Original Research

Preparedness of Community Health Centresand District Hospital for Differentiated Care of Tuberculosis Patients at Banda District

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Abstract

Background: Tuberculosis (TB), caused by Mycobacterium tuberculosis is a leading global infectious disease and remains a major health challenge despite advances in diagnosis and treatment. A total of 1.3 million people died from TB in 2022. India, with a high TB burden, launched the National Tuberculosis Elimination Program (NTEP) in 2020. This study aimed to assess the implementation of differentiated TB care guidelines in Banda district, Uttar Pradesh and to enhance patient outcomes and march towards India's goal of TB eradication.

Aim & Objective: To assess the preparedness of public health facilities for implementation of differentiated care of tuberculosis patients.

Methodology: This cross-sectional study evaluated the preparedness of Community Health Centers (CHCs) and District Hospitals in Banda district for providing differentiated care to tuberculosis (TB) patients. Observations and assessment of healthcare facilities were conducted to evaluate existing infrastructure, resources, and practices. These observations and assessment have been done on the basis of differentiated tuberculosis guidelines issued by ministry of health and family welfare.

Settings and Design: This cross-sectional study in Banda district (April 2023 to March 2024) assessed public health facilities using mixed methods. It included 209 facilities (1 district hospital, 8 CHCs, 52 PHCs, 148 AB-HWCs). The study included all facilities except those with unavailable in-charges, closed, or non-operational centers. Data was collected until saturation.

Statistical analysis used: MS Excel, Jamovi software.

Results: The assessment of TB care in Banda district revealed that Community Health Centers (CHC's) offered essential treatments and diagnostic tools, but only 22% CHC's had renal function tests and 33% CHC's had liver function tests facility, and none had blood culture facility. The District Hospital, on the other hand, provided all

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necessary diagnostics and therapeutics but advanced surgical services were missing. Addressing these gaps is essential for improving TB care in the district.

Conclusions: Despite availability of resource at CHC's and District hospitals, gaps in tuberculosis care, including shortages in diagnostics, and anti-tubercular drugs, should be addressed. Improved training, coordination, and private sector engagement are essential for effective DTC implementation in Banda district.

Key-words: Differentiated Tuberculosis Care, Guideline implementations, Essential and Desirable diagnostics at CHC, Essential and Desirable diagnostics at district hospital, CBNAAT availability.

Key Messages: The "Differentiated Care of TB Patients approach focuses on individualized care by assessing TB patients through clinical, laboratory, and radiological evaluations. Using a risk stratification scoring system, it prioritizes patient-centered care to address risk factors, aiming to significantly reduce preventable TB-related deaths.1.

Introduction

Tuberculosis (TB), caused by Mycobacterium tuberculosis is a leading global infectious disease and remains a major health challenge despite advances in diagnosis and treatment. A total of 1.25 million people died from tuberculosis (TB) in 2023 (including 161 000 people with HIV).[1] The TB mortality was 23 per lakh population in 2023, with 18% decline as compared to 2015 (28 per lakh population).[11] In India, under nutrition is the commonest co-morbidity in patients with TB. Anemia, HIV, and diabetes co-infection increases the risk of mortality. According to new DTCG (Differentiated Tuberculosis Care Guidelines)[2] testing for Diabetes Mellitus and HIV are mandatory for all patients. India also saw a reduction in the number of TB cases reported in 2022, from 29.4 lakh in 2021 to 27.4 lakh. In 2022, India's tuberculosis (TB) mortality rate dropped from 4.94 lakhs in 2021 to 3.31 lakhs.[11] According to India Tb report, 2023, Yes, in 2023, Uttar Pradesh reported the highest number of tuberculosis (TB) cases in a single year in India, with over 6.25 lakh cases. This was a significant achievement, as the Central TB Division had set a target of 5.5 lakh cases for the state in 2023.[11] Strategies are needed for a more comprehensive approach towards the clinical care of tuberculosis patients by evaluating the patients for basic clinical parameters and performing routine investigations to arrive at diagnosis without delay. Early identification of patients with severe disease, along with the assessment of mortality and risk stratification, is crucial for effective management and treatment planning.

To reduce TB deaths in resource-limited settings, a differentiated care strategy can be used to triage patients with high risk of severe illness at diagnosis and refer them for comprehensive assessment and inpatient care.[4]

DTC Guidelines was given by the Ministry of Health and Family Welfare and Central TB Division on January 11, 2021,[1] but in Uttar Pradesh, this guideline is still not implemented. Implementation of DTC Guidelines will help states and districts in early identification of cases who have risk for a poorer outcome and offer them focused care to reduce treatment failure and mortality.

Aim & Objective: To assess the preparedness of CHC's and District hospital for differentiated care of tuberculosis patients of Banda district.

Materials and Methods

Type of Study: Cross-sectional study.

Sampling Unit: Public health facilities of Banda district

Study area - Banda district of Bundelkhand region.

Study population - All Public health facilities (CHC's, and District Tuberculosis Hospital under District male hospital of Banda)

Table No. A

Indicators	Name of District Banda
Total Population (Census 2011)	1799410
Rural Population (In lakhs) (Census 2011)	1523655
Number of Block	8
Number of Villages	682
Number of District Hospitals	1
Number of Community Health Centres	9
Number of Total Primary Health Centres	53
Number of UPHC	04
Number of Sub Centres (RHS 2014)	285
No of Medical Officer	37

Period of Study: April 2023 to March 2024

Inclusion criteria: Public health care facilities of Banda district.

Exclusion criteria: Non-operational health facilities/Private Hospitals.

Sample size:

10 public health facilities (1 District hospital [DTH], All CHC's of Banda District,9)

Plan of study –

List of CHC's, in-charge of CHC were taken from the CMO office and the District Tuberculosis Office in Banda.

- Written informed consent was obtained from the CMO, and DTO Banda for the study.
- All health care facilities were assessed using checklist as per the Differentiated Tuberculosis Care Guidelines (2021) given by Central Tuberculosis Division.

STUDY TOOLS

(A) **Health Facility Assessment** - Checklist was used for facility assessment. Checklist was prepared according to Differentiated Tuberculosis Care Guidelines (2021). Investigator observation method used for assessment. A total of nine public health care facilities were assessed (1 district tuberculosis office,9 community health center) Checklist was filled by examiner. Checklist had questions about availability of essential diagnostics, therapeutics, desirable diagnostics, therapeutics and drugs which were recommended in Differential Tuberculosis Care guidelines.

(B) **Statistical analysis**: Data was entered in MS excel sheet and analysed using Jamovi software.

Results

Table 1: Pulse oximetry, HIV testing and blood sugar, blood grouping, weighing machines, and stadiometers were present at all 9 CHCs (100%). Essential diagnostics like Chest radiography and complete blood count were available at 55% of total CHCs. Renal function test and Liver function test showed gap in availability as only 22% and 33% of CHCs had them respectively.

Blood culture was a desired diagnostic as per DTC guidelines which was covered under FDSI (Free Diagnostic Service Initiative), none of the CHCs had blood culture facility.

Table-2: All CHCs (100%) had availability of Oxygen, broad-spectrum antibiotics, hydrocortisone, vasopressor drugs, multivitamins, iron supplements, and ORS. None of the CHCs had F-75 and F-100 formula feeds or the presence of surgeons recommended in the DTC guidelines. Oral potassium was available in 22% of the CHCs. Non-invasive ventilation, an essential therapeutic, was available in only 66% of the CHCs.

Table-3: All Drugs which are recommended in DTC guidelines for CHCs were available at all CHCs except Syp Portklor, which was not available at 55% of CHC.

Table-4 All essential diagnostics which are recommended in DTC guidelines were available at the District Tuberculosis Hospital.

Desirable diagnostic as per DTG guidelines recommendations were blood culture and Cartridge Based Nucleic Acid Amplification Test (CBNAAT). Blood culture facility was not available at district hospital but CBNAAT was available in Banda district.

Table 5 All Essential Therapeutics, as per recommendation in DTC guidelines were available in district hospital Banda except surgical expertise.

District hospital Banda lacked facilities of invasive ventilation and other surgical desirable therapeutics of Differentiated tuberculosis care.

Availability of Drugs recommended in DTC guidelines were 100% at district hospital Banda.

Table 1: Availability of Essential & Desirable Diagnostics at CHC (N=9)

Essential Diagnostics	**Available, n (%)**	**NOT Available n (%)**
Chest Radiography	5 (55.6%)	4 (44.4%)
Pulse Oximetry	9 (100%)	00 (0%)
Complete Blood Count	5 (55.6%)	4 (44.4%)
HIV Testing	9 (100%)	00 (0%)
Blood Sugar	9 (100%)	00 (0%)
Renal Function Test	2 (22.2%)	7 (77.8%)
Liver Function Test	3 (33.3%)	6 (66.7%)
Blood Grouping	9 (100%)	00 (0%)
Weighing machine	9 (100%)	00 (0%)
Stadiometer	9 (100%)	00 (0%)
Desirable Diagnostics	**Available, n (%)**	**NOT Available n (%)**
Blood Culture	0 (0%)	9 (100%)

Table 2: Availability of Essential Therapeutics at CHC (N =9)

Essential Therapeutics	**Available, n (%)**	**Not Available n (%)**
Oxygen	9 (100%)	00 (0%)
Broad spectrum antibiotics, including intravenous drugs	9 (100%)	00 (0%)
Non-invasive ventilation	6 (66.7%)	3 (33.3%)
Hydrocortisone,	9 (100%)	00 (0%)
vasopressor drugs	9 (100%)	00 (0%)
Multivitamins and iron supplements	9 (100%)	00 (0%)
Surgical expertise: Chest tube insertion	00 (0%)	9 (100%)
Blood transfusion facility	5 (55.6%)	4 (44.4%)
Oral potassium,	2 (22.2%)	7 (77.8%)
ORS including rehydration solution for malnutrition	9 (100%)	00 (0%)
Enteral feeding with F-75 and F-100 formula feeds	00 (0%)	9(100%)

Table 3: Availability of Drugs at CHC (N=9)

Drugs	Available, n (%)	Not Available n (%)
Weight based anti-tuberculosis drugs	9 (100%)	00 (0%)
Multivitamins	9 (100%)	00 (0%)
Thiamine 100 mg daily	9 (100%)	00 (0%)
Syp. Potklor 15 ml	4 (44.4%)	5 (55.6%)
Inj. Magnesium sulphate 50% 2 ml I.M.	9 (100%)	00 (0%)
Albendazole 400 mg single dose	9 (100%)	00 (0%)
Iron and folic acid	9 (100%)	00 (0%)
Ceftriaxone	9 (100%)	00 (0%)
Gentamicin	9 (100%)	00 (0%)
Hydrocortisone	9 (100%)	00 (0%)
Dopamine	9 (100%)	00 (0%)
Phenylephrine	9 (100%)	00 (0%)

Table 4: Availability of Essential & Desirable Diagnostics at DH (N=1)

Essential Diagnostics	Available, n (%)	NOT Available n (%)
Chest Radiography	1 (100%)	00 (0%)
Pulse Oximetry	1 (100%)	00 (0%)
Complete Blood Count	1 (100%)	00 (0%)
HIV Testing	1 (100%)	00 (0%)
Blood Sugar	1 (100%)	00 (0%)
Renal Function Test	1 (100%)	00 (0%)
Liver Function Test	1 (100%)	00 (0%)
Blood Grouping	1 (100%)	00 (0%)
Weighing machine	1 (100%)	00 (0%)
Stadiometer	1 (100%)	00 (0%)
Desirable Diagnostics	**Available, n (%)**	**NOT Available n (%)**
Blood Culture	0 (0%)	1 (100%)
CB NAAT	1 (100%)	0 (0%)

Table 5: Availability of Desirable Therapeutics at District Hospital (N=1)

Desirable Therapeutics	Available, n (%)	NOT Available n (%)
Facilities for invasive ventilation	00 (0%)	1 (100%)
Laparotomy	00 (0%)	1 (100%)
Ventriculo-peritoneal shunt	00 (0%)	1 (100%)
Spinal decompression	00 (0%)	1 (100%)
Decortication surgery	00 (0%)	1 (100%)

Table 6: Availability of Drugs at District Hospital (N=1)

Drugs	Available, n (%)	Not Available n (%)
Weight based anti-tuberculosis drugs	1 (100%)	00 (0%)
Multivitamins	1 (100%)	00 (0%)
Thiamine 100 mg daily	1 (100%)	00 (0%)
Syp. Potklor 15 ml	1 (100%)	00 (0%)
Inj. Magnesium sulphate 50% 2 ml I.M.	1 (100%)	00 (0%)
Albendazole 400 mg single dose	1 (100%)	00 (0%)
Iron and folic acid	1 (100%)	00 (0%)
Ceftriaxone	1 (100%)	00 (0%)
Gentamicin	1 (100%)	00 (0%)
Hydrocortisone	1 (100%)	00 (0%)
Dopamine	1 (100%)	00 (0%)
Phenylephrine	1(100%)	00(0%)

Discussion

Community Health Centers (CHCs):

- **Chest Radiography**: Availability at CHC's in Banda district was 55%, which was lower in comparison to a study in Chandigarh 2019 [5] [61%] but higher than a study from Udaipur in 2007 having [43%] availability of chest radiography.[6]
- **Blood Culture Facilities**: No CHCs in Banda district had blood culture facility, reflecting similar findings in other studies.
- Medical Supplies and Equipment: Oxygen, broad-spectrum antibiotics, hydrocortisone, vasopressors, multivitamins, iron supplements, and ORS are readily available. During the COVID-19 pandemic, oxygen availability improved significantly. Broad-spectrum antibiotics had 100% availability in CHCs in Banda, while non-invasive ventilation availability is around [66%], which is consistent with some studies. Availability of blood transfusion facilities is [55%] in Banda, which is higher as compared to other [Aditya Singh, 2012, U.P.]rural areas.[6]
- **Procedures and Drugs**: Some procedures like chest tube insertion was not available at CHC's, aligning with other study findings. Availability of essential drugs, including anti-tuberculosis drug and multivitamins, is higher in CHC's of Banda District which is comparable with other studies.

District Hospitals:

- **Diagnostics**: All essential diagnostics, including CB NAAT, was available at district hospital. This is consistent with guidelines recommending 100% availability of essential diagnostics at this level. The functionality and reliability of services such as X-ray are generally high but can vary regionally which is similar to findings of Susmita Chatterjee et al (2022)[8]and Hassan A. Hemeg et al (2020) [9]
- **Essential Medicines**: The availability of essential medicines is reported as 100%, contrasting with studies in other regions that showed lower availability and frequent stock-outs. This aligned with findings from various studies indicating higher availability at district hospitals in India.

In summary, while Banda district CHCs face challenges with specific diagnostics and procedures, their overall availability of essential supplies and drugs is high. District hospitals in the region demonstrate full compliance with diagnostic and drug availability standards, surpassing some regional and international averages.

Conclusion

CHCs had high availability of essential diagnostics and therapeutics, including pulse oximetry, HIV testing, and broad-spectrum antibiotics. However, gaps still exist in renal [22%] and liver function tests [33%], whereas blood culture facility was not present. Essential drugs are readily available, but there are limitations in surgical expertise and specific therapeutics like internal feeding formulas and oral potassium. District hospitals provide comprehensive coverage of essential and desirable diagnostics and therapeutics, including CB NAAT and blood transfusion facilities. However, they lack some advanced surgical expertise and invasive procedures. Overall, they offer a wide range of essential services and drugs.

Recommendation: For CHCs:

1. Enhance Diagnostic Coverage: CHCs should prioritize expanding access to essential diagnostics, ensuring 100% availability of complete blood count [currently 56%] and chest radiography [55.6%]. The lack of renal [22%] and liver function tests [33%] should be addressed by acquiring the necessary equipment and training personnel.
2. Introduce Critical Diagnostics: CHCs must invest in diagnostics like blood culture, which is currently not present, to improve infection management and guide treatment plans.
3. Improve Therapeutic Infrastructure: Non-invasive ventilation should be made available at all CHCs [currently 66%].
4. Surgical expertise such as chest tube insertion and availability of enteral feeding formulas like F-75 and F-100 are essential needs that should be addressed.
5. Expand Blood Transfusion Services: Blood transfusion facilities, currently available in [55%] of CHCs, should be expanded to meet the needs of patients.
6. There should be availability of essential medications: Oral potassium supplements [44%] need to be made more widely available to address cases of hypokalemia. Additionally, efforts should focus on ensuring a steady supply of essential drugs.
7. **Capacity Building and Training**: Health workers should receive ongoing training, particularly in handling advanced diagnostics, non-invasive ventilation, and surgical procedures, to improve care quality.
8. Regular monitoring and evaluation should be established to address any deficiencies and ensure sustained improvement in care delivery.

For District Hospital:

1. Address the Lack of Blood Culture Testing: Despite the high availability of diagnostics, introducing blood culture facility is crucial for better infection management.
2. Improve Surgical Expertise: District hospitals should either provide surgical expertise for critical procedures or establishing strong referral systems. This includes addressing gaps in surgical procedures such as chest tube insertion and advanced surgeries like laparotomy, ventriculoperitoneal shunts, spinal decompression, and decortication surgery.
3. Expand Access to Desirable Therapeutics: Facilities for invasive ventilation and complex surgeries should be gradually introduced to enhance the hospital's ability to manage more severe cases.
4. Capacity Building: Healthcare workers should receive training in advanced procedures and the utilization of complex therapeutics to strengthen overall care of tuberculosis patient.
5. Continuous Monitoring: Hospitals should maintain a system for regular evaluation of diagnostic and therapeutic availability to identify and address gaps in real-time.

Limitation of the study:

1. The study is limited to public health facilities in Banda district, reducing generalizability to other regions.
2. Private hospitals are excluded, which can be considered as a potential gap in understanding tuberculosis care across the entire district.
3. The cross-sectional design captures a one-time snapshot, it can miss potential changes in health care availability over time.
4. Rely on self-reporting of data, which could introduce bias and affect the accuracy of the study findings.

Relevance of the study: The study findings provide valuable insight about lacunae in the effective implementation of differential tuberculosis care at public health care facilities at Banda district of Uttar Pradesh and will also help to achieve our final goal of eliminating tuberculosis from India in 2025.[10]

Conflict of Interest: Nil

Source of Funding: Nil

Ethical Clearance: The study was approved by the institute ethics committee with (Ref No. IEC/RDMC/Cert/01) dated 19-01-2023.

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