An Epidemiological Study of Sputum Positive TB Patients & Burden of Tuberculosis amongst their Contacts in East District of Sikkim

Forhad Akhtar Zaman[1], Vijay Kumar Mehta[2], Shraddha Deokota[3]

[1]Professor, Department of Community Medicine, [2]Dean, [3]Assistant Professor, Sikkim Manipal Institute of Medical Sciences, 5th Mile, Tadong, Gangtok, Sikkim

Abstract

Background- Tuberculosis (TB) is a major public health problem all over the world and more so in India as it reports the highest burden of TB (both Drug sensitive and Drug resistant TB) globally. The magnitude of TB in Sikkim is enormous as is evident by the number of cases being reported (275 per 100,000 population) which is higher than the national average. It is a known fact that one single active case of TB can infect about 10 to 15 persons in a year. Early identification of the contacts ensures a better chance at cure and also helps to reduce the transmission.

Materials and Method - It was a cross sectional study conducted among all the Sputum Positive cases of Tuberculosis and their household contacts in East District of Sikkim that were registered with RNTCP for the first and second quarters of the year 2017.

Results- A total of 55 sputum positive cases of Tuberculosis and 196 household contacts were included in the study. Nearly 60% of the index cases reported having cough for more than two weeks along with fever in the beginning of their illness. On assessment of the past medical history of the contacts, it was observed that 8 (4.08%) had a history of TB in past. Almost a quarter of the contacts spent all their time in the same room as the index cases, another quarter spent only night time in the same room while about 61(30%) spend only daytime in the same room as index cases. Among the contacts, 5 were referred for sputum microscopy out of which 1 was found to be positive and 1 was negative. The remaining 3 didn't get themselves tested.

Conclusions- With the burden of TB being highest in India and having a goal to end TB by 2025, a more active approach to diagnose TB among contacts is the need of the hour which can led to early treatment and cut down transmission among the contacts.

Key words- *sputum positive cases of Tuberculosis, Contacts*

Introduction

Tuberculosis (TB) is a major public health problem all over the world and more so in India as it reports the highest burden of TB (both Drug sensitive and Drug resistant TB) globally. In 2017, the estimated number of cases in India was reported to be 2.74 million accounting for about 27% of cases in the world.[1] While TB is both curable and preventable; it is still among the ten leading cause of death in the world accounting for 1.6 million deaths in 2017.[2]

The magnitude of TB in Sikkim is enormous as is evident by the number of cases being reported (275 per 100,000 population) which is higher than the national average of 247 per 100,000 population. In 2016, total number of cases that were notified from Sikkim was

Corresponding Author
Shraddha Deokota, MD
Assistant Professor, Department of Community Medicine, Sikkim Manipal Institute of Medical Sciences, 5th Mile, Tadong, Gangtok, Sikkim -737 102.
Ph. No. +91- 3592- 270294, 231137, Ext: (Office) 150
Fax No. +91 -3592-231496; Mobile: +91-9821293173
Email: shraddhadeokota@gmail.com

1539. Sikkim also reports a high number of MDR TB cases. [3]

TB is transmitted from person to person via droplet infection. It is a known fact that one single active case of TB can infect about 10 to 15 persons in a year. Therefore, the longer a case goes undetected, the more number of people they may infect.[4] Countries that have a high burden of TB report high prevalence of TB in contacts, particularly household members. Effective investigation and screening of such close contacts of TB cases will lead to early identification of a significant number of cases who can then be put on treatment. Early identification ensures a better chance at cure and also helps to reduce the transmission.[5] Many high income countries already have screening programmes for detection of TB in close contacts, however such a mechanism is often seen missing in the countries with highest TB burden.[5] Given the large burden of disease in the state of Sikkim, it is important to assess the burden of disease in the close contacts of an active TB case.

Aims and Objectives

The objective of this study was to assess the epidemiology of Sputum positive TB patients & the burden of Tuberculosis infection amongst their close contacts in the East district of Sikkim.

Materials and Method

It was a cross sectional study conducted among the Sputum Positive cases of Tuberculosis and their household contacts in East District of Sikkim. The study covered all the Sputum Positive cases of Tuberculosis and their close contacts (those sharing same household) that were registered with RNTCP for the first and second quarters of the year 2017. After obtaining the Institutional Ethics Committee clearance and permission from Govt. of Sikkim, the subjects fulfilling the inclusion criteria were first explained about the study in details and written informed consent of the subjects were taken. The study duration was for one year and a pre-designed questionnaire was used to collect information.

Two questionnaires were used: one for the sputum positive patient and another for the contacts. The questionnaire for the patient included information regarding their socio-demographic characteristics, details of household contacts, environmental sanitation, diagnostic and follow up investigations and treatment history. The second questionnaire for contacts collected information on whether they had experienced any symptoms of TB and their medical history. If the contact was found to have any symptom of TB, they were referred to the nearest designated microscopy centre to get their sputum tested and a chest x-ray was also done. The test results and whether or not treatment was started was also noted in the questionnaire. In case of paediatric contact, a history of Isoniazid prophylaxis was also taken.

In children up to 14 years of age, all eligible individuals were subjected to chest x-ray and the individuals showing signs and symptoms were further subjected to microbiological examination. For microbial confirmation, at least one positive sputum smear out of two was taken as a case. If sputum was not available or sputum microscopy failed to detect Acid Fast Bacilli then alternative specimen (like gastric lavage, induced sputum, broncho-alveolar lavage) was collected depending on feasibility and under the supervision of a paediatrician. Chest X-rays (PA view) were read by at least two experienced, independent and blinded readers. In case of discordant findings, the reading by a third expert reader was used.

All contacts regardless of their symptoms were given information on what to do if they developed any symptom.

After checking the questionnaire for completeness, the data was entered into a Microsoft Excel spread sheet and was analysed using SPSS version 20. Data was categorised and is presented in proportions.

ResultS

A total of 55 sputum positive cases of Tuberculosis and 196 household contacts were included in the study. Among the cases 23 (41.8%) were females while 32 (58.2%) were males, with 45.5% of them in the age group of 15 to 25 years.

Table 1: Socio-demographic characteristics of Index TB cases.

Age	**Male**	**Female**	**No (%)**
10-14	1	2	3 (5.45)
15-25	15	10	25 (45.46)
26-35	6	5	11 (20)
36-45	1	0	1 (1.82)
46-55	4	5	9 (16.36)
56-65	2	1	2 (3.64)
66-75	2	0	2 (3.64)
76-85	1	0	1 (1.82)
Religion			
Hindus	16	13	29 (52.73)
Buddhist	8	7	15 (27.73)
Christians	8	3	11 (20)
Educational status			
Graduate	0	1	1 (1.82)
HS	4	4	8 (14.55)
High School	11	6	17 (30.91)
Middle School	8	7	15 (27.27)
Primary School	6	3	9 (16.36)
Illiterate	3	2	5 (9.09)
Type of family			
Joint	9		9 (16.36)
Nuclear	40		40 (72.73)
Three Generation	6		6 (10.91)
Occupation			
Semi professional	2	2	4 (7.28)
Skilled	5	0	5 (9.09)
Unskilled	6	0	6 (10.91)
Unemployed/housewife	19	21	40 (72.73)

Nearly 60% of the cases reported having cough for more than two weeks along with fever in the beginning of their illness, while about 10% reported having only fever and 30% reported having fever with other symptoms of Tuberculosis. A known history of contact was present in 40% of the cases. Among the cases, 23.6% reported consumption of alcohol and smoking, 12.7% were only smokers and 7.3% used smokeless tobacco while 5.5% took only alcohol. On assessment of housing parameters it was found that nearly 13% of cases lived in a kaccha house while 30% had mixed housing. Majority (81%) had adequate ventilation while more than half (52.7%) had overcrowding in the house. About a quarter of the houses did not have a separate kitchen and indoor air pollution was present in nearly 31% of the houses. The initial approach to diagnosis had been x-ray examination in most of the cases (63.6%) and sputum examination in 36.3%.

Table 2: Distribution of the TB cases as per determinants of the treatment adherence & outcome

Motivation for taking treatment				
Who motivated for taking treatment		Total	%	
Health Worker		6	10.92	
House-hold member		44	80	
Neighbor		2	3.64	
Self		3	5.54	
Sex distribution of the time lag between onset of symptoms and treatment				
Time lag	**Sex**		**Total**	**%**
	Male (%)	**Female (%)**		
Within first 2 weeks	13 (40.63)	14 (60.87)	27	49.09
From 2 weeks to 1 month	9 (28.13)	3 (13.04)	12	21.81
From 1 month to 3 months	8 (25%)	4 (17.39)	12	21.81
More than 3 months	2 (6.25)	2 (8.69)	4	7.27
Sputum result at the end of treatment				
Sputum at the end of treatment		**Total**	**Percentage**	
Positive		0	0	
Negative		12	21.82	
Died		1	1.82	
Not Known		42	76.36	

Out of the total 196 contacts included in the study, 48.5% were male and 51.5% were female. Most (20.9%) of the contacts belonged to the age group of 16 to 25 years followed by 20.4% in the age group 36 to 45 years. Paediatric contacts amounted to 6.1% in 0 to 5 years age, 7.6% between 6 to 10 years and 11.2% in age group 11 to 15 years.

Table 3: TB Symptoms screening among the Household contacts

Symptoms of TB	Number (%)
Cough	3(1.53%)
If Yes, < 2 weeks	1(0.51%)
>2 weeks	2(1.02%)
Blood stained	0
Fever	2 (1.02%)
Noticeable loss of weight (> 3 kg in a month)	0
sweating at night for 3 or more weeks in the last 4 weeks	0
swelling and/or lumps on your neck, arm pits, or groin	0

On assessment of the past medical history of the contacts, it was observed that 8 (4.08%) had a history of TB in past. All of them had been tested for HIV and 1(1.02%) came out positive. Diabetes was reported by 3 (1.53%) contacts and 98 (50%) reported having hypertension. Almost a quarter of the contacts spent all their time in the same room as the index cases, another quarter spent only night time in the same room while about 61(30%) spend only daytime in the same room as index cases. Two contacts shared the bed with the cases and 46(23.5%) slept in the same room but did not share a bed. Most of the contacts 137(69.9%) had been living in the same house as the index cases for more than five years. Among the contacts, 5 qualified for referral after screening and were referred for sputum microscopy out of which 1 was found to be positive and 1 was negative but the remaining 3 didn't get themselves tested. Among the paediatric contacts, none was referred as none was found to be chest symptomatic after screening all of them. Among them, 6 had started Isoniazid preventive therapy (IPT), 4 had completed and 3 were yet to start IPT.

Discussion

The present study identified 55 index cases of Sputum Positive TB & 196 household contacts. Along with sharing the same living space, the burden of care for the sick often falls on the household members. This means prolonged periods of close contact, putting the contacts at potential risk for developing Tuberculosis themselves.

In the present study there more male cases as compared to females with most of them in the age between 15 to 25 years. The findings are similar to studies conducted in other parts of the country except a higher proportion of cases in the age group below 14 years (5.5%). This difference may be due to the higher burden of TB in the state of Sikkim as compared to other parts of the country. [3,6,7] Overcrowding is a known risk factor for spread of respiratory illnesses especially tuberculosis and the present study report that almost half of the cases live in overcrowded houses. [8] Similar findings are reported by Singh et al.[6] Known history of contact with tuberculosis was present in 40% of the cases in the present study meaning that the index cases themselves had been contacts of cases of TB. On screening the contacts for symptoms, the commonest was found to be cough followed by fever, other studies also report similar findings with cough and fever being reported more than other symptoms like night sweats, weight loss or any swelling.[6] Among contacts in this study, 4.1% had TB in the past which is higher than that reported by Singh et al (0.8%), Lee et al (2%) and Nair et al (3.1%), which could be due to the higher burden of TB in the state of Sikkim. [6,7,9] Diabetes was reported in 1.53% of the contacts, similar to Lee et al (1.1%), putting these contacts at a higher risk of developing TB as Diabetes Mellitus triples a person's risk for developing TB.[10]

Sevaraju et al conducted a multi-centric cohort study and identified that contacts with age between 6 to 15 years, who are males and have long exposure to index patient per day had higher risk for TB incidence.[11] Similar report is given by Singh et al that male contacts had higher risk for developing TB.[6] The current study reports that 70% of the contacts have been living in the same house as cases for 5 years, almost half are males and 40% belong to age group 15 to 45 years, putting them at a considerable risk for developing TB.

This study could identify 1(0.5%) contact having sputum smear positive tuberculosis, which is comparable to that reported by Thanh et al (0.4%) and less as compared to other studies like Singh et al (6.8%), Nair et al (4.2%), Gupta et al (1.15%) and Fox et al (3%).[6,7,12,13,14] The difference can be attributed to the difference in the process of identifying and screening the household contacts. Some studies have employed more vigorous methods like offering screening to all contacts (Nair et al), use of a prospective study design was also seen with multiple follow up as in Singh et al and Gupta et al while Thanh et al relied on a self-referral mechanism according to the symptoms of the contacts.

Conclusion

With the burden of TB being high in India and having a goal to end TB by 2025, a more active approach to diagnose TB among contacts is the need of the hour which can led to early diagnosis & treatment and therefore cut down transmission.

Ethical Clearance- Ethical clearance was taken from Institution Ethics Committee (IEC) of Sikkim Manipal Institute of Medical Sciences (SMIMS), Gangtok, Sikkim.

References

1. World Health Organisation. Global Tuberculosis Report. World Health Organisation; 2018, Pg- 8
2. World Health Organisation. Top 10 causes of death factsheet. World Health Organisation; 2018. [Internet] [Accessed on 2 October 2019] Available from : https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death
3. https://sikkim.gov.in/DepartmentsMenu/health-family-welfare department/National%20Health%20Mission/state-tb-control-society-rntcp
4. World Health Organisation. Tuberculosis factsheet. World Health Organisation; 2019. [Internet] [Accessed on 2 October 2019] Available from : https://www.who.int/news-room/fact-sheets/detail/tuberculosis
5. World Health Organisation. Tuberculosis: Contact investigation. World Health Organisation;2019[Internet] [Accessed on 5th October 2019] Available from: https://www.who.int/tb/areas-of-work/laboratory/contact-investigation/en/
6. Singh J, Sankar MM, Kumar S, Gopinath K, Singh N, et al. Incidence and Prevalence of Tuberculosis among Household Contacts of Pulmonary Tuberculosis Patients in a Peri-Urban Population of South Delhi, India. PLoS ONE . 2013 Jul 26. 8(7): e69730. doi:10.1371/journal.pone.0069730
7. Nair D, Rajshekhar N, Klinton J S, Watson B, Velayutham B, Tripathy J P et al. Household Contact Screening and Yield of Tuberculosis Cases —A Clinic Based Study in Chennai, South India. PLoS ONE. 2016 Sep 1; 11(9): e0162090. doi:10.1371/journal. pone.0162090
8. Lienhardt C. From Exposure to Disease: The Role of Environmental Factors in Susceptibility to and Development of Tuberculosis. Epidemiol Rev. 2001; 23(2): 288-301
9. Lee MSN, Leung CC, Kam KM, Wong MY, Leung MCM, Tam CM et al. Early and late tuberculosis risks among close contacts in Hong Kong. Int J Tuberc Lung Dis. 2007 Nov 7; 12(3):281–287
10. World Health Organisation. Tuberculosis and Diabetes. 2019; [Internet] [Accessed on 3 October 2019] Available from https://www.who.int/tb/publications/diabetes_tb.pdf?ua=1
11. Sevaraju S, Thiruvenkadam K, Paradkar M, Marinaik S, Bharadwaj R, Rajagopalan S et al. Incidence of Tuberculosis disease among Household Contacts of Adult Pulmonary Tuberculosis Patients in India-CTRIUMPH A Multi Centric Cohort Study.
12. Thanh THT, Ngoc SD, Viet NN, Van HN, Horby P, Cobelens FGJ et al. A household survey on screening practices of household contacts of smear positive tuberculosis patients in Vietnam. BMC Public Health. 2014; 14:713
13. Gupta M, Saibannavar AA, Kumar V. Household symptomatic contact screening of newly diagnosed sputum smears positive tuberculosis patients

- An effective case detection tool. Lung India 2016;33:159-62

14. 1Fox GJ, Barry SE, Britton WJ and Marks GB. Contact investigation for tuberculosis: a systematic review and meta-analysis. Eur Respir J. 2013; 41: 140-56.