

Original Research Article

Epidemiological Study of Utilization of National Tuberculosis Elimination Programme Services among Key TB Patients accessing Public Sector Facilities in Central Gujarat: A Cross-Sectional Study

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ABSTRACT

Background: Tuberculosis (TB) remains a major public health problem in India, with certain vulnerable populations being at increased risk of TB and poorer treatment outcomes. Understanding the characteristics and treatment-related profile of these populations is important for TB care under the National Tuberculosis Elimination Programme (NTEP).

Aim: To assess the utilization of NTEP services among key TB patients accessing public sector facilities.

Material and methods: This observational record-based cross-sectional study included pulmonary TB patients aged >18 years registered as key TB patients over one year. Data were extracted from available programme records and analysed using SPSS version 26. Categorical variables were reported as frequencies and percentages and associations were tested using the chi-square test or Fisher's exact test, with $p < 0.05$ was considered statistically significant.

Results: Of 3279 notified TB patients, 789 (24.06%) belonged to key TB patients. The most common key TB patients were urban slum residents (337; 42.71%) followed by persons with tobacco use (149; 18.88%) and diabetic patients (148; 18.76%). The majority were aged 18-40 years (414; 52.47%). 72.49% were males and 27.51% were females. Among key TB patients, 21 (2.66%) patients did not initiate treatment, while 10.94% patients died and 9.54% were recorded as loss to follow up as treatment outcome.

Conclusion: Young adult males constituted the majority of key TB patients. Treatment delay, drug resistance, recurrent TB, death and loss to follow up were important concerns among key TB patients.

Keywords: Tuberculosis, Vulnerable Populations, Treatment Outcome, Multidrug-Resistant

INTRODUCTION

India bears the largest share of the global tuberculosis (TB) burden and continues to cause substantial burden of TB-related morbidity and mortality.¹ Tuberculosis continues to be a major cause of death and disability among patients living with HIV.² Tuberculosis usually affects adults in their most productive years, although people of all age groups

are at risk. Globally, 10.7 million people were infected with TB and 1.23 million people died. India accounted for about one-fourth of global TB cases and about 28% of global TB deaths. Despite improvements in TB control, including improvement in treatment coverage and treatment success, TB continues to pose a public health challenge in the country.³

A risk group for TB is any group of people within which the prevalence or incidence of TB is significantly higher than the general population.⁴ Key TB populations include the people with increased exposure to TB due to where they live or work (e.g. urban slum), People with limited access to quality TB services and increased risk of TB infection because of biological or behavioral factors that compromise immune function. People living with HIV, malnutrition, diabetes and smoking or addiction and urban slum residence have a higher risk of developing the disease.⁵ TB with HIV: People living with HIV are 12 times more likely to get active TB.⁶ TB with Diabetes: Diabetes has a three - fold increase in the risk of tuberculosis. About 15% of TB cases globally are due to diabetes.⁷ TB and Addiction: Alcohol use disorder and tobacco smoking increases the risk of TB disease. Almost 38% of tuberculosis deaths are related with tobacco – smoking.⁸ The persistence of TB among vulnerable populations remains an important public health concern. If TB is poorly treated in vulnerable communities, it can continue to be transmitted and give rise to drug-resistant TB.

Therefore, rapid diagnosis and adequate commencement and completion of treatment in these populations is crucial for an effective TB control. Although increasing attention has been given to key TB populations because evidence on the epidemiological characteristics and uptake of TB services among these groups remain limited, particularly at the district level. Therefore, the present study was conducted with the aim of assessing the utilization of NTEP services among key TB patients accessing public sector health facilities.

MATERIAL AND METHODS

Stude Design, Setting and Study Population: This observational, record based cross-sectional study was conducted among pulmonary TB patients who were registered as key TB patients > 18 years of age in the public sector and registered in NTEP Records over a period of one year in Anand District, Gujarat. The present study was conducted after obtaining permission from necessary administrative and ethical approvals (IEC/HMPCMCE/115/Faculty/9). Utilization of the NTEP services was defined as accessing or receiving NTEP services for the diagnosis, treatment or follow – up of TB and being registered at a public sector facility.

Data Collection: Data were obtained from the laboratory register, tuberculosis notification registers and from Nikshay (Online software-based records). Relevant information was extracted and entered into Microsoft Excel version 2019. Data were analyzed using SPSS Version 26.

Statistical Analysis: Categorical variables were expressed as frequencies and percentages. Association between categorical variables were assessed using chi-square test or Fisher's exact test, as appropriate. A P -value <0.05 was considered statistically significant.

RESULTS

A total of 3279 TB patients were registered during the study period, of whom 789 (24.06%) were identified as key TB patients. Most key TB patients were aged 18-40 years (414; 52.47%) followed by those aged 41-60 years and 61-90 years. [Table 1]

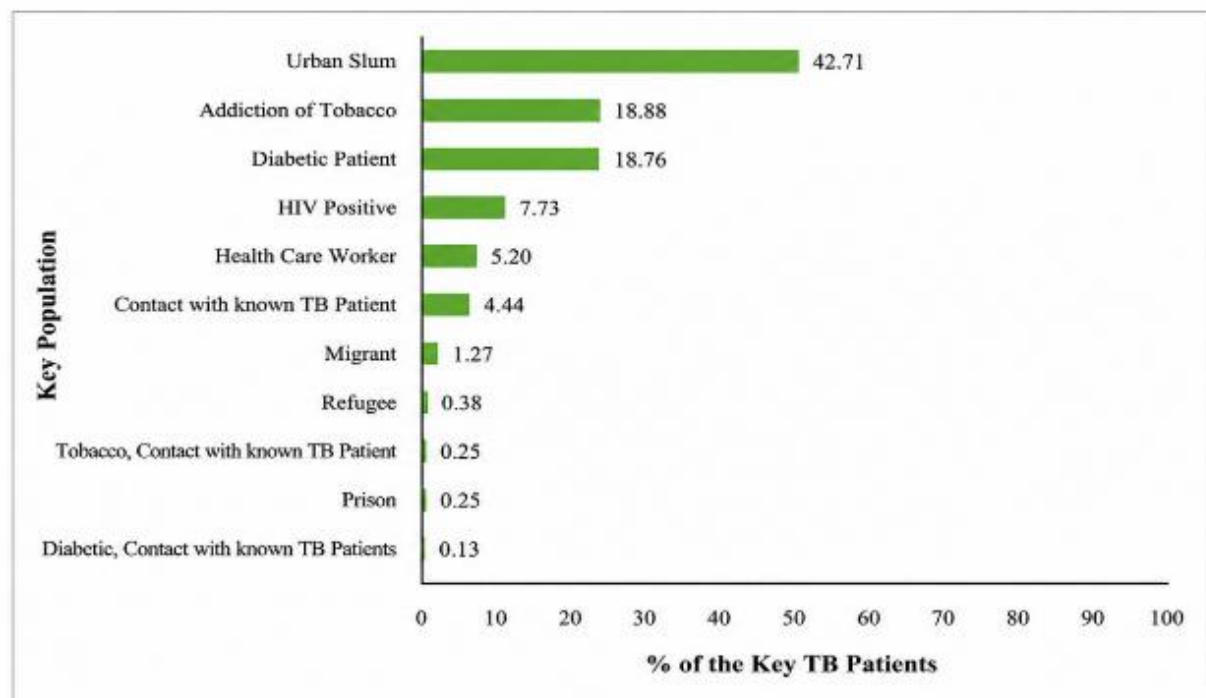
Table-1: Distribution of TB patients according to Age (n = 3279)

Age (Years)	Key TB Patients N (%)	General TB Patients N (%)	Total TB Patients N (%)
18 – 40	414 (52.47)	1355 (54.42)	1769 (53.94)
41- 60	274 (34.73)	861 (34.58)	1135 (34.61)
61 – 90	101 (12.80)	274 (11.00)	375 (11.44)
Total	789 (100)	2490 (100)	3279 (100)

Males predominated among key TB patients (572; 72.49%), while females accounted for 217 (27.51%).

The largest proportion of key TB patients were residents of urban slums (337; 42.71%) followed by those with tobacco use (149; 18.88%) and diabetic patients (148; 18.76%). Other key TB patients included people living with HIV (61; 7.73%), health care workers (41; 5.20%), contact of known TB Patients (35; 4.44%), migrants, refugees, patient with both tobacco use and contact with a known TB patients, prisoners, and patients with both diabetes and contact with a known TB Patients constituted smaller proportion of the key TB patients. [Figure 1]

Figure-1: Distribution of Key TB Patients (n = 789)



Of 3279 notified TB patients, 1993 (60.78%) were microbiologically confirmed, including 174 (8.73%) key TB patients. Among the 1286 patients (39.22%) who were not microbiologically confirmed [which was diagnosed with other methods], 615 (47.82%) were key TB patients.

The distribution of key TB patients according to the type of TB case at time of registration showed that the majority were newly diagnosed cases (72.50%) followed by recurrent TB (10.52%), treatment after loss to follow up (6.84 %), drug resistant TB (4.56%), Treatment after failure and other retreatment cases comprised smaller proportion. [Table 2]

At the end of the year, among the 3279 notified TB patients, 97.25% had a documented treatment outcome, including 765 (96.96%) key TB patients. A total of 2.17% patients had been diagnosed but had not initiated treatment, of whom 21 (2.66%) were key TB patients. 19 (0.58%) patients had been diagnosed and were on treatment, of whom 03 (0.38%) belonged to key TB patients. [Table 3]

Table-2: Distribution of TB patients as per Type of Case (n = 3279)

Type of Case	Key TB Patients N	Total TB Patients N (%)
1.New Case	572	2346 (71.55)
2.Retreatment: Recurrent	83	398 (12.14)
3.Retreatment: Treatment after loss to follow up	54	172 (5.25)
4.Drug-Resistant TB (DR-TB)	36	115 (3.51)
5.Retreatment: Others	30	187 (5.70)
6.Retreatment: Treatment after failure	14	61 (1.86)
Total	789 (100)	3279 (100)
Definitions: 1. Patients who have never been treated for TB or has received anti-TB drugs for <1 month. 2. Previously treated for TB, were declared cured or treatment completed, with a new episode of TB. 3. Previously treated for TB and were declared lost to follow up. 4. Resistant to one or more anti-TB drugs 5. Patients are those who have previously been treated for TB but whose outcome after their most recent course of treatment is unknown or undocumented. 6.Previously treated for TB and whose previous treatment failed.		

Table-3: Distribution of TB patients according to patient status (n = 3279)

Patient Status	Key TB Patients N	General TB Patients N	Total TB Patients N (%)
Diagnosed on Treatment	03	16	19 (0.58)
Diagnosed Not on Treatment	21	50	71 (2.17)
Diagnosed Outcome Assigned	765	2424	3189 (97.25)
Total	789 (100)	2490 (100)	3279 (100)
Note: Patients who did not initiated treatment, classified as a refuse for treatment or migrated as a outcome.			

Three key TB patients were on treatment at the end of the study period were excluded from treatment outcome assessment.

Among 786 key TB patients included in the treatment outcomes assessment, 47.58% were cured and 22.65% had completed the treatment. Death was reported in 10.94% of patients, while 9.54% were loss to follow up. Treatment failure & treatment regimen changed were observed in 2.93% of patients each. The remaining patients had outcomes of patient refusal, not evaluated or migrated. [Table 4]

Table-4: Distribution of TB patients as per Treatment Outcome (n = 3260)

Treatment Outcome	Key TB Patients N	Total TB Patients N (%)
Cured	374	1542 (47.30)
Treatment complete	178	886 (27.18)
Died	86	340 (10.43)
Loss to follow up	75	235 (7.21)
Treatment failure	23	89 (2.73)
Treatment Regimen Changed	23	84 (2.58)
Patient refused	18	48 (1.47)
Not evaluated	06	31 (0.95)
Untraceable Migrated	03	5 (0.15)
Total	786 (100)	3260 (100)
Of the 5 Total TB patients recorded as migrated, 2 had not initiated treatment, while 3 migrated after initiating treatment.		

The distribution of key TB patients according to gender, patient status, type of case at registration and treatment outcome. Among the 572 male key TB patients, the largest proportion comprised those residing in urban slums (222; 38.81%) followed by tobacco users (142; 24.83%). Among the 217 female key TB patients, the majority were residing in urban slums (115; 53%) followed by patients with diabetes mellitus (45; 20.74%).

Among the 21 key TB patients diagnosed with TB but had not initiated treatment, the majority were urban slum residents (14; 66.67%) followed by HIV patients (04; 19.05%). With respect to type of case, among the 83 recurrent

TB patients, the highest proportion were urban slum residents (35;42.17%) followed by tobacco users (21; 25.30%). Among the 54 patients registered as treatments after loss to follow up, the largest proportion were urban slum residents (29; 53.70%) followed by diabetic patients (14; 25.93%). Among the 14 patients registered as treatment after failure, 4 (28.57%) were health care worker and 04 (28.57%) had diabetes mellitus.

Regarding treatment outcomes, among 86 patients who died, the largest proportion were urban slum residents (32; 37.21%) followed by tobacco users (20; 23.26%) Among the 23 patients with treatment failure, tobacco users constituted the largest proportion 9 (39.13%) followed by patients with diabetes mellitus 6 (26.09%).

Table-5: Distribution of Key TB Patient in drug-resistant (Type of Case) according to age, gender, key population, as per treatment outcome (n = 789)

Variable	Non-DR-TB Cases N (%)	DR-TB Cases N (%)	Total	Test Value (P-Value)
Age group (years)				
18–40	390 (51.79%)	24 (66.67%)	414	3.520 (0.17)
41–60	264 (35.06%)	10 (27.78%)	274	
61–90	99 (13.15%)	2 (5.56%)	101	
Total	753 (100)	36 (100)	789	
Gender				
Male	548 (72.78%)	24 (66.67%)	572	0.643 (0.42)
Female	205 (27.22%)	12 (33.33%)	217	
Total	753 (100%)	36 (100%)	789	
Treatment outcome				
Cured	366 (48.60%)	8 (22.22%)	374	85.80 (<0.01)
Died	81 (10.76%)	5 (13.89%)	86	
Loss to follow-up	68 (9.03%)	7 (19.44%)	75	
Treatment failure	16 (2.12%)	7 (19.44%)	23	
Key population				
Tobacco	145 (19.25%)	04 (11.11%)	149	30.26 (<0.01)
Diabetic	133 (17.66%)	15 (41.67%)	148	
HIV	60 (7.97 %)	1 (2.78%)	61	
Urban slum	326 (43.29%)	11 (30.56%)	337	
Note: Only selected key-population categories are shown; statistical test included all categories available in database. Percentages were calculated using 753 non-DR-TB and 36 DR-TB patients.				

Among key TB patients (N=768) who initiated treatment, 137 (17.83%) started treatment after 7 days of diagnosis. The most common key TB Patients were urban slum residents (44; 32.12%) followed by tobacco users (33; 24.09%) and diabetes patients (30; 21.90%). Most of the patients were cured.

The distribution of DR TB patients (type of case) was assessed according to socio-demographic characteristics, key population and treatment outcomes shown in table 5. Among the 789 key TB patients, 36 (4.56%) were registered as DR-TB cases. Among them, the majority belonged to the 18 – 40 years age group and males constituted 24 (66.67%) patients. Diabetes (15; 41.67%) was the most common key TB patient among DR-TB patients followed by urban slum residence (11; 30.56%). Cured was the most frequently observed treatment outcome among DR-TB patients (8; 22.22%) followed by Loss to follow up (07; 19.44%) and treatment failure (07; 19.44%). A statistically significant association was observed between DR-TB patients and treatment outcome ($X^2 = 85.80$, $p = <0.01$), key population ($X^2 = 30.26$, $p = <0.001$). No statistically significant association was observed between DR-TB and Age ($X^2 = 3.520$, $p = 0.17$) or gender ($X^2 = 0.643$, $p = 0.42$).

The distribution of patient's loss to follow up (Outcome) was assessed according to socio-demographic characteristics, key population findings shown in table 6. Among 786 key TB patients, 75 (9.54%) were classified as loss to follow up. Out of them, the majority belonged to the 18–40-year age group (46; 61.33%) and were males (55; 73.33%). Urban slum residence constituted the largest proportion (41; 54.67%) followed by tobacco users (9; 12%) and diabetes patients (08; 10.67%) No statistically significant association was observed between loss to follow up and age ($X^2 = 3.903$, $p = 0.14$) or gender ($X^2 = 0.020$, $p = 0.88$) and key TB patients ($X^2 = 14.924$, $p = 0.135$).

Table-6: Distribution of Key TB Patients treatment outcome (loss to follow up) according to age, gender, key population, as per treatment outcome (loss to follow up) (n = 786)

Age Group (Years)	Treatment Outcome		Total	Test Value (P-Value)
	Other patients (%)	Loss to follow up patients N (%)	Total	
18-40	366 (51.48)	46 (61.33)	412	3.903 (0.14)
41-60	249 (35.02)	24 (32)	273	
61-90	96 (13.50)	05 (6.67)	101	
Total	711 (100)	75 (100)	786	
Gender				
Male	516 (72.57)	55 (73.33)	571	0.020 (0.88)
Female	195 (27.43)	20 (26.67)	215	
Total	711 (100)	75 (100)	786	
Key Population				
DM	138 (19.41)	08 (10.67)	146	14.924(0.13)
HIV	53 (7.45)	07 (9.33)	60	
Toba-cco	140 (19.69)	09 (12)	149	
Urban Slum	296 (41.63)	41 (54.67)	337	
• Note: Only selected key-population categories are shown; statistical test included all categories available in database. • Percentages were calculated using 711 other key TB patients and 75 loss to follow up patients.				

DISCUSSION

The present study assessed the utilization of NTEP services among key TB patients registered at the public sector health facilities. In this study, roughly one fourth of notified TB patients belonged to a population considered as high-risk groups, which highlights the significance of ensuring equal access to TB diagnosis, treatment and follow-up services among these populations.

Among key TB patients, the largest proportion of patients were aged 18-40 years, followed by those aged 41-60 years. A similar finding has been observed from Kangra district, where the 18-45-year age group accounted for the largest proportion of patients.⁹ In South Gujarat study, younger individuals were the largest age group among patients from key populations.¹⁰ The large proportion of younger and working age adults shows the social and economic burden of TB.

A clear male predominance was observed among key TB patients in the present study. A study from Kangra district found a higher number of male TB patients.⁹ While a large study conducted across nine Indian states similarly indicated that males accounted for a greater proportion of TB notifications.¹¹

The distribution of key TB patients in the present study highlights the diverse vulnerabilities among patients accessing NTEP services. Urban slum residents constituted the largest group followed by those with tobacco use and diabetes mellitus. Other groups, including HIV positive patients, health care workers, contacts of known TB patients, migrants, refugees and prisoners constituted smaller groups but they remain important from a programme perspective because of their specific vulnerabilities and healthcare needs. Similar concerns have been reported in recent study from Maharashtra which highlighted that urban slum populations were identified as an “under-reached” population for TB case finding.¹²

In the present study, Ziehl-Neelsen/fluorescent microscopy was commonly recorded diagnostic method while substantial proportion of patients were microbiologically confirmed cases. The continued use of microbiological methods of diagnosis remains an important component of TB case detection.

The predominance of newly diagnosed cases among key TB patients was observed in the present study; however, recurrent TB, treatment after loss to follow up, drug resistant TB and treatment after failure were also observed. The higher proportion of key TB patients who had not initiated treatment suggests delays in treatment initiation among vulnerable population. This finding is consistent with concerns regarding health-system delays reported in a cross-sectional study from Mysuru, where a median health system delay of 12 days was observed.¹³

The treatment outcomes among key TB patients also needs attention. Although many patients achieved cured and treatment completion accounted for a substantial proportion of patients, unfavorable outcome such as death, loss to follow up and treatment failure were also observed in greater number. A study from South Gujarat documented unfavorable outcome particularly among HIV-TB patients.¹⁰ while a study from Maharashtra reported substantial mortality and loss to follow up.¹⁴ Studies from urban slum and rural populations have also reported unfavorable outcomes, including treatment failure, Loss to Follow Up, death, switching to MDR-TB treatment or transfer out. Studies also showed that 15.1% of patients in one such study had unfavorable outcomes. Previous treatment has been identified as an important determinant of unfavorable outcomes, with previous treated patients reported to have approximately twice the odds of unfavorable outcomes¹⁵ In addition, a study from Odisha also found that TB patients with diabetes and/or HIV had less favorable treatment outcomes than those without these comorbidities.¹⁶

In the present study, treatment delay, drug-resistant TB, treatment failure, loss to follow up, death was observed among key TB patients particularly those from urban slum, tobacco use, diabetes and HIV. Delayed treatment initiation was observed among younger patients, females and newly diagnosed cases, while DR-TB was more common among younger males and patients from urban slums and those with diabetes, tobacco use and HIV. These findings highlight the need for early diagnosis, timely treatment initiation, close follow-up and targeted patient-centred interventions for vulnerable populations to improve treatment outcomes and strengthen TB control efforts.

Limitations: This was a record-based study conducted in a single district, the findings depended on the recorded (Secondary) data and may not be generalized to other settings.

CONCLUSION

Vulnerable populations are known to face greater challenges in accessing and continuing TB care, which can contribute to delays and unfavorable treatment outcomes. The present study adds district level evidence showing that key TB patients accounted for a substantial portion of notified TB patients. Young adults, males, urban slum residents, tobacco users and patient with diabetes forming major groups. Although most patient achieved successful treatment outcomes. Treatment delay, drug-resistant TB, loss to follow up, treatment failure and deaths remained main concerns. Strengthening patient centered counselling to address treatment refusal along with treatment support, active follow up and early identification of high-risk patients within routine NTEP services may help improve continuity of care and reduce unfavorable outcomes. Further research is needed to identify the specific barriers contributing to treatment refusal and loss to follow up in the study settings.

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