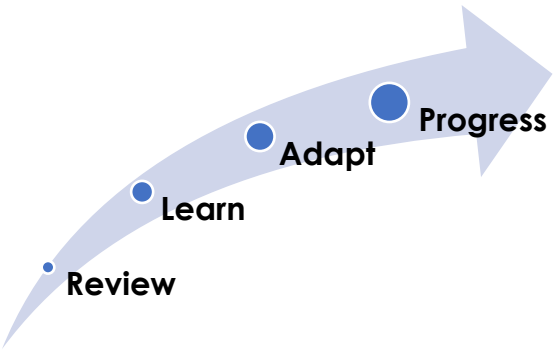
9TH BANGLADESH TB JOINT MONITORING MISSION REPORT





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Abbreviations/Acronyms

ACF	Active Case Finding
ACTB	Alliance for Combating Tuberculosis
ADR	Adverse Drug Reaction
aDSM	active Drug Safety Monitoring and Management
AI	Artificial Intelligence
AIC	Airborne Infection Control
ANC	Antennal Care
ART	Anti-Retroviral Therapy
ARVs	Anti-retroviral drugs
ATT	Anti-TB Therapy
BCG	Bacille Calmette-Guerin
BMA	Bangladesh Medical Association
BPA	Bangladesh Paediatric Association
BPaL	Bedaquiline, Pretomanid, Linezolid
BPaLM	Bedaquiline, Pretomanid, Linezolid, Moxifloxacin
CAD	Computer Aided Diagnostics
CDH	Chest Disease Hospital
CHCP	Community Health Care Program
CKD	Chronic Kidney Disease
cPMDT	Community based Programmatic Management of Drug Resistant TB
CPT	Cotrimoxazole Preventive Therapy
DGDA	Directorate of General Drug Administration
DM	Diabetes Mellitus
DOT	Directly Observed Therapy
DRS	Drug Resistance Survey
DST	Drug Susceptibility Testing
EML	Essential Medicine List
EPTB	Extra Pulmonary Tuberculosis
EQA	External Quality Assessment
FEFO	First Expiry, First Out
FLDs	First Line Drugs
FNAC	Fine Needle Aspiration Cytology
FSW	Female Sex Workers
FQ	Fluoroquinolone
GDF	Global Drug Facility

GFATM	Global Fund to fight AIDS, TB and Malaria
GPP	Graduate Private Provider
HCW	Health Care Workers
HEU	Health Economics Unit
HFs	Health Facilities
HIV	Human Immunodeficiency Virus
ICF	Intensive Case Finding
IGRA	Interferon Gamma Release Assay
INH	Isoniazid
IPC	Infection Prevention and Control
KPIs	Key Performance Indicators
LAM	Lipoarabinomannan
LED	Light Emitting Diode
LPA	Line Probe Assay
MGIT	Mycobacterium Growth Indicator Tube
MNCH	Maternal, Neonatal and Child Health
MSM	Men who have sex with men
MTaPS	Medicines, Technologies, and Pharmaceutical Services Program
NASP	National AIDS and STI Control Program
NCD	Non- Communicable Disease
NGPP	Non-Graduate Private Practitioner
NIDCH	National Institute of Disease of the Chest and Hospital
NTRL	National TB Reference Laboratory
OPD	Outpatient Department
OR	Operations Research
PAF	Population Attributable Fraction
PLHIV	People Living with HIV
PMDT	Programmatic Management of Drug Resistant Tuberculosis
PPE	Personal Protective Equipment
PPM	Public- Private Mix
PV	Pharmacovigilance
PWID	People who inject drugs
QMS	Quality Management System
RR	Rifampicin Resistance
RTL	Regional TB Laboratory
SAM	Severe Acute Malnutrition
SLDs	Second Line Drugs
SOPs	Standard Operating Procedures

t-NGS	Targeted Next Generation Sequencing
TAT	Turn Around Time
TBSTCs	Tuberculosis Screening and Testing Centres
TDCs	Tuberculosis Diagnostic Centres
ToRs	Terms of Reference
TST	Tuberculin Skin Test
TWG	Technical Working Group
UHC	Universal Health Coverage
UHCs	Upazila Health Complexes
VAT	Value Added Tax
VGD	Vulnerable Group Development
VGF	Vulnerable Group Feeding
WGS	Whole Genome Sequencing
XDR	Extensive Drug Resistance

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Executive summary

The 9th Bangladesh TB Program Joint Monitoring Mission (TB-JMM) was carried out from October 16 – 30, 2022. The main objective of this JMM was to evaluate progress that has been made so far in the TB response in Bangladesh, identify gaps and challenges and propose achievable solutions to address those challenges so as to achieve the NTP's overall goal of ending TB as a public health threat by 2030 in line with the targets of the End TB strategy and the Sustainable Development Goals (SDGs). The review used desk review of key documents, field visits to all the divisions of Bangladesh which included health facility visits in both the public and private health sector and key informant interviews to collect quantitative and qualitative data. This data was then synthesized/triangulated to identify key achievements, gaps and constraints in the TB response based on 8 thematic areas. Through discussions and by consensus, the review team then formulated recommendations for each of the 8 thematic areas intended to help the country to ensure gains that have been made in the TB response are sustained and programmatic bottlenecks are overcome. The review findings and key recommendations were presented to the leadership of the Ministry of Health and Family Welfare (MoHFW) at a debrief session, which was graced by the Honourable Minister for Health, Mr. Zahid Maleque, at the Intercontinental Hotel in Dhaka, on October 30, 2022.

Tuberculosis remains a major public health problem in Bangladesh. In 2021 it was estimated that 375, 000 people ((95% CI 273,000-493,00), including 37,500, children under the age of 14, developed TB in the country and 42,000 people (95% CI 28,000-60,000) died of the disease. Even though TB notifications have been on the right trajectory, the country remains off course and is unlikely to achieve the 2030 End TB and SDG TB targets for both TB incidence and mortality. The country may also be off course to achieve the third target of ensuring no person suffers health related catastrophic costs on account of TB. The estimated incidence of TB has not changed for more than two decades, and the country is not on track to achieve the SDG targets of reducing TB incidence and mortality by 80% and 90% by 2030 compared with the 2015 baseline. To illustrate, for Bangladesh to reach the SDG targets in the coming 8 years, the country will need to bring down the number of people developing TB in a year from the estimated 375, 000 currently to less than 70,000 and the number of people who die of TB in a year from the current 42, 000 to 6,000 or less. This will require a high level of political commitment with mobilization of resources, including financial and human resources, commensurate with the size of the public health problem, to upscale the TB response. An approach like what was recently witnessed with, the COVID-

19 response or what has been done with other health programs such as the program to reduce deaths from diarrheal diseases in children is needed to address TB morbidity and mortality in Bangladesh.

In the current TB JMM, it was noted that in all thematic areas reviewed, good progress has been made in virtually all these areas except a few. Thus, reasonable efforts have been made to find people with TB which has led to an increase in the number of TB notifications on a year-by-year basis since 2012 except in 2020 when there was a dip in notification because of the COVID-19 pandemic. In 2022, it appears that TB notifications will not reach the 2021 level or continue the trajectory that has been in place since 2012, most probably because of rapid changes in the stewardship of the TB response that appear to have affected TB service provision and the unavailability of various diagnostic products include Xpert cartridges. Treatment outcomes for both drug susceptible and drug resistant TB are among the best in the world. The laboratory network has expanded with increasing use of rapid molecular diagnostic tests and there is an expanding use of private health care providers. There are however several areas of the TB response that are lagging. These includes under diagnosis and notification of TB in children, inadequate attention paid to drivers of TB such as undernutrition, diabetes and smoking and inadequate screening and testing of populations that have a high burden of TB (vulnerable and high-risk populations). Screening programs appear not to be reaching high proportion of targeted populations and use insensitive tools such as symptom screening with a focus on cough of equal or greater than two weeks. The overall effect of these inadequacies is to delay or miss the diagnosis of TB which facilitates TB transmission, and which may explain the flat TB incidence despite a year-by-year increase in TB notification. These challenges are compounded by inadequate implementation of measures to prevent TB including TB infection transmission prevention in health care settings and the use of TB preventive therapy.

Outlined below is a summary of the key recommendations beginning with the key messages to the leadership of the MoHFW and the National TB program.

1. Adopt an "urgent" and aggressive approach to ending TB

Rationale: To end TB by 2030 Bangladesh will need to not only focus on finding people who are sick with TB but will also need to address transmission of TB. Finding people with TB as early as possible, preferably even before they develop symptoms (although these terms have not been formally adopted or clearly defined, very early pre-symptomatic TB called pre-clinical or incipient TB has been described and may also be associated with TB transmission) will be key to reducing and eventually ending TB transmission at the community and health facility level. This will require scaling up to levels never seen before in Bangladesh of programs for active case finding at both community and health facility level

targeting, where feasible, whole populations that have a high prevalence of TB as currently recommended by WHO (prevalence of 0.5% or more) or selected populations known to have a high burden of TB. Screening programs should utilize tools that have a high sensitivity such as the chest x-ray with or without the use of artificial intelligence and the Xpert MTB/Rif assay. **The enhanced TB case finding efforts will need to twinned with a scaled up effort to provide TB preventive therapy for the best possible effect on TB incidence and mortality to accrue.**

Primary Duty bearers: The MoHFW/NTP and implementing partners with support from funding and technical partners.

Timeline: In the period covered by the TB NSP.

2. Increase financial resources for TB care and prevention

Rationale: Adopting an urgent and aggressive approach to ending TB requires additional financial resources. The size of the populations that need to be reached with TB screening and testing services in Bangladesh is large (for example there are more than 22 million people who live below the national poverty line in Bangladesh currently and who, therefore, are candidates for TB screening) and adopting more sensitive and more effective screening and testing approaches will cost more, however, these interventions are critical if the goal to bring TB to an end in the country is to be realized. If the TB response remains at the same level with arguments against massive scale up of screening and testing services on account of sustainability and cost -effectiveness of interventions, the country would then have to accept that the problem of TB may persist for many decades to come.

Primary Duty bearers: The Government of Bangladesh and health financing partners.

Timelines: In the period covered by the TB NSP.

3. Continue and expedite efforts to support local manufacturer(s) of anti-TB medicines to get these medicines WHO pre-qualified

Rationale: Components of anti-TB medicines formulated in Fixed Dose Combinations (FDCs), such as rifampicin may not be bio-available even when manufactured under Good Manufacturing Practices (GMP). Bio-equivalence studies are critical to confirm bioavailability. As the country switches to procurement of anti-TB medicines from local manufacturers the efforts being made to ensure that these medicines are WHO pre-qualified need to be continued and expedited.

Primary Duty bearers: MoHFW, Bangladesh Drug Regulatory Authority, the NTP, partners of the NTP.

Timelines: As soon as possible

4. Enhance efforts to identify children with TB aiming for zero TB deaths in children by 2025.

Rationale: There is evident low detection of TB among children meaning a large number of children with TB are dying. Over more than a decade the proportion of children under 14 among all TB notifications has been between 2-3% against an expected proportion of about 10-12%. Undiagnosed children with TB are very likely to die from their disease.

Primary duty bearers: The NTP, partners of the NTP including the Bangladesh Paediatric Association (BPA).

Timelines: In the period covered by the next TB-NSP.

5. Expand engagement of private providers with appropriate incentives and enablers to sustain engagement and to enhance quality of care provided by these providers.

Rationale: In Bangladesh, it has been estimated that up to 80% of initial care seeking for any symptoms is to private providers especially private providers that are close to people's homes (pharmacies, general practitioners etc). Engaging these primary care level providers will have far reaching benefits for TB care and prevention in Bangladesh including early diagnosis of TB and thus reduction in TB transmission, faster return of people to good health and a productive life, reduced risk of post TB chronic morbidity and protecting people with TB from incurring high TB associated health care costs. The opportunity to achieve all these benefits should not be missed, however, the risks of engaging private providers in the provision of TB care and prevention services should also not be ignored. These risks should be clearly defined and mitigation measures put in place.

Primary duty bearers: The NTP and implementing and technical partners

Timeline: During implementation of the next TB-NSP

6. Address TB associated co-morbidities

Rationale: The World Health Organization estimates that the major drivers of TB in Bangladesh include undernutrition, diabetes, and smoking. While there are programs that are designed to address these up-front determinants of TB, the TB response does not appear to be linked to these programs. Additionally, people with these risk factors for TB are not routinely mapped and targeted for active TB case finding.

Primary duty bearers: The NTP and implementing/technical partners.

Timeline: During implementation of the next TB-NSP

7. Address congestion in health care facilities, especially the large college hospitals through the development and implementation of comprehensive facility specific infection prevention and control strategies and plans.

Rationale: Current congestion levels in college hospitals makes it impossible to implement airborne infection control measures and pose a significant risk of transmission of Mycobacterium tuberculosis and other airborne infections. A comprehensive plan needs to be developed and implemented to reduce this risk. Building the capacity of lower levels of the health service delivery system may help to reduce referral to or the need for people to seek care at the apex of the public health services delivery system.

Primary duty bearers: the MoHFW, College Hospital administrators and financial and technical partners of the MoHFW.

Timeline: This should be an on-going activity as part of the health system development plan and process.

8. Continue efforts to sustain the high treatment success rates

Rationale: For Drug Susceptible TB (DSTB), Bangladesh achieved a treatment success rate (TSR) of 95% for the 2020 cohort which is commendable. For DRTB, the TSR for the 2019 cohort was 74% which is above the global average. The NTP and implementing partners have been implementing measures that ensure adherence to treatment such as community-based treatment support. These measures need to be continued so that the treatment success rate for both DS and DR TB remain high. It is however important to note that the TSR for DR -TB is still lower than it should be. With only 74% of people treated for DRTB completing treatment, it means a significant proportion of these people have outcomes that are not what is desired. Therefore, for DR-TB measures need to be put in place to also increase TSR beyond just being above the global average.

Primary duty bearers: The NTP and implementing/technical partners.

Timelines: During implementation of the next TB-NSP

9. Empower lower levels of the "system" to localize the TB response.

Rationale: Local planning and implementation will build ownership of the TB response and is more likely to be effective. Attempts have been made to localize SDGs. These efforts can incorporate TB care and

prevention. Lower levels of the health care system should be empowered to use the TB data they generate for local planning of the TB response.

Primary duty bearers: The MoHFW/NTP should drive the creation of inter-ministerial and multi partner engagement platforms for health and TB at all levels but especially at the district level, while empowering these levels to develop, own and implement locally appropriate plans for TB care and prevention.

Timeline: During the period of the next TB-NSP.

10. Integrate TB care and prevention into other health and disease programs

Rationale: The JMM noted a lack of integration of TB screening and testing services in health programs that address morbid states that increase the risk of TB such as diabetes, chronic kidney disease, under nutrition and smoking prevention and cessation. An integrated approach that includes bi-directional screening and testing is expected to have both individual and public health benefit and will optimize use of scarce resources. The inclusion of TB screening (or other disease screening in TB services) in health programs beyond those that address TB co-morbid states such as the family planning program at the community level or the immunization program will provide a synergistic and efficient way of screening and testing people for TB. This opportunity is best exemplified by the health assistants program linked to community clinics. If this cadre of health care workforce is strategically used to deliver TB screening services at the community level, a large proportion of TB key and vulnerable populations (KVPs) would be reached.

Primary duty bearers: the NTP and implementing and technical partners of the NTP should drive the engagement of health programs that are addressing prioritized co-morbid states for TB or offer opportunities to reach a large proportion of TB KVPs synergistically and efficiently.

Timeline: During the period of the next TB-NSP

11. Ensure the functionality of the Xpert testing network to increase rapid molecular testing capacity (Truenat and GeneXpert) to meet the goals of the NSP in addition to developing and implementing a patient-centred specimen referral system throughout the country to improve access to TB diagnostic testing.

Rationale: The capacity to use Xpert as the initial diagnostic for TB is threatened by frequent cartridge shortages and non-functional Xpert modules which could quickly lead to unacceptable delays in returning results. An urgent response and solutions are needed or else the gains achieved in the past few years will be quickly reversed.

Primary duty bearers: The NTP and implementing partners

Timeline: During the period covered by the next TB-NSP

12. **Increase the number of sites where DR-TB treatment can be initiated and accelerate decentralization** of PMDT while rapidly adopting a policy of ambulatory care for people to be treated for DRTB

Rationale: Most people enrolling into treatment for MDRTB do not need to be hospitalized. Limited availability of MDRTB treatment sites leads to delays in initiation of treatment and can be costly to people when the person who needs care has to travel long distances.

Primary duty bearers: The NTP and implementing partners

Timeline: Immediately and during the period of the next TB-NSP

13. **Ensure the recently launched Community, Rights and Gender Action is fully financed and implemented.**

Rationale: There seems to be a general lack of knowledge on TB and high levels of TB associated stigma and discrimination. Tuberculosis interventions are largely not gendered with homogenous approaches to the implementation of interventions. Tuberculosis community support structures are largely missing.

Primary duty bearers: The NTP and implementing partners

Timelines: Immediately and during the implementation of the next TB-NSP.

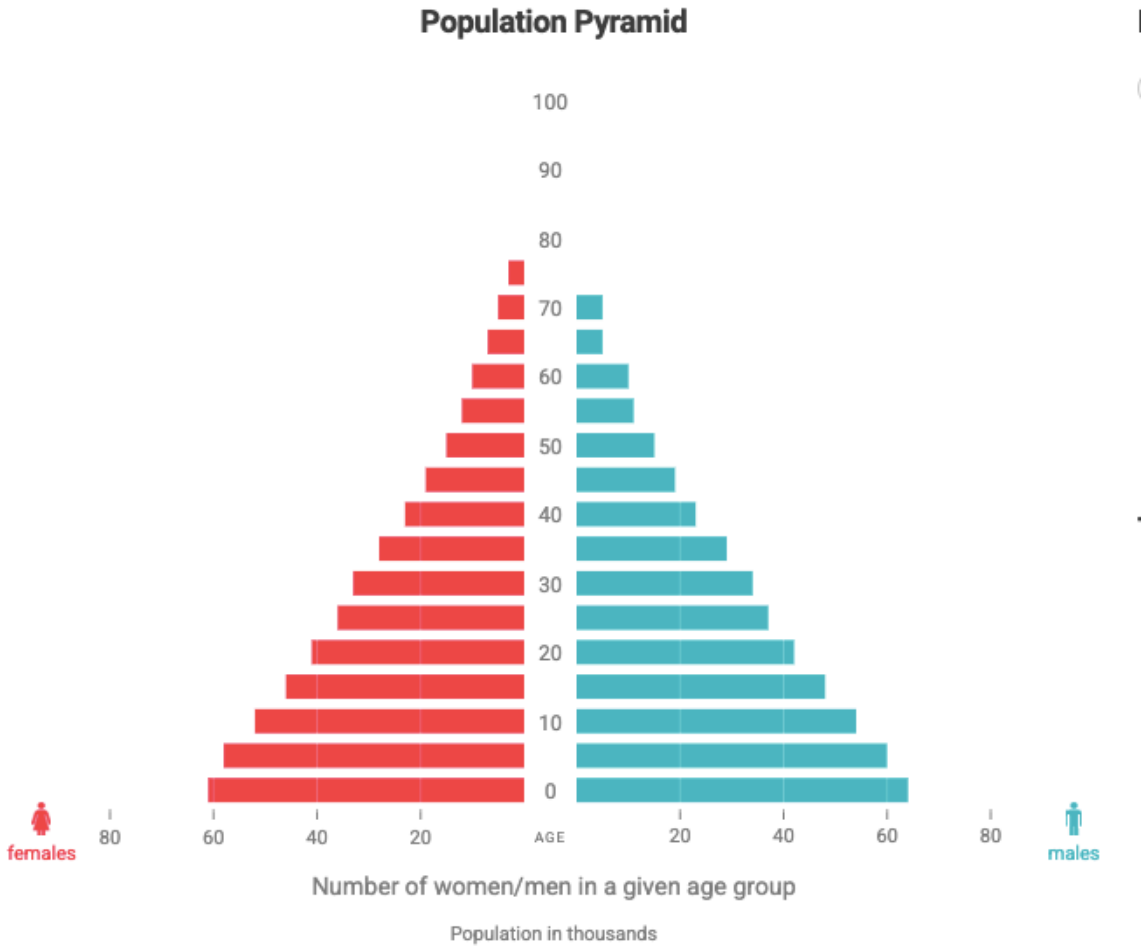
1. Introduction

The People's Republic of Bangladesh located in the South Asia region, borders India to the West, North and East and Myanmar in the East. It covers an area of 147, 570 Km ^{2} and is administratively divided into 8 regions: Barisal, Chittagong, Dhaka, Khulna, Mymensingh, Rajshahi, Rangpur and Sylhet. Due to its geographical location, Bangladesh is at a high risk of water related natural disasters. In 2021 Bangladesh was ranked 7th in the Global Climate Risk Index. There were more than 185 natural disasters including floods, cyclones, and tornadoes, between 2000 and 2019, which on average killed 572 people annually[1] .

With a population that is about or over 166 million currently, Bangladesh is the 7th most populous country in the world. It is also among the most densely populated countries with a population density of about 1265 people per KM^2 throughout the country[2]. The annual population growth rate declined from 2.4% in 1990 to 1.14% in 2021 (World Bank). As shown in figure 1 below the population of Bangladesh is youthful with about 20% of the total population being in the age group of 15-24 years. There are slightly more males than females (male to female ratio of 1.020) in the total population. Life expectancy at birth currently stands at 71.1 years for males and 74.9 years for females.

Figure1: The Bangladesh population pyramid

[1] https://www.germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_2.pdf
[2] https://unfpa.org/data/BD



Source: https://www.unfpa.org/data/BD

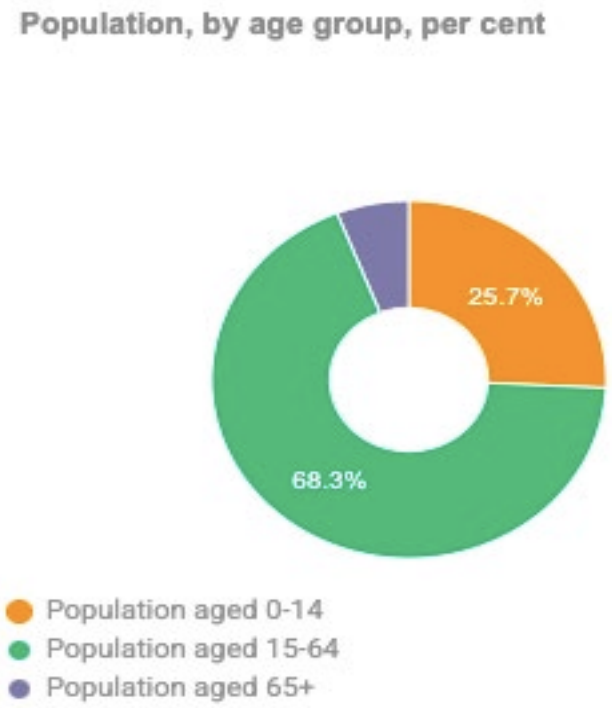


Figure 2: The Bangladesh population distribution by age
Source: https://www.unfpa.org/data/BD

The crude birth rate and crude death rate in Bangladesh is estimated to be 18/1,000 population and 6 per 1,000 population respectively. About 39% of the Bangladesh population lives in urban areas with 54% of urban dwellers living in Dhaka, Chittagong and Khulna. The urban population growth rate is about 3.25% per year[3] .

The People's Republic of Bangladesh is classified by the World Bank (WB) as a Low middle-income country. In 2021, Bangladesh's Gross Domestic Product (GDP) was estimated to be US $416.26 billion and the GDP per capita stood at 2, 503 (PPP Constant 2011 international dollar). In 2021, the Gross National Income (GNI) per capita (Atlas method) was 2, 620 dollars. The GDP has been growing steadily over several decades and in 2021 it grew at 6.9%

Poverty rates have been declining steadily since 2000. In 2000, the poverty headcount ratio at national poverty line was 33.2% and by 2021 it had declined to 13.5%. The country is included in the group of 11

[3] https://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS?locations=BD

countries (Next 11 or N-11) whose economies are poised to grow to reach the potential of the BRIC states and to rival those of the G7. The economy of Bangladesh is diversifying although agriculture continues to contribute a major proportion of the country's GDP (18.6%) and employs over 40% of the country's workforce. Other drivers of the economy include the manufacturing sector, which produces textiles and readymade garments, ceramics, leather goods and pharmaceuticals among many other products both for domestic consumption and export. Bangladesh's Human Development Index (HDI) was 0.661 in 2021, which placed the country at position 129, in the medium human development category. Even though the country has witnessed a steady growth in its economy, there are concerns that income inequality is rising which is posing a significant challenge to human development. In 2021, the income GINI co-efficient was 0.483, indicating a significant level of inequality[4]. Additionally, Gender Based Violence (GBV) is of major concern in Bangladesh. UN Women estimates that two thirds (72.6%) of ever married women in Bangladesh have experienced some form of partner violence with over 50% of them having had this experience in the previous 12 months[5].

Bangladesh, like other low- and middle-income countries is facing a double burden of disease. While infectious diseases remain a significant public health threat, non- communicable and lifestyle diseases are increasingly threatening the health of the population.

Figure 3 sourced from the Institute of Health Metrics and Evaluation, University of Washington, shows the top ten causes of death in 2009 and 2019 and the shifts that happened over this time. It is worth noting that TB has remained among the top ten causes of death in Bangladesh albeit with a downward shift from position 6 in 2009 to 8 in 2019.

[4] Advancing Human Development in Bangladesh. Looking Ahead. National Human Development Report 2021
[5] https://asiapacific.unwomen.org/en/countries/bangladesh#

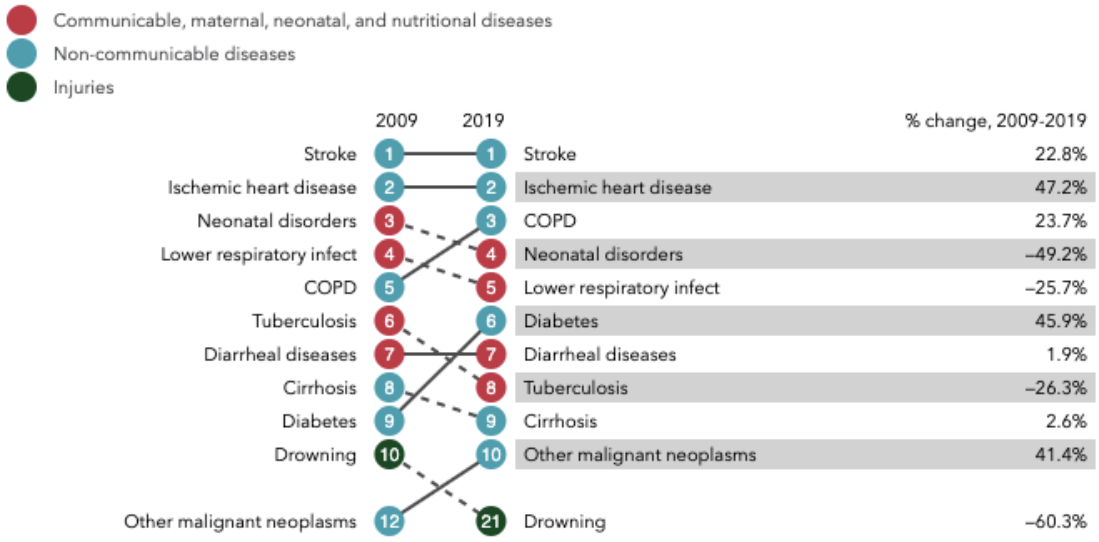


Figure 3: Top 10 causes of deaths, 2009 and 2019, and percent change

Health indicators in Bangladesh have steadily improved in recent years. Table 3 shows some of the health indicators tracked under SDG3 (Good Health and Wellbeing)

Table 1: Key Health Indicators in Bangladesh 2015 and 2020

Indicator	Value at onset of SDG period (2015 unless otherwise stated)	Value after onset of SDG period (2020 unless otherwise stated)
MMR (per 1,000 live births)	200 (2014)	173 (2017)
NMR (per 1,000 live births)	23.6	17.5
Under 5 Mortality rate (per 1,000 live births)	38.1	29.1
TB incidence (per 100,000 population)	225	221 (2021)
New HIV infections (per 1,000 uninfected population)	1	1
Death rate from major NCDs (DM, CRD, CVD, Cancer) in adults aged 30-70 years	18.56	18.89
Death due to HH/Ambient Air Population per 100,000 population		149 (2016)

Life expectancy at birth	73.58	74.25 (2019)
Birth attended by skilled health personnel (%)	42.1 (2014)	52.7 (2018)
Universal Health Coverage (service coverage)	45	51

2. Overall objective of the 9th TB-JMM

The 9th Bangladesh TB-JMM to review the National Tuberculosis Control Programme (NTP) was conducted on October 16 -30, 2022. It was preceded by a TB epidemiological review which informed the approach to the JMM. The previous JMM conducted in 2019 led to the development of the current National TB Strategic Plan (TB-NSP) that covers the period 2021- 2025.

The overall aim of 9th TB-JMM was to evaluate progress so far in the TB response, identify persisting challenges and propose achievable solutions to address those challenges to achieve the NTP's overall goal of ending TB as a public health threat by 2030.

2.1 Specific objectives of the 9th TB JMM

The specific objectives of the 9th TB JMM were to:

1. Conduct a desk review of the National TB Control Programme (NTP).
2. Update the TB epidemiological analysis.
3. Conduct field visits to observe practice, review and validate TB data and carry out key informant interviews to support the identification of key achievements and challenges in 8 TB thematic areas (see annex 1).
4. Synthesize qualitative and quantitative data to draw conclusions and provide evidence based specific and targeted recommendations to the Ministry of Health and Family Welfare (MoHFW) and its NTP and to implementing and technical partners on each of the 8 thematic areas.
5. Identify programmatic bottlenecks whose solutions require the conduct of appropriate operations and or implementation research.

2.2 Methodology of the 9th TB-JMM

In partnership with WHO, the Global Fund, USAID, and local partners, the NTP identified and invited both external and internal experts (see annex 2 for a list of B-JMM participants) in various areas of TB care and prevention to participate in the mission. There were in total over 80 experts who participated in this review including about 50 experts who are either nationals of Bangladesh or work and reside in the country and 30 (international) experts who came from outside the country. Individually and collectively

the team of mission participants undertook the activities highlighted below to respond to the objectives and Terms of Reference (ToRs) of the 9th TB -JMM.

Documents Review

The principal documents that were reviewed include but are not limited to:

- The National TB Strategic Plan 2021- 2025.
- The Funding Request to the Global Fund for the funding period 2021-2023.
- Previous JMM report (the 8th JMM carried out in 2019),
- Annual reports of the NTP.
- The 2022 Global TB Report.
- Published and grey literature relevant to Bangladesh's health system and TB response.
- National TB Programme guidelines.

Key informant interviews

Mission participants held intensive but cordial discussions with a wide range of persons at the national, divisional, district, sub – district (Upazila), health facility, community, and household level. The purpose of these discussions was for mission participants to gain a deep understanding and receive perspectives from a wide array of stakeholders, on the TB situation in Bangladesh, the progress being made, the challenges/constraints being faced, and the solutions being pursued to address these challenges from the political, social, governmental, non -governmental, community, household, and individual perspectives.

Health facility visits

Teams of reviewers visited all divisions of Bangladesh and within those divisions, service delivery sites at all levels of the health care system (hospitals, health centres and clinics) in both the public and private health sector were visited. The purpose was to dialogue with front line health care workers, document and where feasible observe practices in the care and treatment of presumptive and confirmed TB, review and validate data and assess availability and functionality of key equipment in order to assess how TB care and prevention is actually carried out, where it matters most, and if practices conform to laid down national policies and practice recommendations.

Synthesis of review of findings and formulation of recommendations

After the field visits, mission participants shared their observations and discussed the implications of those observations. Through a consensus approach, key achievements and persisting constraints or gaps were identified and recommendations made to sustain the gains made and or address the identified programmatic bottlenecks for each thematic area.

On Sunday October 30, 2022, a debriefing session was held at the Intercontinental Hotel, Dhaka. This debrief session was graced by the Honourable Minister for Health, Mr. Zahid Maleque, which provided an opportunity to convey to the highest health authority in the Government of Bangladesh the major needs of the TB response in Bangladesh.

3. Review Findings: observations, gaps/constraints, and recommendations

3.1 Tuberculosis in Bangladesh

Bangladesh has a high burden of TB. In 2021, the WHO estimated that there were 375,000 (95% credible interval 273,000 -493,000) people who developed TB in the country and 42,000 (credible interval 28,000 – 60,000) people died of the disease[6]. The country notified a total of 306, 701 people with TB in 2021 which represents a treatment coverage (TC) of 82%. Even though a TC of 82% may be considered a sterling performance it also implies that about 68, 000 people who developed TB in Bangladesh in 2021 are not accounted for. These are the missing people with TB.

The country is currently implementing a TB- NSP, that is aligned to the End TB Strategy, covering the period 2021 – 2025. Table 4 below shows output targets, focused on people reached, and how the country performed in each of the output indicators of the TB-NSP for the year 2021. It will be noted that targets were surpassed for the number of new people with TB notified and the TB treatment coverage, however, targets were not reached for the other indicators including the number of people with MDR-TB identified and placed on treatment, proportion of all notified TB that are children in the age range of 0-14 and proportion of all people with TB screened for HIV. Even though a total of 1,601 people were identified to have MDR-TB, only 1, 488 were placed on treatment and this is the number that has been included in the table below. (The number of people placed on TB preventive therapy in 2021 is not available.

Table 2: TB-NSP output targets and achievements, 2021

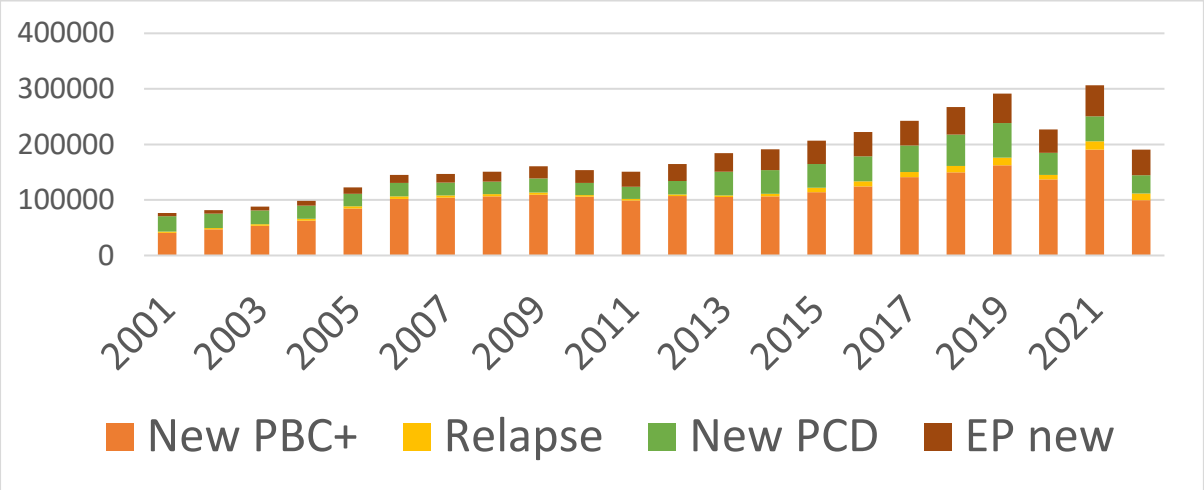
Indicator	Target 2021	Achieved 2021	
TB Treatment Coverage (%)	81	82	
Number of people with new TB notified	292, 745	306, 701	
Number of people with MDR-TB identified and treated	2,365	1, 488	

[6] 2022 WHO Global TB report

Proportion of all notified TB with a known HIV status (%)	33	6.4	
Proportion of all notified TB that are children in the age group 0-14 (%)	5	3	
Number of people provided with TB Preventive therapy	185,560	Not available[7]	

The NTP in Bangladesh has performed excellently in terms of finding people with TB. From 2012 the number of TB notifications increased on a year-by-year basis and only dipped in 2020 because of the COVID-19 pandemic. There was, however, a rapid and robust rebound that returned TB notifications to the trend of an increase in TB notifications that began in 2012. In 2022, it was observed that TB notification has markedly slowed down. By quarter 3 of the current reporting year, less than 200,000 people with TB had been notified and it is unlikely that the 2021 numbers will be reached through the numbers expected to be notified in the remaining quarter of the year (figure 4).

Figure 4: TB Notification in Bangladesh 2001- quarter 3, 2022.



[7] The 2022 WHO Global TB Report indicates that 38% of children under 5, were provided with TPT in 2021

Figure 5 below shows the trend in TB treatment coverage (proportion of incident cases that are identified ad treated) from 2016 to 2021. There has been a steady increase in TC from 64% in 2016 to 82% in 2021.

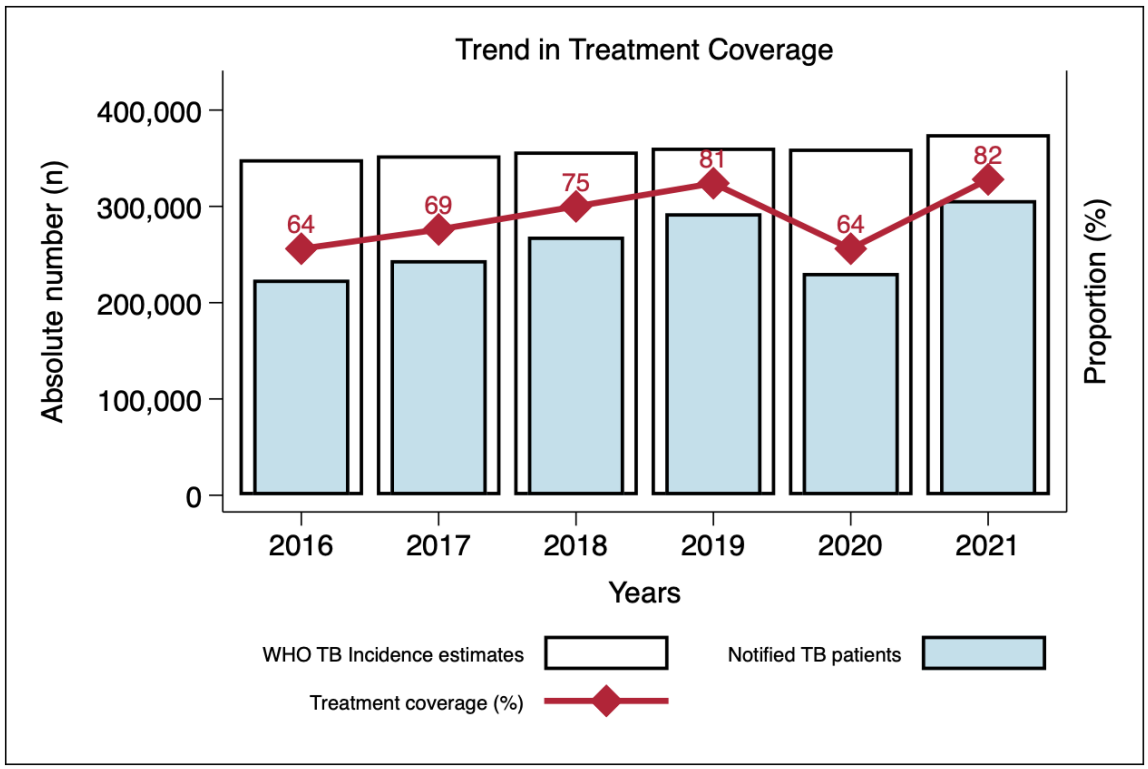


Figure 5: Tuberculosis Treatment Coverage in Bangladesh 2016-2021 (source, Bangladesh TB epidemiological review, 2022)

Even though TB notifications and TC have been on the right trajectory, the country remains off course and is unlikely to achieve the 2035 End TB and 2030 SDG TB targets for both TB incidence and mortality. The country may also be off course to achieve the third target of ensuring no person suffers health related catastrophic costs on account of TB. Figures 5 and 6 illustrates this very well. To achieve the 2030 End TB Strategy/SDG incidence and mortality targets, the NTP will have to reduce the number of people developing TB each year from the current, over 370, 000 to less than 70,000 people and the number of people dying of TB from the current 42,000 to about 6,000.

Figure 6: Estimated number of people who developed TB in 2015 (baseline) and 2021(current) and the 2030 target

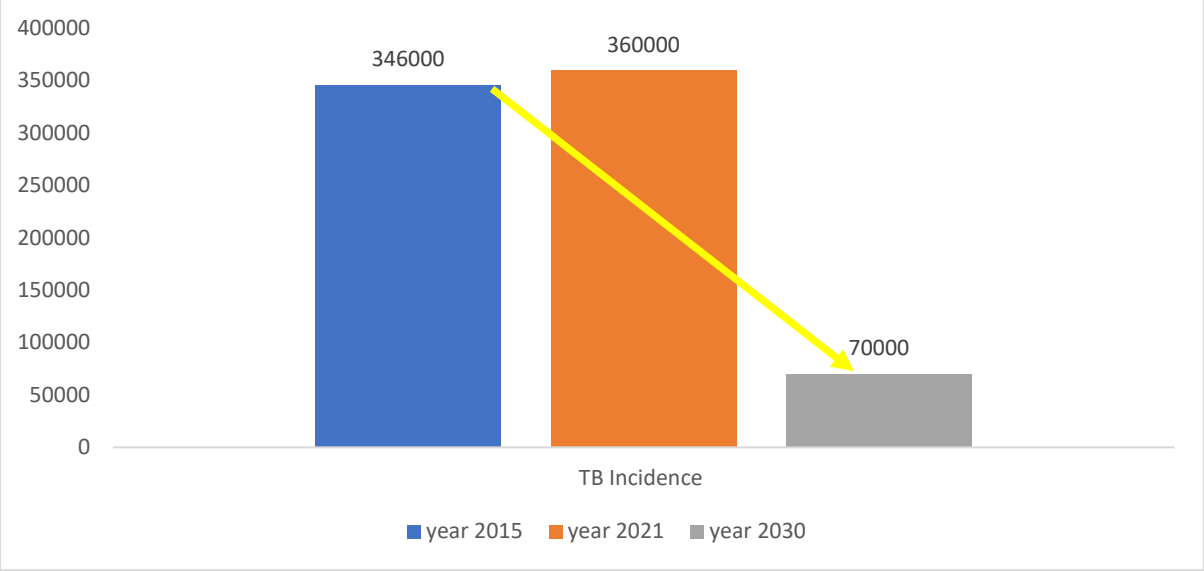
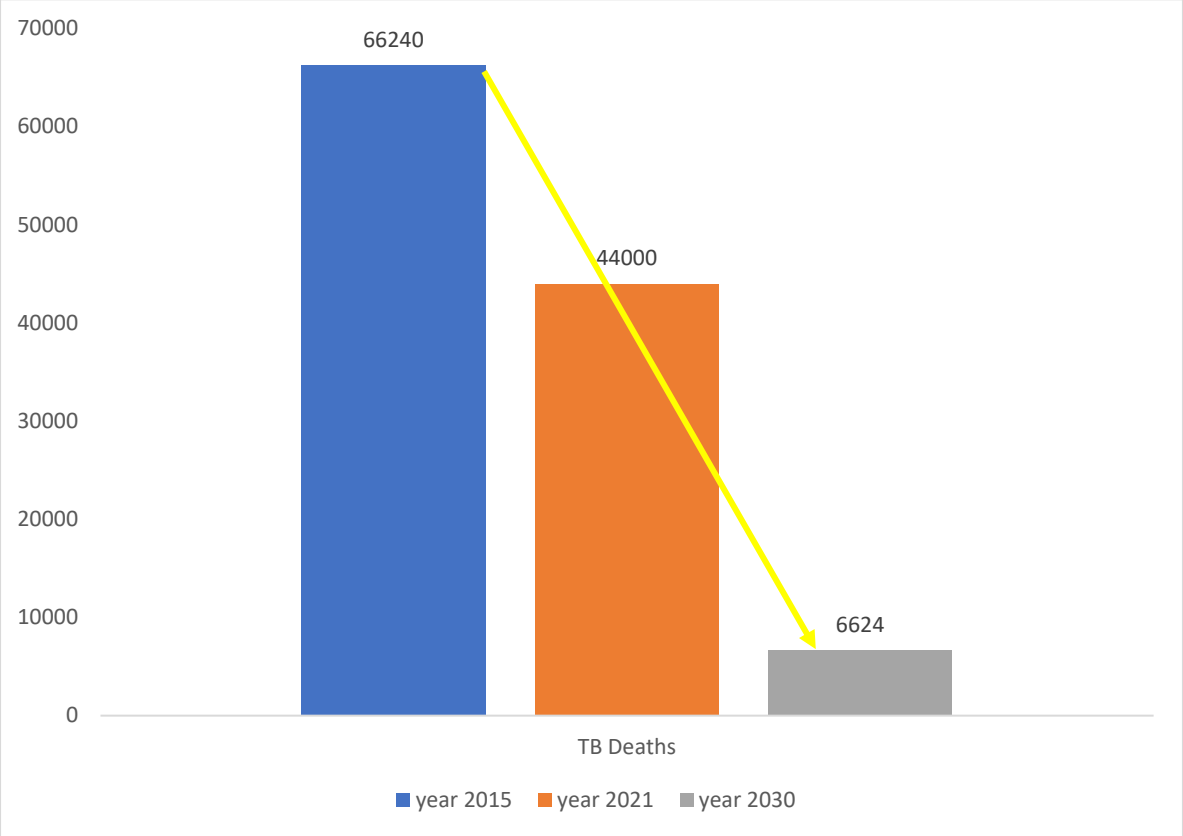


Figure 7: Estimated number of people who died of TB in 2015 (baseline year) and 2021 (current) and the 2030 target



While TB treatment coverage is moving in the right direction and TB notification is high, it is not clear if current TB care and prevention efforts are influencing TB transmission. This is important because the achievement of the End TB Strategy /SDG targets is crucially dependent on ending TB transmission as

well ensuring that people with TB receive appropriate care and treatment to alleviate suffering, prevent TB deaths and TB associated long-term morbidity post TB treatment. In the past it has been documented that, in Bangladesh, there were long TB diagnostic delays, often running into months, from both person/patient factors and health related factors [8] [9][10]. The current TB algorithm attempts to increase the specificity of cough screening and therefore focuses on cough of two or more weeks for a person to be considered to have presumptive TB. This is likely to be contributing to the system related TB diagnostic delays. It is important to note that a major finding of the TB prevalence survey conducted in 2015-2016 was that more than 50% of people identified to have TB did not have classical symptoms of TB including cough[11]. Recently there have been suggestions that cough is not a pre-requisite for TB transmission[12] . Therefore, if efforts are to be pursued to influence TB transmission the focus will need to move away from cough as the all-important symptom for TB screening. Additionally, other factors contributing to TB diagnostic delays will also need to be eliminated.

Key achievements that suggest there is a real potential to end TB in Bangladesh by 2030.

Bangladesh has successfully implemented major health programs that has led to it being recognized as a world leader in public health. Examples include the COVID-19 pandemic response in which the country achieved impressive population vaccination rates when compared with the global rates (87.5% for first dose in Bangladesh versus 63% globally); the diarrheal control program which included the distribution of oral rehydration salts and which markedly reduced deaths of children from diarrheal diseases[13] , the Bangladesh family planning program which halted the burgeoning population and the high immunization coverage rates. The country continues to reduce poverty rates even though inequality is emerging as a major challenge as highlighted previously. The high TB treatment coverage and high TB treatment success rates are exemplary.

In relation to finding people with people, the key achievements in Bangladesh include:

[8] Ehsanul Huq et al BMC Infectious Diseases 2018; 18:515
[9] M. Rifat et al IJTLD 2011; 15 (5): 647-651
[10] Fazlul Karim et al Health Policy and Planning 2007; 22: 329-334
[11] National TB Prevalence Survey
[12] Patterson B, Wood R. Is cough really necessary for TB transmission? Tuberculosis (Edinb). 2019 Jul;117:31-35. doi: 10.1016/j.tube.2019.05.003.
[13] Billah SM, Raihana S, Ali NB, Iqbal A, Rahman MM, Khan ANS, Karim F, Karim MA, Hassan A, Jackson B, Walker N, Hossain MA, Sarker S, Black RE, El Arifeen S. Bangladesh: a success case in combating childhood diarrhoea. J Glob Health. 2019 Dec;9(2):020803. doi: 10.7189/jogh.09.020803.

- TB case notification has consistently increased on a year-by-year basis since 2012 with only a short-lived dip in 2020 which was caused by the COVID-19 pandemic.
- In 2021 the country achieved and surpassed its treatment coverage (TC) and TB case notification targets. While the TC target was 81% the country managed to reach a TC of 82% and for TB case notification, 306, 701 people with TB were notified against a target of 292, 745.
- Attempts have been made to screen vulnerable groups for TB including hard to reach populations, transport workers, people who inject drugs and special groups. For example, the 2022 Bangladesh TB epidemiological review observed that 30, 869 people classified as hard to reach had been screened for TB resulting in the identification of 1, 846 people with TB; of 1, 421 transport workers screened for TB, 85 people with TB were identified and among 6, 769 people screened for TB at the workplace, 85 people with TB were identified to have TB. Other TB case finding activities have included smear camps and TB campaigns in which 30, 869 and 38, 336 people were reached with the identification of 1, 846 and 1, 976 people with TB respectively.
- The country is expanding molecular testing as the initial TB diagnostic test (see section 6) which, as a result of a higher sensitivity of these tests, has the potential to increase the proportion of people with TB among all notified TB notifications who are bacteriologically confirmed , thereby improving the quality of TB diagnosis.
- The country is also expanding private provider engagement (see section 7) which will contribute to narrowing of the estimated incidence- notification gap.
- There are strong community support systems with a well-structured community participatory program across the country with a huge network of community clinics and community health workforce of both government and NGOs.
- Shasthya Shebikas (SS) are effectively linking the community with health care facilities – mobilizing community, identifying TB presumptive cases at community level, referral of presumptive cases to TB facilities for evaluation and diagnosis. They contribute 44% of all TB notification.

Challenges that need to be overcome in the pathway to ending TB in Bangladesh.

Current TB case finding efforts may not be adequate to reduce/end transmission of TB and therefore the impact of these efforts on TB incidence may be subdued. The major constraints include the following:

- Only small proportions of populations that have a high burden of TB disease are being reached with TB screening and testing services. For example, at a national poverty rate of 13.5%, it

means that at the very least 22 million people in Bangladesh are poor and vulnerable or at high risk of TB and could benefit from TB screening, however, in 2021 only about 154, 189 people belonging to various at-risk populations were screened for TB. There were no visible TB screening programs for at risk populations such as prisoners (whose population is estimated to be over 82, 000, which is nearly twice the prison capacity of Bangladesh[14]), health care workers (whose number in the formal sub-sector was estimated to be 350,000 in 2014[15]), undernourished people, diabetics among others.

- When screening program are undertaken the approach used is to identify people with cough using cough of at least 2 weeks as the criterion for placing a person in the group of presumptive TB. This is an insensitive way of identifying people with TB and can delay the diagnosis of this disease, thereby facilitating transmission of TB.
- There is minimal use of more sensitive screening tests recommended by WHO such as the chest x-ray with or without artificial intelligence and the Xpert MTB/Rif assay.
- The opportunity to screen a large proportion of the population for TB, albeit with symptom screening, using the community health care workers attached to the community clinics has been missed for many years. The community clinics and other government community health workers are an untapped resource for TB diagnostic and care. (Missed opportunity to provide Contact Evaluation (CE) and TB Preventive Therapy (TPT))
- There is a lack of up-to-date training and coordination between community and health facility levels workforce leading to delays in TB diagnosis.
- The evolving socio-economic prosperity in Bangladesh appears to be leaving a proportion of the population behind with rising levels of inequality. Those left behind will continue to live in poverty and social deprivation which can continue to drive TB for many years to come. While a section of the population may be undernourished, another section of the population may become overweight/obese from easy access to food, which may be inappropriate, increasing the risk of diabetes, a known driver of TB.

Working towards ending TB in Bangladesh: recommendations

The NTP is advised to develop a clear statement of intent for TB case finding which should include: (a) identifying people who are sick with TB to place these individuals on treatment and thus, return them to good health and a productive life (b) prevent deaths from TB, (c) stop TB transmission; (d) reduce the

[14] World Prison Brief. https://www.prisonstudies.org/country/bangladesh
[15] Bangladesh Health Workforce Strategy 2014

risk of long-term post TB chronic morbidity and (e) prevent people from suffering catastrophic costs on account of TB. To achieve these aims the NTP, implementing partners of the NTP and funding partners of the NTP are advised to:

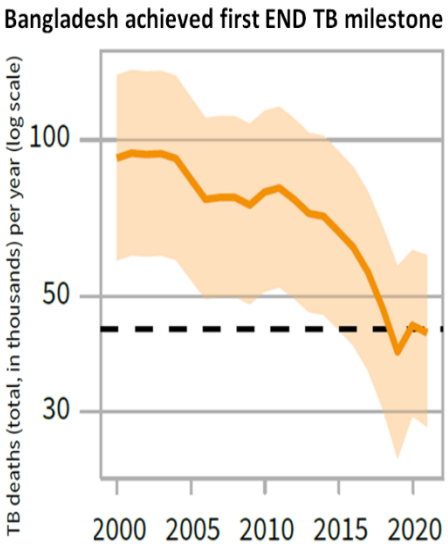
- *Scale up TB screening including, piloting whole population screening in populations with a high prevalence of TB, using highly sensitive tools such as chest x-ray with or without artificial intelligence and remote reading or Xpert MTB/Rif assay. If a targeted approach is chosen, the vulnerable groups* should not only be identified (such as slums dwellers, prisoners, tea garden workers, garment workers and other populations) but their size estimates and geographical locations should also be established and baseline *rate of the burden of TB disease (TB incidence) determined and monitored over time as interventions are implemented. To determine baseline rates of TB in these populations methods that have been used or adopted in some other high burden countries such as India [16] should be explored. To carry out this work, the NTP is encouraged to seek technical assistance from global technical partners including WHO, Stop TB Partnership, the Union among others. The purpose of this work will not only be to identify people who are sick with TB (finding and notifying people who are sick with TB) but also to end or eliminate TB transmission in the targeted population to influence TB incidence. Funding for this work may be sought from the Government of Bangladesh (GoB), the Global Fund, USAID, and other financial partners of the NTP.*
- *Include TB screening in the tasks allocated to community level health care workers, with every precaution taken not to overload these health care workers by for example hiring more of them and reducing the number of households each community health care needs to cover. Thus* conduct an assessment of the workload of the community workforce and rationalize the work and/or hire more workers based on the assessment results and reduce the shortage of community level health workers to meet the growing demand of the TB program.
- *Engage with other arms of Government to ensure socio-economic development policies do not create or exacerbate inequalities or create new health challenges such diabetes that may be associated with the expansion of the pool of the population that is vulnerable to TB.*

[16] Jeyashree K, Thangaraj J, Rade K, et al. Estimation of tuberculosis incidence at subnational level using three methods to monitor progress towards ending TB in India, 2015–2020. BMJ Open 2022;12:e060197. doi:10.1136/ bmjopen-2021-060197

4. The Health System and TB care and Prevention

4.1 Context:

As highlighted in the previous section, Bangladesh has made significant progress towards Ending TB. The country is among the high TB burden countries estimated to have reached, by 2021, the first milestone of the End TB Strategy, which was a 35% reduction in the total number of TB deaths between 2015 and 2020 (figure 8).



Bangladesh has made pioneering innovations in approaches to community involvement, engagement of the private sector, and garment factories involvement to increase TB case finding. The foundations to meet the national commitments – the End TB Strategy and TB-related Sustainable Development Goals (SDG) targets, and actions agreed at the United Nations High Level Meeting (UNHLM) on TB – are all in place.

Notwithstanding the progress, TB continues to be a major public health problem in Bangladesh. The country has the 7th highest burden of TB in the world and is among the world's top 30 high TB burden countries. Tuberculosis continues to impose significant costs on patients and their families, and it causes big losses to the national economy. The country has a significant prevalence of smoking, diabetes, and undernutrition – all of which contribute to driving the TB epidemic. There are however clear **opportunities to END TB** which include:

- The country is amongst the fastest growing economies of the world and is moving steadily towards attaining Universal Health Coverage (UHC) and social protection. Attaining SDGs is a national priority with monitoring being conducted at the Prime Minister's Office (PMO) level.
- Clear policies, strategies, plans and guidelines for an effective TB response are in place.
- The country has demonstrated a readiness to adopt and scale up innovations.
- There exists a long-standing collaboration with the private sector, NGOs and Civil Society across the country with extensive involvement in the entire cascade of TB care of affected individuals and communities.

- The partnerships with international agencies have been durable and robust.

There are nonetheless **challenges that are slowing progress toward ending TB** in the country. These include:

- The current funding is insufficient. The total National TB budget for 2021 was $157 million of which 39% remains unfunded with consequences for programme expansion, innovations and multisectoral interventions. This is despite the fact that an additional $ 75 million was provided by the Global Fund under COVID -19 Response Mechanisms (C19RM) which also benefited TB.
- Continued dependency on external funding creates challenges to sustainability: The Bangladesh government has progressively increased allocation to the NTP with a substantial increase in 2021. However, the NTP continues to rely on international funding sources which accounts for around 60% of the NTP costs.
- While the country targets are aligned to the UNHLM, SDG, and End TB Strategy the accountability mechanisms according to WHO Multisectoral Accountability Framework are yet to be set-up. The progress to create a multi-sectoral coordination mechanism and a "whole of government" approach to TB care and prevention intended to lead to a robust multi- sectoral approach to the fight against TB is slow.

Recommendations (High Level) for HSS

1. Secure and sustain increased government funding for TB: Increased domestic funding for TB is urgently required for strengthening the national TB elimination interventions.
2. Address the drivers of the TB epidemic by engaging support from multiple ministries and sectors beyond health. Thus, the MoHFW/NTP is urged to push for the setting up of a high-level TB multi-lateral coordination and action-oriented mechanism under the patronage of the Honourable Prime Minister. A Parliamentary Caucus for TB may be particularly helpful to provide the push to achieve TB elimination in the country.
3. Leverage the commitment of the divisional and district political and administrative leadership and the "SDG Localization" initiative to carry out community screening and testing activities that target all with the purpose of "Ending TB Locally".
4. The social safety net programmes present an opportunity to link poor TB patients to the schemes through formal collaboration with the Ministry of Social Welfare.

4.2 Addressing the Catastrophic Costs incurred by TB patients

Findings/Issues:

- More than 30% of the households experience catastrophic expenditure owing to health issues. Significantly more costs are incurred by TB patients in urban areas and for those who seek care with private providers.
- Bangladesh has made significant investments in social protection programs—reaching 3 out of 10 households.
- During 2019-2020 period there were 125 social safety net programmes implemented by 25-line ministries, with a budget of Tk. 955.74 billion, accounting for 16.83% of the Government budget, and 3.01% of GDP.
- Currently some support for MDR TB and poor patients is being provided for lab tests/nutrition.
- The hospitals have a "poor patient fund" managed by the Social Welfare Department. For example, the Osmania medical college and Hospital in Sylhet has an annual budget of 22,000 Tk for supporting laboratory investigation and providing treatment support of poor patients with a ceiling of 25,000 Tk for an individual patient.

Recommendations:

- Consider a national survey of costs faced by TB patients and their households. Additionally, patient pathway analysis with an integrated access barriers analysis, including costs, human rights and gender related barriers throughout the pathway should be considered.
- The social safety net programmes present an opportunity for the NTP to link poor TB patients to the schemes through formal collaboration with the Ministry of Social Welfare and others. The NTP is advised to map these social protection schemes, disseminate the information widely and use that information to link TB patients to these schemes.
- Support TB patients with support for nutrition, advanced laboratory and radiological investigations, and transport cost to the health facility.
- Explore the use of the poor patient fund for supporting TB patients admitted in the hospitals.
- Increase knowledge and awareness among TB patients on available social protection schemes and support them to access these schemes.
- Implement comprehensive social and community mobilization interventions to support an increase in knowledge, attitudes and practices of TB care and prevention within communities.

4.3 Multisectoral collaboration and accountability

Findings/Issues:

A national Multisectoral Accountability Framework for TB (MAF TB) Action Plan and Operational Plan (OP) have been developed and funded for implementation by the Global Fund. Ten ministries have been prioritized for collaboration and the areas of collaboration have been detailed in the OP.

Recommendations:

- Liaise with the SDG Affairs at the PMO and utilize TB as a marker for progress on SDGs. Pursue localization of the TB response through initiatives such as SDG localization.
- Build the Bangladesh TB Caucus and support it to engage with political networks, the Government and civil society groups to raise the profile of the disease and confront the stigma and social isolation associated with it.
- Involve the 10 prioritized ministries other-than-health for TB elimination.
- Include TB in the 5th Operation Plan of the MoHFW.
- Involve other programmes (NCD, IMCI, EPI) of the MoHFW in efforts to end TB.
- Engage the corporate sector/principal business associations in Bangladesh to support TB care and prevention.
- Strengthen the programme in institutional congregate settings – like madrasas, prisons, etc.

4.4 Human Resources

Findings/Issues:

The HR issues identified are related largely to staff adequacy (especially lack of sufficient medical technologists, radiology technicians, TB and Leprosy Control Assistants (TLCA) and multipurpose workers at the community and facility levels) to implement comprehensive tasks related to TB diagnosis, treatment, prevention and monitoring; staff competence and motivation to sustain quality services, implement innovative approaches and make analysis and use of routinely collected data; frequent staff turnover outpacing training and retraining opportunities; and incentives available (or unavailable) to staff working on TB.

District Surveillance Medical Officers (DSMOs), one for each district, have been recruited for the TB program. These positions are to be funded through the Global Fund TB grant. There is no plan for the sustainability of these positions. There is close to 40% vacancy rate in the TLCA cadre.

Close to 4000 students are added to the national pool of medical practitioners every year, a majority of whom will work in the private sector given the limited capacity of government to absorb them. Private sector doctors who receive a large proportion of presumptive TB cases receive limited in-practice training in TB care through the PPM program.

Recommendations

- Urgently carry out HRH mapping for available staff including their current roles, to support joint planning and prioritization of their functions. The main focus should be on effective utilization of existing staff – DSMOs, TLCAs, Medical Technologists (MTs) and other health workers, while also considering hiring new staff. Importantly the GoB should strongly consider transitioning Global Fund supported staff to the government payroll.
- Enhance the capacity of the UHCs / district level leadership to manage the TB programme as a part of decentralizing of the TB response. Capacity should be built in program management, data analysis, setting strategic direction and sub-national (District programme implementation plan) planning for TB elimination.
- Review the remuneration of Shasthya Shebikas (SS), who are renown community-based health care workers. The 600 Taka they receive may be inadequate. No allowance for follow-up communication or transport is being provided. There also is a need to review and avoid case screening targets alone, as is the apparent practice currently but also include a focus on the quality of services they provide.
- Examine and update current medical, pharmacy and nursing curricula to optimize human resources and to address the overall health needs of the People of Bangladesh for both communicable and non-communicable diseases. Courses taught at schools for medical and para-medical personnel should as far as feasible, include program management, financial management and the use of digital tools. This is likely to benefit TB by ensuring that fresh medical, nursing and pharmacy graduates are well equipped with essential knowledge and information on TB regardless of whether they work in the public or the private sector. The Bangladesh Medical and Dental Council (BMDC) should be roped in as a partner.
- Undertake continuing medical training of private providers highlighting their expected roles and contributions to TB care and prevention.
- Explore digital technologies and social media to scale-up training and awareness on TB as traditional training/sensitization is unlikely to reach sufficient numbers quickly.
-

Community Rights & Gender (CRG), Community Led Monitoring (CLM)

Findings/issues:

The Hon Minister of Health recently launched the national costed TB CRG Action Plan. It provides a comprehensive framework for identifying and overcoming communities, rights and gender barriers in the TB Program. The Plan highlights TB CRG barriers such as: accessibility, availability, acceptability, and quality of services; stigma and discrimination; privacy, confidentiality and information; key and vulnerable populations; gender; participation of TB survivors and legal remedies. There is a great deal of enthusiasm and support for strengthening the national TB response through CRG, however, there is minimal involvement, capacity and leadership of people with or who have survived TB. While community engagement is strong, mobilization of survivors is suboptimal. There is limited knowledge or understanding of stigma and gender issues. And there are limited opportunities for engagement with TB Key and Vulnerable Populations (TB KVPs)

Recommendations

- Sensitize and build capacity on principles and interventions of CRG for TB survivors, civil society, community health outreach workers, health service providers, national TB program and partners.
- Prioritize implementation of TB community-led monitoring (CLM). There is an established TB approach: community representatives in partnership with the NTP provide feedback on access barriers and quality of services in order to work together and address the challenges.
- Fully integrate the TB CRG Action Plan into the new TB-NSP and fully fund it. Monitor the implementation of the plan, including through community led monitoring system such as OneImpact.
- Develop further TB CRG interventions for TB KVPs (including stigma and discrimination reduction efforts through awareness raising, community sensitization, legal and policy literacy in TB as well KVP mapping, and community based active screening). Examples of KVPs that may be targeted include garment workers, prisoners, urban poor, refugees, and the elderly.
- Mobilize and capacitate a national network of TB survivors with representation in the CCM and other platforms, form sub-national chapters, engage local level partners in the TB response, including peer support and CLM.
- Undertake a policy review and a review of existing social protection and social security schemes for people with TB to address the high out of pocket expenditure experienced by these patients.

HMIS

Findings/issues:

The country has a strong TB surveillance system (routine recording and reporting on TB via a national information system) in place and is reporting annually to WHO via the global TB data collection system. The surveillance system meets WHO requirements for standardization and consistency in the case definitions used and type of data collected. The NTP has introduced an electronic TB notification system (JANAO app) for private practitioners. The country has partially transitioned from paper to digital case-based surveillance systems (e-TB Manager). However,

- Data and reporting practices on TB management in hospital-based additional interventions are often not in line with national guidelines with different indicators used under different projects.
- There is limited awareness about JANAO app among physicians.

Recommendations

- Conduct regular data cross-checks and investigate reasons for discrepancies. There is a need for TB care cascade monitoring and evaluation tools to validate authenticity of data generated at different levels and avoid duplication.
- Make the best use of case-based data to strengthen subnational-level analysis and promote targeted interventions. The NTP can pilot presumptive data entry in a district and based on findings, can decide to roll out the intervention all over the country.
- Ensure institutionalization on e-TB manager and its sustainability while also making the system interoperable with other system such as ASPECT.
- Adequately sensitize all sectors for the implementation of e-TB manager.
- Increase the awareness about JANAO amongst private providers.

5. Financing the TB Response in Bangladesh

Findings / Issues and Challenges:

In spite of the largest economic crisis triggered by Covid-19, the GoB managed to successfully respond by mobilizing the required resources from domestic as well as external funding demonstrating the potential and mechanisms of raising resources for a course. Learnings from the COVID-19 response needs to be utilized for the TB response in Bangladesh.The budget allocation towards the Health and Family Welfare (including operating and development budget) has increased 1.57 times over the last seven years. Inspite of this rise, still the proposed budget allocation for health, which stands at BDT 32731 crore, remains relatively low at around 5.4% of the total National budget for FY 2021-22. The current health expenditure (CHE) is 2.48% of GDP in 2019 as per World Bank data set.

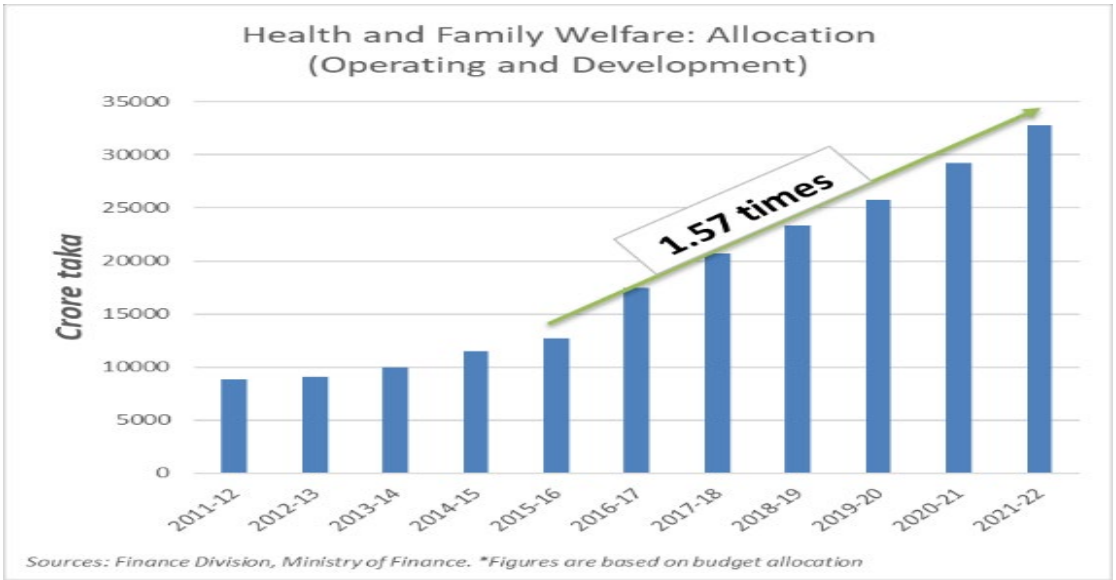


Figure 9: Health and Family welfare budget allocation 2011/12 - 2021/22

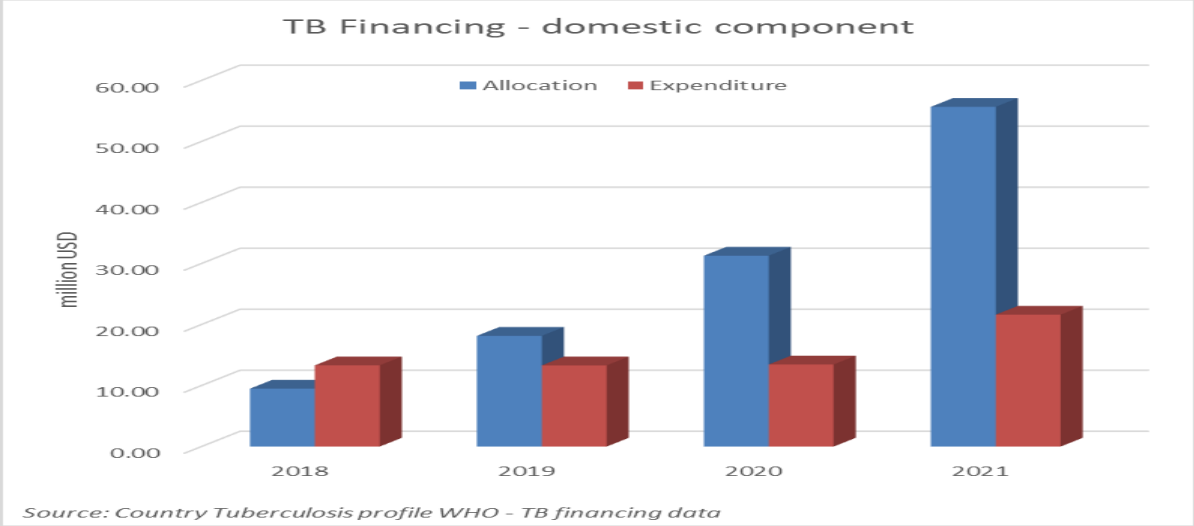


Figure 10: Domestic component of TB financing 2018 –2021

The domestic component of TB financing allocation as reported to WHO has almost doubled annually over the last four years indicating the commitment of the country towards Ending TB. But the reported expenditures have not shown the same trend. The reported figures of expenditure have not considered the domestic investments of General health system (infrastructure, salaries, logistics, supervision etc) providing TB services. There is need for systematic assessment to estimate these investments and thus report them correctly.

Even when the funding from the GoB is available administrative bottlenecks in funds disbursements have the potential to derail implementation of interventions including the procurement of medicines and the recruitment of Human Resources for Health (HRH) as evident from low expenditure figures against allocation.

There is very high out of pocket (OOP) expenditure at 72.7% of CHE, suggesting that a significant proportion of TB patients and their families may be experiencing financial hardships (catastrophic expenditure) as they attempt to cope with the disease.

There has been a long-standing engagement with both the Global Fund and USAID, the organizations that have been the main sources of external financing for the TB response in Bangladesh and they have ongoing commitments to fund TB.

Recommendations

1. The MoHFW/NTP and other partners are advised to push for the establishment of structures like MAFTB, Parliamentary caucus or similar advocacy structures for improving investments for the overall health sector with an intent of increasing allocations for the health of the population in Bangladesh. Such structures should action previous recommendations to engage with the Health

Economics Unit (HEU) in the MoHFW and with other partners, develop a health advocacy strategy and plan to urge and nudge the GoB to increase financing for health overall.

2. The upcoming National Strategic Plan for Tuberculosis (NSP-TB) is expected to be in alignment with 'Global Plan to End TB' to move towards Ending TB in Bangladesh. Ensuring implementation of this plan will require adequate resources which should be fully costed irrespective of the historical trends of expenditure on the TB program. Delaying or failing to cost and implement the End-TB Plan would result in immense human and economic loss. Front-loading investments in the TB program is the real need of the hour. Availability of resources should not be a limitation and barrier in the required "ASK" for ending TB in Bangladesh. A fully costed NSP must be utilized as an investment case for mobilizing financial resources from domestic, other ministries within government, other non-government domestic resources like Corporate Social Responsibility (CSR), domestic organizations and external funding agencies. Financial monitoring mechanism must include regular review of available resources, funding gaps and efforts to mobilize required resources to nullify the gaps so that program moves towards Ending TB.

3. Adequate increase in domestic allocation and expenditure on TB from domestic resources is urgently required. The 4th Health, Population and Nutrition Sector Programme (4th HPNSP) operation plan for January 2017 to June 2022 has been extended till June 2023 as the next 5th HPNSP is under development. The NTP and others within the MoHFW must engage with planning and finance divisions to ensure additional allocations for the TB program with the express goal of Ending TB in Bangladesh and the increased allocations must be utilized in addition to being reflected in the expenditures. The 9th JMM strongly recommends promotion of decentralized, bottom up – approach planning for the TB response.
4. Sustain long standing engagement with development partners for the TB program to ensure that financing from external sources continues, and quantum of fund does not decrease, rather further expands even if domestic contribution increases over time. The finance resource requirement is expected to increase as the country moves on the path of Ending TB. The NTP and MoHFW needs to further strengthen collaboration with other ministries including planning, finance and social welfare, local NGOs, patient advocates, media, and other international organizations to initiate advocacy and engage with external funding agencies to continue and increase the resource envelop to meet increasing demands for Ending TB in Bangladesh. The NTP with all stakeholders needs to develop and plan activities that are synchronized with the ambition and program requirements for ending TB and ensure sustainability of such interventions by

integrating the project activities within health system instead of stand-alone / vertical implementation. Inclusive financial planning must be promoted with participation from development and international funding partners including GFATM, USAID and other partners to mobilize continuous and increased support of international funding and ensuring that the activities for Ending TB are a part of the National Strategic Plan for TB.

5. Innovative Finance mechanisms should be identified and pursued including identifying and engaging with new partners to support resources for Ending TB in Bangladesh. The recent COVID- 19 pandemic received massive support from CSR due to a government order for mandatory investment on health. As the COVID -19 pandemic wanes, efforts should rapidly be put in place to push for a similar order from Government for mandatory allocation of certain proportion of CSR to fund the End of TB in Bangladesh. Other channels like Development Banks Grants, Loan buydowns, Social Impact bonds, etc. should also be explored to mobilize resources for front-loading investment of resources in the TB program to save more lives by ending TB in a few years instead of running the program for decades.

6. The TB Laboratory Network

6.1 Context

The NTP has a well-established network of TB laboratories that is organized in a hierarchical manner from peripheral laboratories to regional TB reference laboratories (RTRLs) to the national TB reference laboratory (NTRL). The tests that are available in the TB laboratory network include smear microscopy, Xpert MTB/Rif assay, Xpert MTB/Ultra assay, Truenat assays, Line Probe Assay (LPA), Mycobacterium *tuberculosis* culture on solid and liquid media and phenotypic drug-susceptibility testing. Coverage of testing of presumptive cases of TB with a WHO recommended molecular diagnostic test with drug susceptibility testing has expanded significantly in recent years as shown in figure 11 below. While in 2017 Xpert testing of presumptive TB cases was equal or less than 100 per 100,000 cases, by 2021, the testing rate was over 400 per 100,000 cases in most parts of the country.

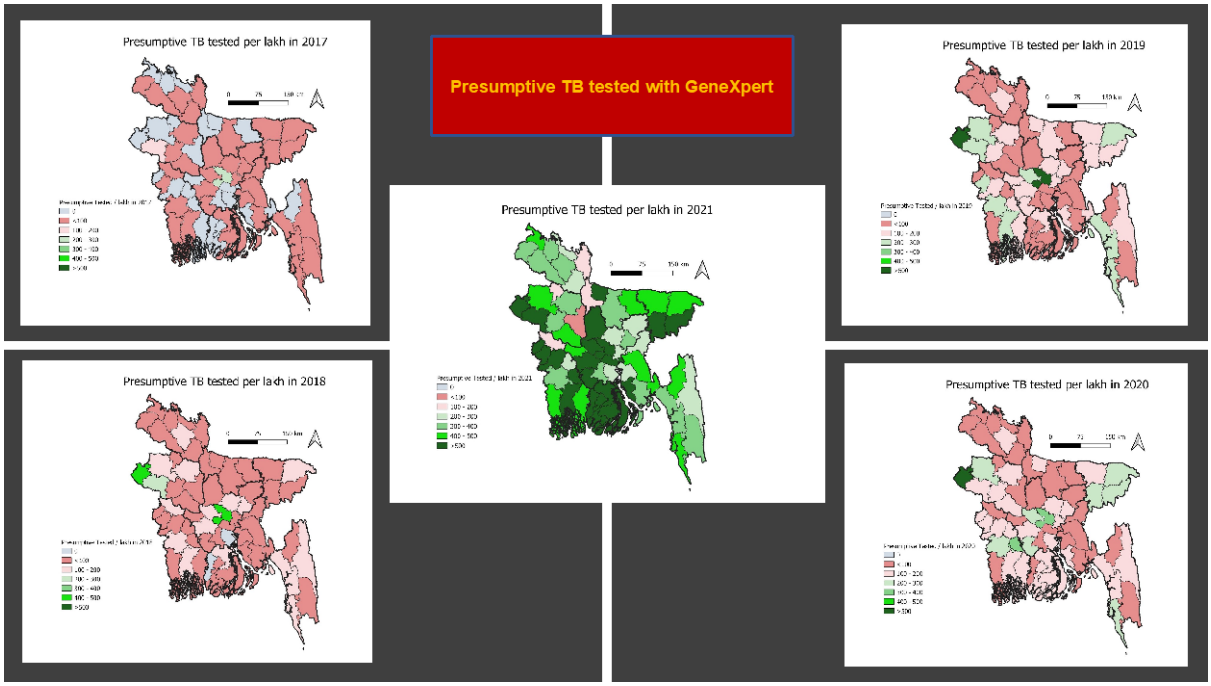


Figure 11. Coverage of Xpert testing among presumptive cases of TB , 2017- 2021.

While whole genome sequencing (WGS) and targeted next generation sequencing (t-NGS) are available in some laboratories in Bangladesh, these tests are currently not in the NTP's list of TB diagnostic tests and are not included in TB diagnostic algorithms. The laboratory network is key to the achievement of component A of the TB – NSP 2021-2025 (early diagnosis of TB including universal DST and systematic

screening of contacts and high-risk groups) under pillar 1 (integrated patient centered care and prevention). The current TB-NSP has outlined measures to strengthen the TB diagnostic system in both the public and private health sectors. These include: revision and updating of the national laboratory strategy; development of a molecular diagnostic roll out plan; development of a plan to improve the NTRL and the RTRLs, enhanced use of culture and LPA; ensuring correct quantification of laboratory reagents; coordination; information management and supply chain; strengthened sputum specimen transportation system; ensuring proper laboratory waste disposable; ensuring regular maintenance of diagnostic equipment; and implementation of a quality assurance system.

The Government of Bangladesh has adopted a national algorithm that embraces state-of-the- art testing to improve the detection of TB and DR-TB and has made significant investment in infrastructure and capacity, but challenges and opportunities exist for expanding access to diagnostic testing for all persons being evaluated for TB everywhere in Bangladesh.

The TB Laboratory Network: Progress and Key Achievements

- Laboratory staff were trained and highly motivated.
- In general, most laboratory facilities visited had adequate space and biosafety level and were clean and well maintained.
- Diagnostic testing was free of cost to persons being evaluated for TB at most sites.
- There has been significant investment in laboratory infrastructure and increasing capacity for rapid molecular testing (GeneXpert and Truenat) and digital X-ray.
- The diagnostic connectivity solution, Aspect, has started to be used for monitoring of the network.
- Use of Xpert Ultra to detect childhood TB using stool specimens has started.
- Turnaround times (TATs) were mostly very good (from collection of samples to release of report).
- Light Emitting Diode (LED) microscopes have been widely distributed; An External Quality Assessment (EQA) program seems to be well-established in most regions and reagents supply has been stable in past 2 years

The TB Laboratory Network: Challenges

A. Sub-optimal capacity for rapid Molecular Diagnostics

1. At the time of the review there was a severe Xpert cartridge shortage which had markedly reduced the capacity of the program to test people for TB by an estimated 40-50%.
2. Many GeneXpert modules were non-functional and there was a very long turnaround time for GeneXpert repairs.
3. All presumptive TB patients and smear-positive patients were not getting Xpert or Truenat testing in accord with the national algorithm.
4. Paediatric TB and EPTB detection are low and patients were infrequently tested with sensitive rapid molecular tests.

B. NTP algorithm and Implementation

1. The current NTP algorithms are not capturing how various technologies including X-ray are interlinked.
2. The approved national algorithm of testing persons with presumptive TB was not fully and consistently implemented in Xpert testing sites.
3. There is a shortage of radiologists and radiographers which limits the use of X-ray in the testing algorithm. Also, the roles of X-ray in screening and in clinical diagnosis were unclear.
4. Patients detected with rifampicin resistance but without MDR risk factors were started on MDR treatment based on a single Xpert result contrary to WHO recommendations.
5. Isoniazid resistance was not being tested or detected according to NTP algorithm.
6. National TB Laboratory Strategic Plan (2021-2025) is not well disseminated.
7. Not possible to ascertain TAT for microscopy based on microscopy register template TB 04.

C. Network Optimization of resources

1. A patient-centred specimen referral mechanism is lacking. Costs (e.g., transportation) to the patient may be significant if the person is referred to another facility.
2. GeneXpert instrument utilization varies considerably in the various regions and facilities.
3. There are 2 separate forms (TB-5 & DR-TB 6) for TB and DR-TB, duplicating entries of patients.
4. There is duplication of effort and work of entries into registers and reporting forms for Xpert testing.

D. Supervision and Quality

1. The NTRL and RTRLs do not systematically conduct a program of supportive supervision for the laboratories they oversee.

2. For some instruments, there is lack of certification, inadequate maintenance, and bio-medical engineers to maintain different types of equipment.
3. Equipment calibration is missing for most equipment and with a huge down-time.
4. Some of the Biosafety cabinets have not been recently certified.
5. Updated Standard Operating Procedures (SOPs), algorithm and job aids are not available in some centers.
6. Quality management systems and EQA of NTRL/RTRLs for molecular tests and phenotypic DST are not established systematically.
7. Induction training and proper refresher courses for all technologies inadequate at few places.
8. Laboratory involvement in programme review activities is limited and interactions between NTRL and RTRL is limited

E. NTRL

1. Sub-optimal Infrastructure. Space for NTRL is limited.
2. Generator back up missing since 2019 (NTRL) and essential areas like the cold room/ equipment do not have power back-up.
3. No sustained manpower supported from NIDCH institute is available, as a result of a legal policy and regulatory framework that does not include the NTR in the organogram of the MoHFW, which has led to the manpower at this laboratory being supported mostly by donors.
4. Microbiology diagnostic tests, in some laboratories, are done solely on requisitions and not done as per NTP or WHO recommendations.
5. There is no 1st line LPA or MGIT DST to second line and newer drugs. The containment facility for doing DST does not meet international standards for biosafety.
6. Persistent sub-optimal quality indicator and high contamination rate
7. No written protocol of processes for working e.g., storing consumables, equipment, competency, and personnel.

F. Waste management is still dependent on burning of waste in open pits at some peripheral sites, although waste is being treated/decontaminated properly.

The TB Laboratory Network: Recommendations

A. Sub-optimal capacity for rapid Molecular Diagnostics

1. Ensure the functioning of GeneXpert instruments and a reliable supply of cartridges.

a. Demonstrate highest-level political commitment and cross-Ministry collaboration to ensure that all TB commodities are exempt from import duties and release at the port.
b. Negotiate with Cepheid at level of NTP, Global Fund, Stop TB GDF and USAID for a service level agreement with Key Performance Indicators (KPIs) and targets, and possibilities of creating a service centre in Bangladesh.
c. Ensure GeneXpert instrument problems are systematically and timely reported as per KPIs established for the service level agreement.
d. RTRLs/NTRL to regularly collect data on refurbished GeneXpert modules that fail.

2. Increase rapid molecular testing capacity (Truenat and GeneXpert) to meet the goals of the NSP and address molecular testing in hard-to-reach areas. Consider increasing current target for GeneXpert testing (2 cycles/day) to 3 cycles/day wherever feasible to increase testing capacity.
3. All persons with presumptive TB should get tested using a rapid molecular test as the initial diagnostic test if available on-site or through specimen referral.
4. All smear-positive patients should get tested using a rapid molecular test as the initial test for rifampicin resistance if available on-site or through specimen referral
5. Roll-out Xpert Ultra testing of stool specimens for detecting TB in children and decentralize EPTB testing at Xpert sites and improve capacity of staff to collect and test samples.
6. Use the newly rolled out Aspect to its fullest potential. When MTB detected, a system should be developed to ensure that messages are sent from APSECT to the clinicians and patients about the readiness of results.

B. NTP algorithm and Implementation

1. Elaborate a consolidated TB diagnostic algorithm that addresses detection of TB and DR-TB and includes the use of X-ray, microscopy, Xpert, LPA and MGIT DST as appropriate and when available and ensure training and sensitization of clinicians and laboratorians to see that it is followed.
2. Adjust diagnostic algorithm to indicate that patients detected with rifampicin resistance but without risk factors for DR-TB get a 2nd Xpert test on a fresh sample in accord with international guidelines.
3. Phase-in testing for isoniazid resistance by adjusting the diagnostic algorithm to include use of 1st line LPA for all MTB-positive patients when LPA is available (and use Xpert MTB/XDR cartridges when GeneXpert10C is available); Consider starting the phased scale up of testing for

isoniazid resistance with the testing of all retreatment patients who have a very high rate of isoniazid resistance.

4. Microscopy register TB 04 should include column headings for date received and collected and date of examination.
5. Implement fully the terms of reference (TOR) of NTRL and RTRLs which have clearly defined roles under the MoHFW.
6. National TB Laboratory Strategic Plan (2021-2025) should be well disseminated and implemented.

C. Network Optimization of resources

1. A specimen referral system for specimens needing testing for all forms of TB should be built up across the country and the practice of referring patients should be discouraged. A diagnostic network optimization exercise should be conducted to map the network and design efficient referral linkages which include the private sector.
2. Xpert testing, mapping and re-distribution of instruments should be considered based on ongoing diagnostic network optimization exercise and geo-spatial mapping of rapid diagnostic availability, accessibility, and efficiency of use, including ensuring that the private sector has improved access to Xpert.
3. Consider developing one common form which has place to enter Microscopy and other tests along with reasons for DR-TB.
4. Promote efficient working without duplication of entries into registers and reporting forms for Xpert testing.

D. Supervision and Quality

1. Strengthen the capacities of the National and regional reference laboratories, improve infrastructure and equipment (and funding) including equipment maintenance to become Centers of Excellence and implement recently approved TORs.
2. Supportive supervision is an integral part of a comprehensive quality assurance system. NTRL and RTRLs should provide supervisory monitoring visits to each of the regional and peripheral labs in their areas at-least annually. As needed, microbiologists should visit sites to find root cause in case of non-conformance and suggest corrective actions.
3. The NTP/ NTRL/ RTRL should critically evaluate performance data sent by laboratories that they supervise, provide feedback and training if required to strengthen Internal quality assurance for all field laboratories. The entire laboratory network should be linked and technical and supervisory support provided appropriately (NTRL to RTRLs to peripheral laboratories) and

adequate resources should be allocated for the NTRL and RTRLs to conduct required supervision and monitoring visits.

4. Fully implement the developed maintenance plan for all laboratories and develop a cadre of biomedical engineers at national or regional level as appropriate for each type of device.
5. All updated SOPs and documents should be available and displayed inside laboratory.
6. Clear and costed plan for EQA and Laboratory Quality Management System (LQMS) should be instituted.
7. Laboratory should be involved in programme review activities at structured intervals.
8. National and regional labs should meet and interact at least twice a year.

E. NTRL

1. Strengthen infrastructure: ensure uninterrupted power supply essential for critical areas and equipment and provide more space for NTRL.
2. Deploy manpower from NIDCH institute / MoHFW to reduce over-dependency on donors.
3. Ensure requested tests are in line with WHO and NTP recommendations. To do this promote interactions between microbiologists, clinicians, and the administration to sensitize teams and to support the move towards appropriate tests requisition.
4. Consumables to be provided for starting 1st line LPA and MGIT DST at NTRL and RTRLs and Bio-safety laboratory requirements must be fulfilled for doing DST.
5. Centralize equipment certification/ calibration.
6. Conduct intensive root cause analysis and relevant corrective action for any sub-optimal laboratory parameter.
7. Develop a system/ protocol and SOPs for the various tests.
8. Explore new waste management practices that are friendly to the environment. Sort and separate used HIV cartridges from TB cartridges and incinerate at ≥ 850°C as they contain guanidine thiocyanate.
9. Use evidence from implementation research around new diagnostic tools including Truenat, ultraportable X-ray, AI (computer-aided detection of TB) and sequencing, to guide programmatic scale-up.

7.PMDT and aDSM

7.1 Context

The NTP in Bangladesh started the drug-resistant TB program in 2008 with hospital-based case management and adopted a community-based Programmatic Management of Drug Resistant TB (cPMDT) approach in 2012. Bangladesh is the first country in the South-East Asia region to introduce shorter treatment regimen for MDR-TB from April 2017, which has been globally recognized as the "Bangladesh Regimen" and has been endorsed by WHO. According to the new WHO guideline, the NTP has already revised and updated the MDR TB treatment guidelines this year. In 2019, there were an estimated 3,300 MDR/RR cases, however, only 1,400 (42.4%) patients were diagnosed of whom 1,200 (85.7%) started on second line treatment. Currently the detection of MDR-TB cases is as low as 34%.

In the second DRS survey carried out in 2018-19 the prevalence rate of Rifampicin Resistant among new and previously treated cases was 0.7%; and 11.4% respectively. According to the second survey among total TB cases 6.9% were retreatment cases. Among RR Mycobacterium tuberculosis, 82.1% (95CI 60.7-93.2%) were also INH resistant while any FQ resistance was present in 21.4% (95% CI 11.2-37.2%) of these patients[17].

The treatment outcome of shorter MDR-TB cohort of 2020 showed treatment success rate 72%, death rate 9.3%, Lost to follow-up 11.3% and failure rate 2.4%. The treatment outcome of longer MDR-TB cohort of 2019 showed treatment success rate 67%, death rate 17.2%, Lost to follow-up 4.3% and failure rate 4.3%.

During the field assessment visits the following achievement of the PMDT programme were observed: -

1. In chest disease hospitals (CDH) there is no shortage of beds or drugs including newer anti-TB drugs. If short periods of stock out were there, redistribution of drugs was done within the facilities
2. Daily DOT is taking place for DS-TB as well as DR-TB patient at home by locally assigned DOT providers community workers and patients are satisfied with DOT services.
3. Most of the time the patient do not have to pay for pre-treatment investigations, social support helps through Global Fund is available, however in Sylhet, out of 4 patients interviewed, one patient mentioned that he had to pay 10000 Takka before reaching the PMDT system.
4. Newer anti-TB drugs (ATT) drugs- Bedaquiline, Delamanid, and linezolid etc. are being tolerated well, with fewer ADRs being reported. At NIDCH in last 2 years among 1244 patients, any grade 4 ADRs was reported in 58 (4%), anaemia in 10 (0.8%), optic neuritis in 9 (0.7%), peripheral neuropathy

[17] 2nd Nation Wide Tuberculosis Drug Resistance Survey in Bangladesh, 2018-2019.

in 3 (0.2%), prolonged QTcF in 2(0.2%) of patients. Most of the times ADRs were minor and could be manged by stopping the offending drug for short periods and drugs could be reintroduced later.

5. Doctors have sufficient experience with using newer drugs and so the country is ready for transition to newer shorter WHO approved regimen - BPaL and BPaLM.
6. Even in difficult-to-reach area, such as Tea Garden areas in Sylhet, community gathering is being organized where symptomatics of area are called and sputum collected and transported. Here even follow up sputum smear & culture are being arranged for MDR-TB patients.
7. The Turnaround time (TAT) of Molecular test reports (i.e., GeneXpert and LPA) are within normal limits. Results for the Xpert test are received by the clinicians on average within 2 days and for LPA it within 5-14 days which is acceptable under field conditions.

Challenges and constraints with Bangladesh PMDT and aDSM

The following challenges and constraints are observed regarding PMDT and aDSM: -

1. Treatment sites where DR-TB treatment is initiated are not decentralized and is available only in select hospitals across country and is based on mandatory initial hospital admission. Patients have to travel long distances to reach and be admitted there. Patients also need to travel long distances to get SL-LPA done. Admission for DRTB may be for 2- 5/6 weeks, may be more. In the process many DR-TB patients after diagnosis may not reach these hospitals leading to initial loss.
2. There are limited number of health facilities which offer facilities for initial evaluation and treatment of DR-TB patients.
3. Sometimes there may be delay in initiation of DR-TB treatment as treatment may not be started till SL-LPA report is available which can take 4-12 days. Meanwhile these untreated patients can spread infection to staff and family members and also miss the opportunity of early treatment initiation which can kill the bacteria.
4. Even sputum smear positive patients are not getting Xpert done, patients may have to travel long distances to get it. Hence, diagnosis of RR-TB may be missed. Also, INH resistance is not being tested and may be missed.
5. Most of doctors, nurses and peripheral workers have not received NTP formal training although have broad knowledge of diagnosis and treatment recommendation for PMDT.
6. MGIT DST to second line & new drugs not being done even in NTRL or RTRL.
7. There are lack of chest specialist in CDH in most of places or post is vacant. Infrastructure and buildings are in poor condition in many CDH.

8. Inadequate knowledge about ADR of DR-TB drugs among doctors, nurses, DOT providers at most of DR-TB facilities was observed. Only severe ADRs are being reported in e-TB manager. Causality assessment is not being done at Divisional or district level.
9. Entries are being done in e-TB manager but the analysis and its use for monitoring and supervision at every level specially at UHC and Divisional level needs improvement.
10. In most of CDH, including NIDCH, the ward is poorly ventilated and the bed spacing is < ~4 feet. Inadequate knowledge about infection control practices among the staff was also observed. Patient's attendants are staying with the patients without using N95 masks in the same wards which can predispose them to the spread of infection.
11. There are significant missing DR-TB cases in children owing to the low detection of TB in children in general. Similarly diagnosis of EPTB takes long and may travel to long distances, therefore DRTB among patients with EPTB is likely to be missed.
12. MGIT DST for drugs- Bedaquiline, Delamanid, Linezolid, clofazimine not being done in RTRL, NTRL.
13. Functional Clinical Management Committee for DR-TB non-existing in most TB health facilities. Wherever it exists, no documents about the discussions held in the meeting etc. are kept.
14. Once admitted, discharge policy for DR-TB patients is not well defined. Usually, patients are admitted till 2 consecutive smears 1 week apart are negative. Even in national guidelines it is based on sputum smear conversion. In Sylhet one patient was admitted for 2 months although he had no symptoms and gained 5 Kg weight. However, in the fields 2 patients were identified who were discharged within 2 weeks of admission.
15. Female DR-TB beds are underutilized as equal number of beds allotted to males and female although females TB patients are less.
16. In some hospitals sputum positive PTB are admitted with non-TB patients, although in different corners.
17. Operational research on WHO approved new shorter regimen for pre-XDR TB- BPaL regimen started late and now the enrolment needs to be hastened.
18. Some patients have out-of-patient expenditure before reaching system. One patient in Sylhet spent 10000 Takka before reaching the PMDT system.
19. Some patients spending money for post-TB sequelae. One patient at Sylhet spent 70000 Takka in last one year due to post-TB sequelae forcing him to go to various private practitioners.
20. Currently in Bangladesh there is no policy for TPT for contacts of DR-TB.
21. Currently longer 6H is being given to contacts of HIV-TB, while other contacts are getting shorter 3 months TPT regimen (3HR/3HP).
22. Research component for vaccines, new drugs, regimen under NTP is suboptimal.

23. Pre-treatment loss-to-follow-up for DR-TB diagnosed patients is happening, however, its causes and ways of reduction are not known. During treatment Loss to follow-up in drug-resistant TB was observed to be around 5-12%. No recent study has been undertaken to understand the reasons and action required to reduce lost to follow-up.
24. Other than for a WhatsApp group, there is no formal facility for discussing difficult-to-treat MDR-TB on e-platform at national level.
25. No facility for clinical Therapeutic Drug Monitoring across country. Patients are being referred to other countries.
26. Newer diagnostics e.g. Whole Genome Sequencing (WGS) or Targeted- Next Generation Sequencing (t-NGS) are not being used for clinical management even in tertiary institutes.

Recommendations

1. Accelerate PMDT decentralization including the health facilities where evaluation and initiation of treatment of DR-TB services can be done. Ambulatory treatment of DR-TB services across the country should be planned and executed and the number of facilities which can offer evaluation and initiation of treatment of DR-TB services after diagnosis should be urgently increased.
2. Complete readiness assessment and plan to introduce WHO endorsed shorter newer regimen (BPaL & BPaLM) as early as possible.
3. Update e-TB manager dashboard to meet end user needs. Develop a plan on how data generated is going to be used across all levels of programme.
4. Improve supervision and monitoring skills among program staff of PMDT through appropriate training and mentoring.
5. Ensure Quality clinical & managerial training for PMDT to physicians, nurses, DOT providers and laboratory personnel across all levels.
6. Ensure quality training for pharmacovigilance, causality assessment etc.
7. Make efforts to find missing DR-TB cases in adults and children.
8. Ensure universal DST for all including newly diagnosed sputum positive PTB patients
9. Train staff on AIC practices and work with relevant entities to ensure comprehensive Infection control plans are established and implemented in each health facility.
10. Minimize out-of-pocket expenditure needs to be minimized.
11. Conduct operational research on post-treatment functional evaluation and rehabilitation and simultaneously develop guidance for management & mobilize social support
12. Ensure that there is at least 1 chest specialist n each DR-TB hospital for better management of DR-TB patients.

13. Establish a policy for ambulatory treatment, irrespective of sputum conversion include early discharge of hospitalized patients for ambulatory treatment with counselling about airborne infection precautions without waiting for sputum conversion.
14. Establish a policy to initiate treatment with shorter MDRTB treatment regimens in patients proven to have RR-TB, without waiting for SL-LPA report and later modify treatment, if required, when the SL-LPA results are received.
15. Establish Clinical Management Committee at PMDT sites, train members and document the minutes of meetings.
16. Allocate male and female beds as per their expected numbers.
17. Admit sputum positive PTB patients in a separate ward.
18. Train doctors on the use of FNAC etc, to enhance access to rapid diagnostic tests in each Upazila to assist in diagnosis of EPTB at peripheral level.
19. Discuss TPT for contacts of DR-TB at an appropriate national committee.
20. Use an operational research approach to understand causes and ways of reducing pre-treatment loss-to-follow-up for DR-TB diagnosed patients.
21. Explore possibility of creating an e-platform at national level for discussing difficult cases of MDR-TB with peripheral doctors
22. Use and Operational research approach to understand reasons and actions required to reduce the currently high rates of lost to follow-up during treatment.
23. Establish 1-2 centres for therapeutic drug monitoring 1-2 centres
24. Explore initiating use of newer diagnostics e.g., WGS and t-NGS for clinical management at-least in tertiary institute to gain experience.

8. Engaging all care providers (Public –Private Mix)

8.1 Context

An estimated 60% of health facilities are private and, based on demographic and health surveys, ~84% of initial care-seeking is to the private sector.[18] Furthermore, many clients seek treatment repeatedly from the informal sector, thus delaying diagnosis.[19] However, sales of TB drugs in the private sector are limited: Bangladesh's sales of TB first-line drugs in 2008-9 was only enough to cover 7% of the estimated incidence, and it had decreased by 51% in the previous 5 years,[20] with anecdotal reports from pharmacies of private TB drug sales dropping even further in subsequent years.

A broad range of partners help to implement the TB program nationally (see Figure on the left), and TB notifications originate from a wide range of referral sources (see table 5 below). The referral contribution from private providers among notified TB patients in Bangladesh was 24% in 2021 contributed by Graduate Private Providers (GPP) -18%, private hospitals (4%), Non GPP (1%) and village doctors (1%).

Table 5: Sources of referral for notified TB patients in Bangladesh, 2021

[18] Engaging private health care providers in TB care and prevention: a landscape analysis, second edition. Geneva: World Health Organization; 2021.

[19] Hossain S, Zaman K, Quaiyum A, Banu S, Husain A, Islam A, Borgdorff M, van Leth F. Care seeking in tuberculosis: results from a countrywide cluster randomised survey in Bangladesh. BMJ Open. 2014 May 28;4(5):e004766. doi: 10.1136/bmjopen-2013-004766.

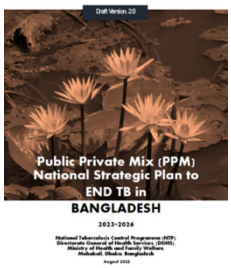
[20] Wells WA, Ge CF, Patel N, Oh T, Gardiner E, Kimerling ME. Size and usage patterns of private TB drug markets in the high burden countries. PLoS One. 2011 May 4;6(5):e18964. doi: 10.1371/journal.pone.0018964.

Table 2: Sources of referral for notified TB patients in Bangladesh 2021

Sl.	Referral Source	Numbers	Percentage
1	Private Hospitals	11950	4%
2	Graduate Private Providers (GPP)	56728	18%
3	Non-graduate Private Providers	2349	1%
4	Village Doctor	3460	1%
5	Shasthya Shebika (SS)/ Non-Government Field staff (NGFS)	136314	44%
6	Community Volunteer (CV)	15448	5%
7	Government Hospital (non-NTP)	47766	17%
8	Government Facility Staff (GFS)	11938	4%
9	Community Healthcare Provider (CHCP)	990	3%
10	TB Patient	4185	1%
11	Self	5440	2%
12	Others	1900	1%

Table 3: Sources of referral for notified TB patients in Bangladesh, 2021.

This referral pattern (from PPM models) is driven by, amongst other initiatives, the placement of DOTS corners in 71 out of a total of 197 large hospitals (24 specialized institute, 60 District hospitals, and 113 medical colleges), the implementation of active case finding in 39 hospitals (both public and private), and the engagement of 25,000 out of 80,000 graduate private practitioners (GPPs) and of 50,000 out of >500,000 non-graduate private practitioners (NGPPs).



To guide this response, there was a National Strategic Plan for Public-Private Mix (2016-2020),[21] which resulted in considerable additional resources being identified for PPM, and there is a draft PPM national strategic plan for 2023-26 which incorporates feedback from the JMM team.

8.2 Achievements

There are key achievements in several distinct areas. In the area of stewardship, Bangladesh is a world leader in government-NGO collaboration in the TB response, with an unprecedented scope of complementary inputs from the two sectors, which contributes greatly to early case finding and patient-centered diagnosis and care. In terms of resource mobilization, the country has shown the willingness to

[21] National TB Control Programme, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh: National Strategic Plan for Public-Private Mix (2016-2020). Dhaka, 2016.

dedicate funding to private sector initiatives at scale, although this is from donor rather than domestic funding.

There is a long history of engaging the private sector in the TB response in Bangladesh. Multiple engagement models have been customized to different provider types and contexts and are all operating at significant scale. In addition to the DOTS corners in private hospitals and GP engagement mentioned above, there are 62 TB diagnostic centers (TDCs), 10 TB Screening and treatment centres (TBSTCs), and 4 mobile vans. There is a mobile app (the JANAO application for TB case notification by GPPs and their assistants) being used in Dhaka and Rajshahi City Corporations, with some private providers being sensitized and oriented to its use, and a 2014 gazette on mandatory notification. There are involved corporate sectors (BGMEA, BKMEA) that have an order on TB care and prevention.

PPM best practices in Bangladesh include the use of DOTS Corners, which involves placement of HR support, notification, and treatment at a specific site in private and public hospitals. Additionally, the diagnostic centers mentioned above have dedicated staff and flexible opening hours, provide free services to all, and have centralized x-ray readings and use of a sputum collection video to improve sputum quality. For the engagement of NGPPs, field officers sensitize on TB, and provide IEC and sputum cups, with a referral slip to diagnostic centers provided along with the sputum cups, and an incentive of 100 BDT provided per bacteriologically confirmed patient diagnosed. Among a number of workforce populations, there are regular cough campaigns done, contact tracing among co-workers, and there is 2 weeks paid leave for patients who are bacteriologically confirmed.

All of this results in a meaningful impact, with ~25% of notified TB patients being referred by the private sector. Furthermore, access has been improved by implementing flexible working hours, and by offering multiple diagnostic services in some of the diagnostic centres.

8.3 Key Challenges

The PPM effort in Bangladesh is currently facing several challenges. In relation to governance, the leadership and coordination on PPM strategies is driven more by centralized decision making than by local priority setting. The coverage of private sector engagement still has significant gaps: a large proportion of private sector providers (e.g., 60% of large hospitals, 70% of GPPs and 90% of NGPPs) are not engaged to provide TB-related services. Quality is also not always optimal: there is limited ICF/ACF for both adults and children in the private sector (particularly in high volume hospital settings), and provision of other services such as TPT are limited. There is sub-optimal implementation of

mandatory notification: not all diagnosed TB patients are notified due to a lack of coverage of notification systems, supervision and sensitization in the private sector, including limited roll-out of the JANAO app. And the country's overall health financing context limits the ability to implement more ambitious efforts. Specifically, the lack of approaches for strategic purchasing of services – either for the purchasing of clinical services directly from private providers, or of engagement services by NGOs – limits the ability to scale up private provider engagement approaches, particularly with domestic financing.

8.4 Key Recommendations

The key recommendations for PPM fall into several categories including the improvement of: PPM governance; PPM coverage; PPM quality; and health system tools and context.

For PPM governance, there is a need for more decentralized PPM planning, implementation, and oversight. Based on the PPM scope defined in the draft national PPM strategy, the JMM recommends that the NTP and partners institute regular local level planning, and reviews of PPM data and of the complementary government and NGO roles, at both regional and district levels.

For the expansion in coverage of private provider engagement approaches, the JMM recommends that the NTP and partners should:

- Quantify expansion needs in the draft PPM National Strategic Plan, prior to its finalization.
- Expand NGPP engagement. After costing, and as part of the PPM National Strategic Plan finalization, the NTP should formulate an achievable expansion strategy, focusing on low-income areas and NGPPs with chambers (e.g., BlueStar). NGPPs should be provided with updated lists of nearby TB diagnostic and treatment centers, and NTPs and partners should use community-based advocacy approaches to reach the lowest level providers that are not engaged directly.
- Expand TB diagnostic centers and GPP engagement. Diagnostic centers with extended opening hours are critical to align with GPP's hours and their need for rapid diagnostic turn-around time. The NTP and partners should also add engagement of specialists working in private diagnostic/consultation centers - focusing on their walk-in clients, thus minimizing disturbance to their core lab business. Diagnostic centres should also be expanded to improve accessibility for presumptives referred by community workers.
- Add DOTS corners in larger private hospitals and in other large volume hospitals that do not currently have a DOTS corner. Implementation should be based on learnings from the medical college DOTS corners.

To increase PPM engagement quality, the JMM recommends that the NTP and partners should:

- Expand ICF within hospitals, using cough triage in high volume outpatient departments and linkage to DOTS corners to increase the yield.
- Increase diagnostic capacity by increasing funding for rapid diagnostic testing and introducing teleradiology and AI for x-ray reading in the diagnostic centers that engage private providers.
- Strengthen workplace and congregate settings models by actively mapping all large industries and engaging the associations to support routine TB screening, testing and treatment, including provision of more sensitive diagnostic tools (CXR and better access to Xpert/Truenat) and paid leave days. Other congregate settings such as madrassas should also be engaged.
- Continue and strengthen existing incentive and enabler systems (both monetary and non-monetary, such as recognition certificates) for private provider engagement.

To improve health system tools and context for PPM, the JMM recommends that:

- The NTP and partners should improve apps and the use of mobile technologies for private provider engagement. The starting point would be to upgrade the JANAO app or a similar technology to support mandatory notification by GPPs and others. As part of this effort, such a technology should be made more useful and appealing to GPPs by: requiring the submission of the minimum number of data fields; providing feedback of diagnostic results to private providers; establishing interoperability with eTB manager; potentially using national ID numbers to avoid double notification;[22] and connection to relevant PPM models for scale-up of provider uptake. Implementers could also consider adding a feature allowing recording of private TB drug sales by the few pharmacies who sell non-NTP TB drugs and adding a feature in Janao on mobile money to allow notifying GPP and GPP assistants to receive a small incentive upon notification and referral to treatment centres.
- The NTP and Health Economics Unit (HEU) of the MoHFW should continue the ongoing conversation on strategic purchasing. Based on the assessment report[23] and draft roadmap,[24] and on the existing GoB-led and GoB-funded contracting examples by the National AIDS and STI Program and in the education sector, the NTP and HEU should explore the use of strategic

[22] This should only be implemented with the correct safeguards related to patient privacy. For detailed guidance, see: LINKAGES, 2016. Unique Identifier Codes: Guidelines for use with key populations. https://www.fhi360.org/sites/default/files/media/documents/resource-linkages-uic-guidance.pdf

[23] Health Economics Unit, MoHFW, 2022. Outsourcing and Social Contracting of Tuberculosis Services in Bangladesh: Assessment Report. https://pdf.usaid.gov/pdf_docs/PA00ZMJ1.pdf

[24] Health Economics Unit and National Tuberculosis Programme, MoHFW, 2022. Roadmap and Action Plan for Social Contracting of TB Services in Bangladesh 2023 – 2028. [DRAFT]

purchasing by the GoB to purchase, via social contracting, private provider engagement services by NGOs.

9. Child & Adolescent TB

9.1 Epidemiology

Globally in 2021, 10.6 million people fell with TB and 11% of them are estimated to be children <15 years. Similarly of the global TB deaths among HIV-negative people 14% were in children (aged <15 years).[25]

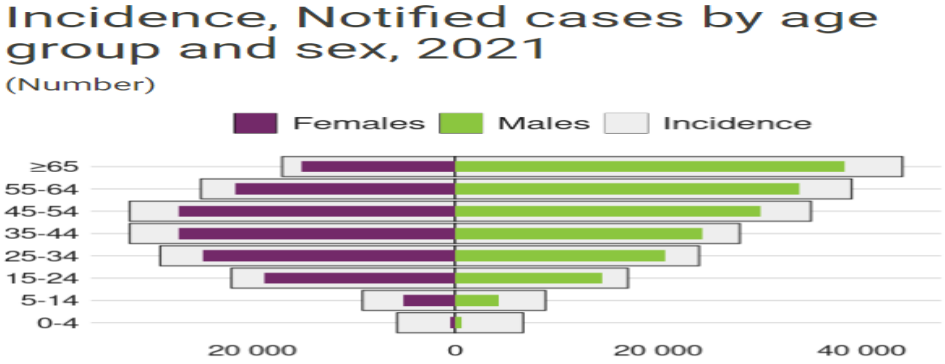


Figure 12: TB incidence and notified cases by age group and sex, 2021

Bangladesh is currently missing more than 25500 child and adolescent TB (<15yrs) cases annually as per current notification trends.[26] In a county where close to 26% population are children <15 years but 4% are being detected predominantly due to underdiagnosis and under reporting. The diagnostic gap for children under 5 years of age is greater still at 72% and they have the highest risk to develop severe forms of TB, often leading to disability and death.[27] Most of the untreated under 5 children infected with TB die (around 80%). Out of them 40-45% are attributed to undernutrition.[28] [29]

In Bangladesh, the TB epidemic is driven predominantly by undernourishment followed by smoking, diabetes, and HIV infection. Risk factors for developing TB disease following infection include young age (<3 years old) and immunodeficiency (such as caused by severe malnutrition, measles, HIV infection etc). Adolescence is another period during which there is an increased risk of developing disease. Once a child contact is exposed to smear positive or smear negative TB patient, the rates of TB infection are 80% and 40% respectively.[30] The sole major risk factor for infection with TB in children 2 years of age

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[25] *Global tuberculosis report 2022. Geneva: World Health Organization; 2022. Licence: CC BY-NC-SA 3.0 IGO.*
[26] *National Strategic Plan for TB Control 2021-2025 REVISION 6.0; 31 March 2020.*
[27] *World Health Organization. Rapid communication on updated guidance on the management of tuberculosis in children and adolescents. Geneva, Switzerland: World Health Organization: 2021.*
[28] *WHO operational handbook on tuberculosis. Module 5: management of tuberculosis in children and adolescents. Geneva: World Health Organization; 2022. Licence: CC BY-NC-SA 3.0 IGO*
[29] *Dodd PJ, Yuen CM, Sismanidis C, et al. The global burden of tuberculosis mortality in children: a mathematical modelling study. Lancet Glob Health. 2017;5(9): e898-e906*
[30] *Marais, B.J., Gie, R.P., Schaaf, H.S., Hesseling, A.C., Obihara, C.C., Nelson, L.J., et al. (2004) The Clinical Epidemiology of Childhood Pulmonary Tuberculosis: A Critical Review of Literature from the Pre-Chemotherapy Era. The International Journal of Tuberculosis and Lung Disease, 8, 278-285*

was household contacts whereas, in children after the ages 5-10 years the community was the source of infection (nursery, schools). In addition, the age that is at high risk for disease progression following primary exposure was under 2 years and above 10 years of age and the highest risk of mortality was recorded at infancy.

The risk factors for TB in subpopulations like urban poor communities due to overcrowding, homeless communities, migrants, refugees, and other vulnerable like prisons, health care workers, police personnel etc or marginalized groups with limited access to health care like people residing in remote islands, gypsy/ fisherman community and tea garden population are specific for country

Progress with childhood TB

NTP has done significant efforts in identifying missing adult TB cases from 36% in 2020 to 15% in 2021. Other noteworthy contributions the country has demonstrated with its political will and commitment are achieve SDG target of malnourishment, a driver of TB sharply declined from 42% in 2013 to 28% in 2019. (Similarly, Severe Acute Malnutrition (SAM) dropped from 32% to 22% during that period). A steady decline of Under 5 mortalities from all diseases from 49/1000 in 2010 to 29/1000 live births in 2020 were noted.

Despite NTP's best efforts child and adolescent TB case detection is stagnant at 4% since 2014 to till 2022. All divisions have shown low child TB case finding efforts (<4%) except Dhaka (5-6%) and Mymensingh division due to ongoing child TB specific projects. Barisal, Khulna, and Rangpur divisions have consistently detected low child and adolescent TB cases below national average (4%) since last 10 years.

Figure 13: proportion of child TB by division 2016-2022: Source: NTP data 2017 – June 2022

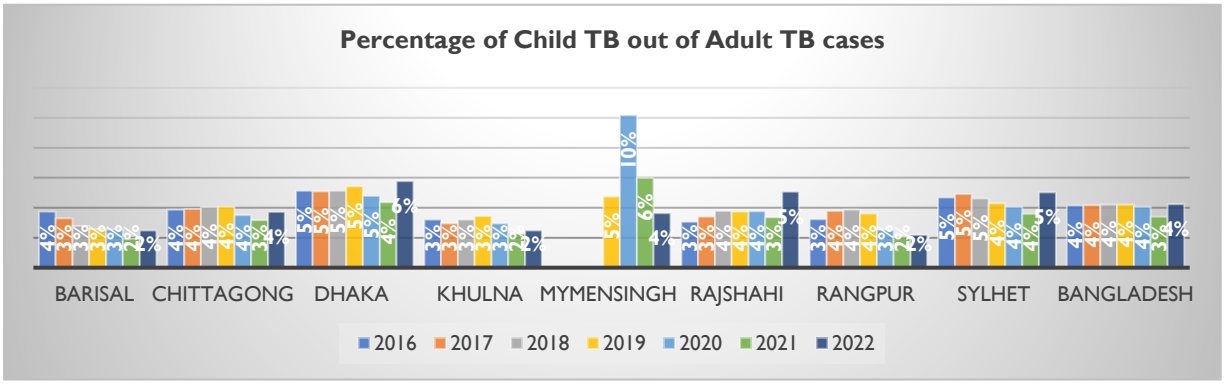
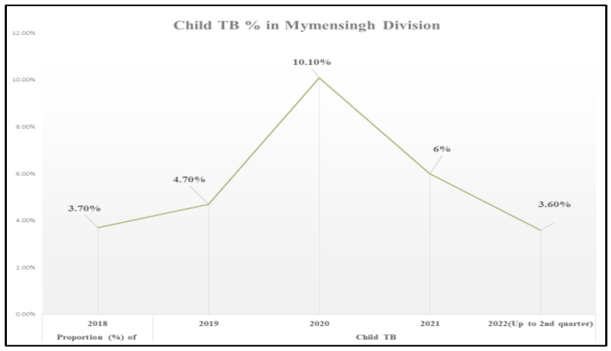


Figure 12:

Figure 14: Proportion of child TB in Mymensingh Division 2021

New EP adjusted additionality			All forms of TB		
			Evaluation Area	Control Area	Double Difference
Historical Baseline Notifications	2019	Q1	72	283	
		Q2	86	386	
		Q3	68	315	
		Q4	67	342	
Implementation Period Notifications	2020	Q1	146	262	
		Q2	37	168	
		Q3	248	358	
		Q4	293	209	
	2021	Q1	287	210	
		Q2	179	246	
		Q3	126	251	
unadjusted additional cases			803	-617	
% Change from baseline			157%	-27%	184%
Additional notifications target			546		



The country has successfully implemented 2 projects focusing on active case finding of child TB cases. One such project is recent Stop TB Partnership funded TB Reach project – implemented by IRD which demonstrated 10% Child TB cases in Mymensingh division in 2021 with its focused efforts, a 184% change from baseline in evaluation area of the project.

Source: IRD project data 2021

The other ongoing project is an USAID's Alliance for Combating TB in Bangladesh (ACTB) project – implemented by Icddr, b in Dhaka and Rajshahi division demonstrated that the country could increase identification of children with TB by up to 8.2%. The project addressed few challenges of underdiagnosis in under 5 children thanks to the introduction of multipronged interventions like: capacity building, facility and community-based active case finding, improved diagnostic tests, awareness raising activities, Introduced sputum induction and stool sample testing of children in selected facilities. Stool samples are transported and tested at icddr, b run TB laboratories in Dhaka, Sylhet and Rajdhani using Xpert MTB/RIF Ultra Assay. During the project period (August '21 to Sept '22) they could detect 2500 child TB cases in its intervention areas (Close to 30% of total child TB cases were diagnosed among the under 5 age group). Fifty-six percentage of (170/299) under 5 years child TB cases were detected, out of them bacteriologically confirmed are 20.5% (35/170), clinically diagnosed 55% (94/170) and EPTB are 24.5% (42/170).

Table 4: Outcomes of the targeted TB case finding in children project, Dhaka and Rajshahi Divisions

ACTB project area till June '22	Screened for TB	Presumptive identified	TB Presumptive Tested	All forms of TB cases diagnosed	Bacteriologically confirmed TB cases	Clinically diagnosed	EPTB cases detected
Adult	208,621	65,018	54,806	8,602	4,506	1,251	2,905
Child	1,097,032	31,021	24,674	2,042 (8.27%)	477	712	853

Source: Icddr,b project data from July'21 to June '22.

Dhaka Shishu Hospital
Under 5 Children TB Case Distribution from August 2021 to September 2022
Date: 22 October 2022

PTB						EP TB								Grand Total (All Cases)
B+			CD	Total	Remarks	Gland TB	Abdominal TB	Pleural Effusion	TB Meningitis	Bone TB	Skin TB	Renal TB	Total	
Gastric Lavage Xpert	Sputum Xpert	Stool Xpert Ultra												
12	0	23	94	129 (*Total case 128)	*1 child both positive in Gastric Lavage and Stool	15	2	6	14	3	1	1	42	171 (*Total case 170)

Source: Icddr,b project data from August '21 to September '22.

NTP efforts since 8th JMM to improve Child & Adolescent TB are:

1. National guidelines for the management of tuberculosis in children 3rd edition was revised in October 2021, shared with all District and Upazila level. Orientation trainings are ongoing. (NTP allocates a separate budget for Child TB training in addition to ACTB project training component on child TB is also available)
2. Engagement with Private laboratories has yielded high EPTB child TB case detection.
3. Coverage with BCG vaccination in Bangladesh is high at over 99%
4. To improve child TB case detection National TB Control Program in collaboration with ACTB Project
   - To establish 8 Child-friendly TB Diagnostic sites in Dhaka & Chittagong.
   - Integrated Tb screening and referral to increase Tb diagnosis among under – five children through IMCI platform. Rolled out in 18 facilities so far (>200 child Tb cases diagnosed through this approach). Planning to expand this approach in all Upazila health complexes of Rajshahi division in near future

- With the help of Renowned paediatricians and TB experts developed a short training module on childhood TB (>650 doctors trained in last year). Currently working to convert this manual into an interactive, digital training tool accessible to physicians beyond ACTB priority districts.
- Bangladesh Paediatric Association (BPA) members are engaged in trainings on Childhood TB. ACTB is already in the process of signing a MoU with BPA to expand this collaboration.
- A TPT SOP developed on April 2021 that within one week after diagnosis of a bacteriologically confirmed TB case, contact investigation will be completed for project identified cases

5. IRD Bangladesh in collaboration with Damien foundation initiated 1) Established facility-based case findings in the Mymensingh division which significantly improve both private and public facilities that increase 11% case detection 2) Reverse contact investigation 3) Supported decision-making multi-disciplinary clinical board.

Challenges with childhood TB

Child & adolescent TB case detection is stagnant at 4% since 2014 to 2022. (Estimated to be 11-12% of adult TB cases).

Diagnosis of TB in children is often difficult for several reasons:

- Symptoms are often non-specific particularly in young children.
- Childhood TB is paucibacillary & a microbiological diagnosis is often not possible.
- It is difficult to obtain sputum for bacteriological confirmation.
- The Mantoux Test or Tuberculin Skin Test (TST) is often negative in malnourished children or overwhelming TB (see below – causes of false-negative TST). Like the Interferon Gamma Release Assay(IGRA), TST also fails to differentiate TB disease from infection.
- X-rays are often nonspecific and prone to variable interpretation.

The main challenges observed by JMM team are

- Despite the availability of revised National guidelines for the management of tuberculosis in children - 3rd edition dated October 2021, training of Paediatricians and general physicians, nursing staff, NTP staff, partner staff and general health staff is found to be not completed across all divisions. Barishal division last trainings done in 2016.
- Child TB (especially under 5 yrs.) is grossly not suspected by clinicians in routine outpatient departments, grossly underdiagnosed and under reported. (Under diagnosis of childhood TB accounts to more than 94% in 0-4 years age group and 47% in 5-14 years age group).
- Children are not considered as key vulnerable population and not offered upfront GeneXpert across all divisions.

- Access to Tuberculin skin test is not uniform across all divisions and lack of functional Xray facilities is a challenge.
- Medical colleges (Public & Private)/ Tertiary care hospitals/ Specialty hospitals and Private sector not fully engaged to support NTP child case finding efforts
- Centralized Child TB care delivery till division level in the country. Scarcity of diagnostic services for children at decentralized settings
- More reliance on facility-based case finding efforts lead to delayed TB diagnosis clinically presenting in tertiary care hospitals with severe complicated forms of TB. Similarly lack of community based active case finding efforts with peripheral health worker will account to delayed identification of childhood TB.
- Contact investigation is currently at 48% and high patient refusal rates up to 30%.
- Absence of large-scale contact screening drives nationwide and provision of TB preventive therapy to eligible children which is largely due to insufficient health-care resources, workforce, and services
- NTP current surveillance data regarding case finding and treatment outcome are not disaggregated data for under 5 years and 5-14 years, gender. Similarly recording and reporting of presumptive paediatric TB tested in GeneXpert reports and private sector referrals also not captured. Therefore, results in low or over estimation of TB burden in children.
- Lack of awareness among health care staff and in the communities. Role of stigma in adolescents (school going children) is also critical.

Recommendations for enhancing care of childhood TB in Bangladesh

As part of the sustainable Development Goals (SDGs) the country is committed to end preventable deaths in children by 2030. Addressing childhood TB is critical to achieve this goal. To achieve these ambitious targets, there is an urgent need to develop an ambitious and robust revised National Strategic Plan which will be laid on the foundations of strengthening the health systems with integrated service delivery approach with a right blend of both facility and community-based interventions. There is an urgent need to build systems to improve prevention, diagnosis, treatment and care for children and adolescents with TB or at risk of developing it.

<u>Key recommendations under various thematic areas are:</u>

1. Develop and implement NTP National training plan to disseminate New Child & Adolescent TB Guidelines 2021

2. Engage the roll of all care providers in medical colleges (Public & Private)/ Tertiary care hospitals/ Speciality hospitals and Private sector build and strengthen their capacity to support NTP child TB case finding efforts (All specialties and specifically Gynaecologists clinics/ Infertility clinics and Children hospitals)

3. Emphasis on early intensified child TB case detection efforts keeping in view of severe complications in children.

    - Plan and implement most cost-efficient strategy of universal TB screening at all general health facilities, TB symptom screening at the registration counters and refer accordingly. Currently <1% are identified from Outpatient dept need to increase to 3-4%

    - Considering Children <15 years as key vulnerable group. Plan for single day diagnosis workup for child TB (upfront TST + Xray + GeneXpert Ultra either stool for children unable to produce sputum and sputum for those able to produce it.

    - Complementing dual package of service delivery need to be explored like decentralized child TB services for uncomplicated cases and complementing specialized child and adolescent TB services for critical care

    - Scale up/ implementation of successful projects like ACTB - USAID Icddr,b and IRD learnings (Dissemination workshops) across all divisions by NTP

4. Address challenges in identifying missing child TB cases (diagnostic challenges, under diagnosis and under reporting especially Under 5 years children) by mainstreaming Stool examination and sample collection systems for gastric aspirate on WHO recommended GeneXpert Ultra testing.

5. Strengthen inter sectoral collaboration between NTP and other national programs: Plan for single window child services across all General Health Service delivery clinics in MCH, IMNCI clinics, SAM units, Nutrition services etc.

6. The country context of continuum of Tb care cascade needs to be studied from susceptibility to cure, this patient pathway needs to be understood and strategies need to be devised to address these gaps. (Turn around times in public sector and private sector service delivery to diagnose DSTB and DRTB case specifically for adult and paediatric cases)

7. Others like PPM, Operational research, and Surveillance.

10.TB & Comorbidities

The three major drivers of TB in Bangladesh are undernutrition, diabetes and smoking. Studies show that undernutrition is the leading risk factor for TB, with a "population attributable fraction (PAF) of 15%, compared to 7.6% for HIV[31]. Diabetes is recognized as a serious challenge to tuberculosis care and prevention as individuals with DM have three times the risk of developing TB[32] . Smoking has a strong influence on TB and is a major barrier towards treatment success with findings indicating that smoking cessation is an effective way to decrease treatment failure and drug resistance[33].

Undernutrition and TB

Individuals who are undernourished are more likely to develop active TB compared to those with a healthy bodyweight. They are also more likely to have greater severity of TB, and less likely to have successful TB treatment outcomes. The likelihood of TB mortality significantly increases as weight decreases. Overall poverty rates are decreasing in Bangladesh, but the poor still constitute a significant proportion of the population. As per the World Bank, even though extreme poverty rates fell by two-thirds to 12.9 percent of the population in Bangladesh[34] but on the other hand, it is still estimated that 36% and 14.3% of children under the age of 5 were stunted and wasted respectively. Urban poverty is another big problem as currently 35.8% of the Bangladesh population lives in urban areas. Bangladesh has one of the highest rates of urban population growth rate which averaged 4.19% between 1980 and 2011. Of the total urban population up to 60% live in slums, which are unplanned urban settlements where social deprivation is the norm. This population is very vulnerable to TB and requires targeted efforts to address the disease.

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[31] Carwile ME, Hochberg NS and Sinha P; (2022); Undernutrition is feeding the tuberculosis pandemic: A perspective,; Journal of Clinical Tuberculosis and Other Mycobacterial Diseases, Volume 27, 2022, 100311, ISSN 2405-5794, https://doi.org/10.1016/j.jctube.2022.100311

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[34] World Bank; (2022). Poverty & Equity Brief Bangladesh South Asia October 2022; https://databankfiles.worldbank.org/data/download/poverty/987B9C90-CB9F-4D93-AE8C-750588BF00QA/current/Global_POVEQ_BGD.pdf

Diabetes Mellitus and TB

The global increase in type 2 diabetes mellitus (DM) is a recognized re-emerging risk and challenge to tuberculosis (TB) care and prevention. Individuals with DM have three times the risk of developing TB[2] and there are now more individuals with TB-DM co-morbidity than TB-HIV co-infection[35]. In 2015 the prevalence of diabetes in the Bangladesh population of ages 20 to 79 was 8.3%. A person with untreated latent TB infection and diabetes is more likely to develop TB disease than a person without diabetes. Without proper treatment, diabetes and TB can increase health complications. Diabetes professional association-initiated program in Bangladesh to screen diabetes patients for TB has shown a model with good results for overall program TB-DM collaboration.

Tuberculosis and Tobacco Smoking

The World Health Organization estimates that 35% of adults currently use tobacco in Bangladesh, either in smoked or non-smoked forms. Additionally, 43% and 39% of adults are exposed to environmental tobacco smoke at work or home respectively. Bangladesh is one of 14 countries in the world facing the heavy burden of tobacco epidemic. Smoking is a major determinant of developing TB among individuals with tuberculous infection. Smoking increases the risk of contracting tuberculosis (TB), increases the risk of recurrent TB and impairs the response to treatment of the disease[36]. Despite evidence showing these harmful links between tobacco and TB, tobacco continues to be majorly used in Bangladesh. In addition, there is a social gradient in the use of tobacco with 24% of the highest wealth quintile using tobacco compared to 48% in the lowest wealth quintile. This has implications for TB since poorer segments of the population are at higher risk of infection and progression to active TB which is then compounded by the tobacco smoking. The MoHFW has recognized smoking as a problem and has established smoking control interventions for the general population which is commendable. Collaboration between the NTP and the National Tobacco Control Initiative and integration of TB with the existing tobacco control initiative is needed to form a part of the efforts to strengthen TB -Tobacco collaborative efforts.

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[35] Ronacher K, Joosten SA, van Crevel R, Dockrell HM, Walzl G, Ottenhoff TH. (2015); Acquired immunodeficiencies and tuberculosis: focus on HIV/AIDS and diabetes mellitus. Immunol Rev. 2015;264:121–137.

[36] van Zyl Smit RN, Pai M, Yew WW, Leung CC, Zumla A, Bateman ED; (2010); Global lung health the colliding epidemics of tuberculosis, tobacco smoking, HIV and COPD. Eur Respir J. 2010;35(1):27–33. doi: 10.1183/09031936.00072909.

TB and HIV co-infection

Bangladesh has been successful in keeping the HIV prevalence to a low level with <0.1% prevalence among adults aged 15-49 years. It remains less than 1% both among key population groups (KP) and bridging populations, the most at risk, but the epidemic is on a rise with Bangladesh being one of the two countries in Asia/Pacific with increasing trends.

Bangladesh adopted WHO recommended collaborative TB/HIV activities and developed its first edition of the national TB/HIV guidelines in 2009 and the 2nd edition in 2016. Following these mechanisms, coordination between the NTP and NASP was established viz. national TB/HIV coordination committee. Recording and reporting formats were modified to capture key TB/HIV data elements in NTP records and reports e.g. HIV status of TB patients, provision of co-trimoxazole preventive therapy (CPT) and ART. Even though HIV testing is being offered for TB patients only but just a small fraction of TB patients is being tested for HIV and the HIV co-infections are not well recorded.

Service delivery architecture and implementation

TB services: TB diagnosis and treatment initiation among notified TB patients is largely done at district and Upazila level (sub-district) public health facilities. There are 492 upazillas over 64 districts in the country. After diagnosis and treatment initiation, TB patients are referred for continuation of treatment closer to their local community. The diagnosis of TB is decentralised with more than 1000+ TB microscopy facilities and more than 500+ GeneXpert labs in Bangladesh at all levels of the health care system till the Upazilla level. The NTP is further planning to scale up GeneXpert and Truenat labs in the country focusing on early and quality diagnosis.

NCD services: In Asia, the prevalence of DM is increasing at a dramatic rate including in Bangladesh. Around seven million people in Bangladesh are suffering from diabetes and the number of such patients is rising by 5-6 percent each year. In the setting of the increasing overlap of populations at risk for both diseases, the combination of TB and DM represents a health threat for Bangladesh. NCD services are being implemented at all levels of the health care system till the Upazila level with establishment of NCD corners with availability of diagnosis and drugs in order to achieve universal health coverage (UHC) through the primary health care system.

HIV services: The HIV response in Bangladesh predates reporting of the first case in the country, focusing primarily on HIV prevention interventions among key HIV high risk populations such as injection

drug users, female sex workers, men having sex with men and transgender populations. There are HIV testing facilities at District level in Bangladesh majorly focusing towards the key HIV high risk populations. Based on HSS data the HIV prevalence in Bangladesh is estimated to be less than 0.1% among adults aged 15-49 years and less than 1% among the key population groups. Although the HIV epidemic is concentrated among key populations, the commonest mode of transmission remains heterosexual transmission. Moreover, HIV testing coverage among key populations viz. PWID, FSW, MSM/MSW remains less than 20%.

TB/HIV collaboration: TB HIV collaborative activities with cross referrals are being implemented in Bangladesh. Screening for HIV among all TB patients in the 23 high -burden districts and for high risk TB patients in other districts is being implemented. Routine TB screening for all PLHIV is offered at all the 11 ART centers and GeneXpert screening along with X-ray is offered for all TB presumptive cases among PLHIV. All the identified HIV infected TB patients are linked to these ART centers for further management with ARVs across the country.

Challenges identified in co-morbid conditions:

There is a lack of specific guidelines and/or programme implementation plans for screening, testing, diagnosis and treatment of TB with comorbidities like NCDs including chronic kidney diseases (CKD) and Cancer etc. There is no formal collaboration with Maternal Child Health division and Mental health services for screening, testing, diagnosis, and treatment of TB. Similarly, there is no formal collaboration with nutrition program especially for children for screening, testing, diagnosis, and treatment of TB. There is inadequate consultation and engagement of broader stakeholders in the process of developing national guidelines and strategies for TB with NCDs, MCH, Nutrition, Tobacco Control, and integrated care. Smoking, already known as a major risk factor for TB, is not yet a focus of the TB program and patients with TB are not asked about their smoking habits nor those who smoke offered cessation interventions.

Health facilities implementation of psychosocial & Mental Health support for DR-TB and DS-TB was inadequate at all levels of health care including even at CDHs. Even with NCD corners established at UHCs coordination and collaboration was not noted with no routine verbal TB screening of NCD patients, resulting in limited effort for provision of bidirectional screening, treatment, and follow-up mechanism within the primary health-care system. Tuberculosis laboratories were not being used for screening for other co-morbidities including NCDs, Cancer, Nutrition etc.

There is insufficient coordination and communication between public and private service providers for TB and NCDs at all levels of health care. There is a lack of availability of trained human resources to deliver integrated TB - NCD care. Also, capacity-building initiatives are lacking to train health-care workers on the co-management. Inadequate recording and reporting and documentation of TB - NCD comorbidity within the current primary health care system.

Challenges identified in TB -HIV co-morbid conditions:

- TB/HIV collaborative guidelines is old (2016) and not in line with latest WHO recommendations
- It was noted that PLHIV were still receiving 6H for TB prevention.
- It was observed that there is inadequate AIC at HIV centers which exposes PLHIV to an increased risk of acquiring TB infection.
- Testing for HIV among TB patients was inadequate due to shortage of testing kits at facilities.
- Limited capacity of HCW on TB/HIV case management in view of inadequate trainings.
- Loss of PLHIV referred from ART centers due to complex referral mechanism.
- Inadequate recording and reporting of TB/HIV cross referrals and case management.
- Inadequate involvement of community clinics in the delivery of components of integrated TB & HIV care.

Recommendations to address the gaps:

Malnourished populations:

- Bangladesh TB elimination effort can no longer afford to ignore undernutrition. Nutritional interventions are likely to improve both nutritional status and TB treatment success, thereby decreasing TB mortality. Additionally, when identified to have TB, persons with malnutrition need to be provided with nutritional interventions to address the nutritional deficiencies.

- Address malnutrition through sponsored patient support systems like nutritional rehabilitation schemes could help to reduce the number of individuals who are at risk of developing TB.

- Integrate TB screening and referral activities within Bangladesh's highly successful IMCI program, provides an important opportunity to identify childhood TB cases through existing, well-established mechanisms.

- Establish coordination mechanisms with the National Nutrition Program along with training at malnutrition clinics and outreach to include TB screening and referral activities.

- Focus on population that is malnourished for risk of TB disease to be identified and targeted with interventions for early detection of the disease.

TB and NCDs:

- Establish a national strategy & coordination mechanism consisting of a comprehensive multi-component approach to increase access to TB services for NCDs, CKDs, DM, MCH and Mental Health by improving prevention, early case detection and quality of care to reduce morbidity and mortality. The strategy needs to include multiple tasks including:

- Improve the early detection of TB among those seeking care for NCDs, CKDs, MCH, etc. with routine bidirectional screening.

- Strengthen provider capacity in NCDs-TB diagnosis & case management and Increase patients' and community awareness about TB-NCD co-morbidity through a public private mixed approach.

- Make collaborative efforts at providing dual care for TB and NCDs with bi-directional screening across all levels of health care.

- Establish collaborative efforts to develop and implement measures for continuous data gathering, recording, and reporting and for operational research.

- Routinely test for DM and other NCDs at every TB diagnostic facility with all MTs working in TB programs and nurses at all health facilities trained on TB and NCD bidirectional testing and co-management of TB co-morbidities to ensure TB- NCD services are widely and easily available.

- Include primary health care providers for screening & managing TB patients with comorbidities while also including an Integrated approach for TB & NCDs at the Community Clinics by the Community health Care Providers (CHCP).

- Adopt an integrated approach for risk factor counselling & screening on TB/HIV, NCDs at the Community Clinics by the Community health Care Providers (CHCP).

- Introduce mental health & psychosocial support not only for DR TB but also DS TB patients.

Smoking:

- Make history taking about smoking mandatory before TB treatment with provision of cessation interventions in line with the national tobacco cessation guidelines.
- Establish a cross referral mechanism with tobacco control unit and develop recording and reporting systems.
- Explore if TB messaging could also be included into cigarette packets similar to Cancer messaging on the packs.

TB and HIV:

- Update the 2016 national guidelines for collaborative TB/HIV activities g) and ensure full implementation of WHO's TB-HIV policy. Include stronger TB/HIV collaboration between the NTP and NASP with coordinated guideline writing and biannual TB/HIV collaborative meetings. Include National Level Advocacy with Policy makers for the integration of TB-HIV patients under social safety net program.

- Strengthen all elements of TB/HIV collaborative activities including HIV testing for all TB patients, routine screening of all HIV patients for symptoms of TB, offering the Xpert assay for the diagnosis of TB in PLHIV and the provision of TB preventive Treatment for PLHIV with no evidence of active TB including those who are contacts of people with active TB.

- Improve PSM planning to make HIV test kits always across health care facilities.

- Train program staff about the newer treatment regimens and TB Preventive treatment and include sensitization programs for service providers to ensure proper referral and to maintain confidentiality of TB-HIV patients. Include a module of recording and reporting system to strengthen the TB-HIV information system with specific formats for TB & HIV.

- Train ART Medical Officers to identify presumptive TB among PLHIV and to directly refer these individuals for TB testing or better obtain samples for TB testing and "refer" the specimen rather than the patients to a TB diagnostic site. Explore the use of Urinary Lipoarabinomannan (LAM) for the rapid identification of PLHIV who may be seriously ill with TB. Focus on early diagnosis of TB among PLHIV while limiting referrals patients are not lost in the maze of care.

- Orient care givers on TB-HIV co infection issues and involve the private sector in the implementation of TB/HIV activities.

- Reduce stigma and discrimination with Local Level Advocacy at community level as well as promote socio-cultural environment and community support towards the TB/HIV patients.

- Involve representatives of key affected populations (KAP) in program planning, policy making and implementation, to further increase case detection among other KAP.

11.TB Prevention: TB preventive treatment and TB Infection Prevention and Control

Context

The thematic group on TB prevention aimed to undertake a comprehensive review of TB prevention interventions starting with the broader TB prevention interventions that impact determinants of TB such as poverty, nutrition and comorbidities; efforts for early detection and treatment of TB; progress in programmatic management of TB preventive treatment and TB infection prevention and control.

Key achievements in Bangladesh

1. An inclusive socio-economic development has been seen in the country over the last decade.
2. Several nutrition support and/or poverty alleviation schemes are implemented at population level with potential contribution to TB prevention (e.g., vulnerable group feeding/development scheme (VGF/VGD). Similarly social protection schemes exist for poor and vulnerable populations, implemented by central and local government (e.g., pregnant, elderly, malnourished children, Boyoshko Vata for elderly).
3. The MoHFW issued an order to expand TPT services to various target populations and also adopted shorter TPT regimens.
4. Implementation of contact evaluation has been on going and examples of good coverage of TPT among ALL household contacts were noted to have happened within the short duration since the start of programmatic implementation.
5. Shorter TPT using three months regimens, 3HR, which is implemented in most of the UHCs visited and 3HP which is gradually being rolled out.
6. Recording and reporting of contact evaluation is currently paper based but electronic modules for the case-based e-TB manager have been developed.

The following paragraphs provide further details including key observations and recommendations around all relevant TB prevention interventions starting with the broader TB prevention interventions, household contact evaluation, programmatic management of TPT and TB infection prevention and control.

Broader TB prevention interventions

Observations:

1. Health care workers taking care of patients with TB have a low knowledge of existing social schemes for poor and vulnerable people.

2. No mechanism exists to link TB patients and families to these schemes.
3. High demand for nutritional support for TB patients and minimal linkages to nutrition support.
4. Nutritional counselling is lacking both for people with DS TB & DR TB.
5. Out of pocket expenses are high as initial misdiagnosis forces change of providers before free TB diagnosis is offered at an NTP/partner site.

Recommendations:

1. Undertake mapping of existing social support schemes from GoB that may benefit populations that are vulnerable to TB.
2. Engage Ministry of social welfare to facilitate linkages of social support schemes implemented by national or local government to families affected by TB.
3. Operational/implementation recommendations:
    - Ensure alignment of eligibility criterion to ensure that TB affected families benefits from above schemes.
    - Consider linkage of social welfare department registry with e-TB manager for efficient provision of support (in kind/financial/nutrition).

Early diagnosis and TB treatment

Observations:

1. Only symptoms-based TB screening is implemented with limited use of chest X-ray.
2. Access to rapid molecular testing using Xpert MTB /Rif or TrueNAT remains very low.
3. No examples of active community level TB screening were noted although few NGO driven projects are implemented in limited geographies.
4. Delay in diagnosis of TB was observed for all forms of TB including DS-TB, DR-TB, and Childhood TB.
5. High proportion of relapse TB among was observed among incident TB indicating high levels of ongoing TB transmission.

Recommendations:

1. Implement mechanisms to support adherence to TB treatment and systematic follow-up for at-least 2 years post TB treatment preferably at the community level.

Identifying target populations for TB preventive treatment: Household contacts

Observations:

a. Implementation of contact evaluation:

1) Contact evaluation (CE) is implemented relatively well particularly at facilities supported by partners e.g. BRAC, Damien foundation.
2) CE happens at patient home in large proportion of cases through community level health care workers (the community cadre).
3) Doctors and field staff at some places visited are not yet oriented on the importance of CE, with this observation more apparent among government health staff (e.g., Dhaka).
4) In some districts, CE is implemented but not followed by TPT initiation which is a missed opportunity.
5) It was noted that in the visited facilities, there are relatively low number of contacts enlisted per index case in contradistinction with the average household size (which is 4[37]) in Bangladesh.

b. Enablers for contact evaluation

1) There is a need to strengthen use of Job Aides developed by the NTP for CE by community cadre/staff as currently only verbal screening is done.
2) Limited access to digital X-ray for contacts of TB patients. Only 185/494 (37%) UHCs have X-ray facility (with paid access in some).
3) No travel support is provided to contacts and health care workers although they face long distances or personal expenditure to travel to health facilities or patient homes.

c. Recording and reporting:

1) Paper based recording and reporting of CE was found to be satisfactory at the facilities visited.
2) e-TB Manager is used in most facilities, however, CE and TPT are considered optional and usually are not filled.
3) Start date/completion for TPT is not captured in the TPT records.

d. Awareness and training

1) Limited TPT IEC /Poster / billboards despite this being a new program.
2) Community awareness of TPT is low, so it is difficult to convince contacts to take TPT.

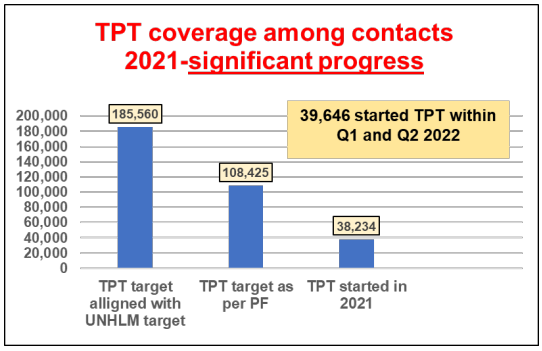
Recommendations:

[37] Key findings of the population and housing census 2022

1. Rapidly scaleup training/ capacity building for doctors, staff, and community cadre both in public and private health care facilities (ToT done to be cascaded to lower levels).
2. Allocate significant additional resources (for staff, training, data entry, and travel support).
3. Ensure access to free chest CXR (digital) for screening of 'asymptomatic' adult contacts before start of TPT.
4. Criterion for TB symptom screening among contacts should be relaxed to cough of ANY duration not of 2 weeks.
5. Prioritize and ensure
    a. Systematic contact evaluation of all DR-TB patients.
    b. Prioritize and strengthen (reverse) contact evaluation for all paediatric TB cases to identify possible 'source'.
6. Disseminate job aids to guide HCW on contact evaluation and SOP for TPT start.
7. Consider provision of incentive/travel support for contacts of TB patients for evaluation and TPT start.
8. Tools
    a. Consider adaptation of app used for TB screening in OPD for CE that is in use at Dhaka Medical College or alternatively the MoH may consider using the WHO prevent TB mobile application preventing TB -WHO.int
    b. Consider use/adaptation of online tool for training on contact evaluation for front line workers e.g. https://training.tbdiah.org/ or develop targeted e-learning modules.
9. Develop communication strategy, billboards and IEC targeting contact evaluation and TPT.

Progress in programmatic management of TB preventive treatment

Isoniazid has been the recommended TPT for contacts less than 5yr since 1994. Contacts of all age groups are recommended to receive TPT since the Q2, 2021 with implementation starting in 20 districts in January 2022 and achievement of nationwide scaleup (64 districts) since April 2022. Shorter TPT is implemented using 3HR and 3HP regimens. The progress in coverage of TPT among contacts has been rapid since the issuance of orders from the MoH.



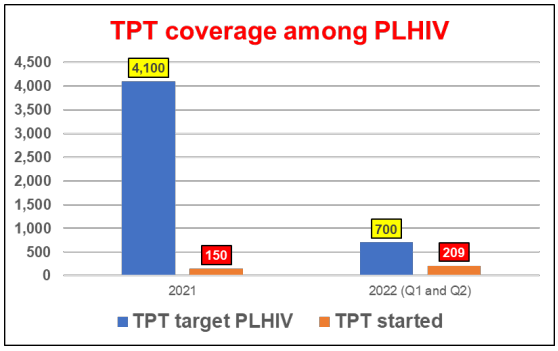


Figure 15: TPT coverage among contacts and PLHIV 2021 –quarter 2, 2022

Observations:

1. Use of shorter TPT started with 3HR in most HFs, however PLHIV are still given 6H.
2. Supply of 3HP just started with a May 2023 expiry of one batch of rifapentine closely approaching.
3. Target populations:
    - PLHIV: There is lack of awareness among HCWs regarding TB screening and TPT.
    - TPT for contacts of MDR-TB patients is not yet part of national guidelines.
    - Health care workers are not yet considered a target population.
4. Diagnosis of TB infection: Tuberculin (MT 10TU) availability is very limited, adhoc and used only for TB diagnosis in children and not for decision making on TPT in adult contacts (except in Sylhet/Rajshahi).
5. There is limited counselling on adverse events of TPT and the recording and reporting as well as management of adverse events does not exist.
6. Low acceptance of TPT was noted among adult contacts likely due to sub-optimal counselling.
7. No engagement of private practitioners in TPT provision was noted.
8. TPT outcomes are recorded in the facility TPT register but not reported at the national level.

Recommendations:

1. 3HP should be the preferred regimen for TPT among adult contacts and PLHIV. Ensure 100% of eligible PHIV receive TPT with this regimen.
2. Child friendly, dispersible 3RH should be preferred for children (until evidence on child dosing and suitable 3HP formulations are available).
3. Ensure access to free chest X-ray at least for adult contacts/PLHIV on ART, explore expansion of digital X-ray with AI (e.g. by using mobile vans or portable digital X-rays).
4. Build capacity of

a) Doctors and staff on starting, counselling and follow up of TPT.
b) Community health workers on counselling and follow up of TPT.
c) Explore use of targeted e-learning modules e.g., adverse event management.

5. Ensure systematic follow-up during TPT and assessment and recording of TPT outcomes.
6. Consider use of video supported treatment (where feasible e.g., using WhatsApp) for management of ADRs and monitor adherence.
7. Build capacity for skin testing at all facilities, streamline supplies of TST and consider novel antigen-based skin tests for TB infection recently recommended by WHO.
8. Incorporate TPT into PPM packages and facilitate sensitization, consider upgrading Janao app to allow notification and follow up of TPT.
9. Implement annual TB screening of health care workers at all levels using chest X-ray and tests for TB infection where available and provide shorter TPT at least once.
10. Recording and reporting: Include dates of start\completion of TPT, total number screened etc. into e-TB Manager.
11. Expand family centered services offered at Diagnostic Centers and Community Clinics for TPT start and monitoring.

TB infection prevention and control

Observations:

1. Administrative controls:
   a) IPC committees exist in most facilities visited; however Airborne infection control is not included in their mandate.
   b) IPC plans are not in place, no staff member has been designated to be in charge of infection control at any of the visited health facilities.
   c) No systematic training on infection-control has been conducted.
   d) There is a lack of triage and fast tracking of patients with cough in OPDs as a result of the large patient load.
2. Environmental controls are not implemented including in tertiary care facilities:
   a) Cross ventilation is lacking in DOTS centers and consultation rooms in busy facilities.
   b) No UV light /any other mechanical ventilation systems was noted in DR TB wards.
   c) Few facilities have segregation and disposal of hospital bio-medical waste.
3. Respiratory protection:
   a) PPE (N95 masks) are not available or not used if available for staff in public health facilities.

b) There is a significant burden of TB among health staff and their families (e.g., 5 staff and 3 family members in one quarter at one medical college).
c) HCWs are not screened for TB and not offered TPT.

Recommendations:

1. **Facility IPC committees should include AIC** and review AIC at least quarterly while implementing administrative controls.
   a) Undertake training of staff and develop IEC materials/ job Aides for use at all health facilities.
   b) Implement cough triage at all health facilities.
   c) Provide respirators (N-95 mask) to staff and surgical masks to outpatient attendees with cough at OPDs.
   d) Fast track individuals with TB symptoms identified in waiting areas.
   e) Implement annual TB screening of staff with chest X-ray/test for TB infection and provide shorter TPT at least once.
2. **Environmental control:**
   a) Ensure cross ventilation in doctors consultation rooms and infectious disease wards.
   b) Consider use of UV light /mechanical ventilation, with all the precautions for the use of these lights, in high volume TB/DR TB in-patient facilities.
   c) Upgrade infrastructure to allow for proper patient separation at least in newly constructed health facilities.
   d) Ensure disposal of bio-medical waste from TB laboratories.

Procurement and Supply Chain Management (PSM)

TB prevention, diagnosis, treatment, and cure of drug susceptible (DS TB) and drug resistant TB (DR TB) require availability and utilization of quality drugs and diagnostics. Thus, to end TB in Bangladesh, the end-to-end Supply Chain system needs to function efficiently and be robust with adequate resources, management support and medical products regulatory and quality assurance systems in place. The supply chain management system ensures right drugs and diagnostics are available at the right place at the right quantity, with the right quality for the right client.

Key findings, progress, and achievement

- In order to ensure uninterrupted supply of TB medicines at the same time avoid or minimize expiries, the country continues to use QuanTB tool for quantification and as an early warning system for TB medicines and for stock management. Thus, there has been uninterrupted supplies of first line Drugs (FLDs) and adult Second Line Drugs (SLDs).
- The Government of Bangladesh (GOB) has shown high level of political will and commitment, since 2017. First line TB Drugs (FLDs) have been procured through domestic funding. In addition, GOB procures ancillary medicines, while the Global Fund support the procurement of second-line TB drugs (SLDs) and the major diagnostic equipment and supplies for microscopy, culture and drug susceptibility testing (DST), including GeneXpert machines and cartridges. Previously, GOB procured FLDs from Global Drug Facility (GDF), however, in 2022, GOB decided and procured from a local manufacturer for the first time.
- It is also necessary to mention that during the COVID 19 pandemic, the country had adequate supply of TB commodities and personal protective equipment.
- One of the recommendations of eighth JMM was for technical assistance (TA) to be provided to NTP for the development, training, and deployment of an electronic LMIS tool. It was observed during the ninth JMM that the TA was provided by USAID funded Medicines, Technologies, and Pharmaceutical Services Program (MTaPS). Currently, NTP uses a mix of paper-based and electronic platforms for recording, reporting, and ordering for TB commodities. One of the digital tools deployed by NTP is the electronic logistics management information systems (e-LMIS) which was introduced in 2022. The e-LMIS is an online electronic tool, which aids better management of stock since it captures real-time stock status of TB commodities end-to-end logistics management information for TB Commodities, i.e., anti-TB medicines, diagnostic reagents, different lab items, and all other logistics information from the central to peripheral

level. So far, 158 Upazila health complexes of 20 districts under 3 divisions namely Mymensingh, Rajshahi, and Rangpur, have been trained on e-LMIS for TB commodities and these facilities in addition to the TB central warehouse use e-LMIS for reporting and ordering of TB commodities.

- TB commodities (drugs and diagnostics) are distributed from central warehouse located in Dhaka to Upazila health complexes, NGO partners as well as health facilities located in different parts of Bangladesh and are done through the coordination between NTP and NGO partners.
- There are different partners providing TA for PSM in different areas
- To improve storage condition at DOTS corner, NTP has procured more TB drug refrigerators and distribution will soon commence.
- The country has a quality assurance and quality control system in place and coordinated by the Directorate General of Drug Administration (DGDA) and performs different regulatory functions which include continuous monitoring of the quality of TB medicines and post marketing surveillance of TB drugs. The national quality control lab is World Health organization prequalified, and there is pharmacovigilance (PV) system under the coordination of DGDA. NTP is using e- TB manager which has a module for capturing ADR (Adverse Drug Reaction) for DR TB cases
- It was observed that the expiry of medicines is minimized through issuing and dispensing using first to expire first out (FEFO) principle and also stock reshuffled across the DOTs centers at Upazila level.
- Despite various challenges at health facility and DOTs Center level, it is observed that health personnel verify the stock on hand, keep stock records and submit report.

Several challenges were identified

Inadequate Human resource and capacity

- Limited manpower for robust PSM functions across all levels- 67% positions at national level are not filled, inadequate number of graduate pharmacists and storekeepers are available at district and Upazila level. Vacant positions also have a negative impact on the effectiveness of the technical assistances provided by different partners.
- Supportive supervision is not done to lower level by national or district PSM team
- Lack of training on TB commodity and inventory management especially at the peripheral level
- There is limited HR responsible for picking and packing of shipments at central level leading to long lead time for distribution
- There is no pharmacist included in the PMDT team

Quantification

- Quantification subgroup is not active due to HR constraints; thus, the quantification files are not updated quarterly and not timely

Procurement and import challenges

- Importation challenges have caused shortages in lab supplies which prevent diagnosis of TB cases due to constraints in payment of custom duty and Value Added Tax (VAT)

Storage and Distribution

- Inadequate space and storage equipment leading to sub-optimal storage conditions at TB central warehouse and Upazila level - Storage conditions at the TB CWH for medicines is relatively fair, however, the section for storage of laboratory, other supplies and flammable substances is not appropriate including potential fire/flood risks given the location. Also, all TB drugs are stored at the back end of the warehouse is a considerable risk in case of flood or fire. There is sub optimal storage conditions and inadequate space at Upazila and HFs, and lack of air conditioners (cooling system), lack of humidity control, fire distinguishers and other equipment. Refrigerators for TB medicines is a good solution for maintenance of optimum temperature, however, only a few HFs currently have TB Drugs refrigerators.
- Peripheral storage system transition issues identified: It is observed that the transition to government facilities were not always done following a physical conditions upgrade. The staff handling the stock have not received any trainings to facilitate the transition.
- Waste disposal has not been done for about 5 years; thus the central warehouse has obsolete items.

Logistics Management Information Systems (LMIS) and recording and reporting (R& R) tools

- e-LMIS tool has been implemented only at central, and in 3 out of 8 divisions so reducing pipeline visibility across the country
- Different tools are used for recording at HFs, coupled with Incomplete documentation
- Absence of updated SOPs causing differences in stock management and distribution

Regulatory and Quality Assurance System

- DGDA has WHO Prequalified national quality control lab, and they use minilabs for field screening, however they do not have modern screening equipment which can ease surveillance
- Locally manufactured FLDs and anti-TB medicines are not WHO Prequalified

- The Essential medicines list was last updated in 2017, the new tools like Bedaquiline, Delamanid and others have not been included and the EML is obsolete
- There is no DGDA ADR reporting format in UHCs and HFs and Adverse Drug Reactions (ADRs) are reported in e-TB manager in some facilities mainly for PMDT

Cross cutting issues

- Challenges observed in the implementation of general pharmaceutical services in the UHC/ HFs
- It is observed that one TB hospital in Dhaka has a waste disposal equipment. However, this is not the case in many other Upazila health complexes.

Recommendation

Provision of adequate resources and capacity building for robust PSM

- Improve TB PSM system by filling up the vacant positions- appoint graduate pharmacists in appropriate positions at Upazila and Health facilities, assess the PSM systems and deploy more resources, appoint storekeepers and assistants from diploma in pharmacy or other relevant qualifications for appropriate positions at all levels, appoint graduate pharmacist as supply officers
- Develop supportive supervision plan and checklist, conduct routine supportive supervision from national to district and then to DOTs centers
- Build capacity across all levels on TB commodity and inventory management, either by conducting specific training, or NTP should coordinate with Upazila health care operation plan to ensure training of storekeepers is done in all UHCs and ensure TLCAs are included
- To improve picking and packing which would shorten the distribution lead time, there is need to deploy more staff at central warehouse on both the government and partner side
- Include a pharmacist to assist with reporting of pharmacovigilance (PV) and Active drug-safety monitoring and management (aDSM) and contribute to DR TB case management

Quantification

- Activate quantification subgroup and implement quarterly subgroup meetings and circulate meeting minutes for monitoring and actions

Procurement and Importation

To resolve the supply chain issues with diagnostics and import issues, the JMM recommends that the procurement be undertaken in coordination with partners on delivery of health products with procurement planning that provides visibility of the dollar value of pipeline orders for importation (quarterly, bi-annually or annually) to CMSD that may facilitate budget planning and allocation of funds for timely importation and customs clearance / CD-VAT payment.

Storage and distribution

- Improve storage condition at all levels:
    a) TB central warehouse – decongest of obsolete items, accelerate the implementation of the different initiatives currently underway including necessary Technical Assistance for outsourcing the central store and accelerate building of a well-organized and government owned TB central warehouse that will support internationally recognized Good Storage Practices.
    b) Store at Upazila and health facilities- expand / renovate storage space at UHC/HFs and provide necessary shelving and racking equipment, digital thermo-hygrometers, air conditioners, exhaust fan and dehumidifier.
    c) DOTS corner- accelerate distribution of TB refrigerators
    d) Stores involved in peripheral transition from partner -conduct field visits to transitioned stores and see current condition. Then support Implementation of the recommendations in Peripheral TB storage assessment report and implementing partner should increase support to UHC and HFs for a smooth transition of storage system
    e) NTP to identify obsolete items across all levels and follow different MOHFW memos and guidelines to destroy the items. In addition, sensitize all levels on disposal guidelines.

LMIS, R&R Tool

- Scale up the use of e-LMIS and train all Upazila and health facilities and ensure availability of IT equipment in store /pharmacy
- Develop, print and distribute standardized TB stock registers, bin cards and other inventory tools and ensure the usage
- Update the SOP and recording and reporting tools to have consistency across the country

Regulatory and Quality Assurance System

- Consider supporting procurement of modern screening spectroscopy equipment

- Continue efforts currently supported by partners such as USAID to support local manufacturers, have their TB medicines WHO prequalified including but not limited to conducting bioequivalence studies
- Update of EML 2017 – NTP to ensure TB medicines including the new tools like bedaquiline, linezolid, Pretomanid, clofazimine and other are included
- To improve PV and aDSM reporting and capacity - print and distribute PV reporting form, link e-TB manager to national PV system, improve linkage between NTP and Directorate General of Drug Administration (DGDA) on PV and aDSM

Cross cutting

- Consider conducting pharmaceutical system assessment and establishment of a department to oversee the implementation of good pharmaceutical services to improve quality of patient care
- Waste management is an area that goes beyond TB program and needs to be addressed comprehensively.

Annexes

Annex 1: Table of key recommendations of the 2019 Bangladesh TB JMM

Recommendation	Primary Duty Bearer(s)	Time frame	Status by Oct 2022
Establish a high level multi-sectoral coordination mechanism that would also be responsible for holding stakeholders accountable for specific actions they commit to	GoB led by the MoHFW and Office of the Prime Minister	Status check every 6 months	Not done
Enhance and sustain domestic financing for a multisectoral TB response	GoB led by the partnership between MoF and MoHFW	Annual checks	Done
Adopt an "urgent" approach to addressing health system bottlenecks, such as human resource, procurement and supply, service delivery gaps incl. infection control.	MoHFW, Ministry for Public Administration, MoF	6- 12 months	Partly done, many challenges persist
Review and Optimize procurement processes to ensure early release of funds for the timely procurement of anti-TB medicines	MoHFW and MoF	Immediate	The challenge persists
Develop approaches that ensure all TB cases are identified early	NTP and partners	3-6 months for defining the interventions	Increasing notification, however, “early” identification may not have been achieved partly as a result of a suboptimal criteria for identifying presumptive cases (cough for two or more weeks) which is promoting health system delay

Enhance the systematic engagement of private health care providers	NTP and Partners	3-6 months for identifying the interventions	Increasing coverage of private providers but the need to expand coverage and quality of engagement persists
Expand Xpert coverage and availability of the CXR	NTP and partners	3-6 months for review and revision of guidelines/development of manuals and SOPs	Xpert coverage is expanding, however, expansion is still needed. Use of the CXR for TB screening remains limited
Enhance capacity for the diagnosis of childhood and adolescent TB	NTP and partners	3-6 months for review and revision of guidelines/development of manuals/SOPs/Training and mentorship plans	Major challenges persist
Sustain high cure rate for all forms of TB	NTP and partners	3-6 to validate cure rates, continuous	Achieved
Rapidly scale up interventions for TB prevention	NTP and partners	3-9 months for defining the interventions, developing protocols, and guiding documents for implementation	Good examples of PMTP in pilot projects. The need to scale up PMTP remains

Annex 2: Thematic areas of the 9th TB -JMM

1. TB Laboratory and Infection Control
2. Procurement and Supply Chain Management (PSM)
3. PMDT & aDSM
4. Health System Strengthening (HSS), Community System Strengthening (CSS), Universal Health Coverage (UHC), Social Protection, DOTS, ACSM
5. Public-Private Mix (PPM) and Multisectoral Accountability Framework for TB (MAF-TB)
6. Child and Adolescent TB
7. TB preventive treatment (TPT)
8. TB-HIV and other comorbidities

Annex 3: Members of the 9th Bangladesh TB- JMM

- Dr Jerimiah Chakaya (WHO consultant, Overall team Lead 9th JMM Bangladesh),
- Dr Joseph P Carel - Stop TB Partnership/ USAID Consultant (childhood TB thematic lead).
- Prof. (Dr). Rupak Singla, WHO, Consultant (PMDT thematic lead)
- Dr Rahul Thakur, WHO Consultant, TB and co-morbidity thematic lead
- Maria Ochigbo, Stop TB Partnership, Global Drug Facility, Team Lead PSM& Dhaka division
- Dr. Ritu Singhal, (WHO consultant, Laboratory team lead)
- Dr. Francis Mhimbira, WHO, PPM thematic lead.
- Avinash Kanchar, WHO, TB Prevention, Team Lead.
- Raj Mohan Singh, USAID Consultant, Health Systems Lead
- Manaj Kumar Biswas, BCCM, Lead, TB financing
- Wayne van Germert, Stop TB Partnership
- William Wells, USAID
- Dr. Peter Kerndt, USAID
- Dr Sreenivas A Nair Stop TB Partnership,
- Rupali Sisir Banu, NTP
- Kamar Rezwan, WHO
- Ashraful Islam, BRAC
- Khandaker Ali Mamun, NTP
- MHM Mahmudul Hasan, MTaPs
- Akhtaruzzaman, NASP
- Farzana Dorin, WHO
- Hamida Hussain, IRD
- Ahmadul Hassan Khan, NTP
- Salfur Reja, BRAC
- Manzur ul Alam, IRD
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- Shakil Ahmed, NTP
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- Victoria Livchits, USAID
- Hyeyoung Lim, Global Fund
- M.A. Hamid Salim, USAID
- Samina Choudhury, USAID
- Adneen Moureen, USAID
- Jobayer Al Mamun, WHO
- Sadekul Islam, DS, MoHFW
- Rana Chowdhury, TB Expert, Rangpur Division
- Dr Thomas M Shinnick, USAID
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- Dr Mannoor Rashid, NTP
- FM Monirul Haque, NTP
- Sarder Tanzir Hossain, IDRS
- Ajit Kumar Kundu, BRAC
- Dr Tapash Roy, IRD
- Dr Dipak Kumar Biswas, Damien Foundation
- Abu Naser Zafar, Daffodil university
- Biplob Palit, Regional NTP
- Toufiq Rahman- Stop TB Partnership/ TB REACH
- Dr. Vikarunnessa Begum- Independent Consultant (TB)
- Dr Abdul Hadi Khan NTP,
- Dr Shahinoor Khursheed,
- Dr Sabbir Ahmed, WHO,
- Dr Mostafa Khaled
- Alessio Mola, , Stop TB Partnership, Global Drug Facility
- Caroline Mubangizi, The Global Fund
- Judith Achola, The Global Fund
- Filiz Cengiz Karakoyun, The Global Fund
- Dr. Md. Khurshid Alam, Director DGHS, LD TB-L &ASP
- Dr. Mostafa Khaled, NTP
- Rosidur Zaman, NTP
- Mr. Ismail Mohammad Ramzy, WHO
- Dr. Ajit Kumar Kundu, BRAC

- Dr. MHM Mahmudul Hassan, USAID-MTaPS
- Dr. Abu Zahid, USAID-MTaPS
- Ms. Mariline Roy, Damien Foundation
- Dr. Md. Alam Jahangir, WHO
- Dr Ahmed Parvez Zabeen, NTP
- Dr Farzana Zaman, NTP
- Pallav Bhatt, WHO
- Dr Md. Rezwan Kamar, WHO
- Dr Farzana Dorin, WHO
- Dr, Md. Ashraful Islam, BRAC
- Mr. Akhteruzzaman, WHO
- Dr. Shahira Sharwat Chowdhury, NTP
- Gyongyver Jakab, Global Fund
- Mohammed Yassin, Global Fund
- Liza Kimbo, Global Fund
- Agnes Dzokoto, Global Fund
- Hyeyoung Lim, Global Fund
- Keith Mienies, Global Fund
- Obert Kachuwaire, Global Fund

Annex 4: Full list of recommendations for childhood TB

Intervention	Activity	Responsibility	Timeline
1. Strengthen the role of medical colleges (Public & Private)/ Tertiary care hospitals/ Speciality hospitals in intensified child and adolescent	NTP should form medical college task force structure with specific roles & responsibilities (Especially for Adult and Paediatric case detection, Operational research, DRTB case management, Airborne infection control etc) 1.1 Task force mechanism is responsible for inter departmental referrals from Pulmonology/ chest diseases, General Medicine, Paediatrics, ENT, Surgery, Orthopaedics, Gynaecology, Microbiology, Pathology etc 1.2 Establish/ Strengthen GeneXpert in all Medical colleges and tertiary care facilities (Public & Private)	NTP, National TB Technical working Group, Bangladesh Medical Association, Dean and or medical superintendents of the	Immediate (New TB NSP)

	TB case finding	1.3 Implement facility based active case finding through systematic screening at all health service delivery points including ensuring access to quality CXR, sample collection, prioritized use of Xpert on specimens obtained from children and TST (Mantoux test) services.	medical colleges	
2.	Strengthen capacity to diagnose TB in children/ Building the capacity of medical professionals in the clinical management of Child & Adolescent TB cases	2.1 Develop cadre wise detailed National training plan 2.2 Orient GPs, Paediatricians from Medical colleges and Staff nurses on new child and adolescent TB guidelines 2021 till upazila level (Use platforms like telemedicine, ECHO etc) 2.3 Orient GPs, Paediatricians and Staff nurses till upazila level on new child and adolescent TB guidelines 2021 (Use platforms like telemedicine, ECHO platforms etc) and build capacity on aspiration techniques (Aspirate gastric lavage samples and priority GeneXpert testing within 4hrs of sample extraction) 2.4 Develop training and reference materials on childhood TB for all cadres of health care workers which are evidence based and simple to administer. 2.5 Initiate training for frontline health workers	NTP, BMA, BPA, NTP TB TWG, Dean and or medical superintendents of the medical colleges, Divisional Directors	Immediate
3.	Early identification of Child & adolescent TB cases	Child & Adolescent TB case detection is stagnant at 4% since 2014 to 2022. (Expected to be 10-12% of adult TB cases). Recommendations are: A. Guideline revision – Policy gap 3.1 Review existing regulatory framework and policy guidelines on TB and child and adolescent TB service delivery, child health and management of childhood illnesses (e.g.,	NTP, BPA, Pediatric TB TWG	Immediate (New TB NSP)

	HIV, malnutrition, pneumonia), and adolescent health. - Identify opportunities for decentralization and integration and update regulatory framework as needed - Develop, adapt or update implementation guidelines, standard operating procedures and job aides 3.2 Revision of guideline to move from chronic cough to current cough. • Symptom screening Infants (<1 year): primarily pneumonia-like Children (1-9 years): usually with a chronic cough Adolescents (10-19 years): as in adults 3.3 Identify Child TB presumptive as key vulnerable population and offer upfront GeneXpert in all sites (GXP testing for all children) 3.4 Single day diagnosis workup for child TB (upfront TST + Xray + GeneXpert Ultra either stool for under 5/ Gastric lavage or sputum in 5-14yrs) B. Early suspicion and identification of Child TB. Child TB (especially under 5 yrs) is grossly not suspected by clinicians in routine outpatient departments, they are underdiagnosed and under reported.	NTP, NTP TB TWG, Dean and or medical superintendents of the medical	Immediate

	a. Facility based interventions: Currently <1% are identified from Outpatient departments (need to increase to 3-4%) 3.5 TB symptom screening followed by evaluation of all under 5 children attending Hospitals with Pneumonia like symptoms - NTP child guidelines 2021 3.6 Implement universal TB screening at all health facilities, TB symptom screening at the registration counters. 3.7 Establish single window child TB services across all service delivery clinics in MCH, IMCI clinics, SAM units, Nutrition services 3.8 Decentralized and family centred, integrated services may be implemented to improve paediatric TB case detection and the uptake of TB preventive treatment till upazila level and support decision making. Decentralized services do not replace centralized or specialized child and adolescent TB services, rather they complement them. 3.9 Identify one General physician and/or paediatrician at the upazilla level and make him/her responsible for child TB case detection activities in that area. 3.10 Engage Private sector. Active referral from Child TB cases from private providers (All specialities and specifically Gynaecologists clinics/ Infertility clinics and Children hospitals) 3.11 To improve participation, parents of child contacts can be supported with diagnosis and transportation assistance	colleges, Divisional Directors	

	when required to perform a radiological or histopathological evaluation. b. Community based interventions. Find all missing adults with TB, diagnose, and treat them early to prevent transmission of TB in children. 3.12 NTP need to conduct national wide vulnerability mapping for TB with special focus on urban poor dwelling in slums, migrants, refugees, hard to reach areas like people dwelling win islands, specific marginalized communities like tea gardens community, HIV infected, prison inmates, gypsy community, fisherman community, successfully treated TB patients families, people having occupational risk like dye factories, cement, silica/ asbestos factories etc. (similar to polio immunization mapping but specific to TB for routine active case finding efforts) 3.13 Continue to invest on Nationwide community-based TB Active case finding efforts/ activities in these vulnerable groups (Door to door survey) using General health staff at least twice a year 3.14 Further scaleup of contact investigation - Move from all Bacteriologically confirmed to all forms of TB cases - Address high treatment refusal rates. - focus on all close contacts, household contacts to be focused and reverse contact screening for child DRTB cases	NTP, Implementing partners	Immediate (New NSP)

	3.15 Strengthen referral systems for pharmacies, informal providers etc. to refer presumptive TB children/ Children with pneumonia like symptoms 3.16 Integrated Child TB screening program in School health services - Strengthen the community engagement approach (including schools) with advocacy on TB 3.17 Identify National champions for childhood TB and National childhood TB working group with representatives from all divisions and build their capacity to represent themselves in National TB forum groups as spokespersons		

4. Address challenges in identifying missing child TB cases – Especially Under 5 yrs	A. Challenges in diagnosing TB especially 0-4yrs - Missing close to 26000 Child & Adolescent TB cases annually. (>80% missing in Under 5 yrs and >40% missing in 5-14 yrs old). 4.1 Target high risk group children, presenting with severe pneumonia, accounted for 23% TB-cases in Bangladesh attending all general hospitals across all levels 4.2 Single day diagnosis workup for child TB (upfront TST + Xray + GeneXpert Ultra stool for under 5 years/ Gastric lavage or sputum for 5-14yrs). 4.3 Continue to use X ray for TB diagnosis in all ages of children for TB diagnosis and wherever digital cray centres are available adopt new technologies recommended like	NTP, Implementing Partners, BPA, NTP TB TWG	New NSP

	computer aided detection software programmes for interpretation of digital chest X rays for screening and triage for TB disease 4.4 EPTB child TB case detection: - Explore options with public & private pathology labs for EPTB sample collection. - Efforts to decentralized EPTB sample collection. - Continue to rely on histopathology diagnosis of EPTB, but explore chances to adopt molecular diagnostics 4.5 Mapping availability of TST vs Digital X ray facilities in all centres till upazila level 4.6 Identify and orient at least one GPs/ Paediatricians and Staff nurses till upazila level and build capacity to collect specimens such as gastric aspirates and the use of GeneXpert 4.7 Roll-out Gastric lavage/ Xpert stool testing at all GeneXpert sites for <5yr children (Ultra Trace result is considered bacteriological confirmation of TB) 4.8 Scaleup TB Preventive Therapy rollout (Identify, household screening (TST/Xray), Treatment completion) 4.9 Scale up/ implementation of successful projects like ACTB - USAID Icddr,b and IRD learnings (Dissemination workshops) across all divisions by NTP - Promising results in USAID Icddr,b child ACF project data yielded 5.5% (49/890)		

	between November 2021- September 2022. - 56% (170/299) Under 5 cases identified in USAID Icddr,b project 10% Child TB cases Notified in Mymensingh division - Stop TB Reach funded - IRD project B. Adolescent TB case finding efforts - School based TB screening efforts need to be explored - Among adolescents living with HIV, systematic screening should be conducted using 4 symptom screening monthly across all ART centres in the country - Symptom screening, chest X ray or molecular WHO recommended rapid diagnostic test alone or in combination are recommended - Target adolescent girls and young women, focus on adolescent friendly services integrating with reproductive health/ family planning services outreach programs on TB health education and counselling, TB screening and linkages to diagnosis and treatment - Target adolescent boys and young men focus on substance abuse like tobacco etc. integrating with smoking cessation programs/ deaddiction centers on TB education and counselling, TB screening and linkages to diagnosis and treatment		
5. Establish/ Strengthen Intersectoral	Strengthen Intersectoral coordination between NTP and other national programmes like MNCH (Antenatal care IMNCI) child HIV care, Prevention of mother to	NTP, MNCH, EPI, Family	Immediate (New NSP)

collaboration with other National programs	child transmission, Nutrition, Immunization, children family planning/ fertility services and Deworming programme etc 5.1 Mandatory TB screening of ANC mothers all children attending Nutrition clinics, ART centres - CLHIV, IMNCI clinics, SAM units and NRC centres 5.2 Offer upfront Genexpert, Xray, TST simultaneously for diagnosis 5.3 Identified vs Screened vs Tested vs Diagnosed 5.4 Periodic reporting and review during routine monitoring & supervision 5.5 Integrated child and adolescent TB awareness, education and counselling, provider-initiated TB screening and linkages to diagnosis and treatment, TB contact investigation, Psychosocial support, strengthening of recording and reporting systems and practices for TB data to reach NTP	planning, Deworming Program, HIV Program, Nutrition Programme	
6. PPM	6.1 Engage partners or intermediary agencies like Bangladesh paediatric association and Bangladesh Medical association which play a major role in bridging the gap between NTP and private providers. Since private sector focus on clinical management intermediaries can particularly support on capacity building efforts to enhance competencies in clinical diagnosis and sample collection 6.2 Allocate adequate funding to engage all care providers and ensure aspects of child and adolescent TB are reflected 6.3 Engage key stakeholders like child focused community-based organizations, civil society organization, CSR projects, corporates and	NTP, BAP, BMA, NGOs, CSO, Corporates etc	New NSP

		NGOs working for child rights, disability, mental health, nutrition, neglected tropical diseases, orphanages, street children, child trafficking, refugees, migrants etc 6.4 Onboard Bangladesh Pharmacy Council to engage all registered pharmacies		
7.	Operational Research	7.1 Country needs to gear up for TB vaccine rollout and should be the 1st to volunteer 7.2 National Research committee need to meet regularly revise national research priorities and have representatives from all divisions, private sector experts, laboratories, medical colleges both public and private etc 7.3 Medical college task force formation with specific roles and responsibilities is critical and NTP should explore options to support faculty OR and Post graduate dissertation. 7.4 Pediatric TB diagnostic and treatment care cascade analysis for both patients seeking care in public and private sector for both Drug susceptible TB and Drug resistant TB needs to be taken up on priority in estimating current delays and plan interventions to minimize the diagnostic and health system delays	NTP. Implementing partners, NTP TB TWG	Immediate (New NSP)
8.	Inclusion of Children in all TB surveillance activities	8.1 Inventory studies on under reporting of childhood TB can be planned 8.2 Ensure reporting of TB cases by age, sex, disease type, HIV status and treatment outcomes 8.3 Strengthen uniform reporting of childhood TB cases in both public and private sector 8.4 Strengthen recording and reporting of active contact management, TB preventive Treatment	NTP in collaboration with WHO/ USAID/ Global fund and other national programs	Immediate (New NSP)

	efforts, integration of TB activities into maternal, new born and child health services		