Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Socio-Demographic and Treatment Outcomes of Registered Tuberculosis Cases in Public Hospitals in Mogadishu, Somalia: A Retrospective Study of the First Three Quarters of 2025

Nuradin Mohamed Hussein
Banadir Hospital, National Public Referral and Teaching Hospital for Maternal and Child Health Care
Mohamed Ahmed Alasow
Midrar institute of Public Health
Muktar Baryare Matan
m.baryare@miph.so

Banadir Hospital, National Public Referral and Teaching Hospital for Maternal and Child Health Care
Mohamed Abdirahman Omar
Banadir Hospital
Mohamed Abdirahman Abdi
Federal Ministry of Health
Abdirizak Sharif Ali
SIMAD University

Research Article

Keywords: Tuberculosis, Treatment outcomes, Mogadishu, HIV co-infection, Public hospitals

Posted Date: June 23rd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9439237/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Research Article

Research Article

Socio-Demographic and Treatment Outcomes of Registered Tuberculosis Cases in Public Hospitals in Mogadishu, Somalia: A Retrospective Study of the First Three Quarters of 2025

Nuradin Mohamed Hussein[1,6], Mohamed Ahmed Alasow[2], Muktar Baryare Matan[2,3]*, Mohamed Abdirahman Omar[4], Mohamed Abdirahman Abdi[5,6] Abdirizak Sharif Ali[7]

[1] TB Unit, Banadir Hospital, National Public Referral and Teaching Hospital for Maternal and Child Health Care, Mogadishu, Somalia
[2] Midrar Institute of Public Health, Mogadishu, Somalia
[3] Pediatric ICU, Banadir Hospital, National Public Referral and Teaching Hospital for Maternal and Child Health Care, Mogadishu, Somalia
[4] Department of Research, Training and Innovation, Banadir Hospital, National Public Referral and Teaching Hospital for Maternal and Child Health Care, Mogadishu, Somalia
[5] Family Health Department, Federal Ministry of Health, Mogadishu, Somalia
[6] Faculty of Graduate Studies and Research, Somali National University, Mogadishu, Somalia.
[7] Department of Microbiology and Laboratory Sciences, Faculty of Medicine & Health Sciences, SIMAD University, Mogadishu, Somalia,

Author: Nuradin Mohamed Hussein: DrNuradinMhHussein@gmail.com
Author: Mohamed Ahmed Alasow: partnership-office@miph.so
Author: Muktar Baryare Matan: M.Baryare@miph.so

Corresponding author:

Muktar Baryare Matan[2,3]* Pediatric ICU, Banadir Hospital, National Public Referral and Teaching Hospital for Maternal and Child Health Care, Mogadishu, Somalia; [2] Midrar Institute of Public Health, Mogadishu, Somalia
Email: M.Baryare@miph.so
Tel: +252 615 286650

Co-Author: Mohamed Abdirahman Omar drmcqalbi@gmail.com
Co-Author: Mohamed Abdirahman Abdi dr.mmagan@gmail.com
Co-Author: Abdirizak Sharif Ali Arshamyare@gmail.com

Abstract

Background Tuberculosis (TB) remains a major public health challenge in Somalia. This study evaluated socio-demographic characteristics and treatment outcomes of TB patients in Mogadishu public hospitals.

Objective: To assess the socio-demographic characteristics, treatment outcomes, and associated factors among registered tuberculosis patients in public hospitals in Mogadishu, Somalia.

Methods: A retrospective review was conducted among 915 TB patients registered from January to September 2025 in four hospitals (Banadir, DeMartino, Madina, and Daynile). Data on demographics, clinical characteristics, and treatment outcomes were extracted from records. Treatment outcomes were classified as cured, completed, died, lost, or failed. Logistic regression identified predictors of treatment success.

Results: Among 915 patients, 65.9% were male, and 26.2% were aged 15–24 years. Pulmonary TB comprised 71.1% of cases, and 95.0% were new cases. HIV co-infection was 1.2%, with 72.7% initiating ART. Overall treatment success ranged from 92–94%. Multivariate analysis identified hospital, age ≥45 years, HIV positivity, patient category, and bacteriological status as significant predictors. HIV-positive and older patients had lower treatment success, while new TB cases and HIV-negative patients achieved higher success.

Conclusion: TB treatment outcomes in Mogadishu public hospitals are high, demonstrating effective program implementation. Focused interventions are needed for older, HIV-positive, and relapse patients to optimize treatment outcomes.

Keywords: Tuberculosis; Treatment outcomes; Mogadishu; HIV co-infection; Public hospitals

1.0 Introduction

Globally,

Tuberculosis (TB) is a chronic infectious disease caused by Mycobacterium tuberculosis that primarily affects the lungs, although it can also involve other organs of the body. [1] TB is a communicable disease that continues to represent a major global health concern and remains one of the leading causes of illness and death worldwide. Before the COVID-19 pandemic, TB was recognized as the leading cause of death from a single infectious agent. [2]

According to the World Health Organization (WHO), TB is among the most important causes of mortality globally and remains the leading infectious killer, surpassing HIV/AIDS. In 2016 alone, an estimated 10.8 million people developed tuberculosis worldwide, including approximately 6.0 million men, 3.4 million women, and 1.3 million children, demonstrating the continued global burden of the disease. [3] The primary objectives of tuberculosis treatment are to cure infected individuals and prevent the transmission of Mycobacterium tuberculosis to other members of the community. [4]

According to the TB India 2014 Annual Status Report, India was estimated to account for approximately 2.3 million of the 8.6 million TB cases reported globally in 2012. [5] India carries one of the highest burdens of tuberculosis worldwide, contributing nearly one-fifth of the global TB incidence and about two-thirds of the cases reported in the South-East Asian region. It is estimated that more than 40% of the Indian population has been infected with the TB bacillus. The WHO Global TB Report (2006) ranked India first among the 22 high-burden TB countries, reporting more new TB cases annually than any other country. [6]

In Sub-Saharan Africa Tuberculosis (TB) continues to be a significant public health challenge worldwide. Ethiopia, the second most populous country in Africa, carries a substantial TB burden and ranks third in Africa and seventh among the 22 high-burden countries globally. South Africa also experiences one of the highest TB burdens and contributes nearly 3% of global TB cases [7]. According to the World Health Organization TB report, Ethiopia is among the 20 countries responsible for about 85% of the estimated global TB cases [8].

Research conducted in different parts of Ethiopia has reported varying treatment success rates, including 89.2% in northern Ethiopia and 60.1% in eastern Ethiopia, differences that may be related to demographic characteristics and access to healthcare services; age, sex, and ethnicity have been identified as important risk factors [1].

Kenya is also listed among the 30 high TB burden countries and faces a triple burden of TB, TB–HIV co-infection, and multidrug-resistant TB. In 2018, Kenya reported 96,478 TB cases, representing a 13.2% increase from the previous year, with TB–HIV co-infection accounting for 26.6% of cases [9]. However, information on treatment outcomes among TB/HIV co-infected patients in the Somali Region of Ethiopia remains scarce. A study conducted in Jigjiga evaluated treatment outcomes among TB/HIV patients attending public health facilities in 2021 and provided baseline evidence for further research in the region [10].

In Somalia

In Somalia, tuberculosis continues to be a major public health challenge and contributes substantially to morbidity and mortality. The 2021 WHO Global TB Report indicated a slight increase in the estimated TB incidence in Somalia, rising from 258 cases per 100,000 population in 2018 to 259 cases per 100,000 population in 2020. [11] After more than two decades of civil conflict, Somalia remains one of the least developed countries in the world. Prolonged instability, particularly in the south-central regions, has resulted in large population displacements and has been compounded by severe drought, flooding, and famine. These conditions have further increased the vulnerability of communities to tuberculosis transmission. [12]

According to the National Tuberculosis Program (NTP), approximately 18,458 TB cases were notified in Somalia out of an estimated 43,000 incident TB cases, resulting in a treatment coverage of about 43%. This represents a slight improvement compared with previous years but still indicates that a large proportion of TB cases remain undetected or untreated. [13]

Tuberculosis remains one of the leading causes of illness and death in Somalia. The estimated incidence and prevalence of TB are approximately 274 cases per 100,000 population and 513 cases per 100,000 population, respectively, indicating a significant disease burden in the country. [13] The mortality rate from TB, excluding HIV co-infection, has been estimated at about 64 deaths per 100,000 population. Earlier WHO estimates also reported approximately 290 TB cases per 100,000 population in 2009 and around 160 sputum smear-positive cases per 100,000 population in 2014. [14] Previous studies have also shown that patients co-infected with TB and HIV often experience lower cure rates and higher mortality and reinfection rates compared with TB patients without HIV infection. [15]

Aim To assess the socio-demographic characteristics and treatment outcomes of registered tuberculosis cases and determine the association between socio-demographic factors and treatment outcomes.

2.0 Methodology

2.1. Study Design This study used a retrospective design to evaluate tuberculosis (TB) treatment outcomes and the socio-demographic characteristics of patients registered between January-September 2025. Existing medical records and program data were reviewed to determine treatment outcomes, success rates, and associated demographic factors.

2.2. Study Area The study was conducted in four public hospitals (Banadir, Demartino, Madina, and Daynile) located in Mogadishu, Somalia. It examined TB treatment outcomes and the socio-demographic profiles of patients.

2.3 Sampling Technique A census sampling approach was used, including all registered TB patients from January to September 2025 in Banadir, DeMartino, Madina, and Daynile hospitals.

2.4 Data Collection Quantitative data were collected using structured data extraction form`s designed to obtain information on socio-demographic characteristics and treatment outcomes of TB patients recorded during the study period. These forms ensured consistent extraction of relevant variables from patient records. In addition, Key Informant Interviews (KIIs) were

conducted with stakeholders and members of the TB management teams in the selected hospitals. These interviews provided qualitative insights into TB service delivery, treatment challenges, program implementation, and factors influencing treatment outcomes.

2.5 Data Management and presentation Quantitative data were entered, cleaned, and analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive statistical analyses were applied, and frequencies and percentages were calculated to summarize socio-demographic characteristics and treatment outcomes. The results were presented in tables for easier interpretation. Qualitative data obtained from the KIIs were analyzed using thematic content analysis. Interview responses were reviewed, coded, and categorized into emerging themes and subthemes to identify recurring patterns and key issues related to TB program implementation and treatment outcomes in the selected hospitals.

2.6 Ethical approval for this study was obtained from the National Institute of Health (NIH) Somalia and the Banadir Hospital Research Ethics Committee. The study was conducted in accordance with the Declaration of Helsinki. Permission to access TB records and conduct interviews was granted by the respective hospital administrations. All collected data were anonymized and handled with strict confidentiality.

2.7 Confidentiality and Consent All information obtained from patient records and respondents was treated confidentially. No personal identifiers were recorded, and data were coded and securely stored to maintain anonymity. Participation in the Key Informant Interviews was voluntary, and informed consent was obtained from all respondents prior to the interviews.

3.0 Results

3.1 A total of 915 participants were included in the study. Of these, 603 (65.9%) were male and 312 (34.1%) were female. The largest proportion of participants was in the 15–24 years age group (26.2%), followed by 25–34 years (19.8%). Participants aged 35–44 years accounted for 12.6%, 5–14 years for 11.4%, 45–54 years for 8.2%, 55–64 years for 7.9%, ≥65 years for 7.7%, and <5 years for 6.3%. Most participants (84.8%) were residents of Mogadishu, while 15.2% were from outside Mogadishu. Regarding time of registration, 36.3% of participants were registered in Quarter III, 35.3% in Quarter II, and 28.4% in Quarter I. (Table 1)

3.2 Among the 915 TB patients, 537 (58.7%) received treatment at Banadir Hospital, followed by 192 (21.0%) at DeMartino Hospital, 135 (14.8%) at Deynile Hospital, and 51 (5.6%) at Madina Hospital. Regarding TB type, 651 (71.1%) had pulmonary TB, while 264 (28.9%) had extra-pulmonary TB. In terms of bacteriological status, 556 (60.8%) were bacteriologically confirmed, while 359 (39.2%) were not bacteriologically detected. Regarding HIV status, 904 (98.8%) were HIV-negative and 11 (1.2%) were HIV-positive. Among the HIV-positive patients, 8 (72.7%) initiated antiretroviral therapy (ART) and 3 (27.3%) did not start ART. Regarding TB case category, 869 (95.0%) were new cases, while 46 (5.0%) were relapse cases while 46 (5.0%) were relapse cases (Table 2).

3.3 In Quarter I, 48.1% were cured and 45.8% completed treatment, giving a treatment success rate of 93.9%. In Quarter II, 43.7% were cured and 49.8% completed treatment, resulting in a

success rate of 93.5%. In Quarter III, 48.2% were cured and 43.4% completed treatment, with a success rate of 91.6%, while 5.7% were lost to follow-up. Among Mogadishu residents, 45.5% were cured and 47.4% completed treatment, resulting in a success rate of 92.9%. Among patients from outside Mogadishu, 52.5% were cured and 5.8% died, compared with 2.7% deaths among Mogadishu residents. Among male patients, 49.9% were cured, 42.6% completed treatment, and 4.1% were lost to follow-up. Among female patients, 40.1% were cured and 53.5% completed treatment, while the death rate was 3.2% for both sexes. Among HIV-positive patients, 63.6% were cured and 27.3% died. Among HIV-negative patients, 46.3% were cured, 46.9% completed treatment, and 2.9% died. Among new TB cases, 46.3% were cured and 46.8% completed treatment. Among relapse cases, 52.2% were cured and 6.5% died. Among pulmonary TB patients, 65.3% were cured, 26.4% completed treatment, and 3.1% died. Among extra-pulmonary TB patients, 95.8% completed treatment. Among bacteriologically confirmed cases, 76.6% were cured, while among bacteriologically undetected cases, 96.6% completed treatment. Among HIV-positive patients who initiated ART, 87.5% were cured and 12.5% experienced treatment failure. Among those who did not start ART, 100% died. (Table 3)

3.4 The overall treatment success rate was 92–94% (92.9%) Quarter of registration was not significantly associated with treatment success (COR = 0.71, P = 0.345). Residence was also not significantly associated (COR = 0.98, P = 1.000). Hospital of treatment was significantly associated with treatment success. Patients treated at Deynile Hospital had higher odds of treatment success compared with those treated at Banadir Hospital (COR = 11.37, P = 0.001). Age group was significantly associated with treatment success: 45–54 years: COR = 0.13, P = 0.042, 55–64 years: COR = 0.12, P = 0.042, ≥65 years: COR = 0.12, P = 0.022 Sex was not significantly associated with treatment success (COR = 1.18, P = 0.590). HIV status was significantly associated with treatment success (COR = 0.13, P = 0.005). Type of TB (COR = 2.08, P = 0.032) and bacteriological status (COR = 3.05, P = 0.0003) were also significantly associated with treatment success. Patient category (new vs relapse) was not significantly associated (COR = 0.61, P = 0.368). (Table 4)

3.5 Multivariate logistic regression identified hospital, age group, HIV status, patient category, and bacteriological status as significant predictors of treatment outcomes. Patients treated at DeMartino Hospital had higher odds of unsuccessful treatment compared with those at Banadir Hospital (AOR = 1.53; 95% CI: 1.02–2.91). HIV-negative patients were more likely to have successful treatment outcomes than HIV-positive patients (AOR = 6.50; 95% CI: 2.10–20.10). New TB cases had higher odds of treatment success compared with relapse cases (AOR = 2.12; 95% CI: 1.03–4.94). Patients with bacteriologically undetected TB had lower odds of unsuccessful treatment compared with bacteriologically confirmed cases (AOR = 0.33; 95% CI: 0.17–0.67). (Table 5)

Table 1: Socio-demographic characteristics of tuberculosis patients attending public hospitals In Banadir Region

Characteristics	Frequency	Percent
Sex		
Male	603	65.9
Female	312	34.1
Age		
< 5 years	58	6.3
05- 14 years	104	11.4
15- 24 years	240	26.2
25- 34 years	181	19.8
35- 44 years	115	12.6
45- 54 years	75	8.2
55- 64 years	72	7.9
65+ years	70	7.7
Residence		
Mogadishu	776	84.8
Outside Mogadishu	139	15.2
Quarter		
QI	260	28.4
QII	323	35.3
QIII	332	36.3

Table 2: Clinical characteristics of tuberculosis patients attending public hospitals of hospitals In Banadir Region

Characteristics	Frequency	Percent
Hospital		
Banadir	537	58.7
DeMartino	192	21.0
Deynile	135	14.8
Madino	51	5.6
Type of TB		
Pulmonary	651	71.1
Extra-Pulmonary	264	28.9
Bacteriological		
Detected	556	60.8
Not-Detected	359	39.2
HIV		
Positive	11	1.2
Negative	904	98.8
ART Initiated		
Yes	8	72.3
No	3	27.7
Categorical		
New	869	95.0
Relapse	46	5.0

Table 3: Distribution of treatment outcome with socio-demographic and clinical characteristics of tuberculosis patients attending public hospitals of Banadir Region

Characteristics	Outcome					Total
	Cure	Complete	Death	Lost	Failure	
Quarter						
QI	125 (48.1%)	119 (45.8%)	10 (3.8%)	5 (1.9%)	1 (0.4%)	260
QII	141 (43.7%)	161 (49.8%)	11 (3.4%)	9 (2.8%)	1 (0.3%)	323
QIII	160 (48.2%)	144 (43.4%)	8 (2.4%)	19 (5.7%)	1 (0.3%)	332
Place of residence						
Mogadishu	353 (45.5%)	368 (47.4%)	21 (2.7%)	32 (4.1%)	2 (0.3%)	776
Outside Mogadishu	73 (52.5%)	56 (40.3%)	8 (5.8%)	1 (0.7%)	1 (0.7%)	139
Age Group						
< 5 years	18 (31.0%)	39 (67.2%)	1 (1.7%)	0 (0.0%)	0 (0.0%)	58
05- 14 years	27 (26.0%)	75 (72.1%)	2 (1.9%)	0 (0.0%)	0 (0.0%)	104
15- 24 years	133 (55.4%)	95 (39.6%)	4 (1.7%)	7 (2.9%)	1 (0.4%)	240
25- 34 years	101 (55.8%)	63 (34.8%)	3 (1.7%)	14 (7.7%)	0 (0.0%)	181
35- 44 years	54 (47.0%)	55 (47.8%)	3 (2.6%)	2 (1.7%)	1 (0.9%)	115
45- 54 years	33 (44.0%)	33 (44.0%)	5 (6.7%)	3 (4.0%)	1 (1.3%)	75
55- 64 years	33 (45.8%)	30 (41.7%)	6 (8.3%)	3 (4.2%)	0 (0.0%)	72
65+ years	27 (38.6%)	34 (48.6%)	5 (7.1%)	4 (5.7%)	0 (0.0%)	70
Sex						
Male	301 (49.9%)	257 (42.6%)	19 (3.2%)	25 (4.1%)	1 (0.2%)	603
Female	125 (40.1%)	167 (53.5%)	10 (3.2%)	8 (2.6%)	2 (0.6%)	312
HIV Status						
Positive	7 (63.6%)	0 (0.0%)	3 (27.3%)	1 (9.1%)	0 (0.0%)	11
Negative	419 (46.3%)	424 (46.9%)	26 (2.9%)	32 (3.5%)	3 (0.3%)	904
Categorical						
New	402 (46.3%)	407 (46.8%)	26 (3.0%)	31 (3.6%)	3 (0.3%)	869
Relapse	24 (52.2%)	17 (37.0%)	3 (6.5%)	2 (4.3%)	0 (0.0%)	46
Type of TB						
Pulmonary	426 (65.4%)	171 (26.3%)	20 (3.1%)	31 (4.7%)	3 (0.5%)	651
Extra-Pulmonary	0 (0.0%)	253 (95.8%)	9 (3.4%)	2 (0.8%)	0 (0.0%)	264
Bacteriological						
Detected	426 (76.6%)	77 (13.8%)	18 (3.2%)	32 (5.8%)	3 (0.5%)	556
Not-Detected	0 (0.0%)	347 (96.6%)	11 (3.1%)	1 (0.3%)	0 (0.0%)	359
ART Initiated						
Yes	7 (87.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (12.5%)	8
No	0 (0.0%)	0 (0.0%)	3 (100.0%)	0 (0.0%)	0 (0.0%)	3

Table 4: Bivariate analysis of treatment outcome with socio-demographic and clinical characteristics of tuberculosis patients attending public hospitals of Banadir Regional Administrative

Characteristics		Outcome			
		Successful	Unsuccessful	P. Value	COR
Quarter	QI	244 (93.8%)	16 (6.2%)		1
	QII	302 (93.5%)	21 (6.5%)	1.000	0.94
	QIII	304 (91.6%)	28 (8.4%)	0.345	0.71
Residence	Mogadishu	721 (92.9%)	55 (7.1%)		1
	Outside Mogadishu	129 (92.8%)	10 (7.2%)	1.000	0.98
Hospital	Banadir	495 (92.2%)	42 (7.8%)		1
	DeMartino	170 (88.5%)	22 (11.5%)	0.138	0.66
	Deynile	134 (99.3%)	1 (0.7%)	**0.001**	11.37
	Madino	51 (100.0%)	0 (0.0%)	—	Not calculable
Age group	< 5 years	57 (98.3%)	1 (1.7%)		1
	05- 14 years	102 (98.1%)	2 (1.9%)	1.000	0.89
	15- 24 years	228 (95.0%)	12 (5.0%)	0.475	0.33
	25- 34 years	164 (90.6%)	17 (9.4%)	0.082	0.17
	35- 44 years	109 (94.8%)	6 (5.2%)	0.426	0.32
	45- 54 years	66 (88.0%)	9 (12.0%)	**0.042**	0.13
	55- 64 years	63 (87.5%)	9 (12.5%)	**0.042**	0.12
	65+ years	61 (87.1%)	9 (12.9%)	**0.022**	0.12
Sex	Male	558 (92.5%)	45 (7.5%)		1
	Female	292 (93.6%)	20 (6.4%)	0.590	1.18
HIV Status	Positive	7 (63.6%)	4 (36.4%)		1
	Negative	843 (93.3%)	61 (6.7%)	**0.005**	0.13
Patient category	New	809 (93.1%)	60 (6.9%)		1
	Relapse	41 (89.1%)	5 (10.9%)	0.368	0.61
Type of TB	Pulmonary	597 (91.7%)	54 (8.3%)		1
	Extra-Pulmonary	253 (95.8%)	11 (4.2%)	**0.032**	2.08
Bacteriological	Detected	503 (90.5%)	53 (9.5%)		1
	Not-Detected	347 (96.7%)	12 (3.3%)	**0.0003**	3.05
ART Started	Yes	7 (87.5%)	1 (12.5%)	Reference	1
	No	0 (0.0%)	3 (100.0%)	—	Not calculable

Table 5: Multivariate analysis of treatment outcome with socio-demographic and clinical characteristics of TB patients attending public hospitals of Banadir Region

Characteristics	Successful Treatment	Unsuccessful Treatment	P value	AOR (95% CI)
Hospital				
Banadir	495 (92.2%)	42 (7.8%)		1.00
DeMartino	170 (88.5%)	22 (11.5%)	0.041	1.53 (1.02–2.91)
Deynile	134 (99.3%)	1 (0.7%)	0.003	0.09 (0.01–0.65)
Madina	51 (100%)	0 (0.0%)	0.021	0.05 (0.01–0.82)
Age group				
<5 years	57 (98.3%)	1 (1.7%)		1.00
5–14 years	102 (98.1%)	2 (1.9%)	0.887	1.12 (0.21–5.99)
15–24 years	228 (95.0%)	12 (5.0%)	0.192	2.83 (0.60–13.21)
25–34 years	164 (90.6%)	17 (9.4%)	0.041	5.91 (1.08–32.24)
35–44 years	109 (94.8%)	6 (5.2%)	0.307	2.78 (0.40–19.19)
45–54 years	66 (88.0%)	9 (12.0%)	0.017	7.78 (1.45–41.77)
55–64 years	63 (87.5%)	9 (12.5%)	0.013	8.14 (1.56–42.51)
≥65 years	61 (87.1%)	9 (12.9%)	0.010	8.47 (1.63–44.09)
HIV Status				
Positive	7 (63.6%)	4 (36.4%)		1.00
Negative	843 (93.3%)	61 (6.7%)	≤0.001	6.50 (2.10–20.10)
Patient category				
Relapse	41 (89.1%)	5 (10.9%)		1.00
New	809 (93.1%)	60 (6.9%)	0.041	2.12 (1.03–4.94)
Type of TB				
Pulmonary	597 (91.7%)	54 (8.3%)		1.00
Extra-Pulmonary	253 (95.8%)	11 (4.2%)	0.083	0.48 (0.21–1.11)
Bacteriological status				
Detected	503 (90.5%)	53 (9.5%)		1.00
Not detected	347 (96.7%)	12 (3.3%)	0.004	0.33 0.17–0.67)

4. Discussion

In the present study, tuberculosis was more common among males (65.9%). This finding is consistent with previous studies in Somalia, including Mogadishu (256, 66.5%) [15] and Mogadishu (1981, 64.7%) [2]. Similar male predominance has also been reported in Ethiopia, including 882 (55.7%) in Gondar, Ethiopia [16], 945 (53.8%) in Asella, Ethiopia [17], 516 (52.4%) in Debre Tabor Ethiopia [18], and 101 (54.0%) in Jigjiga, [14]. The higher proportion among males may be related to occupational exposure, increased mobility, smoking, and delayed health-seeking behavior. The age distribution showed that TB mainly affected young adults, with the 15–24 years group accounting for 26.2%, followed by 25–34 years (19.8%), indicating a high burden among economically productive age groups. Similar findings were reported from Mogadishu with 355 (28.7%) in the 15–24 years group and 363 (29.4%) in the 25–34 years group [2]. Comparable patterns were also observed in other studies, including Harar, Ethiopia. (36.4% and 32.1%) [10], Addis Ababa, Ethiopia. (52.6% under 25 years) [7], and Debre Tabor Ethiopia (29.6% and 23.9%) [18]. Other studies such as Asella, Ethiopia (28.4%) [17], Amritsar, India (43.4%) [5], and Uttarakannada, India (26.8%) [22] also reported similar trends. Similar socio-demographic patterns have also been reported in other settings, including studies from India and other regions [19].

Regarding case classification, the majority of patients were new cases (869, 95.0%), while 46 (5.0%) were relapse cases. Comparable results were reported in other studies, including Mogadishu (18.2%) [15], Harar, Ethiopia. (3.0%) [10], Addis Ababa, Ethiopia (5.4%) [7], Asella, Ethiopia (3.0%) [17], Gondar, Ethiopia (2.6%) [16], Debre Tabor Ethiopia. (5.8%), and Sindh, Pakistan (5.7%) [18,4]. The predominance of new cases suggests active detection of TB, although relapse cases indicate the need for improved treatment adherence and follow-up. Pulmonary TB accounted for the majority of cases (651, 71.1%), while 28.9% were extra-pulmonary TB. Similar findings were reported in Mogadishu (75.6%) [2], Harar, Ethiopia (61.2%) and Addis Ababa, Ethiopia. (62.2%) [10,7], as well as Asella, Ethiopia (63.9%) [17], Gondar, Ethiopia (72.4%) [16], and Debre Tabor Ethiopia (63.1%) [18]. Comparable results were also reported by Malasia (64.2%) [20], Sindh, Pakistan (77.9%) [4], and South Korea (79.7%) [21]. This predominance is expected since pulmonary TB is the most common and most infectious form of the disease.

The proportion of TB-HIV co-infection in this study was relatively low (11 patients, 1.2%), similar to reports from Mogadishu (1.5%) [2] and Mogadishu (0.72%) [12]. However, higher rates have been reported in other studies, including Addis Ababa, Ethiopia (11.9%), Kharamara, Dege-habour and Gode, Ethiopia (4.6%), and Uttarakannada, India (4.26%) [23,22]. These differences may reflect variations in HIV prevalence, testing coverage, and diagnostic capacity across regions. The overall treatment success rate in this study was 92.9%, indicating good treatment performance. This is comparable with findings from Harar, Ethiopia (92.5%) [10], Addis Ababa, Ethiopia (98.3%) [7], North Ethiopia (93.8%), and Debre Tabor Ethiopia (90.1%) [18]. Lower success rates have been reported in Asella, Ethiopia (82.9%) [17], Gondar, Ethiopia (60.1%) [16], Eastern Cape, South Africa (63.8%) [3], Amritsar, India (84.7%) [5], Mumbai, India (82.5%) [6], Malasia (57.1%) [20], and South Korea (83.9%) [21]. Conversely, Sindh, Pakistan reported 95%, while Uttarakannada, India reported 87% [4,22]. Comparable findings on treatment outcomes and associated factors have also been reported in other retrospective studies [24]. These variations may be influenced by differences in healthcare systems, treatment adherence, and TB control program implementation

5. **Key Informant Interview (KII) questions** for four TB center **in-charge personnel** about TB enrolled cases and factors influence their outcome

At first, we asked public hospitals TB center in charge about most affected populations by TB and reported that "low-income individuals, internally displaced persons (IDPs), and people living in overcrowded households are the most affected by tuberculosis in the area." These populations often live in conditions that facilitate TB transmission and have limited access to healthcare services." The supervisors were inquired about TB vulnerable groups and reasons for vulnerability they replied "the most vulnerable groups include people living in poverty, displaced populations, Immunocompromised people, and malnourished individuals, while Some informants also highlighted individuals with limited health awareness. Informants explained that poor living conditions, weak immunity, and delayed health-seeking behavior contribute to their higher risk" The supervisors were questioned about socioeconomic and structural barriers for people with TB, the participants emphasized that "poverty, overcrowding, stigma, education, and limited access to health facilities as well as low awareness about the TB as others extended their reply; negatively affect TB diagnosis and treatment. These factors often lead to delayed diagnosis, treatment interruption, and reduced adherence to medication." The supervisors were questioned about patient response to treatment and the informants testified that "many TB patients respond well to treatment when they adhere to the prescribed regimen, particularly under directly observed therapy. However, treatment interruption and poor adherence still occur among some patients." We inquired the supervisors about groups with poor treatment outcomes supervisor members responded that "patients with poor socioeconomic status, those who has immunodeficiency, and individuals lacking family or community support were reported to have higher rates of unsuccessful treatment outcomes. Stigma and financial difficulties also contribute to treatment incompliance." The supervisors were questioned about the support systems and Program activities, the informants mentioned that there are "several support mechanisms, including TB treatment programs at public hospitals, counseling services, and follow-up systems to encourage adherence and treatment completion"

6. Conclusion

This study evaluated treatment outcomes and associated factors among 915 TB patients in Mogadishu public hospitals. Treatment success was high (92–94%), reflecting effective TB services. Most patients were male (65.9%) and aged 15–34 years, indicating TB primarily affects the economically active population. Pulmonary TB accounted for 71.1% of cases, and 95.0% were new TB cases. TB–HIV co-infection was low (1.2%), though HIV-positive patients had poorer outcomes and higher mortality. Age, hospital, HIV status, patient category, and bacteriological status were significantly associated with treatment outcomes, with older patients (≥45 years) and HIV-positive individuals showing lower success rates. New TB cases and HIV-negative patients had better outcomes. These findings underscore the effectiveness of TB programs while highlighting the need for targeted care for older, HIV-positive, and relapse patients.

7. Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Strengthen TB-HIV collaborative services to ensure early HIV testing and prompt initiation of antiretroviral therapy (ART) for TB patients living with HIV.
2. Improve adherence support and follow-up systems to reduce loss to follow-up and ensure completion of TB treatment.
3. Enhance TB screening and early diagnosis, particularly among high-risk groups such as older adults and individuals with comorbidities.
4. Strengthen capacity of TB treatment facilities, including staff training, patient counseling, and monitoring systems to maintain high treatment success rates.
5. Conduct further research to explore additional factors affecting TB treatment outcomes, including socioeconomic conditions, treatment adherence, and health system factors.

8. Study Limitations

This study had several limitations that should be considered when interpreting the findings:

1. The study used a retrospective design based on secondary data, which limited the availability of some important variables such as socioeconomic status, lifestyle factors, and treatment adherence.
2. Some patient records had incomplete information, which may have affected the analysis of certain variables.
3. The study was conducted in selected public hospitals in Mogadishu; therefore, the findings may not be fully generalizable to all TB patients in Somalia.
4. The number of HIV-positive TB patients was very small, which limited the ability to make strong statistical conclusions regarding TB–HIV co-infection outcomes.

9. Declarations

9.1. Ethics approval and consent to participate

Ethical approval for this study was obtained from the National Institute of Health, Ministry of Health, Federal Government of Somalia**,** and the Banadir Hospital Research Ethics Committee, Banadir Hospital, Mogadishu, Somalia**.** Permission to access tuberculosis registers and patient records was granted by the respective hospital administrations.

Since this was a retrospective study based on anonymized secondary data, the requirement for individual informed consent was waived by the ethics committees. All data were handled confidentially and used solely for research purposes. For Key Informant Interviews (KIIs), written informed consent was obtained from all participants prior to participation. Consent for publication Not applicable. This manuscript does not contain any individual personal data, images, or identifiable information.

9.2.Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request. However, due to institutional privacy regulations and patient confidentiality policies, the data are not publicly available. Competing interests. The authors declare that they have no competing interests.

9.3.Funding: This study did not receive any external funding. All research activities were conducted using institutional resources of the participating hospitals and collaborating organizations.

9.4. Authors' contributions

NMH contributed to conceptualization, data collection supervision, and manuscript drafting.
MAA contributed to study design, methodology development, and critical manuscript revision.
MBM (Corresponding Author) supervised the study, performed data analysis and interpretation, and finalized the manuscript.
MAO contributed to data management, validation, and analysis support.
MAA (Co-author) contributed to data extraction, literature review, and manuscript editing.
ASA contributed to laboratory data interpretation and critical review of clinical sections. All authors reviewed and approved the final manuscript.

9.5.Acknowledgments

The authors sincerely acknowledge the administrations and tuberculosis program staff of Banadir, DeMartino, Madina, and Deynile hospitals for their support during data collection. We also thank the National Institutes of Health (NIH), Somalia, for ethical guidance and oversight. Special appreciation is extended to all TB clinic staff and Key Informant Interview participants for their valuable contributions to this study.

9.6. Abbreviations

TB – Tuberculosis
HIV – Human Immunodeficiency Virus
ART – Antiretroviral Therapy
WHO – World Health Organization
NTP – National Tuberculosis Program
SPSS – Statistical Package for Social Sciences
KII – Key Informant Interview
AOR – Adjusted Odds Ratio
COR – Crude Odds Ratio
CI – Confidence Interval
IDPs – Internally Displaced Persons
LMICs – Low- and Middle-Income Countries
NIH – National Institute of Health
IRB – Institutional Review Board
QI – Quarter I
QII – Quarter II
QIII – Quarter III

Reference

1. Obiageli O, et al. Socio-demographic characteristics of patients that received tuberculosis care at a tertiary health facility in Nigeria: a retrospective study. *International Journal of Health Sciences and Research*. 2024;14(2).
2. Dirie I, et al. The prevalence of HIV among tuberculosis patients in Benadir, Somalia: a retrospective multicenter cross-sectional study. *Annals of Medicine and Surgery*. 2022;78:103793. doi:10.1016/j.amsu.2022.103793.
3. Nxumalo EL, et al. Treatment outcomes of tuberculosis in the Eastern Cape: clinical and socio-demographic predictors from two rural clinics. *International Journal of Environmental Research and Public Health*. 2025;22:1804. doi:10.3390/ijerph22121804.
4. Laghari M, et al. A prospective study of socio-demographic, clinical characteristics and treatment outcomes of children with tuberculosis in Sindh. *BMC Infectious Diseases*. 2019. doi:10.1186/s12879-019-3702-3.
5. Sadana P, et al. Socio-demographic factors affecting the treatment outcome in patients with tuberculosis. *National Journal of Community Medicine*. 2015;6(4).
6. Gajbhare DM, et al. A study of socio-demographic profile and treatment outcome of tuberculosis patients in an urban slum of Mumbai, Maharashtra. *Indian Journal of Basic and Applied Medical Research*. 2014;4(1):50-57.
7. Fentie A, et al. Tuberculosis treatment outcome among patients treated in public primary healthcare facilities in Addis Ababa, Ethiopia: a retrospective study. *Archives of Public Health*. 2020. doi:10.1186/s13690-020-0393-6.
8. Debash H, et al. Tuberculosis treatment outcomes and its predictors among tuberculosis patients registered at Tefera Hailu Memorial General Hospital, Northeast Ethiopia: a seven-year retrospective study. *Canadian Journal of Infectious Diseases and Medical Microbiology*. 2023. doi:10.1155/2023/4212312.
9. Kimani E, et al. Factors influencing TB treatment interruption and treatment outcomes among patients in Kiambu County, Kenya (2016–2019). *PLOS ONE*. 2021;16(4):e0248820. doi:10.1371/journal.pone.0248820.
10. Tola A, et al. Tuberculosis treatment outcomes and associated factors among TB patients attending public hospitals in Harar Town, Eastern Ethiopia: a five-year retrospective study. *Tuberculosis Research and Treatment*. 2019. doi:10.1155/2019/1503219.
11. Ali MM, et al. Rifampicin-resistant *Mycobacterium tuberculosis* and associated factors among presumptive pulmonary tuberculosis patients in Mogadishu, Somalia. *SAGE Open Medicine*. 2022. doi:10.1177/20503121221148603.
12. Guled RA, et al. Prevalence of rifampicin resistance and associated risk factors among suspected multidrug-resistant tuberculosis cases in TB centers in Mogadishu, Somalia. *Open Journal of Respiratory Diseases*. 2016;6:15-24. doi:10.4236/ojrd.2016.62003.
13. Shube MA, et al. Households of tuberculosis patients face high TB-related costs: Somalia experience. *Research Square*. 2024. doi:10.21203/rs.3.rs-5002382/v1.

14. Abdilahi M, et al. Treatment outcomes of tuberculosis and associated factors among tuberculosis and HIV co-infected patients in public health facilities in Jigjiga, Somali Region, Ethiopia. *Cureus*. 2024. doi:10.7759/cureus.56092.
15. Ali MK, et al. Factors associated with tuberculosis treatment outcomes among tuberculosis patients attending tuberculosis treatment centers in Mogadishu, Somalia. *Pan African Medical Journal*.
16. Biruk M, et al. Treatment outcomes of tuberculosis and associated factors in an Ethiopian university hospital. 2016. doi:10.1155/2016/8504629.
17. Tafess K, et al. Treatment outcomes of tuberculosis at Asella Teaching Hospital, Ethiopia: ten years retrospective aggregated data. *Frontiers in Medicine*. 2018. doi:10.3389/fmed.2018.00038.
18. Worku S, et al. Treatment outcomes of tuberculosis patients under directly observed treatment short-course at Debre Tabor General Hospital, northwest Ethiopia: a nine-year retrospective study. *Infectious Diseases of Poverty*. 2018;7:16. doi:10.1186/s40249-018-0395-6.
19. Jethani S, et al. Socio-demographic profile of tuberculosis patients: a hospital-based study in Dehradun. *National Journal of Community Medicine*. 2014;5(1):6-9.
20. Mohd Nor SR, et al. Socio-demographic profile and prevalence of TB treatment outcomes among TB/HIV co-infected patients in Kelantan. *Pertanika Journal of Science and Technology*. 2021;29(4):2279-2293.
21. Mok J, et al. Treatment outcomes and factors affecting treatment outcomes of new tuberculosis patients in Busan, South Korea. *BMC Infectious Diseases*. 2018;18:655. doi:10.1186/s12879-018-3574-y.
22. Girish HO, Megana D. Socio-demographic profile, treatment outcome and factors influencing outcome among tuberculosis cases treated on daily regimen in Uttarakannada. *National Journal of Community Medicine*. 2019;10(12).
23. Getnet F, et al. Do retreatment tuberculosis patients need special treatment response follow-up beyond the standard regimen? *BMC Infectious Diseases*. 2017;17:762. doi:10.1186/s12879-017-2882-y.
24. Taye G, et al. Treatment outcome and associated factors among tuberculosis patients in Ethiopia: a hospital-based retrospective study. *American Journal of Epidemiology and Infectious Disease*. 2018;6(1):14-19.