

## Preventive Practices of Tuberculosis Patients in a Municipality of Chitwan District, Nepal

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### ABSTRACT

**Background:** Tuberculosis (TB) is one of the top 10 causes of death worldwide and sixth leading cause of death in Nepal. Preventing new infections of Mycobacterium tuberculosis is crucial to reduce TB burden and death. The source of infection is an open (sputum positive) case of pulmonary tuberculosis. Poor management of TB-related waste like disposal of sputum by patients has been reported as a risk factor for increasing susceptibility to active TB infection. The present study was undertaken to assess preventive measures practiced by TB patients. **Methods:** A cross-sectional study was conducted among 82 tuberculosis patients who visited the five different DOTs centres of Bharatpur Municipality of Chitwan district, Nepal during December 2016 to February 2017. To find the association between variables chi-square test was used. P-value less than 0.05 were considered as statistically significant. **Results:** The Mean  $\pm$  SD of age of patients was 37.02 $\pm$ 18.90 years. 67.10% of the patients received health education on preventive measures. 59.8% of the respondents had good practice on prevention measures of TB. Only 3.70% used burning method for the sputum disposal after diagnosis of TB. None of the respondents used boiling method for the disposal of sputum. Among all only 6% practiced safe method of sputum disposal. The statistically significant variables with health education were preventive measures like self isolation ( $\chi^2=7.54$ ,  $p=0.006$ ), covering face while coughing and sneezing ( $\chi^2=4.113$ ,  $p=0.043$ ) and keeping surrounding clean ( $\chi^2=7.880$ ,  $p=0.005$ ). **Conclusions:** Patients and family members should be well educated on practicing different preventive measures by further strengthening the preventive measure strategy in the transmission of tuberculosis if we envisioned to end TB by 2035.

**Keywords:** health education; preventive measures; preventive practices; sputum disposal; tuberculosis.

### INTRODUCTION

Tuberculosis (TB) is one of the top 10 causes of death worldwide and sixth leading cause of death in Nepal among which more than 95% of TB deaths occur in low- and middle-income countries.<sup>1,2</sup> Preventing new infections of Mycobacterium tuberculosis as well as their progression to active TB disease is crucial to reduce TB burden and death which is envisioned in the National Tuberculosis Programme of Nepal.<sup>3</sup> The source of infection is an open (sputum positive) case of pulmonary tuberculosis and it has been estimated that a cough can generate 3000 droplet nuclei which can be released during normal activities like talking or spontaneously during breathing.<sup>4</sup> People with active TB can infect 10–15 other people through close contact over the course of a year.<sup>1</sup> Poor management of TB-related waste has been reported as a risk factor for increasing susceptibility to active TB infection.<sup>5–8</sup> The transmission of Pulmonary Tuberculosis (PTB) is attributed to indiscriminate disposal of sputum by

patients.<sup>9</sup> Also, it is important that the TB patient have the crucial knowledge regarding the mode of spread of disease, hazards faulty way of coughing and indiscriminate sputum disposal at home as well as in community.<sup>10</sup> Recommendations have been made concerning safe sputum disposal techniques for health care and domiciliary contexts.<sup>11,12</sup>

To prevent the transmission of the disease it is important to know the preventive practices not only at healthcare but at patient level too. Therefore, the present study was undertaken to assess preventive measures practiced by TB patients.

### METHODS

A cross-sectional study was conducted on tuberculosis patients visiting the five different DOTs centres of Bharatpur Municipality of Chitwan district, Nepal during December 2016 to February 2017. Sample size was determined by using the formula. The prevalence of all types of tuberculosis

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cases in Nepal is 2.41%.<sup>13</sup> So, considering  $p=0.0241$  and  $q=0.9759$ . The z-score value at 95% Confidence interval is 1.96. The desirable error was 4%, the required minimum sample size of this study was 57, and including 10% non-response error the sample size was 82. Non-probability (convenient) sampling technique was used to collect the data. The total of 82 patients who visited these DOTS clinic during the study duration were enrolled in the study. Ethical approval was taken from Institutional Review Committee of College of Medical Sciences and written permission was sought from District Public Health Office, Chitwan, Nepal. Written informed consent was taken from all the respondents and in case of minors (<16 years old) it was taken from the parent/legal guardian. Questionnaire method was used to collect the data from the patients. Safe disposal of sputum was considered on those patient who received sputum in gauze or paper handkerchiefs and best destroyed by burning, or if considerable amount best destroyed by methods like boiling, autoclaving or by using 5% cresol.<sup>14</sup> The collected data was first checked for completeness and consistency. Different variables were coded and entered in Epi Data 3.1 and analysed by using SPSS version 16 software. The entered data were cleaned and edited before subsequent analysis. To find the significant association between categorical variables, chi-square test was used. P-value less than 0.05 were considered as statistically significant.

## RESULTS

Out of the 82 patients, 38 (53.70%) were male and remaining 44 (41.50%) were female, male is to female ratio was 0.8:1. The range of age of respondents was from 4 years to 77 years. The Mean  $\pm$  SD of age of study patients was  $37.02 \pm 18.90$  years. About 37 (45.1%) were in the age group of 20 to 40 years, followed by 15 (18.3%) in 40 to 60 years, and 14 (17.1%) were 60 to 80 years age group. 48 (58.50%) were from nuclear families and 34 (41.50%) were from joint families. Regarding educational status, 29 (35.40%) were illiterate and 53 (64.60%) were literate. Regarding occupation maximum patients i.e. 28 (34.10%) were house workers, 17 (20.70%) were students, 14 (17.10%) were involved in service and 13 (15.9%) were into farming. Maximum 65 (79.30%) were Hindus by religion followed by Buddhists 14 (17.10%) and 2 (2.40%) were Christians. Most of the patients were single 56 (68.30%) and 22 (26.80%) were married. According to the income level, 36 (43.90%) earned monthly between ten thousand to twenty thousand NRs only few 2 (2.40%) earned 30 to 40 thousand NRs (Table 1).

**Table 1. Socio-demographic characteristics of the study patients. (n=82)**

Characteristics	Frequency	Percentage
<b>Age (Years)</b>		
<20	16	19.5%
20-40	37	45.2%
40-60	15	18.3%
60-80	14	17.1%
Mean $\pm$ SD	(37.02 $\pm$ 18.90) years	
<b>Gender</b>		
Male	38	46.3%
Female	44	53.70%
<b>Type of family</b>		
Nuclear	48	58.50%
Joint	34	41.50%
<b>Educational status</b>		
Illiterate	29	35.40%
Literate	53	64.60%
<b>Occupation</b>		
Farming	13	15.90%
Service	14	17.10%
Business	9	11%
House worker	28	34.10%
Social service	1	1.20%
Students	17	20.70%
<b>Religion</b>		
Buddhist	14	17.10%
Christian	2	2.40%
Hindu	65	79.30%
Not know	1	1.20%
<b>Marital status</b>		
Single	56	68.30%
Married	22	26.80%
Divorce	1	1.20%
Widow	3	3.70%
<b>Income</b>		
<10000	21	25.60%
10000 to 20000	36	43.90%
20000 to 30000	16	19.50%
30000 to 40000	2	2.40%
>40000	7	8.50%

68 (83%) were in category I of DOTs treatment whereas 14 (17%) were in category II. History of TB in family was not present in 64 (78%) while 18 (22%) patients had the history of TB in the family. Likewise, 55 (67.10%) had received health education on preventive measures while 27 (32.90%) had not received health education on preventive measures of TB (Table 2).

Characteristics	Frequency	Percentage
<b>DOTS category I</b>	68	83%
Category II	14	17%
<b>History of TB in family</b>		
Yes	18	22%
No	64	78%
<b>Have you received health education on preventive measure</b>		
Yes	55	67.10%
No	27	32.90%

Practice of all preventive measures were found more in literate than illiterate, and more in patients

who received health education than who did not. Regarding use of separate utensil majority patients 56.1% of study patients used separate utensils. Self isolation was practiced by 45.1% of patients and was significantly associated with receiving health education (p= 0.006). Majority of patients used mask (73.2%) and covered their face while coughing and sneezing (78%) which was significantly associated with receiving health education (p= 0.043). Likewise, 45.1% of patients used any method of sputum disposal. About 62.2% patients kept their surrounding clean which was significantly associated with educational status (p= 0.001) and receiving health education (p= 0.005). Screening of contact and family members was done by only 9.8% patients. About 3.7% of people did not practice any of the preventive measures at all. Males practiced all types of preventive measures more than females, except keeping surrounding clean was practiced equally by females (63.6%) than males (60.5%) (Table 3).

The levels of practice of preventive behaviour towards TB were assessed using 7 questions. The types of questions were “Yes”, “No”. Correct answer was coded as One while the incorrect answer was Zero. The total score was 7. The mean (±standard deviation) of the cumulative scores on

Characteristics	Sex		Educational Status		Health Education Received		Total n(%)
	Male	Female	Literate	Illiterate	Yes	No	
Use of separate utensil	24(63.2%)	22(50%)	29(54.7%)	17(58.6%)	30 (20.7%)	16(59.3%)	46(56.1%)
Self-isolation	20(52.6%)	17(60%)	20(37.7%)	17(58.6%)	19 (34.5%)	18(66.7%)	37(45.1%)
	$\chi^2 = 7.54, p = 0.006$						
Use of mask	31(81.4%)	29(65.9%)	40(75.5%)	20(68.9%)	42 (76.4%)	18(66.7%)	60(73.2%)
Covering face while coughing and sneezing	31(81.6%)	33(75%)	45(84.9%)	19(65.5%)	43 (78.2%)	21(77.8%)	64(78.0%)
	$\chi^2 = 4.113, p = 0.043$						
Using any method of sputum disposal	20(52.6%)	17(38.6%)	22(41.5%)	15(51.7%)	22(40%)	15(55.5%)	37(45.1%)
Keeping your surrounding clean	23(60.5%)	28(63.6%)	40 (75.5%)	11(37.9%)	40(72.7%)	11(3.7%)	51(62.2%)
	$\chi^2 = 11.235, p = 0.001$				$\chi^2 = 7.880, p = 0.005$		
Screening of contact and family members	2(5.3%)	6(13.6%)	7(13.2%)	1(3.4%)	6(10.9%)	2(7.4%)	8(9.8%)
Do not practice	1(2.6%)	2(4.5%)	2(3.8%)	1(3.4%)	3(5.5%)	0(0.0%)	3(3.7%)
Do not know	0(0.0%)	2(4.5%)	1(1.9%)	1 (3.4%)	1(1.8%)	1(3.7%)	2(2.5%)

practice of preventive measures of TB was 3.69 ( $\pm 1.65$ ). The mean was therefore used as the cut-off for good and poor on practice of preventive behaviour on TB. Thus, 49 (59.8%) of the respondents had good practice on prevention measures of TB while 33 (40.2%) of the respondents had poor practice on preventive measures of TB (Figure 1). Before being diagnosed as a case of TB, 45.1% of patients disposed sputum

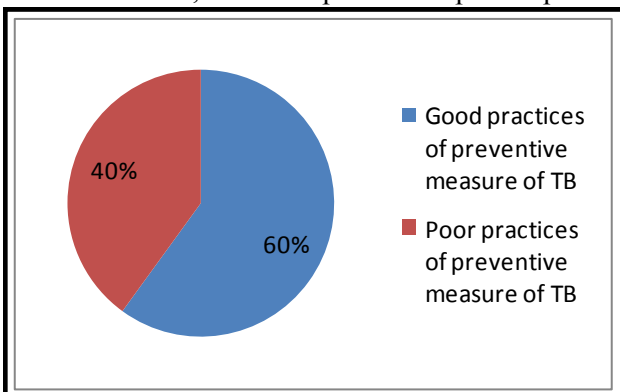


Figure 1. The proportion of respondents with good and poor practice of preventive measures of TB.

by indiscriminate spitting and 30.5% by disposing in dustbin. Also, 15.9% females used paper/handkerchief and 7.9% males used paper/handkerchief. Also, 13.63% females disposed in toilets and basins while only 5.26% males did so (Table 4).

After diagnosis of TB, about 45.1% patients disposed sputum in dustbin which were more in males (52.6%) than females (38.6%). And 12.2% patients used paper or handkerchief. Burying of sputum was done by 9.8% where females were more (11.4%) than males (7.9%). Similarly, indiscriminate spitting was done by only 6.1% patients. Safe methods of sputum disposal like burning was practiced by only 3.7% of patients, pouring boiled water in container was practiced by only 2.4% of patients. And 1.2% of patients used 5% cresol to destroy sputum. Whereas none of the patients disposed sputum by boiling method (Table 5). Only 6% of tuberculosis patients practiced safe methods of sputum disposal, remaining 94% of study patients were found to practice unsafe methods of sputum disposal (Figure 2).

Table 4. Method of sputum disposal before diagnosis of TB. (n=82)

Characteristics	Male		Female		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Indiscriminate spitting	19	50%	18	40.90%	37	45.10%
Using paper/handkerchief	3	7.90%	7	15.90%	10	12.20%
Disposing in dustbin	13	34.20%	12	27.30%	25	30.50%
Others (toilet/ basin)	2	5.26%	6	13.63%	8	9.75%

Table 5. Method of sputum disposal after diagnosis of TB. (n=82)

Characteristics	Male		Female		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Indiscriminate spitting	2	5.30%	3	6.80%	5	6.10%
Using paper/handkerchief	5	13.20%	5	11.40%	10	12.20%
Disposing in dustbin	20	52.60%	17	38.60%	37	45.10%
Burning	2	5.30%	1	2.30%	3	3.70%
Boiling	0	0.00%	0	0.00%	0	0.00%
Pouring boiled water in container	1	2.60%	1	2.30%	2	2.40%
Burying	3	7.90%	5	11.40%	8	9.80%
Use of 5% cresol	0	0.00%	1	2.30%	1	1.20%
Others (toilet/ basin)	4	10.52%	7	15.90%	11	13.41%
Not applicable	6	15.78%	6	13.63%	12	14.6%

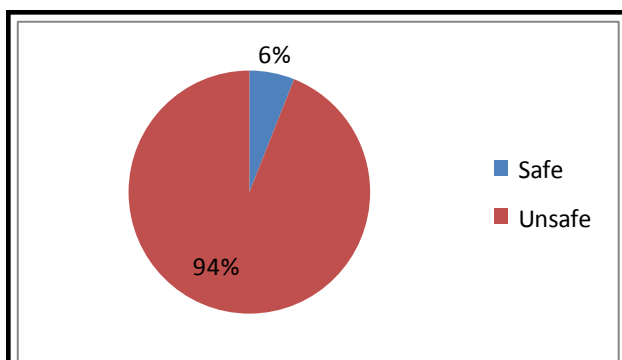


Figure 2. The proportion of respondents with safe and unsafe disposal of sputum. ( n=82)

Safe disposal of sputum was done more by males (60%) than females (40%), more by literate (60%) than illiterate (40%), more by house workers (60%) than other occupations (40%), more in patients without family history of TB 4 (80%) than patients who had history of TB in family 1(20%). Monthly income of more than 10,000 NRs patients were found to dispose sputum safely whereas none of them were found in <10,000 NRs income group. Among all patients who received health education only 3 (5.45%) practiced safe sputum disposal whereas remaining 52 (94.54%) practiced unsafe sputum disposal methods (Table 6).

Table 6. Sputum disposal practices. (n=82)

Category	Sputum disposal practices			
	Safe		Unsafe	
	Frequency	Percentage	Frequency	Percentage
<b>Sex</b>				
Male	3	7.9	35	92.1
Female	2	4.5	42	95.5
<b>Education</b>				
Literate	3	5.7	27	93.1
Illiterate	2	6.9	50	94.3
<b>Occupation</b>				
Farming	1	1.7	12	92.3
Service	-	-	14	100
Business	1	11.1	8	88.9
House worker	3	10.3	25	89.3
Social service	-	-	1	100
Other	-	-	7	100
<b>Monthly income of the family (NRs)</b>				
<10,000	-	-	21	100
10,000-20,000	3	8.3	33	91.7
20,000-30,000	1	6.2	15	93.8
30,000-40,000	-	-	2	100
>40,000	1	14.3	6	85.7
<b>History of tuberculosis in the family</b>				
Yes	1	5.6	17	94.4
No	4	6.2	60	93.8
<b>Received health education</b>				
Yes	3	5.45	52	94.54
No	2	7.4	25	92.6



**DISCUSSION**

In our study, we found that majority (45.2%) of the patients were in 20-40 years age group, ratio of male to female was 0.8:1, maximum patients were literate and most of them were house workers by occupation. In a study by Mei et al., the ratio of male to female patients was 2.36:1.<sup>15</sup> We found that 67.10% of patients had received health education on preventive measures of TB and 32.90% did not. Similarly, Mei et al., found 67.4% of patients received health education and 32.6% did not.<sup>15</sup>

It was observed in our study that majority of patients used mask (73.2%) and covered their face while coughing and sneezing (78%) which was significantly associated with receiving health education ( $p=0.043$ ). Similarly, a study by Shukla et al., also found 61% of the patients covered face while coughing/sneezing.<sup>16</sup> Another study by Yusuf also revealed that 93.8% of the respondents were covering mouth and nose when coughing or sneezing, whereas 78.1% kept face mask or paper tissue when they cough or sneeze.<sup>17</sup> Findings of this study showed that 46% of patients used separate utensils and 37% practiced self-isolation to prevent transmission of infection which was significantly associated with receiving health education ( $p=0.006$ ). F. M. Yusuf also found 77.6% respondents controlled private and personal utensils, drinking and eating equipment from droplet infection whereas 20.1% of the respondents practiced isolation of TB patients.<sup>17</sup> Also our study found that 62.2% of patients kept their surrounding clean and was significantly associated with receiving health education ( $p=0.005$ ).

In this study 59.8% of the respondents had good practice on preventive measures of TB while 40.2% of the respondents had poor practice on preventive behaviour on TB. Similarly, F. M. Yusuf showed 67.2% of the respondents had good practice on prevention behaviour on TB while 32.8% of the respondents had poor practice on preventive behaviour on TB.<sup>17</sup>

Our study showed before diagnosis of TB 45.1% of patients disposed sputum by indiscriminate spitting. Lin Mei et al., also found that maximum respondents spit casually before diagnosis of TB.<sup>15</sup> We found males and females almost equally spitted indiscriminately whereas A. Singh et al., found males spitted indiscriminately more as compared to females.<sup>18</sup>

Our study showed that after diagnosis of TB, indiscriminate spitting was done by only 6.1 % patients. These findings indicate that the number of patients who chose to spit casually decreased significantly before and after diagnosis of TB. About 45.1% patients disposed sputum in dustbin which were more in males (52.6%) than females (38.6%) whereas 12.2% patients used paper or handkerchief. Burying of sputum was done by 9.8% of patients where females were more (11.4%) than males (7.9%). Safe methods of sputum disposal like burning was practiced by only 3.7% of patients, pouring boiled water in container was practiced by only 2.4% of patients and 1.2% of patients used 5 % cresol to destroy sputum. None of the patients disposed sputum by boiling method. Similarly, Lin Mei et al., found sputum disposal method in the first month of treatment, 130 spit casually, 124 used a sputum cup, 37 chose to bury their sputum, 126 used a handkerchief to collect their sputum, 100 spit in a designated location, and 245 said they used other methods to dispose of their sputum or that they had no sputum.<sup>15</sup>

We found that only 6% of tuberculosis patients practiced safe methods of sputum disposal whereas A. Singh et al., found safe sputum disposal was practised by 46.4% of the study subjects.<sup>18</sup> Another study by D. C. Cheriamane et al., found 18% of patients followed correct sputum disposal method.<sup>10</sup> Another study by T. Rekha et al., found safe sputum disposal was practised by 49.5% of the study subjects.<sup>19</sup> Our study shows that safe disposal of sputum was done more by males (60%) than females (40%), more by literate 60% than illiterate (40%), more by house workers (60%) than other occupations (40%), more in patients without family history of TB (80%) than patients who had history of TB in family (20%). Whereas, T. Rekha et al., found more females than males disposed of sputum safely (61.8% vs. 38.2%), as did more subjects of low than middle socio-economic status (75% vs. 25%).

More subjects without a family history of TB (70% vs. 45%), and more literate than illiterate subjects (59% vs. 35.7%) practiced safe sputum disposal methods.<sup>19</sup> A. Singh et al., also found more females 70.4% than males 39.2% disposed sputum safely, as did more subjects of middle than low socio-economic status (74.1% vs. 22.2%). A 70.9% of the subjects with a family history of TB practiced safe sputum disposal methods as compared to 39.5% subjects without a family history of TB practiced the same. Similarly, more literate than illiterate

subjects (57.5% vs. 28.6%) practiced safe sputum disposal methods.<sup>18</sup> Lin Mei et al., found that 64.2% of men and 79.0% of women disposed of sputum correctly and by level of education who were more educated were more likely to dispose of sputum correctly.<sup>15</sup>

In our study among all patients who received health education only 5.45% practiced safe sputum disposal whereas remaining 94.54% practiced unsafe sputum disposal methods. Whereas Lin Mei et al found that among who received health education, 70.7% practiced correct method of disposal of sputum.<sup>15</sup>

This study was conducted only in DOTS centres of Bharatpur municipality, so these findings cannot be truly representative of entire population.

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## CONCLUSIONS

Therefore, to prevent transmission of TB in the community the patients and family members should be well educated on practicing different preventive measures. The preventive measures strategy in the transmission of tuberculosis needs to be further strengthened. Monitoring of preventive practices of these patients through DOTS should be given priority along with other integrated treatment and management strategy if we envisioned to end TB by 2035.

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