

Changing tuberculosis trends in Nepal in the period 2001-2008

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ABSTRACT

To assess the trends on indicators of TB control in Nepal over a period from 2001-2008. Retrospective analysis of information from Annual Reports of NTP, Nepal from 2001-2008. The incidence of New Smear Positive (NSP) TB declined from 58.9 in 2001 to 53.4 in 2006 per 100000 populations then reversed in the period 2006-2008. This TB incidence decreased in males and the age group <45 years (except 0-14 years). The notification rate of all cases of TB declined by 3 % overall over the entire period from 2001 to 2008. Mortality among smear negative and extra pulmonary declined significantly. The failure rate and defaulter rate were declined significantly and the case detection rate (CDR) was increased significantly within the study period. Increasing trend in CDR, Treatment success rate and decreasing trend in failure rate, defaulter rate are the evidence of progress of NTP, in Nepal. Since there is reversal of incidence of NSP from 2006, a detailed analysis of existing TB control measures is required. If the success is continued and quality care is provided as per International Standard of TB Care, the Millennium Development Goals will be an achievable target.

Keywords: Tuberculosis, trend, indicators of TB.

INTRODUCTION

Nepal is situated between India and China. It has an estimated population of above 26 million.¹ Tuberculosis (TB) is still a potential threat to public health, and it requires close epidemiological surveillance at national and international levels to ensure efficient control of the disease. It still remains one of the major public health problems in Nepal. Health services for TB are provided by Government of Nepal's Basic Health Services, Private sectors and international or national non governmental organizations. While TB is a serious problem in low and middle income group in this country,² Nepal is working for the control of the disease by launching National TB Control Programme in 1965 and adopted DOTS strategy in 1996. By the year 2001 DOTS based TB control services were provided in all the 75 districts of the country. Government of Nepal is committed to fight against TB and it has given the status of priority for this programme. There is commitment from different donors to support New Stop TB strategy, which has been adopted by the programme in 2006 in order to provide more comprehensive TB control measures. The Programme has achieved both the global target of tuberculosis as 70.0% case detection and treatment success rate of 88.0%.³ Multi Drug Resistant TB management programme has been launched subsequently in 2005, which is considered a global model for ambulatory treatment. However, there are several critical challenges and issues which need to be

addressed to move towards the achievement of Millennium Development Goals (MDG) goals.

Among the SAARC Member States (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka), Nepal is not ranked as High Burden Country by WHO.⁴ However, according to TB control programme of Nepal, about 50.0% population is infected with TB, of which 60.0% are adult. Every year, 21,827 smear positive infectious TB incidence cases are expected to rise in the country. Although introduction of DOTS has already reduced the numbers of deaths, however 5,000 to 7,000 people still continue to die each year.³

Now that tuberculosis control programmes are being urged to assess progress towards the MDG,⁵ our aim is to provide some insight information in this regard by assessing the trends of TB indicators in Nepal from 2001 to 2008 which might help to identify the factors that need to address to meet MDG within specific timeframe.

MATERIALS AND METHOD

National Tuberculosis Centre (NTC) is the single unit situated in Bhaktapur district, which is dealing exclusively with TB Control Programme of Nepal. Annual reports of TB Control Programme have been published since its inception. A retrospective analysis was conducted on routine programme data in annual reports of the programme from 2000/2001 to 2007/08.

Table-1: TB (all forms) incidence by region, Nepal, 2001 and 2008

	2001		2008		Variation trend	
	TB incidence		TB incidence			
Region	n (%)	Rate*	n(%)	Rate	Overall** trend	annual# mean
Eastern	6577(21.7)	122	6208(18.5)	103	-16	-2
Central	11458(37.8)	142	13725(41.0)	151	6	1
Western	5461(18.0)	119	5815(17.4)	109	-8	-1
Midwestern	4538(14.9)	150	4871(14.5)	143	-5	-1
Far western	2241(7.4)	101	2800(8.3)	112	11	2
Total	30275(100)	123	33419(100)	127	3	

Source: Annual report of NTP, Nepal (2001-2008)

* per 100 000 population

** $IR_i - IR_q / IR_q$, where IR_i = incidence rate in the last year and IR_q = incidence rate of the reference year

$(IR_i - IR_q) / n - 1$, where n = total number of years of the period

Because this was a record based retrospective study, ethical approval was not required.

The National Tuberculosis Programme policy is to provide with free diagnostic and treatment services to all TB patients registered in the programme. All compliance of treatment is directly observed by trained and regularly supervised health workers or volunteers. The sputum smear microscopy remains the key tool for diagnosis of infectious tuberculosis. There are currently 427 microscopy centers offering smear microscopy services, among these 354 operates within Government Health system, 49 through partner NGOs and 24 in private sector.³

The NTP maintains a regular reporting system on case

finding, sputum conversion, treatment outcomes from all levels of the programme by trimester. Data was compiled and published in annual report.

Indicators of TB control such as incidence of New Smear Positive (NSP), case finding of new smear positive, and treatment outcomes were assessed. In addition, patients, age and sex distribution among smear positive cases and mortality trend for different types of TB cases were analyzed after notification.

For the calculation of incidence rate, newly registered sputum smear positive cases were included and for mortality rate all tuberculosis deaths amongst registered TB cases were included. Since national vital registration system for death showing the cause of death is not properly maintained in country, death recorded in TB register is taken as source of mortality data for TB. Relapse cases do not include defaulters or failure cases. Population denominator data were obtained from Annual reports itself which presented on the basis of growth rate provided by Bureau of Statistic, Government of Nepal. Statistical package SPSS-12 version for windows 95.7.5 was used for different analysis.

RESULTS

The incidence of smear positive tuberculosis was 58.9/100 000 in 2001. The average annual rate of decline was 2.0%

Table-2: Age distribution of New Smear positive cases in Nepal (2001-2007)

Age-Years	0-14		15-24		25-34		35-44		45-54		55-64		65+	
	n (%)	Rate*	n (%)	Rate*	n (%)	Rate*	n (%)	Rate*	n (%)	Rate*	n (%)	Rate*	n (%)	Rate*
2001	326 (2.4)	1.4	3252(23.8)	14.0	2769(20.3)	11.9	2581(18.9)	11.1	2064(15.1)	8.9	1675(12.3)	7.2	997(7.3)	4.3
2002	331(2.4)	1.5	3183(23.2)	14.0	2748(20.0)	12.1	2482(18.1)	10.9	2123(15.5)	9.3	1891(13.8)	8.3	956(7.0)	4.2
2003	311(2.2)	1.3	3322(23.2)	13.9	2765(19.3)	11.5	2492(17.4)	10.4	2378(16.6)	9.9	2125(14.8)	8.9	955(6.7)	4.0
2004	309(2.1)	1.3	3273(22.4)	13.4	2887(19.8)	11.8	2501(17.1)	10.2	2387(16.3)	9.7	2279(15.6)	9.3	978(6.7)	4.0
2005	343(2.3)	1.4	3154(21.5)	12.5	2796(19.1)	11.1	2519(17.2)	10.0	2464(16.8)	9.8	2294(15.7)	9.1	1088(7.4)	4.3
2006	304(2.2)	1.2	3078(21.9)	12.0	2652(18.9)	10.3	2428(17.3)	9.5	2302(16.4)	9.0	2214(15.8)	8.6	1051(7.5)	4.1
2007	325(2.3)	1.2	3174(22.1)	12.1	2618(18.2)	10.0	2429(16.9)	9.2	2339(16.3)	8.9	2293(16.0)	8.7	1177(8.2)	4.5
Total	2249(2.3)	1.3	22436(22.6)	13.1	19235(19.4)	11.2	17432(17.5)	10.2	16057(16.2)	9.4	14771(14.9)	8.6	7202(7.2)	4.2

Age group	0-14	15-24	25-34	35-44	45-54	55-64	65+
% Total**	-14	-14	-16	-17	0	21	5 %
annual mean**	-2	-2	-3	-3		4	1
Z value	0.55	3.38	4.45	4.36	-2.76	-8.91	-2.81

Table-3: Sex Distribution of New Smear positive cases (2001-2008)

Year	Male		Female	
	n. (%)	Rate/lakh	n. (%)	Rate/lakh
2001	9130 (66.8)	39.3	4534(33.2)	19.5
2002	9304(67.8)	40.9	4410(32.2)	19.4
2003	9581(66.8)	39.9	4767(33.2)	19.9
2004	9725(66.5)	39.7	4889(33.5)	19.9
2005	9886(67.4)	39.1	4772(32.6)	18.9
2006	9522(67.8)	37.1	4507(32.1)	17.6
2007	9756(67.9)	37.1	4599(32.0)	17.5
2008	10088(68.9)	38.4	4552(31.1)	17.3
Total	77292	39.1	37030	18.7
Decline % total	Male -2		Female -11	
% Annual Mean	-0		-2	

from 2001 to 2006, with a slight rise of 2.0% per year from 2006 to 2008. In comparing the incidence of New Smear positive TB with Gross Domestic Product (GDP) growth of Nepal⁶ till 2006, along with decline of GDP growth from 2001 to 2005, the incidence decrease, thereafter both increased (Fig 1 and 2).

The incidence rates of all forms of TB were reported highest in mid-western region and lowest in far western region in 2001, whereas in 2008 highest in central and lowest in eastern region of Nepal. A decline was reported

in eastern region (16.0% overall and 2.0% annually), in western region (8.0% overall and 1.0% annually) and in mid-western region (5.0% overall and 1.0% annually), where as in other regions the incidence was increasing, with a highest incline in far western region (11.0% overall and 2.0% annum) in the period from 2001 to 2008 (Table-1).

The trend in notification rates of all cases and different types of TB is demonstrated in Fig. 3. The notification rate of all cases of TB declined from 130 in 2001 to 126 per 100000 populations in 2008, the overall decline was 3.0% over the entire period from 2001 to 2008. Similarly, the notification rate of smear negative cases declined from 39 in 2001 to 35 per 10000 populations with in this period. However notification rate of extra pulmonary TB cases increased from 21 to 25 per 100000 populations within 7 years gap.

The incidence of NSP TB showed significant declined in age groups before 45 except in 0-14 years, and significant increased after 54 age group over the period from 2001 to 2007. The greatest decrease occurred in the age group 35-44 years (17.0% overall and 3.0% annually), while in young age group 0-14 years there was a decrease of 14.0% overall and 2.1% annually. In every year it showed that an incidence is peak among 15-24 age groups followed by 25-34 age groups (Table-2).

In males, the annual incidence of smear positive tuberculosis decreased from 39.3 in 2001 to 38.4/100000 in 2008 at a rate of 2.0% overall. In females, the

Table-4: Mortality among tuberculosis patients registered in NTP, Nepal

Years	New Smear Positive		Smear Negative		Extra Pulmonary		Relapse		Failure		Return after default (RAD)	
	No. Regd	No Died	No. Regd	No Died	No. Regd	No Died	No. Regd	No Died	No. Regd	No Died	No. Regd	No Died
2001	13579	636	8907	501	4848	202	1798	107	237	19	517	43
		4.6 %		5.6%		4.2%		5.9%		8%		8.3%
2002	13669	739	9496	494	5185	201	1898	124	300	22	465	37
		5.4 %		5.2%		3.8%		6.5%		7.3%		7.9%
2003	14288	784	8786	543	5555	232	2052	160	293	26	395	36
		5.5 %		6.2%		4.2%		7.8%		8.9%		9.10%
2004	14554	776	8903	504	6268	273	2065	121	426	28	361	32
		5.3 %		5.6%		4.3%		5.8%		6.5%		6.4%
2005	14625	755	9489	539	6999	253	2341	130	316	28	312	29
		5.1%		5.7%		3.6%		5.5%		8.9%		9.3%
2006	14028	653	9170	438	7089	275	2383	128	285	21	252	24
		4.6 %		4.8%		3.9%		5.4%		7.4%		8.3%
2007	14355	652	9350	374	6986	214	2249	109	230	16	269	21
		5.0 %		4.0%		3.0%		4.8%		6.9%		7.8%

Z value 0.78(P=0.21) 6.24 (P=<0.05) 1.70 (P=0.04) 1.54 (P=0.06) 1.31 (P=0.09) 0.58 (P=0.28)

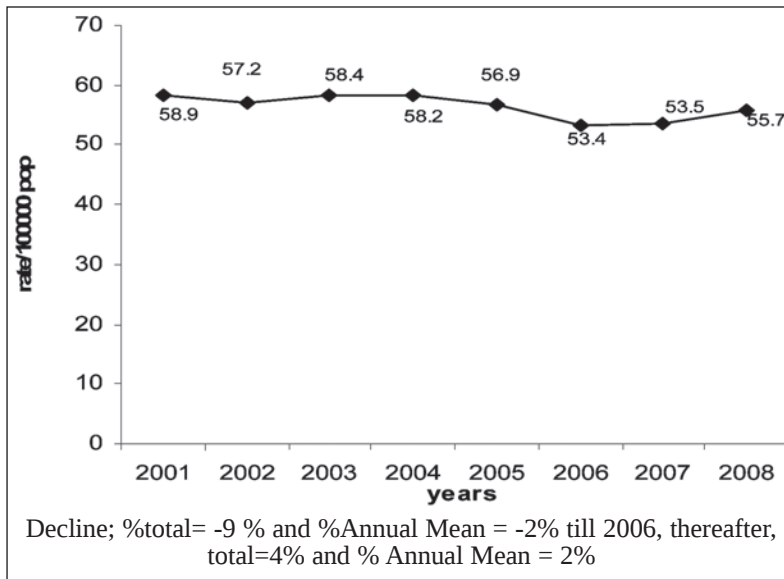


Fig. 1. Trend of incidence of new smear positive TB cases, 2001-2008

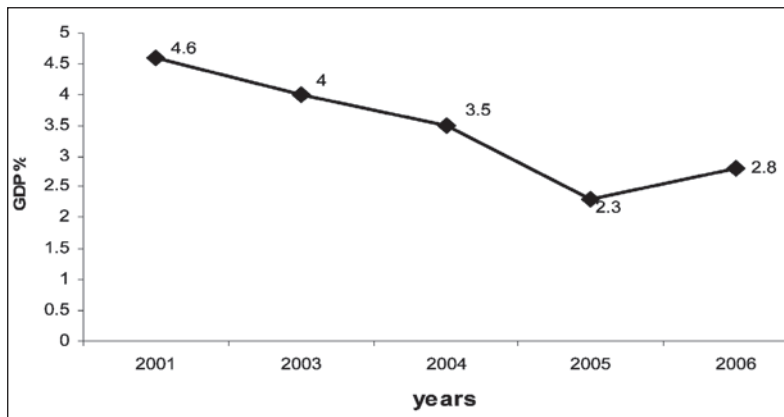


Fig. 2. Trend of real GDP growth, Nepal, 2001-2006

corresponding values were 19.5 and 17.3 with an annual decrease of 2.0% (Table-3).

The mortality trend among different types of TB showed increasing trend till 2003, then start decreasing till 2007. Among smear negative tuberculosis there was significant decline ($Z=6.24$, $p<0.05$), and also among extra pulmonary ($Z=1.70$, $p=0.04$), whereas among new smear positive the decline was not significant (Table-4).

On the analysis of data on adverse treatment outcomes of New smear positive tuberculosis, it showed that the failure rate and defaulter rate decreased significantly in the period from 2000 to 2007, while transfer out rate increased insignificantly in this period (Fig. 4).

Treatment success rate ranged between 87% in 2000 and 88% in 2007. Case detection rate ranged between 67.0% in 2000 and 72.0% in 2008. Regarding case

detection rate there was significant rise over the period from 2000 to 2008 ($Z=10.48$, $p<0.05$) (Fig. 5).

DISCUSSION

Nepal is a country faced with many challenges including poverty, illiteracy and political instability. Despite these problems NTP, Nepal has made considerable success over the past years. This is due to strong political commitment of the government of Nepal and the priority given to TB control. Similarly, the TB project study in Bangladesh⁷ showed considerable success due to strong political commitment of the government of Bangladesh.

The current trend of tuberculosis in Nepal is promising based on a detection rate in 2008 of 72.0% and treatment success rate of 88.0% with some challenges to TB control.

The incidence of New Smear Positive (NSP) tuberculosis in Nepal showed a steady decline till 2006 and thereafter increases and reached to 55.7 per 100000 populations in 2008, whereas in neighboring countries like India⁸ showed slow inclination and in Pakistan⁹ there is steady inclination since 2001. Study regarding epidemiology of TB in Kuwait showed a steady decline from 1965 to 1989 and thereafter slight increase in the incidence till 1999.¹⁰ The slower decline

before 2006 and slow incline after 2006 in this study can be explained by multi-drug resistant and TB/HIV co-infection which are directly related to the resurgence of TB elsewhere in the world.¹¹

The overall incidence of all forms of TB, declined in all regions except in central and far western region, which

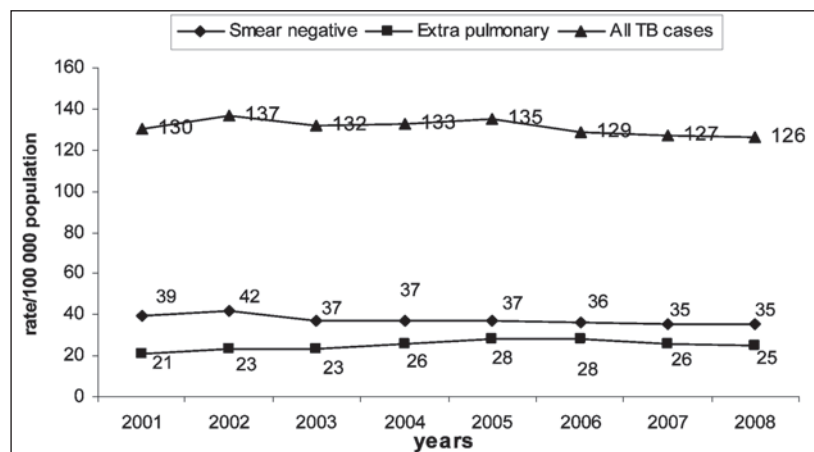


Fig. 3. Trend of notification of all and different types of TB cases, 2001-2008

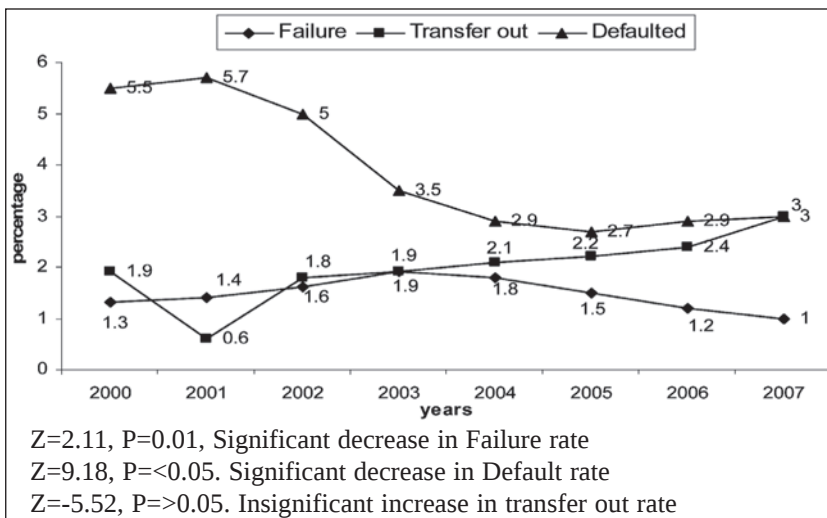


Fig. 4. Trend of adverse treatment outcomes among new smear positive TB cases, 2000-2007

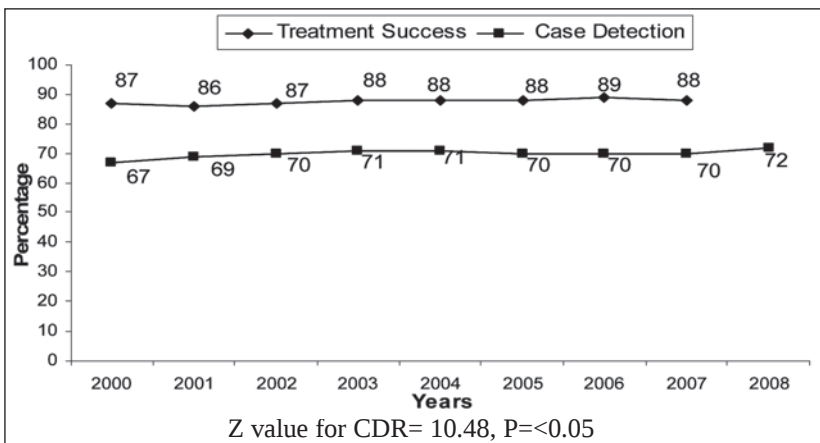


Fig. 5. Trend of treatment success and case detection rate (CDR), 2000-2008

might be due to increase accessibility and availability of health services in these areas. During the last 8 years, slower decline in TB of all forms and smear negative notifications have been observed, whereas notifications of extra pulmonary cases have been increased. Similar situation in relation to extra pulmonary cases observed in neighbor countries like India,⁸ Pakistan⁹ and Bangladesh.¹²

Though the incidence of NSP is highest among 15-24 years group in every year, the rate of occurrence of NSP in this age group is significantly decreasing with preceding years, while the occurrence of same is increasing among elderly group. If this occurrence is continued to be increased among elderly, it could be assured that there will be age shifting in relation to TB occurrence in future. While tuberculosis trend study in South India¹³ showed a decreasing trend in age group less than 35 years. Similar study in Cuba¹⁴ showed that there is decrease in incidence of NSP in all age group from 0-64 years. Males had consistently higher incidence than females with an average ratio of 2.05 for smear positive tuberculosis in this study; where as study in

South India¹² showed 4.5 average ratio for this group of tuberculosis.

Trend of mortality showed the significant decline among smear negative and extra pulmonary which is different from mortality trend study in Delhi,¹⁵ which showed a significant decline among new smear positive cases. Based on this information, we could state that NTP, Nepal needs to look into the factors that might help to bring about significant decline in mortality among NSP.

In analysis of adverse treatment outcomes among NSP, there is significant decline in failure rate and defaulter rate, similar findings in relation to default rate found in study in Delhi.¹⁵ This shows that treatment adherence is improving under the TB Control programme of Nepal.

Information in epidemiological trend in tuberculosis is of great importance for planning, monitoring and evaluating NTP. Increasing trend in case detection rate, treatment success rate and decreasing trend in failure rate, defaulter rate are the evidence of progress of TB control programme in Nepal. If the success is continued and

quality care is provided as per International standard of TB care of Stop TB Strategy, Millennium Development Goals will be an achievable target.

Since there is reversal of incidence of NSP from 2006, a detailed analysis of existing TB control measures is required. In conclusion though the TB control programme is successful, further progress is therefore necessary mitigating the problems for the TB control. In addition, NTP Nepal needs to tackle the increasing problems on HIV, MDR-TB, which may probably increase TB incidence in future, with scaling up the responses focusing the components of Stop TB strategy and cross border issues related to TB control as Nepal has open border with High Burden Country like India.

ACKNOWLEDGMENTS

The authors would like to thank all those working in National Tuberculosis Control Programme of Nepal.

REFERENCES

1. Central Bureau of Statistics, Kathmandu, Nepal. Statistical pocket book 2006.
2. World Health Organization. WHO report 2004. Global

- tuberculosis control-surveillance, planning, financing. WHO/HTM/TB/2004.331. Geneva, Switzerland:WHO, 2004.
3. Ministry of Health, Department of Health Services, National Tuberculosis Centre. Annual report of tuberculosis control programme, 2007/2008, Nepal.
 4. World Health Organization. Global tuberculosis control-epidemiology, strategy, financing. WHO/HTM/TB/2009. 411. Geneva: WHO, 2009.
 5. Bassili CD, Bierrenbach AL, Brockmans JF *et al.* Measuring tuberculosis burden, trends and the impact of control programmes. *Lancet* 2008; 8: 233-43.
 6. SAARC Human Resource development Centre, Islamabad, Pakistan. Database Profile on Macroeconomic and HRD indicators in the SAARC Region (1990-2006): 29.
 7. Kumaresan JA, Md. Ahsan Ali A K, Parkkali L M. Tuberculosis Control in Bangladesh: Success of the DOTS Strategy. *Int'l J Tuberc Lung Dis* 1998; 2: 992-8.
 8. Ministry of Health and Family welfare, Directorate General of Health Services, Central TB Division. RNTCP status report 2001-2008, India.
 9. Ministry of Health, Government of Pakistan, National TB Control Programme. Annual Report 2001-2007, Pakistan.
 10. Behbehani N, Abal A, Al-Shami A, Enarson A. Epidemiology of tuberculosis in Kuwait from 1995-1999. *Int'l J Tuberc Lung Dis* 2002; 6: 465-9.
 11. Porter JD, McAdam KP. The re-emergence of tuberculosis. *Annu Rev Public Health* 1994; 15: 303-23.
 12. Ministry of Health and Family welfare, Directorate General of Health Services, National Tuberculosis Control Programme. Tuberculosis control in Bangladesh, Annual Report 2001-2008.
 13. Radhakrishna S. Trends in the prevalence and incidence of tuberculosis in South India. *Int'l J Tuberc Lung Dis* 2001; 5: 142-57.
 14. Gonzalez E, Armas L, Lianes MJ. Progress towards tuberculosis elimination in Cuba. *Int J Tuberc Lung Dis*. 2007; 11: 405-11.
 15. Dhingra VK, Agarwal N, Chandra S, Vashist RP. Tuberculosis Mortality Trends in Delhi after Implementation of RNTCP. *Indian J Tuberc* 2009; 56: 77-81.