

Original article

TUBERCULOSIS SANATORIUM OF 21ST CENTURY EXPLORING THE ADMISSION PATTERN AND DURATION OF STAY AT TB SANATORIUM BHOWALI, UTTARAKHAND, INDIA: A RETROSPECTIVE STUDY

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ABSTRACT

Introduction: With time there have been major changes in the management of TB. No longer TB sanatoriums are preferred. However, in this 21st century, few sanatoriums do exist but are no longer in their original forms, to explore the admission patterns and duration of stay at the TB sanatorium Bhowali, Uttarakhand.

Methodology: We retrieved the data between 1st January 2018 to 31st July 2021 from the inpatient Department (IPD) of TB sanatorium Bhowali. Data were extracted in an extraction sheet and descriptive data analysis was done to see the admission patterns and duration of stay. The place of residence was analysed as per the district-wise distribution.

Results: There were 1247 admissions. These admissions were limited to six states, and the majority were from the state of Uttar Pradesh (50.7%) and Uttarakhand (46.7%). The highest cases were in the year 2018, and during April to July. As per the district-wise distribution, Udham Singh Nagar had the highest proportion of admissions (18.6%), followed by Bareilly (15%), Nainital (11.4%), and Rampur (10.9%). The mean (SD) and median (IQR) duration of stay were 22.7 days (SD=24.7) and 14 (IQR 7– 8) days, respectively. The median duration of stay was significantly higher for females (25.1 days) compared to males (21.6 days).

Conclusion: TB sanatorium Bhowali (Uttarakhand) caters majority of the patients from the neighbouring state of Uttar Pradesh. The admissions were high during the spring and summer seasons. The median duration of hospital stay for patients admitted with TB was two weeks.

Key words: TB, Sanatorium, Hospital admission, Duration of stay.

INTRODUCTION

Tuberculosis (TB) is one of the oldest diseases in India. For several years India is trying to control and eliminate this infectious disease.¹ In

1854, Hermann Brehmer started the sanatorium movement for the management of TB. This included isolation of a patient in a sanatorium for open-air, bed rest and providing a nutritious diet. These sanatoriums were mainly located at high altitudes for fresh air and health restoration.^{2,3} India had its first TB sanatorium near Ajmer (Rajasthan) in 1906, followed by in Almora (Uttarakhand) in 1908. Thereafter several sanatoriums were constructed in India.¹ With the advent of chemotherapy these sanatoriums became superfluous and were closed. Also, studies had proved that the home treatment with chemotherapy at home is no different from

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sanatorium treatment in terms of the clinical outcome and infection in the household contact.^{4,5} This was a turning point for India where TB was a major public health problem and sanatoriums had limited beds.

TB sanatoriums were built before the discovery of drugs for the treatment of TB. These sanatoriums were associated with longer stays and substantial death rates. With time and scientific updates, they have incorporated the modern clinical treatment for TB.^{4,6} Currently in the Uttarakhand state (India), there are a few TB sanatoriums, and one of them is TB sanatorium Bhowali which was established in the year 1912. It is located 11km away from the famous hill station Nainital (in Kumaon division). It is on the top of the hill at an elevation of 1706 meters above sea level.⁷ It has a historical past, where the wife (Mrs Kamala Nehru) of the former prime minister of India (Jawaharlal Nehru) was admitted for the treatment of tuberculosis. In 1929 it was visited by Mahatma Gandhi.⁸ There is a dearth of literature related to the admission and stay duration in these modern TB sanatoriums. We conducted this study to explore admission patterns and duration of stay among the hospital admissions in TB sanatorium Bhowali (Uttarakhand).

METHODOLOGY

It was a retrospective record review. This study was conducted at TB sanatorium, Bhowali, Nainital District, Uttarakhand (India). TB sanatorium Bhowali has 78 functional beds and a pulmonologist for specialist care. It is equipped with an X-ray machine and with the facility of GeneXpert testing. It plays a vital role in providing clinical management for stabilizing TB patients in terms of fluid and electrolyte imbalance, co-morbidity management. It also provides interventions for symptomatic relief for TB patients. We included the record of all the TB patients admitted to the TB Sanatorium Bhowali from 1st January 2018 to 31st July 2021. There were no exclusion criteria. We extracted the data related to the date of admission, date of discharge, gender, religion, and place of residence. The data were entered in a data extraction sheet in Microsoft Excel. We used a 'form' option with validation checks to minimise the errors related to the data entry. We did an analysis of secondary data using STATA 13 software (StataCorp, College Station, Texas, USA). Admissions numbers were presented in proportions for the year and state-wise distribution. The trend of monthly admission

was depicted using a line diagram. We presented the duration of stay in mean (standard deviation - SD) and median (Interquartile range - IQR). The normality was assessed using the Shapiro-Wilk test and by plotting a frequency distribution. As the data were non-normal we used the Mann-Whitney test for the test of significance for comparing the duration of stay for males and females. The place of residence was analysed as per the district-wise distribution and it was represented using a heat map in Tableau software (Seattle, Washington, USA). Permission from the authorities was taken to access the records of the Inpatient Department (IPD) of TB Sanatorium Bhowali. The details of the participants were kept confidential and safe. This study has been carried out in accordance with declaration of Helsinki.

RESULTS

From 1st January 2018 to 31st July 2021, there were 1247 admissions. Out of these admissions, the maximum number of admissions (n= 510, 40.9%) were in the year 2018. There were only 158 admissions in 2020, and 152 admissions in 2021 (till 31st July 2021). We saw a decline in admissions in the years 2019 and 2020. The mean number of monthly admissions in the year 2018, 2019, 2020 and 2021 (till 31st July 2021) were 42.5 (SD – 19.9), 35.6 (SD- 22.2), 13.2 (SD – 11.3), and 21.7 (SD- 12.6), respectively. The mean number of admissions in the reference period was 29 (SD - 41.7). Considering 2020 and 2021 as not typical year; the mean and median admissions in the year 2018 and 2019 was 78 (SD- 40.3) and 74 (IQR – 46.5 – 103.5), respectively. Most of the admissions were in the month from April to July except in the year 2020 (**Figure 1**). The majority of admissions were males (75.2%) and Hindu religion (79.9%). (**Table 1**)

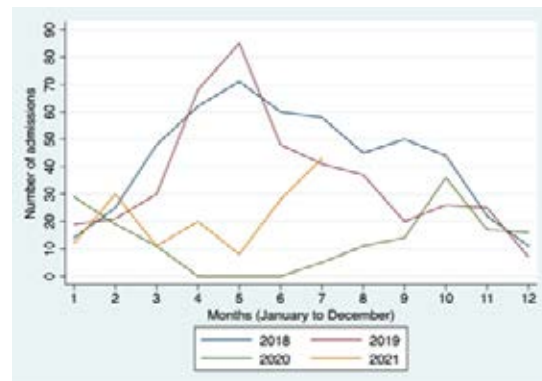


Figure 1: Distribution of admission numbers as per the month and year wise in TB sanatorium, Bhowali (Uttarakhand).

Table 1 – Details about the admissions done in TB sanatorium, Bhowali (Uttarakhand) from 1 st Jan 2018 to 31 st July 2021					
Variable	Year				
	2018 N(%)	2019 N(%)	2020 N(%)	2021 (till 31 st July), N (%)	Total admissions N (%)
Gender					
Female	130 (25.5)	108 (25.3)	36 (22.8)	35 (23.0)	309 (24.8)
Male	380 (74.5)	319 (74.7)	122 (77.2)	117 (77.0)	938 (75.2)
Religion					
Christian	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	1 (0.1)
Hindu	404 (79.2)	335 (78.5)	134 (84.8)	124 (81.6)	997 (79.9)
Muslim	103 (20.2)	91 (21.3)	24 (15.2)	28 (18.4)	246 (19.7)
Sikh	3 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)	3 (0.2)
State					
Delhi	3 (0.6)	1(0.2)	0 (0.0)	0 (0.0)	4 (0.3)
Haryana	12 (2.4)	6 (1.4)	0 (0.0)	2 (1.3)	20 (1.6)
Punjab	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)
Rajasthan	3 (0.6)	5 (1.2)	0 (0.0)	0 (0.0)	8 (0.6)
Uttarakhand	218 (42.8)	177 (41.5)	97 (61.4)	90 (59.2)	582 (46.7)
Uttar Pradesh	273 (53.5)	238 (55.7)	61 (38.6)	60 (39.5)	632 (50.7)
Total admissions	510 (100.0)	427 (100.0)	158 (100.0)	152 (100.0)	1247 (100.0)
Mean (SD) monthly admissions	42.5 (19.9)	35.6 (22.2)	13.2 (11.3)	21.7 (12.6)	*NA
Median (IQR) admissions in a month	46.5 (23.5 – 59)	28 (20.5 – 44.5)	12.5 (2.5 – 18)	20 (11 – 30)	*NA

*NA denotes not applicable

The admissions were limited to the neighbouring six states of India. The majority of the admissions were from Uttar Pradesh (50.7%) and Uttarakhand (46.7%).(Figure 2).



Figure 2: Number of admission from 1st January 2018 to 31st July 2021 among six states

As per the district-wise distribution, Udham Singh Nagar had the highest proportion of admissions (18.6%), followed by Bareilly (15%), Nainital (11.4%), and Rampur (10.9%) (Table 2 & Figure 3).

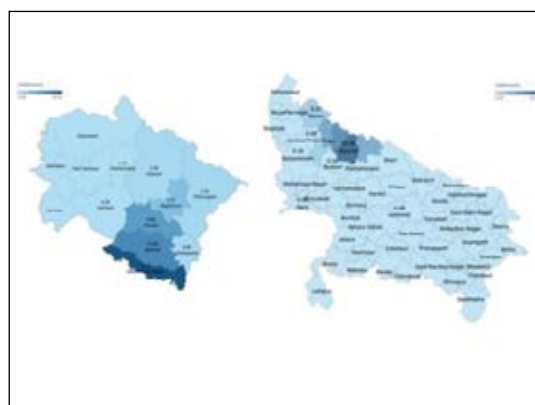


Figure 3: Heat map showing the proportion of admissions from the districts of Uttarakhand and Uttar Pradesh between the period 1st January 2018 to 31st July 2021

Table 2– District wise distribution of admissions done in TB sanatorium, Bhowali (Uttarakhand) from 1st Jan 2018 to 31st July 2021

State	District	Total Patient (n=1247)	Percentage (%)	State total (%)
Delhi	New Delhi	4	0.3	4 (0.3)
Haryana	Ambala	19	1.5	20 (1.6)
	Faridabad	1	0.1	
Punjab	Amritsar	1	0.1	1 (0.1)
Rajasthan	Chittorgarh	7	0.6	8 (0.6)
	Jaipur	1	0.1	
Uttarakhand	Almora	112	9.0	582 (46.7)
	Bageshwar	52	4.2	
	Chamoli	13	1.0	
	Champawat	12	1.0	
	Nanital	142	11.4	
	Pauri Garhwal	4	0.3	
	Rudraprayag	1	0.1	
	Udham Singh Nagar	232	18.6	
	Pithoragarh	14	1.1	
Uttar Pradesh	Agra	1	0.1	632 (50.7)
	Bareilly	188	15.1	
	Bijnor	42	3.4	
	Budaun	13	1.0	
	Bulandshahr	2	0.2	
	Ghaziabad	1	0.1	
	Jyotiba Phule Nagar	25	2.0	
	Lucknow	1	0.1	
	Moradabad	96	7.7	
	Pilibhit	91	7.3	
	Rampur	136	10.9	
	Sambhal	36	2.9	

Table 3– Hospital outcomes about the admissions done in TB sanatorium, Bhowali (Uttarakhand) from 1st Jan 2018 to 31st July 2021

Year wise distribution	Death	Discharged	Leave Against Medical Advice	Referred	Total
2018	17 (43.6)	446 (40.3)	7 (46.7)	2 (40.0)	472 (40.5)
2019	13 (33.3)	386 (34.9)	6 (40.0)	1 (20.0)	406 (34.9)
2020	7 (17.9)	142 (12.8)	1 (6.7)	0 (0.0)	150 (12.9)
2021 (till 31st July)	2 (5.1)	132 (11.9)	1 (6.7)	2 (40.0)	137 (11.8)
Gender wise distribution					
Female	9 (23.1)	276 (24.9)	1 (6.7)	0 (0.0)	286 (24.6)
Male	30 (76.9)	830 (75.1)	14 (93.3)	5 (100.0)	879 (75.5)
Religion wise distribution					
Christian	0 (0.0)	1 (0.1)	0 (0.0)	0 (0.0)	1 (0.1)
Hindu	35 (89.7)	880 (79.6)	14 (93.3)	4 (80.0)	933 (80.1)
Muslim	4 (10.3)	222 (20.1)	1 (6.7)	1 (20.0)	228 (19.6)
Sikh	0 (0.0)	3 (0.3)	0 (0.0)	0 (0.0)	3 (0.3)
Total (%)	39 (100.0)	1106 (100.0)	15 (100.0)	5 (100.0)	1165 (100.0)

The hospital outcome data were available for 1165 (93.4%) admissions. Majority of the patients were discharged (94.8%), whereas 15(1.3%) patients took leave Against Medical Advice (LAMA and 6 (0.5%) patients were referred to higher centre for further management (**Table 3**). There was total 39 deaths recorded in which 76.9% (n= 30) were male and 23.1% (n= 9) were female. The overall death rate at the TB sanatorium was 3.3%. The mean (SD) and median (IQR) duration of stay were 22.7 days (SD – 24.7) and 14 (IQR 7 – 28) days, respectively. It ranged from 0 to 170 days. The mean and median duration of stay for females was 25.1 days (SD- 24.1) and 18 (IQR 9 – 33) days, respectively. The mean and median duration of stay for males was 21.6 days (SD- 24.9) and 14 (IQR 7 – 26) days, respectively. There was a significant difference in the duration of stay for males and females (p-value – 0.0017).

DISCUSSION

We found that the median duration of stay at TB sanatorium was two weeks and with a death rate of 3.3%. The estimated death rate was almost half compared to the TB sanatorium where pulmonary TB patients were treated with isoniazid and p-aminosalicylic acid in India.⁴ This could be due to the usage of better and effective drugs, and the short duration of admission as deaths occurring outside the sanatorium related to TB couldn't be captured. Considering the readmission rate as 16.9%, the mortality rate was estimated to be 4%.⁹ This mortality rate was similar to the national mortality rate of TB patients (4%) followed up in the year 2019.¹⁰ We couldn't estimate the readmissions, and the number of deaths that occurred outside the sanatorium which could have affected our estimates of mortality rate. The duration of stay was diminutive (2 weeks) compared to the sanatoriums of the 20th century where patients were admitted for almost 6 months to one year.^{3,6} This huge difference was there because the TB sanatorium Bhowali admits patients only for stabilizing the health condition in the initial stage. The treatment completion is done near the residence of the patient as a daily observed treatment short course (DOTS). Also, TB sanatorium Bhowali does not admit a patient with drug-resistant TB (DR-TB). A study comparing the admission and duration of stay in TB sanatoriums across various era have found a significant reduction in length of stay and deaths during the triple therapy era compared to the pre-

chemotherapy era.⁶ The admissions were higher during the spring and summer seasons (April to July) which could be due to the seasonal variation of TB transmission and incidence.¹¹ However, this could be also due to comfortable weather during summers. The number of admissions in the year 2020 was less. This was due to the stringent lockdown imposed due to the COVID-19 pandemic, as no were patients admitted in April, May, and June. Lockdown measures also resulted in a decrease in TB notification cases. In 2020, tumbling in the notification of cases was estimated to be 38% in India. Most of the admissions were from the nearby districts (Udham Singh Nagar & Bareilly). This could be due to higher TB incidence in these areas due to overcrowding and poor living condition.^{12,13}

World Health Organization (WHO) and Sustainable Development Goals (SDGs) has set a target to eliminate TB globally by the year 2035 and 2030, respectively.^{14,15} In line with these global commitments, National Strategic Plan for Tuberculosis Elimination in India has set a target to eliminate TB by 2025.¹⁶ One of the key indicators for TB elimination is the reduction in mortality. For this several initiatives has been taken like real-time monitoring and patient tracing through Nikshay, daily drug regimen, decentralised DR-TB treatment services, active case finding, bi-directional screening and community awareness. Despite these initiatives, there is significant mortality of TB. In the 20th century, TB sanatoriums were considered as the backbone of TB treatment and now they seem to be forgotten. Currently, these TB sanatoriums no longer exist in their original form and have not been utilised to expand the TB care services. TB sanatoriums have certain advantages like supervised medications, a nutritious diet for patients and nursing care for people without caregivers. In the Madras trial, it was found that the weight gain of patients in TB sanatorium was 1.6 – 2 times higher and had a shorter time to sputum conversion compared to patients treated at home.⁵ Studies in India have found a substantial non-medical cost borne by TB patients for diet, nutritional supplements and travel.^{17,18} A sanatorium can address the financial problem which is considered a major socio-economic problem faced by TB patients,¹⁹ as these sanatoriums provide a nutritious diet with a better living condition for the patient free of cost. There is a substantial burden of tobacco and alcohol use among TB patients which is often ignored. Alcohol and tobacco use have combined

effects and are associated with unfavourable outcomes in TB.^{20,21} With the strengthening of staff and facilities these sanatoriums can provide the services for deaddiction, and behaviour change communication. These sanatoriums can be upgraded to Drug-resistant TB centres (DR-TBC), difficult-to-treat clinics and research centres to achieve the ambitious target of TB elimination in India by 2025.

This study explored and generated data related to admission patterns and duration of stay at the modern TB sanatorium of the 21st century. Findings from this study can be useful for the policymakers to plan an expansion and intervention for TB care services using these TB sanatoriums whose roles are undermined. We couldn't assess the readmission rates, age-specific mortality rates and treatment outcome. This was due to the limitation of the secondary data. Patient details records were outspread to multiple registers and lacked unique IDs. It was difficult to compile the data. Inability to assess the readmission rate could have affected the estimation of the death rate.

CONCLUSION

TB sanatorium Bhowali at Uttarakhand state caters to the majority of the patients from the neighbouring state of Uttar Pradesh. The admissions were higher in the year 2018 compared to the years 2019 and 2020. The majority of the admissions were during the spring and summer seasons. The median duration of hospital stay at TB sanatorium Bhowali, Uttarakhand (India) for patients admitted with TB was two weeks. The median duration of stay was significantly higher for females compared to males. Further studies can be planned to explore the role of these tuberculosis sanatoriums.

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CONFLICT OF INTEREST

None

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