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Evaluation of Tuberculosis Treatment Compliance in Smokers and Non-Smokers in Bengaluru Region

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Abstract : Objectives: Tuberculosis (TB) is a foremost public health problem worldwide. In current years, increasing efforts have been devoted for assessing the health related quality of life of people infected with tuberculosis. The objective of study is to assess the tuberculosis treatment compliance in smokers and non-smokers in Bengaluru region.
Methods: TB patients meeting the inclusion criteria had enrolled for the study. The frequency and percentage of each parameter such as occupation, education, patient type, diagnosis, treatment, duration of hospitalization, abdominal pain and dizziness were evaluated.
Results: After the treatment of 3month, out of 300 patients 24 patients of smokers and 12 patients of non-smokers were suffered from abdominal pain and 8 patients of smokers and 24 patients of non-smokers were suffered from dizziness. The duration of hospitalization in smokers was 383 days whereas in non-smokers it was 115 days. Maximum numbers of TB patients were found to be unemployed in smokers than in non-smokers patients.In smoker group 82 patients have gotCAT-1 and 68 patients have gotCAT-2 treatment but in non-smoker group 129 patients were taken CAT-1 and 21 patients were received CAT-2 treatment.
Conclusion: The percentage of abdominal pain and dizziness, duration of hospitalization was seen more in smokers as compared to non-smokers. Percentage of education, occupation level and salary was found to be less in smokers than the non-smokers as it causes low hygienic and easy susceptibility to TB infection. Final diagnosis suggests that pulmonary TB was seen in smokers and extra pulmonary TB in non-smokers patients.
Keywords: Extra-pulmonary, Non-smokers, Pulmonary, Smokers and Tuberculosis.

Introduction:

Tuberculosis is one of the globally important health problems. India has the highest TB burden, accounting for 1.9 million cases of the 9.1 million cases of globally [1]. Smoking and tuberculosis are the two main issues of public well-being in developing countries. Tuberculosis is the disease primarily affetcs the lungs called as Pulmonary TB, but it can also affects other secondary sites such as brain, bones, lymph nodes and gastrointestinal tract known as Extra-pulmonary TB [2, 3].

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According to the World Health Organization, 8.6 million cases of TB were responsible for 1.3 million deaths in the year 2012. Every year near about 6 million deaths are due to smoking amongst which more than 600,000 are non-smokers who exposed to the smoke known as passive smokers. The statistics of smokers have been constantly increasing in both developing and developed countries during the last many decades, and smoking is associated with numerous diseases and health problems[4]. Various research studies suggest that smoking is an imperative risk factor for the development of TB. The possible mechanism of TB infection due to cigarette smoke includes; inactive natural killer cells, decreased alveolar macrophage activity, dysfunctional mucociliary clearance, immunosuppression of the pulmonary lymphocytes and dysfunctional pulmonary dendritic cells[5, 6].

The knowledge of relationship between smoking and TB is important because both smoking and TB cause extensive morbidity and mortality worldwide. As compared with people those who have never smoked, it is assessed that people who smokes have roughly twice risk of both active tuberculosis [7] and infection of *Mycobacterium tuberculosis*[8]. However, limited data is available on impact of smoking on treatment outcomes among active tuberculosis patients [9].

Therefore, this study was undertaken to assess the tuberculosis treatment compliance in smokers and non-smokers in Bengaluru region.

Methods

We made a retrospective case–control study with patients monitored for pulmonary tuberculosis in a TB department at Dr. B. R Ambedkar Medical College and Hospital located in a socioeconomically backward region of east Bengaluru. The total study duration was of 3 months and size of population was 300 male TB patients. The patients admitted in hospital were selected for the study according to the inclusion and exclusion criteria. We excluded patients in poor condition or malnourished, patients treated with steroids or immunosuppressive therapy and those with a history of respiratory diseases. The data were collected from the patient case sheets, TB card, treatment chart, by communicating with the physicians, nurses and by interacting with patients. The data were collected in the form of demography (education, occupation), habits, past medical history, reason for admission, symptoms, clinical data such as various laboratory reports and therapeutic data including time of administration and concomitant medication. This relevant data will be collected and documented in the suitably predesigned patient data collection form and quality of life from questionnaires. The collected data were then entered in Microsoft Excel®, tabulated and analysed by using Microsoft Excel. The frequency and percentage of each demographic parameter, including occupation, education, type of patient, diagnosis, treatment category, duration of hospitalization and symptoms like abdominal pain and dizziness were evaluated.

Result

The study was performed over a period of 6 months and a total of 300 TB patients were enrolled for the study.

Comparison of Percentage of Smokers and Non-smokers patients with Abdomen pain

Out of 300 patients 24 patients (16%) of smokers and 12 patients (8%) of non-smokers were suffering from abdominal pain**(Table 1)**.

Table 1: Percentage of Smokers and Non-Smokers in patient with abdominal pain

Parameters	**Smokers**	**% of Smokers**	**Non-Smokers**	**% of Non-Smokers**
Patients With pain	24	16%	12	8%
Patients without pain	126	84%	138	92%
Total no. of Patients	150	100%	150	100%

Table 2: Percentage of Smokers and Non-Smokers in patient with Dizziness

Parameters	**Smokers**	**% of Smokers**	**Non-Smokers**	**% of Non-Smokers**
Patients with Dizziness	8	5.4%	24	16%
Patients without	142	94.6%	126	84%
Total no. of Patients	150	100%	150	100%

Comparison of Percentage of Smokers and Non-smokers patients with Dizziness

Out of 300 patients 8 numbers (5.4%) of smokers and 24 numbers (16%) of non-smokers were suffered from dizziness**(Table 2)**.

Comparison of Hospitalization in Smokers and Non-smokers

Out of 300patients, duration of hospitalization in smokers were found to be 383 days (77%) whereas, in non-smokers it was found be 115 days (23%)**(Table 3)**.

Table 3: Duration of Hospitalization in Smokers and Non-smokers

Type	**No ofDays**	**% of Hospitalization**
Smokers	383	77%
Non- Smokers	115	23%

Table 4: Comparison of type of patient in Smokers and Non-Smokers

Type of Patients	**No. of Smokers**	**No. of Non-Smokers**
Failure	11	5
Default	30	14
Relapse	45	22
New Class	64	109
Total	150	150

Comparison of Types of patient in Smokers and Non-smokers

Out of 300 patients, in smokers 11 persons were failure, 30 persons were default, 45 persons were relapsed and 64 were having new class cases in therapy but in non-smokers 5 patients were failure, 14 persons were default, 22 persons were relapsed and 109 persons were received new class therapy**(Table 4 and Figure 1)**.

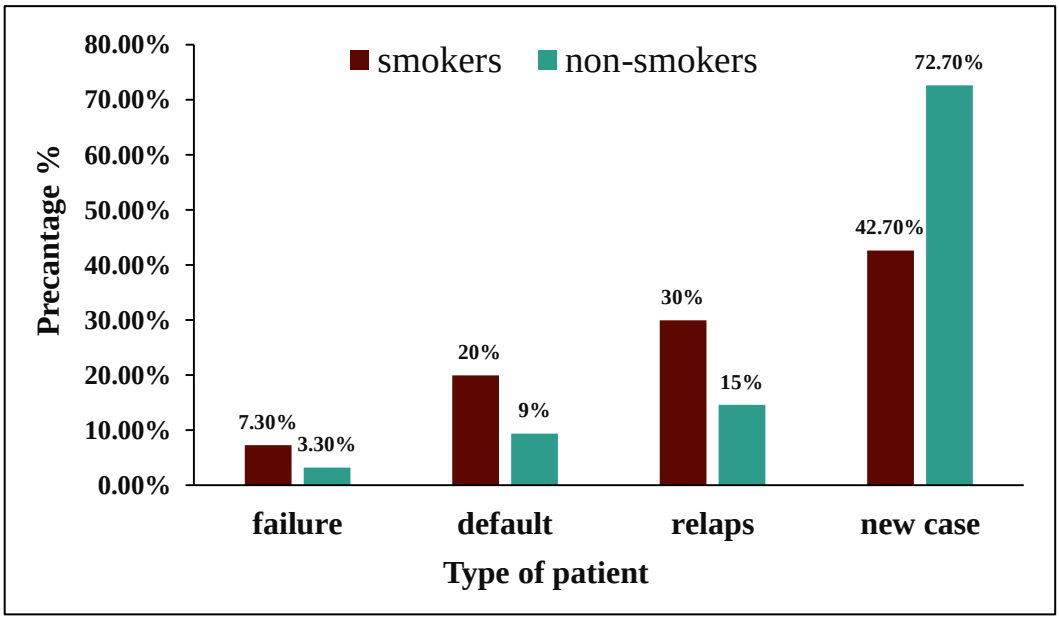

Figure 1: Compare of percentage of type of patients in Smokers and Non-smokers

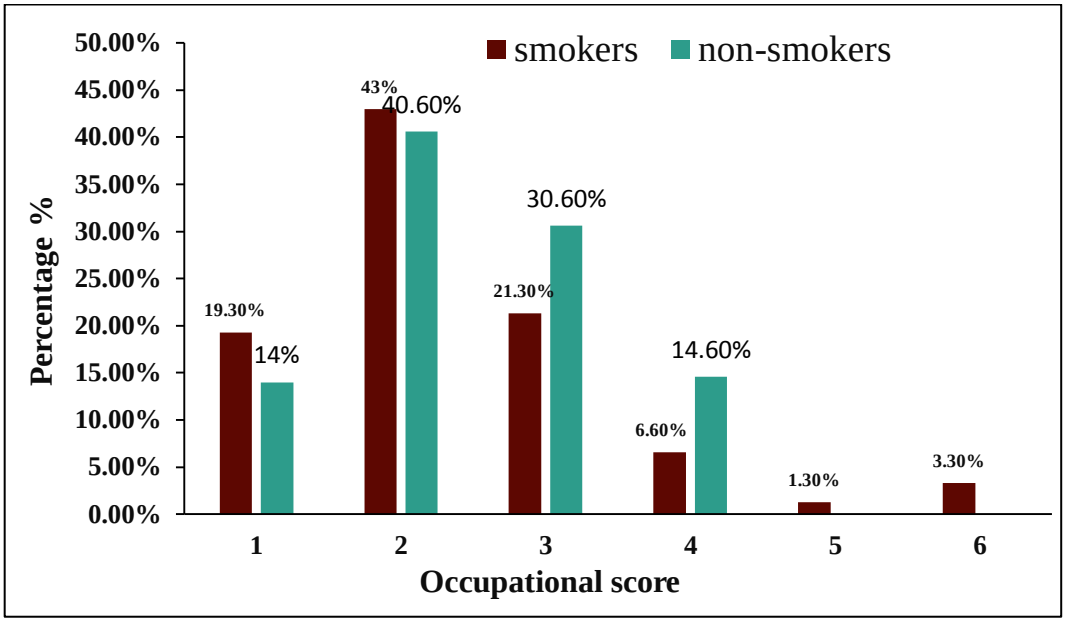

Figure 2: Comparison of percentage of occupation in Smokers and Non-smokers

Comparison of occupation in Smokers and Non-smokers

Out of 300 patients, in smoker group 29 patients were unemployed (Score 1),72 patients were in lower class (Score 2), 32 patients were in upper lower class (Score 3), 10 patients were in lower middle class (Score 4), 2 patients were in upper middle class (Score 5) and 5 patients were found to be in upper class (Score 6).

Whereas, in non-smoker group 21 patientswere found to be unemployed (Score 1), 61 patients were in lower class (Score 2), 46 patients were in upper lower class (Score 3), 22 patients were in lower middle class (Score 4), none of the patient were found in upper middle class (Score 5) and upper class (Score 6) **(Table 5 and Figure 2)**.

Table 5: Comparison of Occupational score in smoker and non- smoker

Occupational score	Smokers	Non-Smokers
Unemployed = 1	29	21
Lower class = 2	72	61
Upper lower class = 3	32	46
Lower middle class = 4	10	22
Upper middle class = 5	2	0
Upper class = 6	5	0
Total	150	150

Comparison of Education in Smokers and Non-smokers

Out of 300 patients, in smoker group 38 patients were found to be uneducated (Score 1), 63 patients were passed from primary school (School 2), 30 patients were from secondary school (Score 3), 13 patients werefrom high school (Score 4) and 6 patients were studying in college (Score 5). Whereas, in non-smoker group 32 patients were uneducated (Score 1), 51 patients were passed primary school (Score 2), 43 patients were passed secondary school (Score 3), 21 patients were passed high school (Score 4) and 3 patients were studying in college (Score 5)**(Table 6)**.

Table 6:Comparison of Educational score in Smokers and Non-smokers Patients

Educational score	Smoker	% of Smokers	Non smoker	% of Non- Smokers
Uneducated = 1	38	25.3%	32	21.3%
Primary School = 2	63	42%	51	34%
Secondary School =3	30	20%	43	28.6%
High School = 4	13	8.6%	21	14%
College = 5	6	4%	3	2%

Table 7: Comparison of Treatment Category in Smokers and Non-smokers

TB Treatment	Smoker	% of Smokers	Non-smoker	% of Non-Smokers
CAT-I	82	54.6%	129	86%
CAT-II	68	45.4%	21	14%

Comparison of Treatment category in Smokers and Non-smokers Patients

Out of 300 patients in smoker group 82 patients (54.6%) had got CAT-1 and 68 patients (45.4%) had got CAT-2 treatment but in non-smoker group 129 patients (86%) were taken CAT -1 and 21 patients (14%) CAT-2 treatment**(Table 7)**.

Comparison of Final diagnosis in Smokers and Non-smokers

Out of 300 patients,127 patients were diagnosed with pulmonary TB and 23 patients were diagnosed with extra pulmonary TB in smokers group. Whereas, in non-smoker group 108 patients have pulmonary TB and 42 patients had diagnosed with extra pulmonary TB. In pulmonary TB the percentage of smokers was found to be 84.60% which was found to be greater than the percentage of non-smokers 72% group. Whereas, in extra pulmonary the percentage of smokers was found to be 28% which was found to be greater than the percentage of non-smokers 15.40 % group**(Table 8 and Figure 3)**.

Table 8: Comparison of Final diagnosis in Smokers and Non- smokers

Diagnosis	Smoker	% Smokers	Non-smoker	% of Non- Smokers
Pulmonary	127	84.6%	108	72%
Extra Pulmonary	23	15.4%	42	28%
Total	150	100%	150	100%

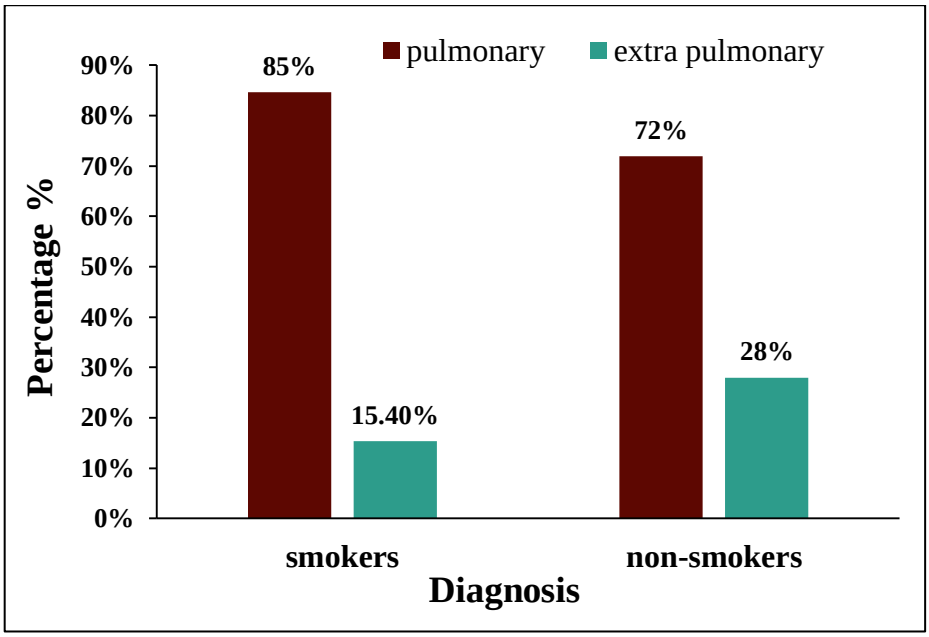

Figure 3: Final diagnosis Comparison in Smokers and Non-smokers patients

Discussion:

The prevalence of smoking among TB patients in India found to be high and in such a TB patients smoking significantly increase the risk of a poor treatment outcome. Recent research studies also found that patients who had stopped smoking recently had a lower risk of a poor TB outcome than the current smokers [10].

The biological mechanism behind smoking is impairment of host defence mechanism and increases the risk of *M. tuberculosis* infection contribute to poor results of TB treatment among smokers. Smoking of cigarette can increase the availability of iron in the lower respiratory tractand then iron may bind with nitric oxide to generate toxic radicals that can obstruct the function of alveolar macrophages [11-13]. Smoking may produce an irreversible inhibitory effect on nitric oxide synthase enzyme that is needed to form nitric oxide to inhibit the multiplication of *M. tuberculosis* by the alveolar macrophages [14, 15].This was a prospective and retrospective observational study analysed the compliance of TB treatment in smokers and non-smokers in Bengaluru region. Total 300 TB patients were enrolled for the study based on the inclusion and exclusion criteria of which 150 patients were smokers and 150 patients were non-smokers.

In the study, out of 300 patients in smoker group 127 patients out of 150 smokers have pulmonary TB and 23 patients have extra pulmonary TB. Whereas, in non-smoker group 108 patients from 150 have pulmonary TB and 42 patients have extra pulmonary TB. The number of pulmonary TB (84.6%>72%) in smoker group was found to be greater than non-smoker and extra pulmonary TB (28%>15.4%) in non-smoker was found to be greater than smoker[16].

In the study, out of 150 patients, in smokers group 11 persons were failed, 30 persons were default, 45 persons were relapsed and 64 were new class cases in therapy but in 150 non-smokers group 5 patients were failed, 14 persons were default, 22 persons were relapsed and 109 persons were new class cases in therapy.

Education is one of the most important factor. The level of education provides meaningful contributions towards the quality of life. The higher level of education will lead into advancement of health treatment of oneself. In the present study, the percentage of uneducated patients (19.30% > 14%) was found to be more in smokers than in non-smokers group.

As the TB is most contagious disease, the treatment and control is always remained a big challenge. From the starting the treatment of TB was associated with numerous problems. We had only few number of anti-TB drugs like Streptomycin, Pyrazinamide, Rifampicin, Isoniazid and Ethambutol were the first line anti TB drugs. The treatment of TB faces two most important problems such as; emergence of multi drug resistance (MDR) and extensive drug resistance (XDR). MDR is defined as resistance against at least two drugs Rifampicin and Isoniazid, which are very important first line anti-TB drugs. XDR is characterized by development of resistance, apart from Rifampicin and Isoniazid, against one of the flouroquinolones and one or more of the second line injectable drugs like Kanamycin, Capreomycin or Amikacin [17, 18].The treatment of MDR and XDR TB is tremendously difficult and needs addition of more drugs including second line drugs which increases the price and toxicity of the regimens [19].

In study of TB, out of 300 patients in 150 smokers patients, 82 patients (54.6%) have got CAT-1 and 68 patients (45.4%) have gotCAT-2 treatment but in non-smokers 129 patients (86%) were taken CAT-1 and 21 patients (14%) received CAT-2 treatment. From the study it clears that, the percentage of CAT-1 treatment (86% > 54.6%) was found to be more in non-smokers than in smokers. Whereas, the percentage of CAT-2 treatment (45.4%> 14%) was found to be more in smoker than in non-smoker.

Conclusion

Smoking is an important risk factor for poor tuberculosis treatment outcomes. Smoking cessation programmes need to be targeted for tuberculosis patients by doctor specialist in TB and by national tuberculosis control initiatives. The programmes will be more effective in reducing smoking among TB patients and improving the TB treatment outcomes.

Conflicts of interest

The authors declare no conflict of interest.

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