Workshop on

Strategies for Tuberculosis Control: China and India

7th and 8th March 2016

A report

Organized by

Institute of Chinese Studies, Delhi

and

Centre of Social Medicine and Community Health, Jawaharlal Nehru University, New Delhi

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Acknowledgement

The Convenors would firstly like to thank the Indian Council of Medical Research (ICMR) and the Indian Council of Social Science Research (ICSSR) for funding the two day Workshop which was held at the Jawaharlal Nehru University, New Delhi. They would like to thank the four public health scholars from China who showed keen interest in participating and presented their excellent work. They would like to then thank the faculty of the Centre of Social Medicine and Community Health, JNU and at the Institute of Chinese Studies who supported and intellectually contributed to it. They are immensely grateful to the volunteers and research assistants who worked tirelessly to make the Workshop a success.

Rama V. Baru

Madhurima Nundy

A Dialogue on

Strategies for Tuberculosis Control: China and India

A Report

A two day dialogue was held between Chinese and Indian public health scholars, practitioners and policy makers on *Strategies for Tuberculosis Control in China and India* at the School of Social Sciences, Jawaharlal Nehru University (JNU), New Delhi. This was jointly organised by the Institute of Chinese Studies (ICS) and the Centre of Social Medicine and Community Health, JNU and was supported by the Indian Council for Social Science Research (ICSSR) and Indian Council of Medical Research (ICMR). The four Chinese scholars and policy makers were from Fudan School of Public Health, Shanghai and Centre for Disease Control, Beijing. Apart from ICS and CSMCH faculty and research scholars, the Indian participants in the dialogue included representatives from Central TB Division of the Ministry, Delhi; ICMR, Delhi; the International Union Against TB and Lung Disease, Delhi; National Institute of TB Research, Chennai; Jan Swasthya Sahyog (an NGO working with TB patients in Chhattisgarh); Tata Institute of Social Sciences.

Dr. Soumya Swaminathan, Director-General, ICMR gave a keynote address on the prevalence of tuberculosis (TB) and gave a wider picture on drugs, diagnostics available in the programme. She emphasised the need for an inter-sectoral approach to control TB as the programme must take cognisance of socio-economic, behavioural, environmental factors that contribute to its spread.

China and India embarked on a new strategy to control TB from the 1990s with the implementation of DOTS (Directly Observed Treatment Short Course) strategy. After more than two decades, TB remains a public health concern for both countries. In fact, of the estimated total TB burden in 2013, India and China alone accounted for more than one-third (37%) of total TB cases (22% and 15% respectively). Poverty, socio-economic inequalities, dense populations, high rural to urban migration and inequalities in health systems across states /provinces, pose major challenges for TB control in both these countries. This was a dialogue to understand the

TB programme and its challenges in both countries. At the end of the dialogue, the idea was to set common research agendas that arose from the two day discussions.

The following domains related to TB Control Programme in both countries were the focus of the dialogue – epidemiology; structure, organisation and financing of programme; rising cases of drug resistant of TB and social determinants of TB. The dialogue report summarises the main areas of concern that were presented by the experts and discussions that transpired around these themes. The structure of the report is categorised in to the following themes.

- TB programme in India and China (epidemiology, structure, organisation, financing)
- Understanding Social Determinants of TB in India and China - *Challenges in Mainstreaming in TB Control Policy*
- Research Collaboration for future

Dialogue
on
Strategies for TB Control: China and India

Venue: School of Social Sciences II, Committee Room, Jawaharlal Nehru University, New Delhi
7th and 8th of March 2016

Programme

7th March 2016 (09:30 AM – 5:00 PM)		
Themes	Presenters	Affiliations
Registration – 9:30 -10:00		
Inaugral by Dean, SSS 10:00-10:15	**Prof. C.P. Chandrasekhar**	Dean, School of Social Sciences
Welcome and Introduction to the Workshop 10:15-10:30	By Organisers (Institute of Chinese Studies and CSMCH, JNU)	
10:30-11:00	Tea	
Structure, organisation and financing of TB in China and India *and* Epidemiology, Diagnosis and Treatment of TB in China and India 11:00 – 12:30 - Presentations	**Zhang Hui** / (presented by Biao Xu) The structure, system and TB care in China	Director, National Centre for TB Control and Prevention in China, Beijing
	Biao Xu TB control in China: Epidemiology, strategies and challenges	Director, TB Research Centre and Vice Chair, Department of Epidemiology, Fudan University, Shanghai
	K. S. Sachdeva Structure, organisation and financing of TB in India and Epidemiology, Diagnosis, Treatment of TB in India	Former Director General, Central TB Division, Ministry of Health, Government of India
Discussion 12:30 – 1:00		
Lunch : 1:00 – 2:00		
Social Determinants of TB control	**Rama Baru** Overview of social determinants of TB control	Professor, CSMCH, JNU
2:00 – 4:00 – Presentations	**Madhurima Nundy** **Mita Deshpande** Review of health system challenges in TB in India and China	Associate Fellow, Institute of Chinese Studies, Delhi Research Scholar, CSMCH, JNU
	Weibing Wang Social determinants and TB/MDR-TB	Associate Professor, Department of Epidemiology, Fudan School

	control under China's health system	of Public Health, Shanghai
	Sangeeta Singh Understanding responsiveness of health services through experiences of TB	Research Scholar, CSMCH, JNU
	Yasir Hamid Bhat Health Service System Issues in TB Control and Access to Healthcare in Armed Conflict Areas	Assistant Professor, TISS, Guwahati
4:00 – 5:00 PM – Discussion		
5:00 PM- Tea		
8th March 2016 (09:15 AM-5:30 PM)		
Address by Director, ICMR 9:15-10:00	**Dr. Soumya Swaminathan**	
10:00-10:30 Tea		
Social Determinants in TB Control (continued) 10:30 – 12:30PM	**Anurag Bhargava** Social Determinants of TB: Undernutrition and Tuberculosis	Professor, Department of Medicine, Yenepoya Medical College Mangalore
	Lakshmi Kutty Social factors in tuberculosis: The question of nutrition	Research Scholar, CSMCH, JNU
	Ramila Bisht Health workers in TB Control programme	Professor, CSMCH, JNU
	Ajay M.V Impact of operational research on policy and practice: TB-Diabetes case study in India	Deputy Director – Research, The Union
12:30 – 1:30 Discussion		
1:30 – 2:30 Lunch		
Policy impact on TB patient (MDR and XDR-TB) 2:30 - 3:30	**Yi Hu** Transmission and evolution of multidrug/extensive drug-resistant tuberculosis and its implication for the control strategy in China	Associate Professor, Department of Epidemiology, Fudan School of Public Health, Shanghai
3:30 – 3:45 – Tea		
Round Table (Open Session)	*Panelists:*	

Challenges to TB Control Programme: Setting a research agenda 3:45-5:30	Fudan University; CSMCH, JNU; ICS; ICMR; The Union	
Vote of Thanks		

I. TB Programme in India and China (Epidemiology, Structure, Organisation & Financing)

i. China TB Control Programme

***Epidemiology*:**

In China, more than 400 million people have tuberculosis. It is the infection with third highest incidence. Incidence of tuberculosis in 2015 was 68 new cases per one lakh population. In China, 17 percent of patients die directly from TB and rest from other related co-morbidities, such as diabetes and other lung cancer or infection. There is high rate (8 percent) of patient dying in first two years of treatment. The public health service system in China has managed to deal with the heavy disease burden situation in the country with 47 percent of decrease in death rate due to tuberculosis and 43 million lives being saved in two decades and achieved 88 percent case detection rate. According to unpublished 5^{th} tuberculosis survey in China it has been observed that more cases were reported from rural areas than urban areas and western regions of the country.

Multi-Drug Resistant-TB (MDR-TB) was more likely to be recent phenomenon. Many studies have shown that more than 50 percent of MDR-TB cases were new cases. According to nationwide drug resistant tuberculosis survey in China 2007-2008, estimated annual number of MDR-TB cases was 100,000 and estimated annual number of Extreme Drug Resistance-TB (XDR-TB) cases was 9,000. There were 5.71 percent of new cases of tuberculosis reported as MDR-TB and 0.475 of new cases were reported as XDR-TB. Retreatment cases were 25.64 percent and 2.06 percent in MDR-TB and XDR-TB respectively. WHO 2015 health statistics has shown that there was only 11 percent case detection rate in China.

In recent transmissions of MDR-TB in east China (2008-2014), it was noticed that 49 of 157 MDR-TB cases were identified into 48 clusters and it was higher than DS-TB (drug susceptible tuberculosis) (31.2 percent vs. 19.0 percent respectively). There were several problems related with the control of MDR-TB such as high risk to acquire DR, MDR, XDR; high risk of DR transmission; inadequate capacity in DR diagnosis; treatment and management; poor

accessibility to DR diagnosis and severe economic burden on DR treatment. It has been observed that most of the patients who completed treatment were treated from Centre for Disease Control (CDC). Different studies have shown that fluoroquinolones resistance has emerged and threatened TB control in eastern rural China. It has also been reported that the Beijing family and its major subgroup strain have contributed to the epidemic and transmission of drug resistant TB in rural China. One significant challenge in China was that MDR-TB had no obvious high risk group of population. Based on current epidemiology and transmission, trends and treatment efficiency in China, it was speculated that by 2050, the incidence of DS-TB would be decreased by 32 percent but MDR-TB would increase by 60 percent. Due to high rate of transmission the proportion of newly diagnosed MDR-TB will increase.

The molecular fingerprinting discovery in early 90s led to address and resolve many queries related to tuberculosis epidemiology. It included the impact of HIV co-infection on transmission, the infectiousness of smear-negative tuberculosis, the transmissibility of different strains, and other phenotypic differences among strains of mycobacterium tuberculosis. It also included the relative contributions to reactivation and primary disease in areas of high and low prevalence, risk factor for recent infection and/or primary disease, and occurrence and frequency of exogenous reinfection. The most commonly used marker is the transposable element.

Organisation:

China has more than 1.3 billion population. Administrative systems in China have covered 31 provinces and 343 prefectures and about 3000 counties. Chinese Centre for Disease Control and Prevention (China CDC) is the national level disease control centre of China. County level CDC serves as the basic unit of the system. The system is involved in public health promotion and health research. China CDC was in charge of control programme of tuberculosis, HIV and chronic diseases. The system served specific services to control tuberculosis and it offered outdoor management for tuberculosis for past two decades and in some places it had hospitals and departments.

In China, the administrative levels for National TB control Programme have been divided into national, provincial, prefectural and county. Under the county there are villages and community. The public health service system in China was commonly known as a convergent management

system. It was divided into two parts such as administrative system and technical system. Both have their respective divisions. In addition to that, the technical system also covered primary health centre as village level unit. Each administrative level also has CDC system as technical counterpart. So, there is national CDC, provincial CDC, prefectural CDC and county level CDC system. County level CDC covered primary health centres in rural china and one county CDC covered half to one million populations. China has 32 provincial CDCs and five specialised dispensaries for tuberculosis control. The country has more than 300 CDCs at the prefecture level. County level CDC served as the basic unit for tuberculosis control programme. One county has at least one unit for tuberculosis control or dispensary. In some cases tuberculosis facility is located in hospital. So in the designated hospital, there is a department for tuberculosis management.

In early 1950 more mass activity was practiced for tuberculosis screening, treatment and prevention. Since inception in 1992 to the first ten years, stage 1 of DOTS programme in China was implemented in 13 provinces, 1156 counties and in 560 million populations with subsidised care with the help of World Bank loan. At the end of 2001, 1.3 million populations were treated and 90 percent of them were cured and also 60 percent of the country was covered by the programme.

In next ten years, Stage 2 comprehensive DOTS was implemented with help of the World Bank. Then tuberculosis diagnosis and treatment was made at the tuberculosis centres and designated hospitals or clinics and 94 percent new cases were detected and in 84 percent, re-treatment was started. Stage 2 involved 8.4 billion CNY, 0.6 CNY/capital for system, infrastructure and capacity building. The second stage incorporated internet based surveillance. Individualised data of cases, fast case searching, accurate statistic report, timely assessment for programme were important achievement of National Tuberculosis Control Programme in China.

Referral system and shift between two policies of tuberculosis control programme:

China established tuberculosis control system in early 1950s. Before implementation of DOTS programme, tuberculosis was almost controlled all over the country. Patients were treated at hospital and the programme was integrated with the general health service system at all levels. The tuberculosis control programme in China was mainly based on the passive case findings.

The diagnosis part majorly depended on the microscopic examination of sputum. In treatment of tuberculosis, the standard regime of DOTS (Directly Observed Short-course Therapy) was used across the country. The referral system was one of the important parts of the national programme. The clinically suspected individual usually has been referred to the tuberculosis dispensary or tuberculosis department of the hospital. Village health centres referred patients to the county tuberculosis dispensaries for diagnosis. Patient with cough symptoms were usually diagnosed at county level tuberculosis dispensary. The county tuberculosis dispensary provided free diagnosis and treatment. County tuberculosis dispensaries registered the cases of tuberculosis and simultaneously reported to the higher levels of authorities.

Previously, patients with cough were usually registered at county level dispensary followed by initiation of treatment. But the process of diagnosis in the new delivery model for tuberculosis/MDR-TB management was gradually changed over the period of time and designated hospitals at provincial and county level were responsible for diagnosis and initiation of treatment instead of tuberculosis dispensaries. County level CDC referred the patients to the prefectural level. The shift between old and new health service model was significant. The first contact point for tuberculosis management was shifted from county tuberculosis dispensary to county designated hospital.

Qualification of the health personnel who provided medical services in public health system played important role in the shift. Though doctor-patient ratio in China was 4 doctors per 1000 population, it did not include county level or village level doctors but it included Chinese medicine doctors. In many cases it was noticed that different complications of tuberculosis and drug resistance often required thorough curative management under strict medical supervision, hence skilled medical personnel with qualification. Though county or village level doctors could follow-up patients after diagnosis and initiation of treatment but they could not prescribe medicine for tuberculosis treatment. Chinese doctors in designated hospitals could prescribe medicine for TB treatment. Another important shift was that TB services were covered by medical insurance and insurance covered only hospital services. This shift majorly occurred in public hospitals because China has about 99 percent public hospitals. Private health sectors are few in number and their services are also limited.

The CDCs and dispensaries at provincial, prefectural and county level started offering other public health services like monitoring and evaluation of tuberculosis programme, conducting training programmes, conducting External Quality Assessment (EQA) and surveillance of the ongoing programme. The effective new MDR-TB management model framed the public health services in a way that 'the county level refers patients; the prefectural level diagnoses and treats patients; and the village health unit level manages patients'. Newer laboratory techniques like Light Emitting Diode (LED), the Hain test, Gene-chip and GeneXpert would help to diagnose cases of tuberculosis rapidly and prevent in delay in treatment. In other hand, newer technology in mobile phone/electronics reminders kept reminding patient about their due course of medicine which helped to improve medication adherence in tuberculosis patients. Medical insurance also played important role in management of tuberculosis in China.

Health care services for MDR-TB offered out-patient management at community health centre. In addition to OPD management of MDR-TB cases, county designated tuberculosis hospitals referred suspected cases of MDR-TB to the higher facilities for further management and helped to transport the sputum specimen for further diagnosis. Designated hospitals at prefectural level served as tertiary institutions for diagnosis, initiation of treatment and thorough in-patient management of MDR-TB cases.

Funding:

TB program in China was grossly underfinanced in the nineties and had a very low allocation. It was as worse as 2 crores or 20 million rupees for the entire TB program in 1981, which was not more than 10 rupees per patient. So, once funding was external, it could not be called as stable source of funding, whereas, TB control required a stable commitment. Experiences from different parts of the world have shown that external funding is inherently unstable. Besides, there was some conditionality built in to the financing, which were sometimes difficult to implement at the ground level for example the DOTS strategy was not being able to be implemented properly in the country. So, it has been assumed that China has a process to put the money into TB from its own resources. The case of technical support different from international funding agency was quite different from financial inputs.

The fund input of national tuberculosis control programme was increased from 130 million to 1.22 billion RMB Yuan within 2001 to 2014. Though the Chinese governmnet increased the funding for tuberculosis control programme from 40 million to 0.64 billion RMB within 2001 to 2015 but presence of medical insurance in public hospitals and its influence on the TB programme indirectly put the focus on ensuring cost efficiency of public health service system.

Majority of the rural population in China got covered by rural health insurance. Urban health insurance covered population of cities and towns. About 70-80% of the costs were covered for hospitalisation in town level while 60-70% was covered in county level. But, for the outpatient (OPD) services, the coverage was very low. It has been observed that about 100 CNY per year was spent for general medical services. But, in the case of TB, outpatient costs were covered in many provinces; the anti-tubercular drugs, sputum microscopy, X-ray were free of cost under insurance coverage. The rest of the services were still borne by the patients.

The treatment of drug resistant tuberculosis in China was mainly supported by Global Fund and now by Gates Foundation. MDR-TB treatment project of Global Funds included several medical models for MDR-TB, evaluation of feasibility of strategies on screening in high risk population or standardised chemotherapy and hospitalisation + outpatient treatment and regulation of setting for case management. On the other hand Sino-Gates foundation support the tuberculosis programme through regulation of TB health care, financing through health insurance, government input, project funding and civic and medical aids. They also supported payment mechanism and inspection with the help of multi-stage payment and third-party inspection. China has a very long history of work with the World Bank for public health interventions. A number of programmes like Fight for TB have been financed by World Bank in the past.

ii. India Revised National Tuberculosis Control Programme (RNTCP)

Epidemiology:

According to WHO Global Tuberculosis Report of 2015, estimated number of new cases was 2.2 million and 1.1 lakh cases were co-infected with HIV. India is in second position after South Africa in absolute numbers of TB and HIV co-infected cases. About 71,000 cases were notified as the estimated incidence of MDR-TB as reported by Revised National Tuberculosis Control Programme (RNTCP) in 2014. India has conducted one state level, seven district level and two

sub-district level prevalence surveys in between 2006 to 2012. State level prevalence survey was conducted in Gujarat.

Organisation Structure:

RNTCP central level organisational structure activities are carried out in a six tier system. Union Health Minister of State is the supreme authority of the programme. Health secretary and DGHS along with additional secretary, joint secretary and deputy director general of tuberculosis formed the authority of central level organisational structure of the programme. The additional deputy director general of epidemiology, Programmatic Management of Drug-Resistant TB (PMDT) and drugs and logistics formed important part of central level authority of the programme. The organisational structure is divided into different levels included central TB division, state TB cell, district TB centre, Tuberculosis unit, Microscopy centre and DOTS Centre. One tuberculosis unit covers 250,000 population and one microscopy centre covers 100,000 population. DOTS Centre is a basic unit of the service system. Programme has wide laboratory network available in three tire level. The laboratory network is distributed from sub-district level (Designated Microscopy Centre - DMC one for one lakh population) to Intermediate Reference Laboratory (IRL) and National Reference Laboratories. It has incorporated about 13,000 designated sputum microscopy centres (DMCs), 121 cartridge based nucleic acid amplification test (CBNAAT) centres, 64 Culture and Department of Science and Technology laboratories and 6 national reference laboratories. DMCs have been supervised by the intermediate reference laboratories at state level and NRLs and Central TB division at the central level. DMCs were most peripheral unit of laboratory networks under RNTCP.

Financing:

The programme is supported by the World Bank and the Department for International Development (DFID). RNTCP is also supported by the Global TB Drug Facility (GDF), Global Fund, USAID and DANIDA. The government of India provided 100 percent grant in aid to the implementing agencies besides provision of free drugs. The TB programme budget per established TB case, as percentage of GDP per capita is 7.4 percent for India and 4.8 percent for China. Both, approved allocation by planning commission and revised budget outlay have been increased over the years. The approved allocation by planning commission and revised budget

outlay in 2014-15 was 172 million and 98 million respectively. Proposed budget for the RNTCP under the 12th five-year plan is 692 million USD. The programme had different sources of financial assistance such as domestic budget, Externally Aided Component (EAC) which included Global Fund (NFM – 230 million) and World Bank (100 million), there is extra-budgetary support from UNITIAD, BMGF, WHO and USAID. Despite such funding for the disease programme, out of pocket expenditures are still incurred.

Diagnosis and management of tuberculosis under RNTCP:

Recommended diagnostic tools under RNTCP were sputum examination under microscope, nucleic acid amplification test and culture of the organism. Management of tuberculosis patients usually followed an algorithm formulated under the programme. It has been observed that there were some fallacies of the algorithm such as only 5.1 percent of cases have followed the algorithm completely. Chest X-ray has been prescribed on the preference of medical officers. It has been noticed that most of the patients have not returned for follow up and many went to the private sectors and were retained in the private sectors. Beside these, other fallacies documented in many studies are decrease adherence to the treatment regimens and co-infection with HIV. So a revised algorithm for pulmonary tuberculosis was prepared where chest x-ray and sputum microscopy were used as primary screening tools.

Other new diagnostic methods like Real Time-PCR as Xpert MTB/RIF, line probe assays and liquid culture helped to monitor the treatment outcome. Xpert MTB/RIF especially detected tuberculosis infection in paediatric age group and HIV positive population. There are other imaging techniques such as PET and CT scan present to diagnose tuberculosis infection. Strategies for case finding started with passive case findings followed by intensified case findings followed by active case findings in high risk group like in slums, migrant population and other communities.

Different programmes were to be implemented to improve the medication adherence of the patient to the treatment. The regimen would be of daily regimes or there would be some incentives for DOTS providers and other. The 99DOTS (Pill in Hand) was one of the effective adherence monitoring tool of daily regime. There were two reasons to explain the shift to daily regime. Scientific reason was to prevent relapses. The second reason was programmatic reason

which observed that the private sectors did not accept intermittent regime. Almost 40-70% of patients went to private sector for anti-tuberculosis therapy. It has also been noticed that large proportions of the patient in private sectors did not accept the intermittent treatment regime. Similar is the case by default TB patients. In private health sector there is no proper follow up of TB patients compared to public health sector. So initiatives are taken by public health sectors to improve patient adherence to treatment regimes.

II. Understanding Social Determinants of TB in India and China- *Challenges in Mainstreaming in TB Control Policy*

Historically TB is a social disease and its determinants transcends biomedical framework. Risk factors are linked with TB pathogenesis and epidemiology at different stages of disease progression from exposure, infection, disease development and access to TB care and clinical outcome. Some of the major risk factors are age, being female, over- crowding, undernutrition, high population density, poverty, co-infections such as diabetes, HIV, smoking and weak health care system. Social determinants of TB are to be understood at to levels- social determinants as risk factors to TB infection and availability, accessibility of health service system as determinant to TB care services.

Understanding of social determinants of TB goes beyond the narrow vision of modern epidemiology, technological solutions and health service system determinants. TB as a problem is to be conceptualised as a problem of *human suffering* caused by TB infection to TB patient and their families. TB is not just a biological pathology but causes destruction in the life of human beings - socially, economically, and psychologically. Thus understanding of TB problem needs to go beyond the biomedical curative model to analysing the destruction it produces in the life of people suffering from TB and their families. Historical literature had shown the associations with poverty, inequality and disease. The decline of TB mortality in large parts of Western Europe was associated with improvement in overall health status of population. It is necessary to revisit the historical factors which resulted in decline of TB and improvement in health status to reduce TB burden. This will require transcending the boundaries of TB programme and bringing in inter-sectoral understanding into the program from other areas such as livelihood, access to food and nutrition security, housing, etc. The inter-sectoral approach to

the programme does not negate the importance of biomedical approach and health services system determinants but emphasises on the need to develop pro-poor TB strategies addressing social dimension of disease.

The dominant paradigm in TB control programme is biomedical curative individualistic DOTS strategy and behaviour change communication. Exclusive focus on biomedical approach in TB control programme and behaviour change strategies puts the onus of treating and getting cure on individual patient ignoring the structural context which produces disease risk factors and influence individual health. Terms such as default, non-compliance to TB treatment used in the programme put individual responsibility for getting treatment and judge the TB patient and family intentions to cure the illness. Such conceptualisation of TB problem ignores the fact that individual choices are made within the social and structural context and health service system in itself a behavioural entity modifying the individual choices to adhere TB treatment. To reduce the burden of disease programme needs to go beyond this narrow individualistic model and look at the complex interaction between health services system with health system determinants. Addressing social determinants through social protection and health insurance is a narrow reductionist strategy to address social dimensions of diseases as they divert the attention from addressing structural determinants of diseases.

Social determinants of TB challenges the dominant biomedical and individualistic TB control paradigm and calls for the need to investigate intervention points within the programme to address social determinants of TB along with the biological determinants. The programme needs to look at the role health and non-health institutions play in producing the risk factors of TB and in promoting the measures to address questions of poverty, inequality and inequity. The programme needs to incorporate polices of employment generation, housing, addressing hunger and nutrition, livelihood generation and reducing poverty to promote health equity and wellbeing.

i. Social Determinants of China TB Control Programme

In China, TB is a major public health problem despite implementing DOTS strategy for more than two decades. Major challenges to TB Control Programme in China are poverty, social,

economic inequality, inequalities in health service system across provinces, rural to urban migration, and highest burden of MDR-TB in world. These challenges need to be contextualised within the transition in Chinese health system post 1979 with economic and heath sector reform and introduction of market economy within health sector. This increases the inequality in access to TB services and vulnerability to TB infection. Even after 30 years of economic reforms, China's healthcare system and economy are in deteriorated conditions with high escalating medical costs and worsening patients and doctor's relationship.

Social challenges to TB control are large rural population (80 percent) and high number of rural to urban migration. There is high prevalence of TB among women, elderly, prisoners, urban poor dwellers, migrants, diabetics and malnourished people. Regional differences in prevalence of TB are seen in less developed northeast and southwest regions. Diabetes is major co-morbidity of TB in China and high proportion of patients with TB had diabetes. Around 80 percent of MDR-TB patients are from rural areas mostly having low education.

Rural to urban migration is major problem to TB control in China. The migrants are called *floating population* as they migrate from rural-urban to urban-rural areas. In 2014 floating population accounts to total of 253 million workers in China (20 percent of population) working in industries with long working hours. The direction of movement of migrants is from western high TB prevalence areas to eastern regions and from internal coastal areas to outer coastal areas. As a result urban migrants (38.9/100,000) had higher incidence rate than local residents (27.8/100,000). The rate among persons < 35 years was 3 times higher among urban migrants than among local residents. Movement of population from high TB burden regions results in increase in total number of TB patients in urban areas and forming mixed clusters of transmission of TB patients consisting of local and migrant TB patients. Floating population is at higher risk of TB infection as they reside in poor residences, overcrowded communities with poor nutrition status. Thus urban areas import healthy migrant population and export unhealthy TB patients as often sick migrants go back to native regions for TB treatment.

Stigma and high financial difficulties influence health care seeking in both programme and non-programme areas despite subsidised TB services and is one of the major reasons for not completing the treatment. Migrant's workers face major challenges in accessing TB services.

Defaulters in the TB treatment are generally the migrants. Migrants often navigate for TB services in different hospitals of county as there are cultural and structural barriers experienced in accessing TB services because of appearance. Stigma related to TB result in loss of work; force them to take home treatment; difficulty in finding partner; divorce; job loss; loss of neighbourhood etc.

Programmatic health service system challenges to TB Control Programme in China are inequality in access and affordability across provinces, delay in diagnostic, case findings, quality of TB services, inequality in health financing across regions.

Medical insurance has shortened patient delay but there is diagnosis delay of more than four weeks to several years across poor provinces especially among women and elderly. Generally patients seek treatment in general system than dispensaries. The common reasons for patient delay are poverty, social disadvantages, and out of pocket expenditure. One of the remarkable features of China DOTS strategy was that social assessment preceded implementing DOTS in provinces and counties. Social assessment funded by World Bank forms the basis of implementing DOTS policy in 1990s with the purpose to implement pro- poor TB control strategies to reduce access barriers. DOTS was implemented in 1990s and expanded to provinces in 2000 after assessment studies between DOTS and non-DOTS regions. DOTS implementation and functioning is better in economically richer and better functioning health service systems compared to poorer regions with weak health service system.

Inequality in health financing mechanism is present in poor regions. Health financing is decentralised where central assistance is provided only for drugs and equipment and other costs such as operational, transport and maintenance cost are spent by county through raising the hospital revenue through other finances. Poor regions had to raise health institution revenue through introduction of user fees and other supportive insurance based treatment services along with TB treatment to recover cost. This resulted in differences in the implementation and performance of TB control programme across regions. TB control programme is not as successful as projected and is not reaching to poor population because of differences in performance of programme in poor and rich provinces and high out-of-pocket expenditures that are incurred. Quality of TB services is affected because health workers do not have required

training to effectively diagnosis TB, lack of equipment or non-functional equipment and DOTS treatment regime is inadequate compared to international standards.

Major programmatic challenge in TB control is extremely high levels of catastrophic health expenditure inversely associated with household income level. A survey done by Chinese government in 2010 shows that majority of patients (53 percent) never sought professional care despite large health insurance coverage (95 percent in 2010). Around 84 percent of newly-diagnosed TB patients paid out-of-pocket (OOP) despite covered by the rural health insurance - New Rural Cooperative Medical Scheme (NRCMS). Over 94 percent of households in the poorest quintile (Q1) spent at least 10 percent of their income directly on TB care as compared to 41 percent of those in the richest quintile (Q4).

China has very high OOP expenditure in TB programme at the same time has a high case completion or cure rate which is paradoxical. The relationship between high OOP along with cure rate is that in China there is performance assessment at each level. There are targets given to each county to reduce the burden of TB and it is carefully collected data which shows high figure of cure rates but in reality China has low cure rates never higher than 85 percent.

The major reason for such high figures of out of pocket (OOP) expenditure despite free TB care are - health insurance schemes in rural areas that have not provided sufficient financial protections to poor, health insurance policies do not cover outpatient services, excess use of diagnostic, expenditure on supportive services such as liver, lung, or other related diseases examination or hospitalisation for MDR-TB patients for two months, over-prescription of drugs and over-medicalisation to generate revenue for health institutions. Such supportive treatment based health insurance produces differences between real OOP expenditures and actual OOP expenditure. Coverage of large number of population by health insurance negatively impacts the TB control programme. Insurance model splits the public health services from curative services and pushes public health program towards a curative model and promotes technical curative solutions that fit the insurance model for reducing the burden of disease. This does not allow for systematic re-designing of public health programme. Existing health insurance and medical assistance schemes need to be more pro-poor to reduce high OOP expenditure on TB patients.

One of the important features of Chinese TB control policy compared to India is large scale longitudinal surveys (in 1990, 2000 and 2010) to assess to prevalence and incidence of TB combined with small surveys in provinces and counties. China TB control strategies before 2010 were government commitment to free treatment and health education. There are currently three models for delivery of TB services in China:

- Dispensary model: patients are diagnosed and treated in TB dispensaries, which are usually affiliated with local CDC.
- Specialist model: similar to the dispensary model, but a specialised hospital is also responsible for treating patients.
- Integrated model: TB diagnosis and treatment is integrated into a general hospital which is referred to as a "designated hospital"

China's TB control strategies focus on improved case detection mechanism and pro-poor socially oriented policy actions where patient and reducing barriers in accessing to TB services are at central of TB programme actions. To reduce physical, financial and social barriers China provides free diagnosis for TB patients for both Microscopy and X-ray examination, free anti-TB drug for treatment for first-line anti-TB drugs and DOT. To reduce access barriers, China incentive mechanism provides subsidies for reporting, referring and tracing patients, subsidy for DOTS, and transport fee for poor patients.

China has an active case finding mechanism for TB screening in community through 'contact investigation surveys' with children, households and in workplaces. HIV-TB epidemic was not severe in China compared to other countries thus only secondary preventions are provided but not through routine project. Currently pilot surveys are conducted to address challenges reducing TB burden among vulnerable groups such as floating population, prisoners, TB/HIV and MDR patients. Urban areas have community- based TB management system.

For addressing TB epidemic among floating population there are management procedures of floating patients which involve 'free policy' as residents TB patients for floating population and 'cross-district TB information sharing system', which has platforms for sharing the information from different TB dispensaries. Some provinces and counties can enlarge the free policy, reimbursed by local medical insurance and provide incentive with transport fee and nutrition.

Free medical services, transport and living allowance subsidies to migrant patients with TB improved the treatment outcome significantly.

TB control programme in China collaborate with range of other providers for delivering TB services (such as public hospitals and public and public mix) and involvement of village doctors in TB control (public private mix). In recent year new form of PPM-DOTS initiative has emerged known as 'designated hospital-based model' in some provinces of China where a 'designated' hospital provides the standard TB diagnosis and treatment, while the TB programme remains the basic management unit. However, this model of collaboration did not necessarily reduce patients' out-of-pocket payments.

To reduce the high burden of MDR-TB in 2009, the Chinese government launched a plan for MDR-TB prevention and control. The purpose of the new plan for MDR-TB was to assess and develop the TB control strategies post comprehensive health system reform. Major challenges in MDR-TB control in China is of resources - domestic sources need to be mobilised to raise funding for TB/MDR-TB prevention and control as there is no designated fund for MDR-TB and at the national level appropriate incentives should be given to both health facilities and their care providers.

ii. Social Determinants of TB Control Programme in India

Health system challenges to TB control in India can be divided into categories - social challenges to TB control and programmatic challenges. Both cannot be seen as discrete as the social challenges also create many programmatic challenges. Social challenges to TB control are poverty, migration, undernutrition, stigma. Poverty, exclusion, marginalisation and vulnerability are related to TB infection, disease progression, access to treatment and completion of treatment. Social and programmatic barriers exclude people from seeking treatment and adherence to TB treatment. The socio-cultural context determines susceptibility to TB infection experience. This also results in constraints in accessing treatment and constraints in implementing the programme affect the overall outcomes of the programme. TB patients are often caught in the vicious cycle of poverty and inaccessibility to TB services. Poor and marginalised are often excluded from reaching the programme and treatment completion because of stigma and other direct and indirect costs of treatment.

Social Challenges lead to programmatic challenges. Revised TB Control Programme (RNTCP) DOTS strategy focuses on effective diagnosis and ensures treatment completion. But still the programme faces challenges of compliance and treatment adherence such as delay in access to TB services, unregulated private sector, irrational use of first and second line of TB drugs by private health providers leading to MDR-TB burden and co-morbidities HIV and diabetes.

Large number of migration from rural to urban areas is a major challenge to TB control in India. TB patients and migrants workers in India often seek treatment from different sources determined by economic capacity, time and knowledge, accessing the local pharmacist or private health providers and finally reach DOTS centres after much delay. Migration also results in problem of completion of treatment and follow-up as migrant population often travel back to their home towns. Policy for migration and TB control is launched in India but at implementation level the policy is not working. Migrants often face problems in accessing TB services and are asked for permanent residential proof for enrolling in TB programme. There is a policy for transfer of migrant patients to native DOTS centres but there are problems in tracing and follow-up of migrant TB patient as feedback mechanism is poorly implemented. For prisoners related TB epidemic there is ongoing policy level effort to draft prison TB policy in India.

Health service system is a major determinant of TB and health service system responsiveness does not only include clinical aspects but also human dimensions for care of TB patients. Interaction between patient and health institutions and providers is another major challenge leading to seeking services from private providers and delay in diagnosis, treatment initiation and adherence to treatment.

Health workers in TB programme

There is distrust among general population and TB patient towards public health institutions and health workers. The distrust is at higher level with frontline health workers working in TB Control Programme. There is lack of communication in informing TB patients about diagnosis and treatment completion. Often the health workers are overburdened with other vertical programme work which results in failure to complete duties of TB programme. Health workers face with problems of low motivation, low wages, and work in poor conditions in health facilities and are at higher risk of getting infected with TB.

A study conducted among community health workers in tuberculosis hospitals in Mumbai shows that health care workers are at significant risk of TB infection. In the health service system there is hierarchy of work and informalisation of a highly hazardous occupation. The inequality in hierarchy of health care work is seen through significant relationship with increased risk of TB infection among lower class workers. There are unequal differences in percentage of tuberculosis infection in white collar personnel and non-medical health workers. The risk of TB infection among lower class health care workers poses a serious concern and is applicable within the context of detrimental effects of occupation in public health sectors. The increased vulnerability to infectious disease among voluntary workers in health sectors shows the important aspect of caste, class and gender in health occupation.

The study shows that community health workers in tuberculosis hospitals in Mumbai were working in high risk exposure environment with no personal protective measures. Health care workers perceive job as a very essential component of life irrespective of nature of job - government or contractual. So in spite of knowing the hazardous impacts on health even death health care workers have no other option but to continue the work as a means of livelihood. Employment insecurity, absence of functioning workers union, influence of private health sectors and contested labour market makes the situation precarious. Though community health workers were treated free of cost but they again have to come back to the same occupation which leads to occurrence of re-infection or emergence of drug resistance tuberculosis.

The general impression among most of the health institutions employers/organisation of health care and community health works such as (NGOs and public funded health institutions) is that the community health workers were more susceptible to tuberculosis because they were living in communities where high rates of TB infection and they are also poor and undernourished. These employer's/organisation did not realise that high rates of infection might be due to hazardous situation of work place in health sectors.

The main challenge in conducting studies on occupational risk among health care workers in India is lack of availability of data. Although the collection, compilation and recording keeping of data on occupational risk among health care workers systematically by public hospitals is started but it still very difficult to access official health data by general public for research and other purposes.

TB control programme in conflict areas

Conflict is a major contextual social determinant and programmatic challenge for providing TB care in India. Areas of conflict TB Control Programme face challenges in provision of health services and accessibility to services. Conflict areas poses challenges of insecurity to health care staff in provisioning of health care services and obstruct accessibility and mobility of both patients and health care staff, this seriously affect the implementation of TB control programme and provision of TB care to patients. Backward, rural excluded marginalised population face more challenges in accessing general health services as well as TB services areas where conflict is part of routine life. In conflict areas there are regional variation in availability of health care facilities, physical proximity to health facilities is difficult, absence of regular staff, non-availability of nearby diagnostic services in far flung areas, emergence of un-regulated private sector, drug scams, restricted mobility because of day to day violence, gender norms restrict accessing TB services with more dependence on male family members, stigma delay in seeking TB diagnosis and treatment adherence. Violence in conflict areas restrict the provision of services as there are often attacks on health facilities, ambulances, health care staff couldn't attend duties because of restricted movement and curfews, there are often cases of attacks on health care staff, abduction, harassment to provide care to injured people.

Role of private providers in TB control

Private providers are a major challenge in India to TB control as for 70 percent of population private provider is major source of health care. TB treatment by private providers results in irrational treatment, misuse or overuse of treatment resulting in increased burden of MDR-TB. India TB Control Programme has made extensive efforts to engage private providers and NGOs in TB control programme through public private partnership models for case detection, adequate treatment at primary level of care and reducing stigma in accessing TB care. PPP within TB programme has increased the demand for active TB detection but treatment adherence and completion and referral are still major issues within the programme. Co-morbidities such as diabetes and HIV are major challenges in TB control along with high OOP expenditure for managing such non-communicable diseases.

Thus TB programme in India lack patient centred pro-poor approach and strategies compared to China. The programme needs innovations from community level to global level within the TB control programme to address the social, cultural economic, political dimension of TB.

Undernutrition and Tuberculosis Control Policy in India

One of the important risk factor and a co-epidemic fuelling the TB epidemic in India is undernutrition. Undernutrition is a serious co-morbidity in TB patients. Relationship between under nutrition and risk of tuberculosis is bidirectional and is one of the major risk factor with very high prevalence of BMI<18.5kg/m in rural areas among younger age population, women, lower socio economic groups and tribal population.

In active TB cases patients undernutrition can enmeshes in a vicious cycle of malnutrition and disease leading to higher risk of adverse outcomes. Undernutrition results in:

- Missed diagnosis because of atypical features
- Increased severity of disease
- Increased risk of mortality
- Predictor of treatment success
- Mal-absorption of key anti-TB drugs
- Increased risk of drug toxicity
- Increased risk of relapse
- Exacerbate MDR-TB

It has been observed in many studies that incidence of tuberculosis is increased by about 14 percent for each unit reduction of BMI. About 50 percent of tuberculosis cases in men and women could be attributable to under nutrition. On the other hand, success of treatment also depended on the BMI status of the patients. In many studies it was observed that about $1/3^{rd}$ of men and $1/4^{th}$ of women had normal range BMI after successful treatment or successfully completed treatment of tuberculosis did not have any positive effects to improve the nutritional status of patients.

Undernutrition and TB are two diseases, convergence of which magnifies the burden of both the diseases in India. More than a million of the new cases annually in India could be attributable to

undernutrition. Undernutrition interacts synergistically with other risk factors such as HIV, diabetes, smoking and alcohol. It is a modifiable risk factor at population level. Improvement in nutritional status could result in dramatic reduction of TB incidence in India.

Undernutrition as major determinants of TB is always overlooked by policy makers. There is constant debate in India on evidences related to under- nutrition as major risk factor of TB and programmatic challenges to address under- nutrition in TB control programme. In India there is major debate on mainstreaming social determinants of TB into the TB control policy for making the policy pro-poor. The debate focuses on mainstreaming nutritional support in TB control policy but the problem in addressing undernutrition is 'lack of evidence' and hence results in programmatic challenges in addressing undernutrition in TB control programme.

The debate on undernutrition as significant co-morbidity of TB infection is rooted in germ theory. The germ theory model of tuberculosis exclusively focuses on *M.tuberculosis* as the only cause of TB infection but ignores the complexity of causation of TB and does not explain adequately the outcomes. The epidemiology of TB is primarily descriptive with no analysis on the questions on reasons for progression and death of TB patient and role of social determinants of TB. The debate gives an overview on challenges in mainstreaming social determinants understanding in biomedical curative TB control policy discourse. The challenges are at two levels conceptual level and evidences for under nutrition and TB relationship.

Conceptually undernutrition like poverty is multidimensional requiring actions at different levels. But in India the whole debate around malnutrition is diverted to obesity as one of the major public health problem. Under nutrition is considered to be a problem exclusively prevalent in children, pregnant women excluding adult men with high burden. The focus of India feeding programme is on addressing micronutrient rather than macronutrient. There is inversion of meaning as undernutrition is not considered a social problem but a medical problem and artificial dichotomies are created of social vs medical approaches than focusing on combination of both approaches to address undernutrition. There is constant debate on whether undernutrition is risk factor TB disease or TB causes severe levels of undernutrition in TB patients. There are ambiguities in accepting undernutrition as major problem in India and one of major risk factor for TB. Such ambiguity is generated because of difficultly to show clear statistical causal

relationship between social determinants of health (undernutrition) and diseases. Studies on social determinants of disease have only generated associations with risk factors and disease susceptibility, prognosis and mortality. Such casual associations are often weak and are not considered scientifically valid within the hierarchy of epidemiological tools for collecting evidences. Hence, policy action on social determinants of health is much debated and challenging task with public health policy.

Despite large body of literature on under nutrition as social determinants of TB there is debate on evidences for showing association between undernutrition and TB infection, disease development, relapse and mortality. The debate on evidences for relationship between undernutrition and TB needs to be contextualised historically. Historical evidence by Mckeown suggested that TB decline in Western European regions have shown possible reason for decline in TB mortality were not fall in transmission, decreased susceptibility and change in virulence of organism but it was improvement in levels of nutrition with rising wages. But historical evidences are ignored within the hierarchy in methodology of generating evidences. Randomised Control Trials (RCT) and systematic studies evidences are generally considered by policy makers for any policy actions. Therefore evidences generated by other methodology clearly showing the undernutrition as one of the significant risk factor producing susceptibility to TB infection and progression of disease and relapse are not accepted for policy actions.

The debate on evidences often calls for evidence showing mechanisms through which undernutrition causes TB. But such need for mechanisms was not required for policy action on smoking and HIV/AIDS for TB control.

End TB strategy has acknowledged the role of social determinants of health in TB control and have promoted bold polices such as social protection, poverty alleviation and actions on other determinants of tuberculosis for eliminating TB. But in the debate on evidences for policy actions on social determinants of health often importance is given to statistical techniques and clinical experts but patients' values and expectations are never researched. There is lack of human dimension to generating evidences for policy actions in public health. There is need to generate evidences within the country rather on relying on international community to give evidences on undernutrition and TB and policy actions. Studies have shown that to lower TB

rates to significant levels, programme needs to look beyond the curative individualistic diagnostic and successful treatment strategies towards addressing social determinants of TB. The debate on social determinants of TB where undernutrition is one of serious co-morbidity of TB infection points that undernutrition has role in causation, treatment and elimination of disease at the population level. TB control in India requires socially appropriate sensitive TB control strategies to eliminated TB. Undernutrition and its relationship with TB epidemic bring out the social and human dimension of TB control program.

The overall agenda of social determinants of TB got pushed in policy discourse with Commission on Social determinants of health (SDH) by WHO in 2008 but still there is less space for SDH and undernutrition within Indian policy discourse. After the publication of WHO guidelines for nutrition support in TB programme the literature on undernutrition and TB relationship increased and evidences generated by studies got support. In India SDH with focus on undernutrition is considered an essential aspect in TB infection and control but not desirable for policy action.

There is a long term engagement between policy makers and public health professionals on undernutrition and its significance in addressing in TB programme. The general impression of policy makers is that addressing undernutrition is much broader and beyond the scope of programme and will dilute the focus of the programme and also cite lack of resources. The problem is not of resources but of social and biological mix which the policy makers are not ready to address. India managed to get funding for MDR-TB control and now MDR-TB gets 50 percent of total TB budget. Nutrition as a social problem does not attract the policy makers as it is a much wider social issue.

Within the TB policy making team there are two groups of people, one that is more receptive to idea of addressing undernutrition and other that is not supportive to the idea. Despite large body of evidences on undernutrition-TB there is delay in measures for addressing within the programme. One of major reason is that changes in national policy are often guided by the influence of international organisations such as WHO. There are efforts taken by some government people in India for state level funding commitment for nutrition support such as Karnataka and Chhattisgarh but it is still is difficult to incorporate nutrition support within the TB control policy. Nutrition support in TB control does not ask for feeding programme to be run

under TB programme but provision of food basket to TB patient. The larger issue for ignoring undernutrition as major problem in TB control is that polices in India never want to address larger structural issues of power, resources and politics such as agricultural production, food production, pulse production, export of food, rural poverty, farmers distress and crop failure. The politics of evidences and programmatic challenges in addressing a disease with social characteristics explains that policy measures for addressing social determinants of diseases always look for managerial narrow and reductionist strategies such as social protection to address structural determinants. The debate on evidences for undernutrition suggests that idea of disease being social disease and translation from sciences to programmatic action is difficult. There is need to incorporate large evidences on undernutrition in the TB programme to make policy more pro-poor and generate models through operational research for successfully reducing TB burden in India.

Operational Research and Addressing Tuberculosis-Diabetes in TB Control Programme

Contrary to nutrition debate, diabetes as major co-morbidity to TB disease is addressed in National Tuberculosis Control Programme of India. The policy space for action on diabetes mellitus was made by using global to local evidences on TB-diabetes relationship and using operational research for policy action.

In international and national studies it has been observed that diabetes mellitus did not only increase the risk of tuberculosis by two or three times more, but it also deteriorated the treatment outcomes in tuberculosis. It delayed sputum conversion and increased the chance of treatment failure and relapse. WHO formulated a framework to bidirectional screening and care for tuberculosis with diabetes. The recommendations were described in three parts. First part was to establish mechanisms for collaboration, second one was to detect and manage tuberculosis in patients with diabetes and third recommendation was to detect and manage diabetes in patients with tuberculosis.

Tuberculosis-Diabetes collaboration in India was formed between international and national stakeholders for bidirectional screening of tuberculosis and diabetes in October 2011.Through the series of follow up meetings, the screening process of diabetes in tuberculosis in eight tertiary centres and sixty peripheral centres was decided and algorithm of screening process was

recommended. Algorithm of screening process recommended for diabetes mellitus was mainly based on blood glucose level. If the random blood glucose value was more than equal to 110 mg per dL then fasting value of blood glucose (FBG) would be checked. If FBG was more than equal to 126 mg per dL then patient would be referred to the care for diabetes.

In September 2012, the director general of health and RNTCP released an immediate national directive of screening diabetes mellitus in tuberculosis patients. The directive was applicable across the country and national and international stakeholders were actively involved with ministry of health since its formulation. Simple parameters such as numbers of tuberculosis patient registered, number of tuberculosis patients screened for diabetes mellitus or number of tuberculosis patients diagnosed with diabetes mellitus were added for routine recording in quarterly tuberculosis report. But there were several challenges in implementations of these recommendations. In national tuberculosis programme, though training modules were drafted but it has not implemented in all states and there was no availability of electronic reporting data. In national Non-Communicable Disease control programme, nationwide coverage has not been achieved yet and procurement and distribution of diabetes mellitus kit was not adequate. Through operational research these challenges were identified and it was noticed that the existing screening programme for diabetes was unidirectional. It meant only tuberculosis control programme has screening facilities for diabetes not vice versa. The changes have been made so far in the TB control programme was changes in the record formats and follower readiness. So there it was rapid generation of operational evidence which led to decisions at national policy levels for addressing diabetes as major co-morbidity to TB disease.

III. Research Collaboration for Future

The two day discussion was also an initiative to form institutional networks between both the countries for engaging TB related institutions and civil society organisation people working with TB patients for collaborative research. At the end of two days a round table discussion was held. This included all the institutions representing in the dialogue from the Chinese and India side.

From the two day discussions on strategies for TB control in India and China, following agendas were decided:

- Build a multidisciplinary team of social scientist and medical experts in area of TB between both the countries for future dialogue, research, publication and representation such as joint groups in conferences and meetings as *India-China joint action public health group*.
- Similar to China, India too needs contact investigation research to assess the prevalence of TB among family members and in workplaces.
- Looking for funding opportunities of collaborative research by approaching international funders for development grants which give greater flexibility compared to research grants.
- There is need to study the methodology to conduct studies on structural determinants of diseases.
- Comparative studies on China and India based on review of literature for policy groups. These could be synthesis review papers on different health related topics in China and India.
- Studies on TB epidemiology, poverty, inequality in India and MDR-TB management through engagement of private health providers in China
- Studies on common interest issues in both countries such as public-private or public-public partnerships and MDR-TB detection, MDR TB drugs, operation research, cost effective analysis, rapid diagnostic technologies, studies on urban poor and migrants focusing on issues of vulnerability to TB infection, barriers to access and relevance of health insurance.
- Studies on differences between both countries across regions in TB programme with focus on social dimensions such as undernutrition as common factor impacting TB burden to develop innovative strategies to address social determinants of health.
- Studies focusing on peoples' experience with the TB control programme and other people involved with programmes implementation such as health workers to give comprehensive overview to policy makers to develop pro-poor programme strategies for TB control taking patient as central of TB programme. Such studies need to document the human dimension of TB and its care.
- Studies on TB related health expenditure and social protection measures.

- Studies on co-morbidities such as diabetes and other high risk factors such as NCDs, smoking, alcohol to share research for policy action.
- Research studies on re-structuring of health system post reform and impact on disease control programme.
- Conducting capacity building for operational research in both countries organised in India by Union for people involved with the implementation of TB control programme. Such programmes reduce the requirement for accessing separate grants for conducting operational research.
- Research collaborations, student exchanges, faculty exchanges and meetings through own institutional funding and though international funding.
- Developing large bodies of collaborative systematic review research through internal funding so as to easily avail international grants for collaborative work

The two day dialogue came to an end with a vote of thanks by the organisers to all participants from China and India who made the dialogue engaging.