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A retrospective study of burden, pattern, and site of pediatric tuberculosis patients registered in the district tuberculosis center of Jabalpur district

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ABSTRACT

Background: Tuberculosis (TB) is a major global public health threat and its impact on pediatric population is particularly concerning. India has the highest fraction of the world's TB burden. TB is a disease with high morbidity and mortality. Aiming for eradication in 2025 announced by the honorable Prime Minister which is ahead for global eradication which is 2030. **Aims and Objectives**: This study aims to find out the burden, pattern, site, and outcomes in District TB Center (DTC), Jabalpur. **Materials and Methods:** It is a retrospective record-based study conducted in the DTC, Jabalpur, for 6 months (January 2024–June 2024) for the years 2021, 2022, and 2023 among 623 patients. Data were entered in MS Excel, and descriptive statistical analysis was done using IBM-Statistical Packages for the Social Sciences version 23.0. **Results**: The burden of pediatric patients in 2021, 2022, and 2023 was 2.91%, 4.43%, and 3.03%, respectively, among all TB patients. Among 623 patients, the mean age was 8.42 ± 4.42 (M ± SD) years. 346 (55.5%) were female and 277 (44.4%) were male. Overall, 368 (59%) were extrapulmonary cases and 255 (40.9%) patients of pulmonary TB. In treatment outcomes 451 (72.3%) were treatment completed, 67 (10.7%) cured, 59 (9.4%) died, 12 (1.9%) treatment ongoing, 3 (0.4%) treatment regimens changed, 1 (0.1%) treatment failure, and 18 (2.8%) were not evaluated. **Conclusion:** The pattern of pediatric TB increased and then slightly decreased in 3 years. Among extrapulmonary patients, majority were of lymph node TB, followed by meningitis, abdominal, pleural, bone, and spinal; maximum cases classified as others which were not specified.

Key words: Pediatric tuberculosis; District tuberculosis center; Treatment outcome; Burden of pediatric tuberculosis; Site of pediatric tuberculosis

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INTRODUCTION

Tuberculosis (TB) remains one of the most persistent public health challenges globally, and its impact on pediatric populations is particularly concerning. Although historically associated with adults, TB in children is a significant cause of morbidity and mortality, particularly in regions with high disease prevalence. The World Health Organization (WHO) estimates that over 1.2 million children develop TB each year,[1] with many cases going undiagnosed or inadequately treated, leading to severe health consequences.

There were 30 high TB-burden countries that accounted for 87% of estimated incident cases in the world. Children account for approximately 12% of all TB cases globally.[1] Among the estimated 1.2 million pediatric TB patients,

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only about one-third or 36.5% (399,000) were notified to the national TB control programs, and an estimated 226,000 children below 15 years died due to TB in 2020.[2] There is an expanding global TB epidemic, especially drug-resistant TB in children, which remains one of the leading causes of childhood morbidity and mortality.[3] Diagnosis of childhood TB is quite challenging, and the reporting and treatment of childhood TB are not easy.[4] There was difficulty in collecting samples, the scarcity of bacteria in pediatric TB patients, and the insufficiency of sensitive pathogenic diagnosing techniques all contributed to difficulties in diagnosing and drug sensitivity testing of pediatric TB.[5,6] The diagnosis of pediatric TB is challenging due to many reasons such as the spectrum of the disease being age-dependent with the younger children often presenting as a paucibacillary intrathoracic or disseminated disease with non-specific signs and symptoms.[7] The risk factors for TB exposure, infection, and disease and addresses some of these preventable or modifiable factors such as smoking, malnutrition, alcohol use, diabetes, and human immunodeficiency virus (HIV).[8] The treatment success rate of TB in children (0–14 years) was 91% in 2021 which slightly increased from 88% in both 2020 and 2019.[1]

In India, there were 135,921 TB cases notified in the 0–14 years age group in 2022, in which the number of pulmonary and extra-pulmonary was 68,872 and 61,869, respectively. Females have a greater prevalence than males. The death rate was 2% in pediatric group in the public sector as compared to the private sector was 1.2%.[9]

This study was done to find out the yearly burden, pattern, and outcome of pediatric patients for the last 3 years because TB is a disease-causing financial and economic burden in healthcare facilities at every level in India. Despite advancements in medical science, the diagnosis, treatment, and prevention of pediatric TB present unique challenges that demand focused attention.

Aims and objectives

The aims of this study were as follows:

1. To estimate burden of pediatric TB among the TB patients registered in district TB Center of Jabalpur district
2. To assess the pattern of TB patients registered in the district TB center in Jabalpur district
3. To find out the site of TB in pediatric patients registered in the district TB Center of Jabalpur district
4. To find out treatment outcomes in pediatric patients registered in the district TB Center of Jabalpur district.

MATERIALS AND METHODS

Sampling technique and sample size

It is a retrospective study conducted in the District TB Center (DTC), Jabalpur for a period of 6 months (January 2024–June 2024). All pediatric patients (<15 years of age) diagnosed and treated for TB between January 01, 2021, and December 31, 2023, were considered in the study. Wrongly diagnosed and transferred out cases were excluded from the study. There were 623 TB pediatric patients registered in DTC, Jabalpur considered as sample size in the study for the 3 years.

Data collection tools and technique

After receiving approval from the Institutional Ethical Committee (IEC) (No. IEC/2023/6481, Jabalpur dated July 27, 2023), permission from the State TB Officer of Madhya Pradesh (MP) was taken. The information of pediatric TB patients was collected quarter-wise from record registers and treatment cards with the help of the District TB Officer Jabalpur. The information about their sociodemographic profile (age, gender, and place of residence), type of diagnosing facility, type of case, site of TB, HIV status, and treatment outcomes were extracted by accessing the records available in DTC. Treatment outcomes of success (cured and completed treatment) and poor or unsatisfactory outcomes (failure, not evaluated, lost to follow-up, and death) were measured after completing the standard anti-TB regimen.

Data analysis

The data were entered in MS-EXCEL, and descriptive statistical analysis was done using IBM-Statistical Packages for the Social Sciences version 23.0.

RESULTS

In this study, among the total TB patients registered in the district TB center, the burden of pediatric patients in 2021, 2022, and 2023 was 2.91%, 4.43%, and 3.03%, respectively (Figure 1). However, total cases of TB increased in subsequent years.

Among 623 patients from the record, the mean age was found to be 8.42±4.42 (mean±standard deviation) years. It was found that the maximum age group among the patients was 11–14 years for all the 3 years. It was observed female patients (55.5%) were more affected for the 3 years and the maximum number of patients used public (77%) diagnosed facilities for all 3 years. It was observed that the type of case of majority of patients were new cases (96.9%) as registered in DTC for the 3 years (Table 1).

It observed that the majority of patients were extrapulmonary cases (59%) for all the 3 years, but it declined from 2021 (61.2%), to 2022 (59.1%) to 2023 (57.3%). Among extrapulmonary patients, the majority were of lymph node TB, followed by meningitis, abdominal, pleural, bone, and spinal, maximum number of cases was classified as others which were not specified cases (Table 2).

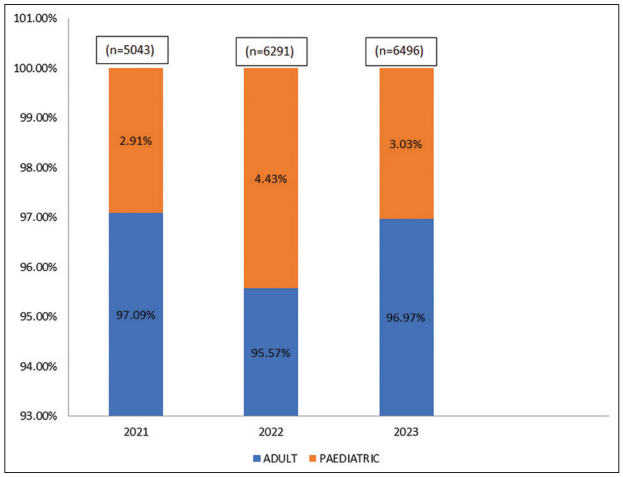

Figure 1: Burden of pediatric patients of tuberculosis in 2021, 2022, and 2023

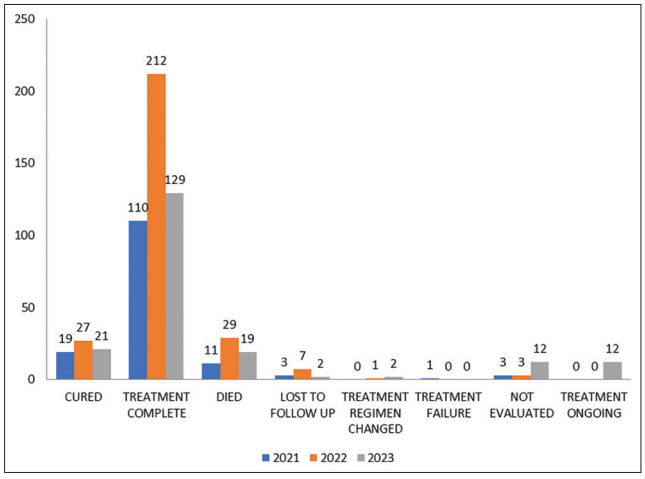

Figure 2: Outcomes of pediatric tuberculosis patients among 2021 (n=147), 2022 (n=279) and 2023 (n=197) (n=623)

It was found in this study that in treatment outcomes, 451 (72.3%) were treatment completed, 67 (10.7%) cured, 59 (9.4%) died, 12 (1.9%) lost to follow-up, 12 (1.9%) treatment ongoing, 3 (0.4%) treatment regimen changed, 1 (0.1%) treatment failure, and 18 (2.8%) were not evaluated cases (Figure 2).

DISCUSSION

In this study on the yearly burden, pattern, site, and outcome of pediatric patients among 623 patients for the years 2021, 2022, and 2023 conducted in the DTC in Jabalpur, maximum cases were seen during 2022 for the past 3 years, followed by the year 2023, and in 2021, showing an increase in pattern and then a downfall in 2023. There was underreporting or hiding of TB cases in 2021 due to COVID-19 disease as WHO has reported disruption of essential TB (preventive treatment has been reduced by 21%) services due to the COVID-19 pandemic. In the year 2022, after the downfall of COVID-19, the reporting of TB cases increased, and due to active and strict monitoring by DTC Jabalpur and the effective implementation of TB preventive therapy, there was a decrease in pediatric cases in 2023.

It was observed that the maximum age group of TB patients was 11–14 years, similar to Kamble and Malhotra[10] and Dhaked et al.[11] This may be due to this particular age group being involved in outdoor activities for the majority of the time. In this study, females were more affected than males similar to Kamble and Malhotra[10] and Dhaked et al.,[11] which could be because females are more prone

Table 1: Sociodemographic characteristics of pediatric patients of tuberculosis

Demographic variables	2021 (n=147) (%)	2022 (n=279) (%)	2023 (n=197) (%)	Total (n=623) (%)
Age group (years)				
0–5	38 (25.8)	96 (34.4)	64 (32.4)	198 (31.7)
6–10	39 (26.5)	69 (24.7)	54 (27.4)	122 (26)
11–14	70 (47.6)	114 (40.8)	79 (40.1)	263 (42.2)
Gender				
Male	65 (44.2)	124 (44.4)	88 (44.6)	277 (44.4)
Female	82 (55.8)	155 (55.6)	109 (55.3)	346 (55.5)
Type of diagnostic facility				
Public	102 (69.3)	207 (73.1)	171 (86.8)	480 (77.04)
Private	45 (30.6)	72 (25.8)	26 (13.1)	143 (22.9)
Type of case				
New	143 (97.2)	271 (97.1)	190 (96.4)	604 (96.9)
Retreatment	2 (1.36)	7 (2.5)	5 (2.5)	14 (2.2)
PMDT*	2 (1.36)	1 (0.3)	2 (1)	5 (0.8)

*PMDT- Programmatic management for drug-resistant tuberculosis

Table 2: Pattern and site of pediatric tuberculosis patients among 2021, 2022, and 2023

Site	2021 (n=147) (%)	2022 (n=279) (%)	2023 (n=197) (%)	Total (n=623) (%)
Pulmonary extrapulmonary	57 (38.7) 90 (61.2)	114 (40.8) 165 (59.1)	84 (42.6) 113 (57.3)	255 (40.9) 368 (59)
In extrapulmonary disease, it will be further classified as per site				
Site	**2021 (n=90)**	**2022 (n=165)**	**2023 (n=113)**	**Total (n=368)**
Meningitis	11 (12.2)	19 (11.5)	14 (12.3)	44 (11.9)
Bone (Excluding Spine)	2 (2.2)	4 (2.4)	1 (0.8)	7 (1.9)
Pleura	4 (4.4)	1 (0.6)	4 (3.5)	9 (2.4)
Abdominal	10 (11.1)	12 (7.2)	7 (6.1)	29 (7.8)
Lymph node tuberculosis	26 (28.8)	31 (18.7)	28 (24.8)	85 (23.1)
Spinal	1 (1.1)	2 (1.2)	1 (0.8)	4 (1.08)
Others (not specified)	36 (40)	96 (58.1)	58 (51.3)	190 (51.6)

to disease due to undernourishment and ignorance. It was observed that the majority of patients were new types of cases, similar to the study by Kamble and Malhotra[10] and Abdullah et al.[12]

It was observed that the majority of patients were extrapulmonary cases, similar to the study by Weldegebreal et al.,[13] Kamble and Malhotra[10] and dissimilar to Abdullah et al.[12]

It was observed that the majority of extrapulmonary patients were of lymph node TB, similar to the study of Weldegebreal et al.,[13] and dissimilar to Abdullah et al.,[12] which may be due to a less developed immune system as the TB infection may spread through lymphatics to the nearest cervical lymph nodes from the lung parenchyma. The majority of patients are not classified in extrapulmonary patients as developed nations have good infrastructure and good diagnostic techniques with carefully examined by highly trained and skilled persons but in developing countries, there may be a deficiency of skilled persons due to a lack of training in diagnostic procedure and technique. There was also a lack of health education and awareness of parents/guardians of TB patients in developing countries.

In this study, a total of 83% of patients achieved successful treatment outcomes, and the study treatment success rate remained below the standard set by the WHO (90%). Among the successfully treated patients, 10.7% were cured and 72.3% declared as treatment completed. In the year 2021, the treatment success rate in this study was 87.7% which was less than WHO (91%), India (89.3%), and MP (91%).[9]

It was comparatively higher than pediatric TB treatment success rates observed in studies conducted in Kenya (69.5%),[14] Nigeria (79.2%),[15] and Malawi (77.3%)[16] and lower than studies conducted in Pakistan (95.1%),[12] and Haryana (97%).[10] In this study, a total of 9.4% of patients died, similar to the study of Limungi et al., (8.5%)[14] conducted in Kenya from January 2021 to April 2021. In the year 2021, the death rate in this study was 7.5% which was more than from India (1.7%), and MP (1.4%).[9] In the year 2022, the death rate in this study was 10.3% which was more than from India (1.5%), and MP (1.4%).[17] In this study, a total of 1.9% of patients were lost to follow-up. It was lower than the rates reported by Weldegebreal et al., (2.9%).[13] In the year 2021, the lost to follow-up rate in this study was 2% which was less than from India (2.3%), and MP (3%).[9] In the year 2022, the lost to follow-up rate in this study was 2.5% which was less than from India (1.6%), and MP (1.7%).[17]

These differences may be due to differences in the study area, education and awareness of TB in TB patients in Jabalpur, the magnitude of TB, parental/guardian awareness of TB, sociocultural, economic, availability and accessibility of health facilities, management of TB, or treatment monitoring criteria.

Limitations of study

As this is a retrospective study, we were able to analyze the data available within the records available in DTC, with a possibility of information bias.

CONCLUSION

We concluded that the pattern of pediatric TB increased and then slightly decreased in 3 years. Among extrapulmonary patients, the majority were of lymph node TB, followed by meningitis, abdominal, pleural, bone, and spinal, with maximum cases classified as others which were not specified.

RECOMMENDATION

In the study, the majority of the extrapulmonary cases are classified as others that were not specified in the DTC Jabalpur. Classification of extrapulmonary TB has to be done according to their respective sites. There was a rise in the cases of meningitis in the age group of 11–14 years.

Awareness should be done by mass media and IEC charts in public places and schools.

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Authors' Contributions:
AS- Definition of intellectual content, literature survey, prepared first draft of the manuscript, implementation of the study protocol, data collection, data analysis, manuscript preparation and submission of the article; **SP-** Concept, design, clinical protocol, manuscript preparation, editing, manuscript revision, review of manuscript; **PKL-** Design of study, statistical analysis and interpretation, literature survey and preparation of figures; **Ap-** Coordination and manuscript revision

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