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**Original Research Article**

# Adherence to tuberculosis treatment among patients attending national tuberculosis elimination centre in tertiary care hospital, Bangalore

**Julie K. John*, B. G. Parasuramalu**

Department of Community Medicine, Rajarajeswari Medical College and Hospital, Bangalore, Karnataka, India

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***Correspondence:**
Dr. Julie K. John,
E-mail: Julieshijin9889@gmail.com



## ABSTRACT

**Background:** Annually ten million cases of tuberculosis (TB) and 1.8 million mortalities are recorded. Adherence to TB treatment not only reduces death outcomes but prevents prolonged sickness, transmission to others and development of multi drug resistant TB. This study was aimed at determining the rate of treatment adherence and possible factors influencing adherence to TB treatment in the NTEP Centre at Rajarajeswari medical college and hospital, Bangalore.
**Methods:** It was a cross sectional study design. A validated 8 item Morisky medication adherence scale was used to obtain data from respondents. Adherence to TB treatment was assessed. Chi square test was used to determine the variables that were associated with treatment adherence.
**Results:** Out of 60 patients, majority i.e. 18 (30%) were in the age group 25-34 years, males were more compared to females. Majority i.e. 21 (35%) were studied up to post high school diploma, 31(51.67%) were unemployed, majority i.e. 48 (80.00%) were married, 42 (70.00%) were from nuclear family. Out of 60 patients, majority 54 (90.00%) were Hindus 24 (40.00%) were from lower middle class.
**Conclusions:** The adherence rate for TB treatment in this study was 68.33%. There was no significant association between socio demographic variables, personal habits, health status, current TB status, type of TB, and common symptom with treatment adherence. An intensified health education on the adherence of TB treatment therefore recommended.

**Keywords:** Morisky medication adherence scale, Treatment adherence, Tuberculosis

## INTRODUCTION

Out of the causes of death worldwide, tuberculosis is the most common communicable disease. *Mycobacterium tuberculosis*, a tubercle bacillus is the cause for tuberculosis in humans. Many causes, such as the pandemic, poor nutrition, overcrowding, unhygienic living conditions, drug barons, and alcoholics, are to be blamed for the recurrence of tuberculosis.[1] Globally, tuberculosis claimed 1.6 million lives in 2021; it ranks as the second most common cause of infection after COVID-19 and the 13th major cause of mortality overall.[2] Globally, 10.6 million cases of tuberculosis were reported in 2021. India's incidence of tuberculosis for the year 2021 is 210 per 100,000 people, an 18% decrease from the baseline year of 2015. According to these data, India ranks 36$^{th}$ in terms of incidence rates.[3] Following the World Health Organization (WHO) declaring TB as a 'global emergency' in 1993, the Government of India (GoI) launched the Revised National TB Control Programme (RNTCP) in 1997 based on WHO endorsed directly observed treatment short course (DOTS) strategy. RNTCP was expanded in a phased manner to achieve complete population coverage by 2006, with an overarching objective to detect at least 70% of sputum positive pulmonary TB cases and to achieve a cure rate of

at least 85%.[4] In 2014, the world health assembly unanimously approved to end global TB epidemic by "end TB strategy" a 20-year programme with vision of a world with zero death, disease and suffering due to TB. In view of End TB targets, the programme has been renamed from Revised National Tuberculosis Control Programme (RNTCP) to National Tuberculosis Elimination Programme (NTEP).[5]

The degree to which a patient takes their medication as directed by their doctor and as specified in their treatment plan is known as medication adherence. Treatment for tuberculosis, a chronic infectious disease that can be spread by droplets from individuals who have active pulmonary tuberculosis and its treatment involves a 6-9-month medication regimen with combinations of drugs, which may cause side effects and non-adherence. Inadequate adherence to TB medicine can provide special challenges as it may lead to treatment prolongation, increased expenses, a rise in new cases, and the emergence of multidrug resistance.[6] One of the main causes of high death rates in the public health sector is tuberculosis. Since the start of the AIDS epidemic, the prevalence of tuberculosis in adults has more than doubled, with the majority of cases being associated with HIV/AIDS disorders. The number of cases of tuberculosis has risen to more than 500 per 100,000 people due to the AIDS epidemic that has struck the nation.[7] A formal self-report measure of medicine taking behaviour is the eight-item Morisky medication adherence scale. It was created using a four-item scale that had already been validated and supplemented with additional items addressing the circumstances surrounding adherence behaviour.[8]

Hence the present study was conducted to find out the factors influencing adherence to tuberculosis treatment in a national tuberculosis elimination program center in Rajarajeswari medical college and hospital (tertiary care hospital), Bangalore.

### *Aim*

To assess the adherence to tuberculosis treatment among patients attending NTEP centre in a tertiary care hospital, Bangalore

### *Objectives*

To describe the socio demographic profile of tuberculosis patients. To assess the tuberculosis treatment adherence among patients. To identify the factors influencing adherence to treatment among tuberculosis patients.

## METHODS

### *Study design*

Cross sectional descriptive study design was employed in this study.

### *Sample size determination*

A minimum sample size of 60 was calculated using Yamane equation

$$n = \frac{N}{1 + Ne^2}$$

n= sample size, N = known population size, average number of patients attending NTEP unit =10/month, therefore for 7 months =10×7 =70 patients, e=margin of error = 0.05 (95% confidence level).

N= 10×7 =70,

e= 0.05

$$n = \frac{70}{1 + 70 \times 0.0025}$$

=70/1.17

= 59.829 =60

### *Inclusion criteria*

Pulmonary and extra pulmonary tuberculosis patients registered and attending NTEP centre at Rajarajeswari Medical College and Hospital, Bangalore.

### *Exclusion criteria*

Patients who have not given consent and those who were not traceable.

### *Sampling technique*

Purposive sampling technique was employed.

### *Methodology*

60 TB patients were selected for the present study based on inclusion and exclusion criteria. The information regarding tuberculosis treatment adherence was obtained from the tuberculosis (pulmonary and extrapulmonary) patients who were diagnosed and registered in NTEP centre, between May 2022-November 2022 through telephonic conversation with the patients and also by going through the documented evidence from the registers. Information was collected using validated 8 item self-report Morisky medication adherence scale which was entered in predesigned and pretested proforma.

Adherence was defined as self-report of having completed TB treatment plus documented evidence from the TB register of having completed treatment regimen as prescribed by the clinician. Standard Tb treatment requires patients to take a complex combination of drugs for 2 months in intensive phase and 4 months in

continuation phase for new patients.[9] Old TB cases were those who were discontinued on treatment and were put on treatment for 9-11 months.

### *Data analysis*

Data were entered into Microsoft excel version for analysis. Descriptive statistics like mean and SD, inferential statistics like chi- square test was performed to determine the association between variables and potential factors that could influence adherence to TB treatment respectively. At a 95% level of confidence interval, p value of less than 0.05 was considered statistically significant.

### *Ethical consideration*

Ethical clearance was obtained from the institutional ethics committee.

## RESULTS

### *Age*

Out of 60patients, majority i.e. 18(30%) were in the age group of 25-34 years, next highest i.e. 11 (18.33%) were in the age group of 15-24 years and 45-54 years respectively. Least i.e. 2 (3.33%) were in the age group of less than 15 years.

### *Gender*

Out of 60 patients, 36 (60%) were males and 24 (40%) were females.

### *Educational status*

Majority i.e. 21 (35%) were studied up to post high school diploma, next highest i.e. 18 (30%) patients were illiterate and least i.e. 1 (1.67%) patient studied up to high school certificate and professional course.

### *Occupation*

Out of 60 patients, majority i.e. 31 (51.67%) were unemployed. Next highest 14 (23.33%) were semi skilled and least was 1 (1.67%) was professional.

### *Marital status*

Majority i.e. 48 (80.00%) were married, 5 (8.33%) were unmarried, 4 (6.67%) were divorced and 3 (5.00%) were single.

### *Type of family*

Majority i.e. 42 (70.00%) were from nuclear family and remaining 18 (30%) were from joint family.

### *Religion*

Out of 60 patients, majority i.e. 54 (90.00%) were Hindus, 4 (6.67%) were Christians and 2 (3.33%) were Muslims.

### *Socio economic status*

Majority i.e. 24(40.00%) were from lower middle class, next highest 19 (31.67%) were from middle class and least 1 (1.67%) was from upper class (Table 1).

**Table 1: Socio demographic profile.**

| Age (years) | Frequency | Percentage |
|---|---|---|
| Less than 15 | 2 | 3.33 |
| 15-24 | 11 | 18.33 |
| 25-34 | 18 | 30.00 |
| 35-44 | 8 | 13.33 |
| 45-54 | 11 | 18.33 |
| 55-64 | 4 | 6.67 |
| 65-74 | 3 | 5.00 |
| Above 75 | 3 | 5.00 |
| Total | 60 | 100.00 |
| **Sex** | | |
| Male | 36 | 60.00 |
| Female | 24 | 40.00 |
| Total | 60 | 100.00 |
| **Education** | | |
| Illiterate | 18 | 30.00 |
| Primary school certificate | 2 | 3.33 |
| Middle school certificate | 10 | 16.67 |
| High school certificate | 1 | 1.67 |
| Post high school diploma | 21 | 35.00 |

Continued.

| Age (years) | Frequency | Percentage |
|---|---|---|
| Graduate | 7 | 11.67 |
| Professional | 1 | 1.67 |
| Total | 60 | 100.00 |
| **Occupation** | | |
| Unemployed | 31 | 51.67 |
| Unskilled | 6 | 10.00 |
| Semi skilled | 14 | 23.33 |
| Skilled | 2 | 3.33 |
| Shopowner | 6 | 10.00 |
| Semi professional | - | - |
| Professional | 1 | 1.67 |
| Total | 60 | 100.00 |
| **Marital status** | | |
| Married | 48 | 80.00 |
| Unmarried | 5 | 8.33 |
| Single | 3 | 5.00 |
| Divorced | 4 | 6.67 |
| Total | 60 | 100.00 |
| **Type of family** | | |
| Nuclear | 42 | 70.00 |
| Joint | 18 | 30.00 |
| Three generation | - | - |
| Total | 60 | 100.00 |
| **Religion** | | |
| Hindu | 54 | 90.00 |
| Christian | 4 | 6.67 |
| Muslim | 2 | 3.33 |
| Total | 60 | 100.00 |
| **Socio-economic status** | | |
| Upper class | 1 | 1.67 |
| Upper middle class | 19 | 31.67 |
| Middle class | 16 | 26.67 |
| Lower middle class | 24 | 40.00 |
| Lower class | - | - |
| Total | 60 | 100.00 |

***Co morbidities among tuberculosis patients***

Out of 60 patients, 4 patients (6.67%) had diabetes mellitus and only 1 (1.67%) patient was HIV reactive.

Out of 60 patients, 24 (40.00%) had substance abuse, out of them 13 (21.67%) were using both tobacco and alcohol, 7 (11.67%) were consuming only tobacco and the remaining 4 were (6.67%) consuming only alcohol (Table 2).

**Table 2: Substance abuse among tuberculosis patients.**

| | Frequency | Percentage |
|---|---|---|
| **Tobacco** | 7 | 29.17 |
| **Alcohol** | 4 | 16.66 |
| **Both** | 13 | 54.17 |
| **Total** | 24 | 100.00 |

Out of 60 patients, 54 (90.00%) were new TB patients and remaining 6 (10.00%) were old TB patients.

**Table 3: Distribution of tb patients according to type of tuberculosis.**

| Type | Frequency | Percentage |
|---|---|---|
| **Pulmonary** | 49 | 81.67 |
| **Extrapulmonary** | 11 | 18.33 |
| **Pleural** | 5 | 8.33 |
| **Lymphnode** | 5 | 8.33 |
| **Bone and joints** | 1 | 1.67 |
| **Total** | 60 | 100.00 |

Out of 60 patients ,49 (81.67%) had pulmonary TB, and 11 (18.33%) had extra pulmonary TB. Out of them, 5 (8.33%) had pleural effusion and 5 (8.33%) had cervical lymph nodes and 1 (1.67%) had TB bone and joints (Table 3).

Majority i.e.; 50 (83.34%) patients had cough, remaining 5 (8.33%) each had cough with fever and cough with weight loss as their common symptom respectively (Table 4).

**Table 4: Distribution of tb patients according to their common symptom.**

| Symptoms | Number | Percent |
|---|---|---|
| **Cough** | 50 | 83.33 |
| **Cough with fever** | 5 | 8.33 |
| **Cough with weight loss** | 5 | 8.33 |
| **Total** | 60 | 100.00 |

**Table 5: Adherence with socio demographic variables.**

| Age (years) | Adherent | Percentage | Not adherent | Percentage |
|---|---|---|---|---|
| Less than 45 | 24 | 40 | 15 | 25 |
| Greater than 45 | 17 | 28.3333 | 4 | 6.66667 |
| **Chi square** | | 2.3775 | P value | 0.12309 |
| **Educational status** | | | | |
| Upto primary | 13 | 21.6667 | 7 | 11.6667 |
| Above primary | 28 | 46.6667 | 12 | 20 |
| Chi square | 0.154 | P value | 0.6947 | |
| **Occupational status** | | | | |
| Unemployed | 19 | 31.6667 | 12 | 20 |
| Employed | 22 | 36.6667 | 7 | 11.6667 |
| **Chi square** | 1.4703 | P value | 0.2253 | |
| **Religion** | | | | |
| Hindu | 37 | 61.66 | 17 | 28.33 |
| Christian | 3 | 5.00 | 1 | 1.66 |
| Muslim | 1 | 1.66 | 1 | 1.66 |
| **Chi square** | 0.3937 | P value | .821327 | |
| **Type of family** | | | | |
| Nuclear | 28 | 46.66 | 14 | 23.33 |
| Joint | 13 | 21.66 | 5 | 8.33 |
| **Chi square** | 0.1797 | P value | .671616 | |
| **Socio economic status** | | | | |
| Upper class | 1 | 1.66 | - | - |
| Upper middle class | 14 | 23.33 | 5 | 8.33 |
| Middle class | 12 | 20.00 | 4 | 6.66 |
| Lower middle class | 14 | 23.33 | 10 | 16.66 |
| Lower class | - | - | - | - |
| **Chi square** | 2.1711 | P value | | .704332 |
| **Personal habits** | | | | |
| Tobacco | 6 | 10.00 | 1 | 1.67 |
| Alcohol | 3 | 5.00 | 1 | 1.67 |
| Both | 5 | 8.33 | 8 | 13.33 |
| No abuse | 27 | 45.00 | 9 | 15 |
| **Chi square** | 7.1596 | P value | 0.06698 | |
| **Health status** | | | | |
| Diabetes | 3 | 5.00 | 1 | 1.66 |
| non diabetes | 35 | 58.33 | 18 | 30.00 |
| HIV | 1 | 1.66 | - | - |
| Non reactive | 40 | 66.66 | 19 | 31.66 |
| **Chi square** | 0.1344, 0.278 | P value | 0.713878, 0.598003 | |
| **Current TB status** | | | | |
| New | 35 | 58.33 | 19 | 31.66 |
| Old | 4 | 6.66 | 2 | 3.33 |

Continued.

| Age (years) | Adherent | Percentage | Not adherent | Percentage |
|---|---|---|---|---|
| **Chi square** | 0.0081 | P value | 0.928111 | |
| **Type of TB** | | | | |
| Pulmonary | 49 | 81.66 | - | - |
| Extra pulmonary | 10 | 16.66 | 1 | 1.66 |
| **Chi square** | 1.4296 | P value | 0.23183 | . |
| **Symptom** | | | | |
| Cough | 36 | 60 | 14 | 23.33 |
| Cough with fever | 2 | 3.33 | 3 | 5 |
| Cough with weight loss | 3 | 5.00 | 2 | 3.33 |
| **Chi square** | 2.3261 | P value | 0.312538 | |

Out of 60 patients, 41 (68.33%) Patients were adherent to treatment and the remaining 19 (31.67%) patients were not adherent to treatment.

## DISCUSSION

In the present study, among 60 patients 30% were in the age group of 25-34 years, which differs from the study conducted by Dogah et al where 33.6% were in the age group of 30-39 years.[10] In the study conducted by Yadhav et al where majority of participants i.e. 52.2% were in the age group of 15-40 years.[11] In the study conducted by Ubajaka et al mean age of respondents was 36.1±13.3 years.[12] In the present study 60% were males, this was in accordance with study conducted by Woimo et al, Yadhav et al Bagchi et al where 53.6%, 65% and 64% were males respectively.[9,11,13] It differs from the study conducted Ubajake et al where most of the respondents i.e.58.1% were females.[12] In the present study 35% were studied up to post high school diploma which differs from the study conducted by Ubajaka et al and Dogah et al where 41.9% and 42.2% had primary education respectively.[10,12] In the present study majority i.e. 90% were Hindus, this was in accordance with the study conducted by Yadhav et al and Bagchi et al where majority i.e. 82.8% and 80% were Hindus.[11,13] But differs from the study conducted by Dogah et al where majority i.e. 79.2% were Christians.[11] In the present study, majority i.e. 51.67% were unemployed, this differs from the study conducted by Yadhav et al and Gopi et al where 26.7% and 35% were unemployed.[11,14] In the present study 80% were married ,this was in accordance with the study conducted by Yadhav et al where 71.7% were married.[11] In the present study, 70% were from nuclear family, this differs from the study conducted by Yadhav et al where 52.8% belonged to nuclear family.[12] In the present study 1.67% of patients HIV reactive, this differs with the study conducted by Ubajaka et al where 28.1% of patients taking anti-retroviral drugs in addition to anti TB medications.[12]

In the present study medication adherence rate for tuberculosis was 68.33%which was lower than the study conducted by Eyramdogah et al, Yadav et al, Ubajaka et al, Bagchi et al where the adherence rate was 81.6%, 79.4%, 74.2% and 84% respectively.[10-13] In the present study, in the age less than 45 years, 40% were adherent 25% were not adherent. This differs from the study conducted by Widjanarko et al where in less than 40 years of age, 53% were adherent and 50% were not adherent.[15]

In the present study, among new TB patients 58.33% were adherent and 31.66% were not adherent. This differs from the study conducted by Widjanarke et al where among new TB patients 87% were adherent and 50% were not adherent.[15] In the present study where majority i.e. 81.67% were pulmonary TB patients. This was in accordance with the study conducted by Woimo et al where majority of participants i.e. 60.2% were pulmonary TB patients.[9] In the present study patients consuming alcohol 5% were adherent. This differs from the study conducted by Woimo et al where 57.9% of alcohol consuming patients were adherent.[9]

In the present study non adherence was 31.66% which was higher than the study conducted by Weiguo et al where non adherence to tuberculosis treatment was only 12.2%.[16] In the study conducted by Gopi et al non adherence to tuberculosis treatment was 33%.[14] In the study conducted by Santha et al, among new smear positive patients 17% were defaulted treatment.[17]

## CONCLUSION

In this study adherence to tuberculosis treatment was 68.33%. There was no significant association between age, education, occupation, type of family, socioeconomic status, health status, personal habits, current TB status, type of TB, symptoms, personal habits and adherence to the tuberculosis treatment.

### *Recommendations*

We recommend intensified health education and follow up and monitoring of patients for better adherence.

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