



Paediatric Tuberculosis at the Directly Observed Treatment Short-Course Clinic of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

**B. I. Garba^{1*}, T. Yusuf¹, L. K. Coker¹, K. O. Isezuo¹, M. O. Ugege¹
and A. Adamu¹**

¹Department of Paediatrics, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. Authors BIG and TY conceptualised and designed the study, performed statistical analysis and interpreted the data, drafted the manuscript and critically revised the manuscript. Author TY obtained the data and managed analyses of the study. Authors KOI, MOU and AA critically revised for important intellectual content, interpreted data and carried out the literature search. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Tuberculosis (TB) is the leading infectious disease killer worldwide, despite significant progress against the disease in recent years. Most cases of TB in children occur in the TB endemic countries but the actual burden of paediatric TB is unknown. With early diagnosis and treatment using the first-line anti-tuberculous drugs, most people who develop the disease can be cured and onward transmission of infection curtailed.

Objective: To determine the pattern and outcome of paediatric tuberculosis managed at a tertiary facility in Sokoto, Nigeria.

Materials and Methods: Records of children managed for TB at the Directly observed treatment short-course (DOTS) clinic over a three-and-a-half-year period were reviewed retrospectively. All children (≤ 15 years) treated for TB over the study period was included. Relevant information was retrieved from the register and analysed accordingly.

Results: 74 children were treated with 33(44.6%) being males, giving a M: F ratio of 1:1.2. Mean

*Corresponding author: Email: bgilah@yahoo.com;

(\pm SD) age was 85.78 (\pm 55.40) months and 34 (45.9%) belonged to the 0.0-5.0-year age group. Seventy-one (95.9%) were new cases and three (4.1%) were relapse. Pulmonary TB (PTB) was seen in 50 (67.6%), more females had PTB than males, which was not significant ($\chi^2=0.4$, $p=0.52$). Acid fast bacilli (AFB) were positive in only 8 (10.8%) while GeneXpert MTB/RIF sensitivity was detected in 7 (9.2%). Majority 36 (48.6%) were lost to follow up, 30 (40.5%) completed treatment, only 4(5.4%) were cured with no recorded mortality. Successful treatment outcome was low (45.9%).

Conclusion: Treatment outcome using DOTS strategy was poor, far below the WHO benchmark. There is need to improve adherence to DOTs therapy to prevent development of multi drug resistant TB.

Keywords: Paediatric; DOTS; TB; tuberculosis.

1. INTRODUCTION

Tuberculosis is the leading infectious disease killer worldwide, accounting for 1.5 million global deaths in 2018 alone, with 608,000 of these occurring in Africa, [1] despite significant progress against the disease in recent years. With early diagnosis and treatment using the first-line anti-tuberculous drugs, most people who develop the disease can be cured and onward transmission of infection curtailed [1].

Challenges of management of TB in paediatric age group are relatively as a result of large proportion of unrecognized cases due to the paucibacillary nature of the disease, difficulty in sputum collection, poor sensitivity of currently available diagnostic modalities, presumptive diagnosis based on a combination of clinical presentation, positive tuberculin test, contact with an open case of pulmonary TB and an abnormal chest radiograph suggestive of TB [2-5]. Tuberculosis in children needs to be identified promptly and managed effectively in line with the Stop TB Strategy [6].

Evidence has suggested that TB prevalence and mortality are under-estimated in many high burden countries including Nigeria [1,7-9]. Most cases of TB in children occur in the TB-endemic countries but the actual burden of childhood TB is unknown [10].

DOTS involves mainly early diagnosis by quality ensured sputum-smear microscopy and standardized short-course anti-TB treatment given under direct and supportive observation [11]. Other components are a regular, uninterrupted supply of high quality anti-TB drugs, standardized recording and reporting; and sustained political and financial commitment [11]. It aimed at ensuring that patient with TB complete treatment to cure and prevent the

development of multi drug resistant TB in the community [11].

1.1 Objective

To document the pattern and outcome of paediatric tuberculosis managed at the DOTS clinic of Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria.

2. MATERIALS AND METHODS

2.1 Methods

This was a retrospective review of children managed for tuberculosis at the DOTS clinic of UDUTH, Sokoto, Nigeria over a three and half year period (1st January 2016 to 30th June 2019). All patients that have completed treatment over the study period were included in the study.

Relevant information from the TB register which included age, gender, HIV status, method of diagnosis of tuberculosis, form of TB and the treatment outcome were retrieved and analysed accordingly.

Treatment outcomes were assessed according to World Health Organisation (WHO) [12] and National Tuberculosis and Leprosy Control Programme (NTLCP) guidelines [13].

Tuberculosis treatment outcomes were classified as follows:

1. Cured- sputum smear positive patient who was sputum negative in the last month of treatment and on at least 1 previous occasion.
2. Treatment completed- Patient who has completed treatment but who does not meet the criteria to be classified as a cure or a failure.

3. Treatment failure- Any TB patient who is sputum smear positive at 5 months or later during treatment.
4. Died- Patient who died from any cause during the course of treatment (regardless of the cause of death).
5. Lost to follow up- Patient whose treatment was interrupted for two consecutive months or more after registration.
6. Not evaluated- A TB patient for whom no treatment outcome is assigned (includes case of transferred out to another treatment unit) where the treatment outcome is unknown.
7. Transferred out- A TB patient who has been transferred to another local government area to continue his/her treatment and for whom treatment outcome is not known.
8. Removed from TB treatment register- Patient who became MTB detected/RIF resistance detected at any point of their treatment and who is moved to 2nd line treatment register.

“Cured” and “treatment completed outcomes” were referred to as treatment successful while outcomes such as death, default and treatment failure were considered unsuccessful.

2.2 Data Analysis and Statistics

Data analysis was performed using the Statistical Package for Social Sciences (SPSS) software,

version 23.0. Means and standard deviations (SD) were used for numerical variables, categorical variables were summarized using frequencies and percentages. Chi-Square (χ^2) test was used to determine association between categorical variables. The level of statistical significance was set at p-value < 0.05.

3. RESULTS

A total of 74 children were treated at the DOTS clinic of the hospital over the study period, 33(44.6%) were males and 41(55.4%) were females, with a M:F ratio of 1:1.2. The mean(\pm SD) age was 85.78(\pm 55.40) months (range of 7 months to 15 years). Majority were aged 5 years and below, with a surge in the adolescent age group as shown in Fig. 1.

More males were seen in the adolescent age group than females, while more females were seen in the under-fives age group. However; there was no significant association between gender and age group as shown in Table 1.

Seventy-one (95.9%) of the children were new cases, while 3(4.1%) were relapse. Pulmonary TB was seen in 50(67.6%) and extra pulmonary TB in 24(32.5%). More females had pulmonary TB than males, which was not statistically significant as shown in Table 2. ($p=0.52$). Similarly, form of TB was not significantly associated with any age range.

Age Distribution

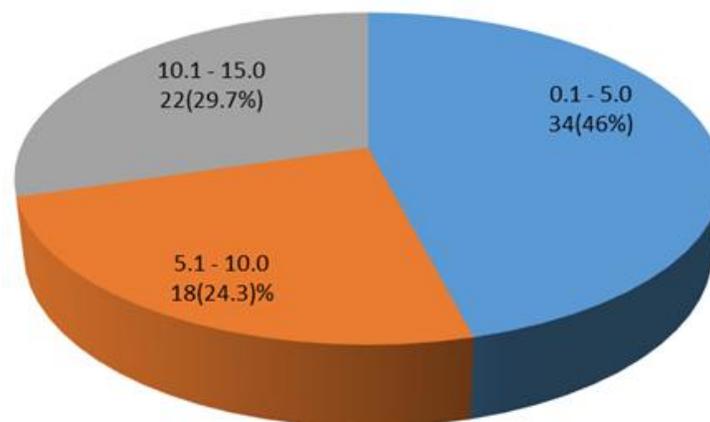


Fig. 1. Frequency distribution of various age groups

Table 1. Age and gender distribution of paediatric TB at DOTS clinic, UDUTH, Sokoto

Age group (years)	Gender		Total f (%)
	Male f (%)	Female f (%)	
0.1 – 5.0	14(41.2)	20(58.8)	34(46.0)
5.1 – 10.0	7(38.9)	11(61.1)	18(24.3)
10.1 – 15.0	12(54.5)	10(45.5)	22(29.2)
Total	33(44.6)	41(55.4)	74(100.0)

($\chi^2=1.3$, $p=0.53$), *f*=frequency, %= percentage

Table 2. Association between form of TB with gender and age range

Variable	Pulmonary TB f (%)	Extra pulmonary TB f (%)	P value
Gender			
Male	21(28.4)	12(16.2)	0.52 *
Female	29(39.2)	12(16.2)	
Age range (years)			
0.0-5.0	22	12	0.86 #
5.1-10.0	13	5	
10.1-15.0	15	7	

* $\chi^2=0.4$, # $\chi^2=0.3$, *f*= frequency, %=percentage

Table 3. Type of extra pulmonary TB

Type of extra pulmonary TB	Frequency (Percentage)
Disseminated	12(50.0)
Abdominal	4(16.0)
Not specified	3(12.5)
TB spine	2(8.3)
TB meningitis	1(4.2)
Miliary TB	1(4.2)
TB adenitis	1(4.2)
Total	74(100.0)

The types of extra pulmonary TB are shown in Table 3 above with disseminated TB (DTB) contributing to half of the cases.

Seventy-one (95.9%) of the children were new cases, while 3(4.1%) were relapse.

Documented samples used for diagnosis included sputum in 21 (28.4%), gastric washout in 17 (23.0%), histology in 2 (2.8%) and 34 (45.9%) had no documented sample taken. Chest x-ray was suggestive of TB in 63 (85.1%), not suggestive in 5 (6.8%) and not done in 6 (8.1%).

The AFB positivity was seen in only 8 (10.8%), GeneXpert MTB/RIF was detected in only 7 (9.6%) while only one (1.4%) was HIV positive as shown in Table 4 below. All the GeneXpert MTB/RIF were sensitive; no MTB/RIF resistance was detected.

Thirty (40.5%) had their treatment completed and four (5.4%) were cured, as shown in Table 5, with 45.9% successful treatment outcome. No death was recorded from the register.

Table 4. Results of investigation carried out on the children

Test	Positive result f (%)	Negative result f (%)	Not done/Not tested f (%)
HIV	1(1.4)	73(98.6)	0(0.0)
AFB smear	8(10.8)	32(43.3)	34(45.9)
GeneXpert MTB/RIF	7(9.2)	8(10.5)	61(80.3)

f=frequency, %=percentage

Table 5. Treatment outcome of the children

Outcome	Frequency (Percentage)
Lost to follow up	36(48.6)
Treatment completed	30(40.5)
Cured	4(5.4)
Transferred out	2(2.7)
Treatment failure	2(2.7)
Died	0(0.0)
Removed from register	0(0.0)
Total	74(100.0)

4. DISCUSSION

This study was retrospective and conducted over three and a half years, but only 74 children were found to be treated in the TB register, which shows that paediatric TB is still under diagnosed and under treated as earlier reported [10,14].

The study showed more females were treated than males, which is comparable to what was reported by Garba et al. [14] and Panigatti et al. [15] but contrasts reports Ramesh et al. [16], Nandimath et al. [17], Bandichhode et al. [18], Oloyede et al. [19] and Paul et al. [20]. Reason for the disparity maybe due to variation in sample size and sampling methods.

Majority of the children were under-fives which is similar to reports from other studies [14,16-19], however contrasts findings by Adejumo et al. [21]. This could be explained by the fact that such age group are prone to infections due to poor immunity, and some of the children may not have been immunised against TB; although this was not looked for due to the methodology. This is a reflection of the impact of unrecognised adult infection or lack of INH prophylaxis for children exposed to adults with TB. Similarly, the progression from infection to active disease is very high compared to the older children [18]. Screening for TB is strongly advocated in this age group when treating adults with the disease [20].

A surge in TB was seen in the adolescent age group which is similar to report by Oloyede et al. [19], where they attributed an increase in adolescents to be linked to their increased independence, mobility and risk taking behaviour in that age group [19].

Majority of our patients had PTB, which is similar to reports from other studies [14,16,18-21], but contrasts findings by Panigatti et al. [15]. Most

TB cases are primarily pulmonary and easier to diagnose than extra pulmonary which requires high index of suspicion [14].

In this study, PTB and disseminated TB were the commonest forms of TB in our study, which is similar to a hospital report from Uyo [19]. There was no significant gender difference between children with PTB and extra pulmonary TB.

Most of the patients were new cases similar to findings by Garba et al. [14] in Gusau, Adejumo et al. [21] in Lagos and Daemo et al. [22] in Ethiopia. This can be explained by better awareness about the disease and availability of drug treatment with increased presentation to the hospital [14].

The AFB detection rate in this study was low, however it was higher than 5.3% reported from Kerala [16], 7.0% from Uyo [19], and 10.7% from Solapur [17]; but lower than 15.8% reported from Gusau [14], and 20.7% reported from Ethiopia [22]. Reason for this may be because of rarity of smear positive TB in children and difficulty getting sputum/gastric samples from children [14] and paucibacillary nature in children [19]. The MTB detection using GeneXpert was also low, similar to 9.2% reported by Garba et al. [14].

Only 1.4% of the children had HIV/TB co infection, similar to 1.3% reported from Gusau [14], in contrast to 30.0% from Uyo [19], 40.2% from Port Harcourt [20], 15.4% from Ethiopia [22] and 19.5% from Abuja [23]. Even though the study is hospital based, reason for the low prevalence could be attributable to the fact that Sokoto State has a low HIV sero-prevalence in Nigeria with 0.4% [24].

The chest x-ray findings were suggestive of TB in most of the children which shows that in children with TB, their chest radiographs may be suggestive even in the absence of chest signs [19]. This finding is similar to reports from Uyo [19] and South Africa [25]. Pulmonary TB commonly co exists with other forms of TB, which may have prompted the use of chest x-ray in almost all the children.

DOTS have been found to be effective and efficient in treating TB [14,26,27], however, the treatment outcome in this study showed that the majority of the children were lost to follow up. This is in contrast to reports from other studies where majority of the children completed treatment [14,15,17,18,21,28]. This may be a

reflection of inadequate counselling with poor adherence to medications or poor attitude by the parents resulting to lack of regular follow up to ensure completion of treatment. Incomplete treatment and lack of compliance with follow up is a serious challenge because it can lead to development of treatment failure and multi drug resistant TB.

The lost to follow up from our study may be due to inadequate data entry or counselling of parents which would have increased the treatment completion by the children. This is higher than 1.3% reported from Gusau [14], 12.0% from Uyo [19], 15.0% from Lagos [21] and 7.0% from Kinshasha [29].

The successful treatment outcome was poor, far away from the WHO bench mark of 85.0% [12], which contrasts other studies that showed an overall good success rate [14,15,17,18,21,28]. However, some studies reported low treatment success rate higher than our finding which include 78.0% by Oloyede et al. [19], 77.4% reported by Adejumo et al. [21] and 78.9% by Kebede et al. [28]. There was no death recorded in this study, which may be due to inadequate follow up of the children as many were lost to follow up or small sample size. However, this finding is similar to reports from Uyo [19] and Port Harcourt [20].

5. CONCLUSION

Treatment outcome using DOTS strategy was poor, far below the WHO benchmark. There is need to ensure follow up of patients to improve adherence to DOTs therapy to prevent development of multi drug resistant TB.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Ethical approval was obtained from the hospital ethical committee.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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