MERIT RESEARCH JOURNALS
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Merit Research Journal of Medicine and Medical Sciences (ISSN: 2354-323X) Vol. 5(7) pp. 331-336, July, 2017
Available online http://www.meritresearchjournals.org/mms/index.htm


*Original Research Article*

# Clinical profile and factors associated with treatment outcome in tuberculosis in children in Kinshasa, Democratic Republic of Congo

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**Abstract**

**The aim of our study is to evaluate the clinical profile of tuberculosis (TB) patients and identify factors associated with treatment outcomes in Kinshasa. A retrospective and multicenter study of children aged 0 to 15 years who presented with TB from January 2010 to December 2014 at 18 TB unit in Kinshasa was conducted. A total of 2500 cases were included [average age: 6.8 (± 4.7) years]. The majority, 1350 (54 %), had EPTB and 1150 (46 %) had PTB [834 (33.36 %) clinically diagnosed and 316 (12.64 %) bacteriologically diagnosed]. Concerning the treatment outcomes, 2094 (83.8 %) cases completed treatment, 295 (11.8 %) cases were cured, 34 (1.4 %) cases were transferred, 48 (1.9 %) cases defaulted, 21 (0.8 %) cases died, and 8 (0.3 %) cases were failed, then the treatment success (cure/treatment completion) was represented by 2389 (95.6 %) cases, and the poor outcome (defaulter/deceased/failure) was encountered in 77 (3.1 %) cases. There was a significant association (*P*=0.001) between the form of TB and treatment outcome. The chi-square of tendency showed that having PTB+ was associated with 2 times greater risk of poor outcome. The treatment success rate was appreciable in Kinshasa, but there is a need to improve the diagnosis of childhood TB.**

**Keywords:** Tuberculosis; Children; Clinical profile; Outcome; Kinshasa

## INTRODUCTION

Childhood tuberculosis (TB) is in a state of constant evolution worldwide, but especially in limited resource countries (Bhutta et al., 2014). Children are an important risk group, specifically those aged less than 5 years (Nelson and Wells, 2003). Pulmonary tuberculosis (PTB) is the common form of TB, and the lungs are almost always the point of entry of the TB bacilli and therefore the most common site of disease (Nelson and Wells, 2003). At present, the treatment of TB is well codified and available through the National Program of TB (NTP) (Guidance for national tuberculosis programmes on the management of tuberculosis in children, 2014), and treatment outcomes are often good if timely and appropriate therapy is completed (Adherence to long-term therapies, 2003). However, some factors have been identified as being associated with poor outcomes. In Ethiopia, Hailu et al reported these factors to include age, form of TB, treatment category and co-infection with human immunodeficiency virus (HIV) (Hailu et al., 2014). In Iran, Alavi et al found that age, low body weight, household TB contact and exposure to cigarette smoke were the main risk factors for poor treatment outcomes (Alavi et al., 2015). In the Democratic Republic of Congo (DRC), Aketi et al conducted a study at a university hospital and observed a predominance of TB in children aged 10 years and older, and of extrapulmonary TB

(EPTB) cases. The same study revealed good outcomes to have occurred in 70 % of cases and found form of TB, Ziehl test positivity, and having undergone chest X-rays to be associated with poor outcomes (Aketi et al., 2016). After obtaining these data, a better understanding of the epidemiology of childhood TB in the DRC may shed light on the performance of TB control programs in the country; in turn, this understanding may lead to the development of better strategies and tools for pediatric TB control in the DRC, thereby contributing to global TB control because the DRC has the 3rd place highest TB burden worldwide. Then measures can be taken to improve TB control and meet the World Health Organization (WHO) objectives. The objective of this study is to evaluate the clinical profile of childhood TB patients and identify factors associated with treatment outcomes in Kinshasa.

## METHODS

This research was a retrospective multicenter study of children aged 0 to 15 years who received or not Bacille Calmette Guérin vaccine, and who presented with TB from January 2010 to December 2014. The study was conducted at 18 primary and secondary level health care containing a “Diagnostic and Treatment Unit of TB” (DTU) in Kinshasa Democratic Republic of Congo, randomly selected from the all 316 DTU located in the 4 health districts of Kinshasa, by using a simple stratified sampling. The 18 included DTU were the Pediatric Hospital of Kimbondo, Health center (H.C.) of Libiki/Kingabwa, Kasavubu/Binza-Meteo, Lufungula, 2nd street Limete, Lisanga Saint Benoit, Mont Amba, Kokolo, Lisungi, Saint Ambroise/Kisenso, Saint Alphonse, Mobengi/Ngaba, Maternity/Binza, Kimbanguiste, Bomoi, Kizito, Lubudi, and Etonga.

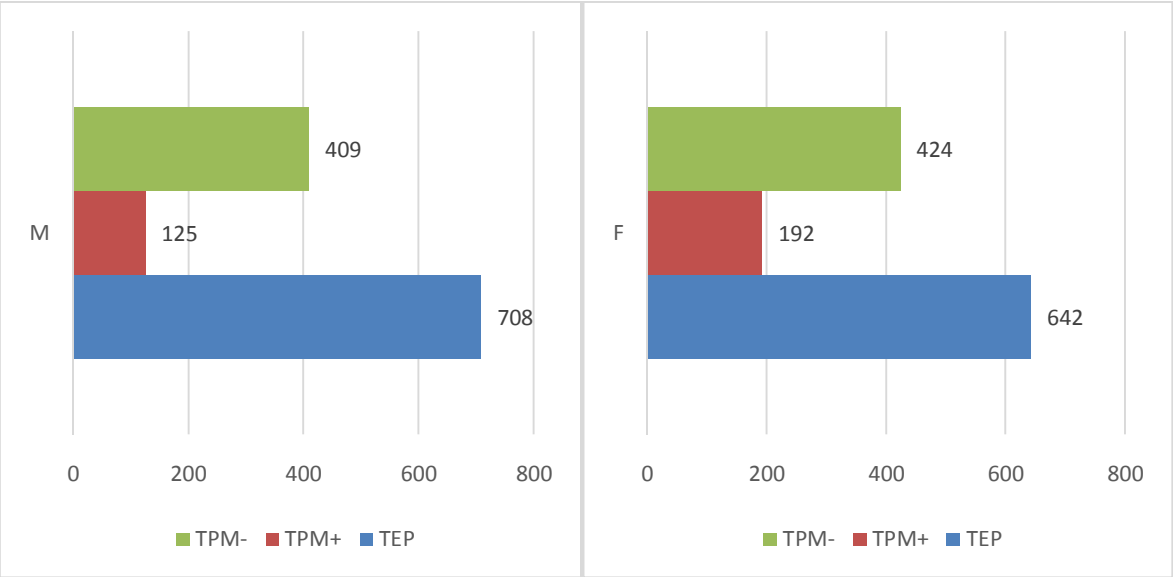
Cases were categorized into 3 age groups. The first group included children aged 0 to 4 years; the second group included children aged 5 to 10 years, and the last group included children between the ages of 11and 15 years. The TB diagnosis was considered when clinical elements was associated with one or several positive elements, as the Keith-Edwards score, the tuberculin skin test, acid fast bacilli coloration (on sputum, gastric fluid or other biological fluid), Lowenstein culture, Gene Xpert (available in the country between 2011-2012), chest X-ray, and histopathology. The human immunodeficiency virus (HIV) status was defined according to the national guidelines, by using 2 different tests (Determine and Unigold). The tuberculin skin test, Lowenstein culture, Gene Xpert, chest X-ray, and histopathology was not available in all DTU. Where it was missing, exams was sent to others hospitals where there was available.

The sample included all patients who fulfilled the inclusion criteria during the study period and sought care at one of the 18 selected DTU. We obtained data, from the patient registries and files, of the facilities and collected parameters including name of the DTU, age, sex, form of TB, Ziehl test result, treatment received, co-infection with HIV, and treatment outcome.

During the study period, the NTP used the older guidelines (République Démocratique du Congo, 2008; Stop TB Partnership Childhood TB Subgroup, World Health Organization, 2006), the new guidelines, which have been developed in accordance with the new WHO recommendations, were notyet utilized by the NTP (République Démocratique du Congo: Programme national de lutte contre la tuberculose, 2015). After diagnosis, patients suffering from TB are referred to the nearest health center for treatment according to the national guidelines for TB. Some operational definitions were used as defined by the WHO (République Démocratique du Congo: Programme national de lutte contre la tuberculose, 2015). The PTB was defined when cases had lesions in the lung parenchyma and EPTB when it was lesions outside the lung parenchyma (World Health organization, 2004). We considered PTB cases all children who had both pulmonary and extrapulmonary lesions (Stop TB Partnership Childhood TB Subgroup, World Health Organization, 2006). Patients were defined as “cured” when they had bacteriologically confirmed pulmonary TB at treatment initiation and were smear- or culture-negative during the last month of treatment and on at least one previous occasion. The “completed treatment” category included TB patients who had completed treatment without evidence of failure but had no recorded negative sputum smear or culture results during the last month of treatment and on at least one previous occasion because either the tests were not performed or the results were not available. The “treatment success” group included patients who were cured or had completed treatment, and the “poor treatment outcome” was composed of all patients who defaulted, died, or experienced treatment failure (World Health Organization, 2014).

Data were entered into Excel and analyzed using SPSS version 20.2. Means and frequencies were calculated; the associations between clinical parameters and outcomes were assessed using correlation coefficients or the Pearson chi-square test, and the chi-square test for trend was used to identify factors associated with poor outcomes. The significance threshold was set at $P \leq 0.05$.

Data were collected and analyzed anonymously. The principles of the Helsinki Declaration were observed. Patient consent was not obtained because of the retrospective nature of the study. The study was approved by the ethics committee of the Public Health School of the University of Kinshasa (Permit Number: ESP/CE/042B/2015). There were no conflicts of interest.




**Legend:** M: masculine; F: Female; TPM+: TB bacteriologically confirmed; TPM-: TB clinically diagnose; TEP: Extrapulmonary TB.

**Figure 1.** Distribution of children according to sex and type of TB


**Legend:** *y: yearsold; TPM+: TB bacteriologically confirmed; TPM-: TB clinically diagnosed; TEP: Extrapulmonary TB.

**Figure 2.** Distribution of children according to age group and type of TB

## RESULTS

During the study period, 2514 children were admitted to the selected DTUs for TB treatment. Fourteen cases were excluded because of incomplete data. A total of 2500 cases were included, 1258 (50.3 %) of whom were female and 1242 (49.7 %) of whom were male; thus, the sex ratio was 1.01.The distribution of children according to sex and type of TB was reported in figure 1 (Figure 1). The mean age was 6.8 (standard deviation± 4.7) years, and the median age was 6 years (extremes: 5 days and 15 years). The cases were categorized into 3 age groups: 0 to 4 years old (1014 cases or 40.6 %), 5 to 10 years old (793 cases or 31.7 %), and 11 to 15 years old (693 cases or 27.7 %), the first of which included the majority of the patients.

Regarding the residence of patients, the majority (1801 or 72.04 %) resided in the same health district as

**Table 1.** Factor associated with treatment outcome

| Parameters | Good outcome n(%) | Poor outcome n(%) | *P*-value |
|---|---|---|---|
| **Age(years)** | | | 0.436 |
| 0-4 (n=1004) | 978 (97.4) | 26(2.6) | |
| 5-10(n=779) | 753 (96.7) | 26(3.3) | |
| 11-15(n=683) | 658 (96.3) | 25(3.7) | |
| **Sex** | | | 0.491 |
| Male(n=1227) | 1193 (97.2) | 34(2.8) | |
| Female(n=1239) | 1196 (96.5) | 43(3.5) | |
| **Health care facility** | | | 0.914 |
| In the zone of residence(1776) | 1722(97.0) | 54(3.0) | |
| Out ofthe zone of residence (690) | 667(96.7) | 23(3.33) | |
| **Form of TB** | | | **0.001** |
| PTB+(n=305) | 288(94.4) | 17(5.6) | |
| PTB-(n=824) | 799(97.0) | 25(3.0) | |
| EPTB(n=1337) | 1302(97.4) | 35(2.6) | |

the DTU from which they received treatment, and 699 (27.96 %) resided in other districts. Of the 2500 TB cases, 1350 (54%) had EPTB and 1150 (46%) had PTB, of whom 834 (33.36%) were PTB- and 316 (12.64%)were PTB+.

Of the 1350 patients with EPTB, 1057 (42.3 %) had lymphadenitis, 163 (6.5 %) cases pleural effusion, 37 (1.5 %) had meningitis, 35 (1.4 %) had osteoarticular TB, 35 (1.4 %) had vertebral TB, 13 (0.5 %) had abdominal TB, 4 (0.3%) had pericardial TB and 3 (0.1%) had miliary TB.

Between the 1150 PTB cases, 998 (86.8%) did chest X-ray. The radiological findings were well defined in 956 cases. The abnormal imaging was found in 947 (99.1 %) cases: parenchymal infiltration (697 cases or 72.3 %) of which the majority was alveolar infiltration (608 cases or 64.2 %), pulmonary hilaror/and paratracheal lymphadenopathyin 125 cases (13.2 %) associated with other pulmonary lesions, atelectasis in 58 cases (6.1 %), cavity in 53 cases (5.6 %), and fibrosis in 14 cases (1.5 %).

About the 1350 EPTB cases, 428 (31.7 %) did chest or abdominal or osteoarticular or vertebral X-ray, of which 51 (11.9 %) was not available or not well described. The available X-ray results revealed 163 (38.1 %) pleural effusion, 48 (11.2 %) hilaror/and paratracheal lymphadenopathy, 35 (8.2 %) osteoarticular lesions, 35 (8.2 %) vertebral lesions, 5 (1.2 %) abdominal lesions, 4 (0.9 %) cardiomegaly, 3 (0.7 %) miliary TB, and 84(19.6 %) normal X-ray results.

The distribution of cases by age group and type of TB indicated a predominance of EPTB (595 or 44.07%) and PTB- (399 or 47.84 %) in the group of cases aged 0 to 4 years and a predominance of PTB+(234 or 74.05%) in the group aged 11 to 15 years. (Figure 2)

The *Mycobacterium* tuberculosis was identified in 316 (12.6 %) cases, 231 (73.1 %) with acid fast bacilli coloration, 81 (25.6 %) with Gene Xpert and 4 (1.3 %) with Lowenstein culture. The HIV test was performed in 1202 (48.1 %) cases of which17 was positive (1.4 %).

At admission, the majority of cases (2451 or 98.04 %) were new cases, while 35(1.4 %) were relapse cases, and 14 (0.6 %) had been transferred from other health care facilities. Concerning the treatment outcomes, 2094 (83.8 %) cases completed treatment, 295 (11.8 %) cases were cured, 34 (1.4 %) cases were transferred, 48 (1.9 %) cases defaulted, 21 (0.8 %) cases died, and 8 (0.3 %) cases were treatment failures. When we excluded the transferred cases (34 or 1.4 %), the cases could be classified into 2 therapeutic groups, the good outcome group, which included 2389 (95.6 %) cases, and the poor outcome group, which included 77 (3.1 %) cases.

The analysis of the associations between the previously described outcomes and the other assessed parameters indicated the presence of a significant association (*P*=0.001) between the form of TB and treatment outcome variables. (Table I)

The results of the chi-square test for trend showed that having PTB+ was associated with 2 times greater risk of poor outcomes.

## DISCUSSION

The objective of this study was to describe the clinical profile of and outcomes in children treated for TB in Kinshasa. The main results indicated that the majority of children were aged between 0and4 years (40.56 %). A predominance of EPTB (54 %) was identified in all age groups. The highest prevalence of PTB+ was observed in children aged 11 to 15 years (74.05 %); and good outcomes were identified for the majority of cases (95.6 %).

A previous study (Aketi et al., 2016) that was conducted in a tertiary level hospital in the same country

in 2016 (the University Hospital of Kinshasa) reported a different TB distribution, with the majority of TB cases aged 11 to 15 years (41.0 %) and less good outcomes (70 %).

The discrepancy observed between these 2 studies may be explained by differences in study site, with the previous study conducted in a university hospital and the present study conducted in basic health care facilities. The low number of younger children observed in the 2016 study may be explained by the fact that the study was conducted in a tertiary level hospital. Younger children are initially treated in a primary health care facility after receiving a clinical diagnosis of TB, and older children are transferred to referral care facilities for diagnosis. However, it is possible that in the present study, the number of cases considered to have clinically diagnosed TB was overestimated, as they may have been affected by nonspecific pneumonia or other pathologies. This may be especially true in young children, as it may be difficult to obtain sputum samples from this population (Swaminathan and Ramachandran, 2015). Indeed, we realize that diagnosing TB in children using clinical signs and symptoms may be complicated because the signs of disease are less specific than those observed in adults (Marais et al., 2006). In fact, overdiagnosis of childhood TB has been found to be common in high burden countries (Cuevas et al., 2012). This diagnostic difficulty may explain the very low number of children diagnosed with PTB+ in the younger group. It is likely that in most cases, sputum samples were not obtained, and practitioners may have limited their diagnostic procedures to clinical and radiological exams. There is a need to improve the management of childhood TB in primary and secondary level health care facilities by regularly training clinical staff on how to obtain sputum or other biological material in children and supervising sampling efficacy. The lack of human and laboratory capacity to diagnose childhood TB cases can constitute an obstacle to the WHO goals (World Health Organization, 2015).

Second, in primary care facilities, some procedures are low cost or free, but in tertiary level hospitals, patients have to pay for all consultations, laboratory exams and X-ray except for the Ziehl test. Therefore, people may prefer to undergo these procedures at primary health facilities. Except for within the national laboratory of the NTP, X-pert MTB devices are available only in some primary and secondary level health care facilities and are not available in university hospitals. It is possible that the prevalence of TB may be underestimated in tertiary level facilities because of difficulties in accessing diagnostic tools. However, these underdiagnoses can contribute to poor outcomes (Drobac et al., 2012), as suggested by the poor outcomes observed in the previous study. Conversely, in the present study, the outcomes were better, and treatment success was identified in almost 95% of cases, a proportion that is in line with the WHO objectives (World Health Organization, 2015). This result was better than those previously reported in the literature. In Cameroon, Pefura et al observed that up to 20% of children with TB in low- and middle-income countries failed to complete treatment (PefuraYone et al., 2011). In Vanuatu, the treatment success rates in 2014 were 79% in children aged 0 to 4 years and 92% in children aged 5 to 14 years (Tagaro et al., 2014). In Ethiopia, Hailu at al identified a treatment success rate of 82% in new cases (Hailu et al., 2015), and in Australia, Teo et al reported a treatment success rate of 89.4 % in 2015 (Teo et al., 2015).

Concerning the factors associated with poor outcomes, in this study, type of TB was found to be significantly associated ($p$=0.001) with poor outcomes; similar results have been reported in others studies, such as those conducted by Aketi et al in 2016 in the DRC and Hailu et al in 2014 in Ethiopia (Hailu et al., 2014).

This study can help the NTP and TB practitioners to improve the guidelines for, supervision of, and provision of care to children with TB, and especially diagnostic procedures. These efforts can contribute to control of the disease and to meeting the “End TB” objectives. However, the parameters used in this study were limited to those available in the patient registry. Patient files were incomplete in some cases and, therefore, not useful for the purposes of this study. A prospective study may help identify others factors associated with TB outcomes.

## CONCLUSION

In this multicenter study conducted in Kinshasa, the majority of children with TB were aged 0 to 4 years, more than half had EPTB, almost 95 % had good outcomes. A significant association (P=0.001)was identified between form of TB and outcome. The treatment success rate was appreciable in the Kinshasa’s DTU, but there is a need to improve the management, specially the diagnosis of childhood TB in primary and secondary level health care facilities.

## ACKNOWLEDGEMENTS

The authors want to thank Jack, a nurse, for his valuable contributions for collecting data. We also thank all of the TB nurses in all the health care facilities for their participation in the collection of these data. There is no conflict of interest. The study did not receive any funding.

### REFERENCES

Adherence to long-term therapies (2003). Evidence for action. Geneva: World Health Organization.

Aketi L, Kashongwe Z, Kinsiona C, Fueza SB, Kokolomami J, Bolie G, Shiku DJ (2016). Childhood Tuberculosis in a Sub-Saharan Tertiary Facility: Epidemiology and Factors Associated with Treatment Outcome. PLoS ONE, 11(4): e0153914.

Alavi SM, Salmanzadeh S, Bakhtiyariniya P, Albagi A, Hemmatnia F, Alavi L (2015). Prevalence and treatment outcome of pulmonary and extrapulmonary pediatric tuberculosis in southwestern Iran. Caspian J Intern Med; 6(4):213–219.

Bhutta ZA, Sommerfeld J, Lassi ZS, Salam RA, Das JK (2014). Global burden, distribution, and interventions for infectious diseases of poverty. Infect Dis Poverty Jul 31; 3:21.

Cuevas LE, Petrucci R, Swaminathan S (2012). Tuberculosis diagnostics for children in high-burden countries: what is available and what is needed. PaediatrInt Child Health.; 32(Suppl 2):S30–S37.

Drobac PC, Shin SS, Huamani P, Atwood S, Furin J, Franke MF, Lastimoso C, del Castillo H (2012). Risk factors for in-hospital mortality among children with tuberculosis: the 25-year experience in Peru. Pediatrics.; 130(2):e373–e379.

Guidance for national tuberculosis programmes on the management of tuberculosis in children (2014). 2nd ed. Geneva: World Health Organization.

Hailu D, Abegaz WE, Belay M (2014). Childhood tuberculosis and its treatment outcomes in Addis Ababa: a 5-years retrospective study. BMCPediatr; 14: 61.

Hailu DM, Gemechu DD, Lindtjorn B (2015). Low case notification rates of childhood tuberculosis in southern Ethiopia. BMC Pediatrics; 15:142.

Marais BJ, Gie RP, Schaaf HS, Enarson DA, Beyers N (2006). The spectrum of disease in children treated for tuberculosis in a highly endemic area. Int J Tuberc Lung Dis; 10:732-8.

Nelson LJ, Wells CD (2003). Global epidemiology of childhood tuberculosis. Int J Tuberc Lung Dis;8:636–647.

PefuraYone EW, Kengne AP, Kuaban C (2011). Incidence, time and determinants of tuberculosis treatment default in Yaounde, Cameroon: a retrospective hospital register-based cohort study. BMJ Open.; 1(2):e000289.

République Démocratique du Congo (2008). Programme national de lutte contre la tuberculose. Guide de prise en charge de la tuberculose PATI 4. Kinshasa. Edition.

République Démocratique du Congo (2015). Programme national de lutte contre la tuberculose. Guide de prise en charge de la tuberculose PATI 5. Kinshasa. Edition.

Stop TB Partnership Childhood TB Subgroup, World Health Organization (2006). Guidance for National Tuberculosis Programmes on the management of tuberculosis in children. Chapter 2: Anti-tuberculosis treatment in children. Int J Tuberc Lung Dis; 10:1205–1211.

Swaminathan S, Ramachandran G (2015). Challenges in childhood tuberculosis. ClinPharmacolTher Sep; 98(3):240–4. doi: 10.1002/cpt.175 PMID: 26088359

Tagaro M, Harries AD, Kool B, Ram S, Viney K, Marais B, Tarivonda L (2014). Tuberculosis case burden and treatment outcomes in children, adults and older adults, Vanuatu, 2007–2011. PHA; 4(2): S14–S18.

Teo SS, Tay EL, Douglas P, Krause VL, Graham SM (2015). The epidemiology of tuberculosis in children in Australia, 2003-2012. Med J Austr; 11: 440.

World Health Organization (2015). The End TB Strategy. Geneva; March.

World Health organization (2004). Toman's Tuberculosis: case detection, treatment, and monitoring-Questions and answers. 2nd edition, Geneva.