



## Original Article

## Clinical, Radiological and Biological Characteristics of Pulmonary Tuberculosis in Children and Adolescents in a Tertiary Level Hospital, in Douala-Cameroon: A Retrospective Cross-Sectional Study

*Caractéristiques Cliniques, Radiologiques et Biologiques de la Tuberculose Pulmonaire Chez les Enfants et les Adolescents dans un Hôpital de Niveau Tertiaire à Douala-Cameroun : Une Étude Transversale Rétrospective*

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## ABSTRACT

**Introduction.** Tuberculosis (TB) remains a major health concern in Cameroon. Diagnosing TB in children and adolescents is challenging, with up to half of cases undetected. This study aimed to characterize and compare clinical and radiological indicators of pulmonary TB in pediatric patients. **Methodology.** We conducted a retrospective hospital based cross sectional study at the Respiratory Disease Centre, Laquintinie Hospital, Douala. 232 participants aged 0–19 years followed for pulmonary TB between January 2024 and March 2025 were included. Primary outcomes were clinical and radiological signs; secondary outcomes included laboratory findings. **Results.** Fever (78%) and cough (88.4%) were the most common presenting complaints. Adolescents more frequently reported chest pain (85.3%,  $p=0.000$ ) and hemoptysis (75.0%,  $p=0.000$ ), often in chronic infections (56%), whereas children presented predominantly with acute (41.7%) or subacute (21.9%) symptoms. Rhonchi were more common in children (84.2%,  $p=0.000$ ). Gene Xpert was less sensitive, with 66.7% of children testing negative, while sputum smear microscopy was positive in 57.7% of adolescents ( $p=0.000$ ). Interstitial opacity was the most frequent lesion (98.8%), though significantly less common in children (29.2%,  $p=0.000$ ). **Conclusion.** Children typically presented with acute or subacute symptoms, airway compression signs, and limited radiological abnormalities, while adolescents more often showed chronic disease, tachycardia, and parenchymal destruction. Sputum smear microscopy proved more useful in adolescents, underscoring age specific diagnostic differences.

## RÉSUMÉ

**Introduction.** La tuberculose (TB) demeure un problème majeur de santé au Cameroun. Le diagnostic chez l'enfant et l'adolescent reste difficile, avec près de la moitié des cas non détectés. Cette étude visait à caractériser et comparer les indicateurs cliniques et radiologiques de la TB pulmonaire pédiatrique. **Méthodologie.** Étude rétrospective transversale menée au Centre des maladies respiratoires de l'Hôpital Laquintinie de Douala. 232 participants âgés de 0 à 19 ans, suivis pour TB pulmonaire entre janvier 2024 et mars 2025, ont été inclus. Les principaux critères étaient les signes cliniques et radiologiques ; les critères secondaires incluaient les résultats biologiques. **Résultats.** La fièvre (78 %) et la toux (88,4 %) étaient les motifs de consultation les plus fréquents. Les adolescents présentaient davantage de douleurs thoraciques (85,3 %) et d'hémoptysies (75,0 %), souvent dans un contexte chronique (56 %), tandis que les enfants manifestaient surtout des formes aiguës (41,7 %) ou subaiguës (21,9 %). Les ronchi étaient plus fréquents chez les enfants (84,2 %). Le test Gene Xpert était peu sensible (66,7 % négatif chez les enfants), alors que la microscopie des frottis était positive chez 57,7 % des adolescents. Radiologiquement, l'opacité interstitielle était la lésion la plus fréquente (98,8 %), mais moins observée chez les enfants (29,2 %). **Conclusion.** Les enfants présentaient surtout des symptômes aigus ou subaigus avec signes de compression bronchique et peu d'anomalies radiologiques ; tandis que les adolescents manifestaient davantage de formes chroniques avec destructions parenchymateuses. La microscopie s'avère plus utile chez les adolescents, soulignant des différences diagnostiques selon l'âge.

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**HIGHLIGHTS FOR READERS IN A HURRY**

**What is already known on this topic.** Pediatric tuberculosis is difficult to diagnose, with often non-specific clinical presentations. Data comparing children and adolescents in sub-Saharan Africa are scarce.

**The question this study addressed.** This retrospective cross-sectional study compared clinical, paraclinical, and radiological features of 232 patients aged 0–19 years treated for pulmonary tuberculosis at Laquintinie Hospital, Douala.

**What this study adds.** Adolescents (10–19 years) more often present with chronic disease, chest pain (85%), hemoptysis (75%), and parenchymal destruction (cavitations, lymphadenopathy). Children (0–9 years) have acute or subacute symptoms, rhonchi (84%), and more frequently normal chest radiographs. Gene Xpert is often negative in children (76%), while smear microscopy is more sensitive in adolescents (81%). Mortality is low (4.3%) but higher in children.

**How this is relevant to clinical practice.** These findings call for age-adapted diagnostic strategies: emphasize clinical and imaging features in children, strongly associate microscopy in adolescents. Training clinicians on age-specific presentations is crucial to reduce diagnostic delays.

**INTRODUCTION**

Tuberculosis (TB) remains the leading cause of death from a single infectious agent worldwide. Its high morbidity, mortality, and the growing challenge of antimicrobial resistance make TB a major public health concern (1). According to the World Health Organization (WHO), approximately 1.25 million people died from TB in 2023, and 10.8 million developed active disease, including 1.3 million children (2). Although less common in infants than in older children and adults, TB in this age group carries a high risk of disseminated forms such as miliary TB and tuberculous meningitis, with correspondingly higher mortality (3). Each year, more than half a million older adolescents (15–19 years) are affected (4).

Infection rates vary by age and geography: in Africa, TB primarily affects children, adolescents, and young adults, whereas in low-incidence countries such as the United States, it is more common among older adults and immunocompromised individuals (1). Diagnosis in children remains particularly challenging.

The paucibacillary nature of paediatric TB reduces the sensitivity of microbiological tests, while nonspecific symptoms limit clinical specificity, especially in children with HIV co-infection or severe malnutrition (5–7). As a result, up to 50% of pediatric TB cases in Cameroon go undiagnosed, contributing to a substantial case detection gap (8). This underscores the need for clinicians to maintain a high index of suspicion across age groups, as delayed diagnosis in infants is associated with poor outcomes.

Radiological evaluation is an important adjunct in TB diagnosis. Chest radiographs may reveal hilar, paratracheal, or subcarinal lymphadenopathy (9), but inter-observer agreement between clinicians and

radiologists is often poor. This variability reflects the absence of standardized imaging criteria and the tendency to prioritize sensitivity over specificity. In a previous study, chest X-rays achieved specificity above 75% but sensitivity below 50% for pulmonary TB in both ambulatory and hospitalized patients (6). Standardization of radiographic reporting in suspected pediatric and adolescent TB is therefore essential to improve diagnostic accuracy.

Against this background, we aimed to describe the clinical and radiological features of pulmonary TB in children and adolescents in a high-transmission setting, and to evaluate correlation between clinical and radiological signs to support diagnosis in these populations.

**METHODOLOGY****Study design and setting**

We conducted a hospital-based retrospective cross-sectional study at Laquintinie Hospital, Douala, within the Respiratory Disease Centre (RDC), from January 1, 2024, to March 31, 2025. The RDC is staffed by four pneumologists, specialized personnel, and equipped with appropriate diagnostic facilities.

**Study population and sampling**

The study included children (0–9 years) and adolescents (10–19 years) diagnosed and followed up for pulmonary TB during the study period. Case files containing medical records and chest radiographs were reviewed.

Exclusion criteria were:

- Incomplete files (missing radiographs, past history, physical examination findings, or confirmatory laboratory results).
- Cases of extrapulmonary TB only.
- Children with TB contact history but no respiratory symptoms and negative confirmatory laboratory tests.

Convenience sampling was used to select the study site and participants.

**Sample Size**

The minimum sample size was calculated using the formula for proportions:  $n = (Z^2 pq) / e^2$

Where: ( $Z = 1.96$ ) (95% confidence level); ( $p = 0.15$ ) (assumed prevalence of pulmonary TB among children/adolescents in Cameroon) (8); ( $q = 1 - p = 0.85$ ); ( $e = 0.05$ ) (margin of error). The sampling method was consecutive.

**Ethical and administrative clearance**

Approval was obtained from the Institutional Review Board of the Faculty of Health Sciences, University of Buea (Ref: 2025/1688-12/UB/SG/IRB/FHS). Administrative authorization was granted by the Dean of the Faculty of Health Sciences and the Director of Laquintinie Hospital, Douala.

**Data collection**

Data were extracted from medical records, admission files, and anteroposterior chest radiographs of eligible participants. A structured data extraction form was used, with each participant assigned a unique code.

The form comprised four sections:

- Identification and sociodemographic data.

- Clinical history, symptoms, and physical examination findings.
- Paraclinical results (laboratory and radiological findings).
- Diagnosis and outcomes.

### Study variables

Variables included:

- Sociodemographic data: age, sex, residence, education, guardians' occupation.
- Clinical history: HIV co-infection, malnutrition, BCG vaccination, TB contact history.
- Symptoms and signs: fever, cough, chest pain, respiratory distress, weight loss, haemoptysis.
- Laboratory findings: complete blood count, CRP, HIV serology, sputum microscopy/AFB, Gene Xpert.
- Radiological features: hilar opacities, pleural effusion, lobar infiltrates, nodular opacities, bronchial wall thickening, calcifications, cavitations.

Definitions of numerical variables

- Birth weight: low (<2.5 kg), normal (2.5–4 kg), macrosomia (>4 kg).
- Symptom duration: acute (<3 weeks), subacute (3 weeks–2 months), chronic (>2 months).
- Temperature: <36.5°C (hypothermia), 36.5–37.5°C (normal), 37.5–38.3°C (low-grade fever), 38.3–39.9°C (high-grade fever), 40.0–41.5°C (hyperpyrexia).
- Pulse: <1 year (110–160 bpm), 1–2 years (100–150 bpm), 2–5 years (95–140 bpm), 5–12 years (80–120 bpm), >12 years (60–100 bpm). Values below/above normal defined bradycardia/tachycardia.
- Oxygen saturation: 90–100% (normal), 90–94% (mild hypoxia), 80–89% (moderate hypoxia), <80% (severe hypoxaemia).
- WBC count: <1 year (6000–20,000/ $\mu$ L), 1–5 years (6000–17,000/ $\mu$ L), 6–12 years (4500–13,500/ $\mu$ L), 13–19 years (4500–13,000/ $\mu$ L).
- Granulocytes: 1500–8000/ $\mu$ L (all ages).
- Haemoglobin: 12–17 g/dL (normal), 11–9 g/dL (mild anaemia), 9–7 g/dL (moderate), <7 g/dL (severe).
- Platelets: 150,000–450,000/ $\mu$ L.
- CRP: <6 mg/L (negative), >6 mg/L (positive).
- Pleural effusion: small (<1/3 thorax), moderate ( $\leq$ 1/2 thorax), large (>1/2 thorax).

### Data management and analysis

Data were collected using Kobo Toolbox, coded, and entered into Microsoft Excel 2016, then exported to SPSS version 22.0 for analysis. Continuous variables were summarized as means and standard deviations; categorical variables as frequencies and proportions. Results are presented in tables and figures. Statistical significance was set at  $p < 0.05$  with 95% confidence intervals.

### RESULTS

**Enrolment of participants.** In this study, A total of 249 files of children and adolescents with pulmonary TB were study. 17 files were excluded giving us a sample size study population of 232 files.

**Socio demographic characteristics of the study population.** The mean age was 11.5 years (range: 1 month–19 years). Most of the participants (60.8%) were adolescents aged 10–19 years. females accounted for a larger proportion of cases among children (59.3% female vs. 40.7% male), while males showed a slightly higher prevalence in the adolescent group (53.2% male vs. 46.8% female). The male to female sex ratio was 1:1.09.

Most participants resided in Douala 3 (36.2%) and had no formal education (29.3%). A substantial proportion of guardians, especially mothers, were unemployed (40.9%) and most of the male participants were self-employed (51.7%).

**Past medical history of the study participants.** About 15.9% of the participants had a history of malnutrition. Notably, the majority had received Bacillus Calmette-Guérin (BCG) vaccination (84.9%), and nearly half of the children (54.9%) had documented contact with a known TB case. Birth weight data, available for a subset, indicated a predominance of normal birth weights.

**Clinical characteristics of the study population.** Fever (78.4%) and cough (88.4%) were the most common symptoms across both age groups. Chest pain, haemoptysis, and night sweats were markedly more prevalent in adolescents. Furthermore, chronic presentations were more common in adolescents (Table I). A higher percentage of adolescents (62.5%) had temperatures within normal range as shown in Table II.

**Table I: Signs and Symptoms presented by the participants**

Variable	Children (n=91)		Adolescent (n=141)		Total (n=232)		p-value
	N	%	N	%	N	%	
Symptoms							
Fever	70	38.5	112	61.5	182	78.4	0.371
Cough	76	37.1	129	62.9	205	88.4	<b>0.000</b>
Chest pain	15	14.7	87	85.3	102	44.0	<b>0.000</b>
Night sweat	5	25.0	15	75.0	20	8.6	<b>0.005</b>
Haemoptysis	4	15.4	22	84.6	26	11.2	<b>0.000</b>
Weight loss	42	32.1	89	67.9	131	56.5	<b>0.023</b>
Asthenia	24	39.3	37	60.7	61	26.3	0.965
Anorexia	11	35.5	20	64.5	31	13.4	0.359
Others	58	41.1	83	58.9	141	60.8	0.129
Duration of symptoms							
<3 weeks	38	48.1	41	51.9	79	34.1	0.542
3 weeks– 2 months	20	48.8	21	51.2	41	17.7	
>2 months	33	29.5	79	70.5	112	48.3	

<3 weeks, acute; 3 weeks–2 months, subacute; and >2months, chronic

**Table II: Vital Signs and Anthropometric Measurements in the Study Population**

Variable	Children (n=91)		Adolescent (n=141)		Total (n=232)		p-value
	N	%	N	%	N	%	
Temperature							
Normal	3	37.5	5	62.5	8	19.0	
Low grade fever	7	58.3	5	41.7	12	28.6	<b>0.009</b>
High grade fever	10	55.6	8	44.4	18	42.9	
Hyperpyrexia	1	25.0	3	75.0	4	9.5	
Pulse							
Bradycardia	6	100.0	0	0.0	6	3.8	
Normal range	25	40.3	37	59.7	62	38.8	0.304
Tachycardia	12	13.0	80	87.0	92	57.5	
Oxygen saturation							
Normal	25	32.5	52	67.5	77	80.2	
Mild hypoxemia	3	30.0	7	70.0	10	10.4	
Moderate hypoxemia	2	33.3	4	66.7	6	6.3	<b>0.001</b>
Severe hypoxemia	3	100.0	0	0.0	3	3.1	
Weight							
Normal	44	41.5	62	58.5	106	47.5	
Marginally underweight	18	31.0	40	69.0	58	26.0	<b>0.000</b>
Moderately underweight	12	26.7	33	73.3	45	20.2	
Severely underweight	14	100.0	0	0.0	14	6.3	

**Physical examination findings of the study population**

Most participants were conscious with normal muco-cutaneous coloration. Abnormal respiratory findings such as crepitations (23.7%) and rhonchi (8.2%) were observed, with rhonchi being more frequent in children (Table III).

**Table III: Physical Examination Findings of the Study Population**

Variable	Children (n=91)		Adolescent (n=141)		Total (n=232)		p-value
	n	%	n	%	n	%	
Level of Consciousness							
Conscious	87	38.3	140	61.7	227	97.8	<b>0.000</b>
Unconscious	4	80.0	1	20.0	5	2.2	
Muco-cutaneous coloration							
Pink	79	38.0	129	62.0	208	89.7	
Pale	10	45.5	12	54.5	22	9.5	0.176
Cyanoses	2	100.0	0	0.0	2	0.9	
Crepitations							
Yes	19	34.5	36	65.5	55	23.7	0.099
No	72	40.7	105	59.3	177	76.3	
Rhonchi							
Yes	16	84.2	3	15.8	19	8.2	<b>0.000</b>
No	75	35.2	138	64.8	213	91.8	
Thoracic distension							
Yes	4	80.0	1	20.0	5	2.2	<b>0.000</b>
No	87	38.3	140	61.7	227	97.8	

**Paraclinical characteristics of the study population****Laboratory Investigations**

Sputum smear positivity was significantly higher in adolescents (81.2%), among whom the test was also performed more frequently. Whereas Gene Xpert, which was performed more often in children, was also more frequently negative (75.8%) (Table IV).

**Table IV: Laboratory Investigations**

Variable	Children (n=91)		Adolescent (n=141)		Total (n=232)		p-value
	N	%	N	%	n	%	
Granulocyte count							
Below normal range	2	40.0	3	60.0	5	17.2	
Normal range	5	35.7	9	64.3	14	48.3	0.508
Above normal	5	50.0	5	50.0	10	34.5	



**Table IV: Laboratory Investigations**

Variable	Children (n=91)		Adolescent (n=141)		Total (n=232)		p-value
	N	%	N	%	n	%	
Haemoglobin count							
Normal	3	13.0	20	87.0	23	19.7	0.231
Mild	23	37.7	38	62.3	61	52.1	
Moderate	14	60.9	9	39.1	23	19.7	
Severe	5	50.0	5	50.0	10	8.5	
Platelet count							
Below normal range (thrombocytopenia)	1	33.3	2	66.7	3	3.6	0.419
Normal range	19	31.7	41	68.3	60	71.4	
Above normal range (thrombocytosis)	8	38.1	13	61.9	21	25.0	
C-Reactive Protein (CRP) ranges							
Negative	15	78.9	4	21.1	19	17.0	0.000
Positive	23	24.7	70	75.3	93	83.0	
HIV RDT*							
Not reactive	85	39.0	133	61.0	218	96.9	0.831
Reactive	4	57.1	3	42.9	7	3.1	
Sputum analysis + AFB*							
Negative	28	40.6	41	59.4	69	39.2	0.000
Positive	13	18.8	56	81.2	69	39.2	
Not done	24	63.2	14	36.8	38	21.6	
Gene Xpert							
Negative	50	75.8	16	24.2	66	45.2	0.000
Positive	15	57.7	11	42.3	26	17.8	
Not done	10	18.5	44	81.5	54	37.0	

(\*) HIV RDT, human immunodeficiency virus rapid diagnostic test; AFB, acid fast bacilli

**Radiological findings in the study population**

A significantly higher proportion of children (72.7%) had normal chest radiographs compared to adolescents (27.3%). Notably, diffuse involvement was also more frequent in adolescents (60.0%) compared to children (40.0%). Adolescents more frequently presented with pleural effusion, bilateral involvement, mediastinal lymphadenopathy, interstitial opacity/consolidation, and cavitation (Table V).

**Table V: Radiological Findings in the Study Participants**

Variable	Children (n=91)		Adolescent (n=141)		Total (n=232)		p-value
	n	%	n	%	n	%	
White blood cell count							
Below normal range	6	40.0	9	60.0	15	12.1	0.274
Normal range	29	34.1	56	65.9	85	68.5	
Above normal range	10	41.7	14	58.3	24	19.4	
Normal Chest X-ray							
Yes	8	72.7	3	27.3	11	15.0	0.761
Number of lobes							
0	2	66.7	1	33.3	3	2.7	0.092
1	10	27.0	27	73.0	37	33.3	
2	4	16.7	20	83.3	24	21.6	
3	5	35.7	9	64.3	14	12.6	
4	1	20.0	4	80.0	5	4.5	
5	4	50.0	4	50.0	8	7.2	
Diffuse	8	40.0	12	60.0	20	18.0	0.091
Pleural effusion							
Yes	15	30.0	35	70.0	50	79.4	
No	5	38.5	8	61.5	13	20.6	0.052
Abundance							
<= 1/3	3	20.0	12	80.0	15	30.0	
1/2	7	29.2	17	70.8	24	48.0	0.621
>= 2/3	5	45.5	6	54.5	11	22.0	
Location (Unilateral)							
Right	6	27.3	16	72.7	22	50.0	0.621
Left	8	36.4	14	63.6	22	50.0	
Location (Bilateral)							
Yes	0	0.0	3	100.0	3	1.3	0.004
No	91	39.9	137	60.1	228	98.7	

**Table V: Radiological Findings in the Study Participants**

Variable	Children (n=91)		Adolescent (n=141)		Total (n=232)		p-value
	n	%	n	%	n	%	
Mediastinal lymph ADP							
Yes	19	34.5	36	65.5	55	23.7	0.099
No	72	40.7	105	59.3	177	76.3	
Location (Ipsilateral)							
Right	12	52.2	11	47.8	33	82.5	<b>0.030</b>
Left	2	28.6	5	71.4	7	17.5	
Bilateral							
Yes	5	20.8	19	79.2	24	10.4	<b>0.000</b>
No	86	41.5	121	58.5	207	89.6	
Interstitial opacity							
Yes	50	29.2	121	70.8	171	73.7	<b>0.000</b>
No	41	67.2	20	32.8	61	26.3	
Cavitation							
Yes	8	13.6	51	86.4	59	25.4	<b>0.000</b>
No	83	48.0	90	52.0	173	74.6	
Bronchi wall thickening							
Yes	24	85.7	4	14.3	28	12.1	<b>0.000</b>
No	67	33.0	137	67.0	204	87.9	
Nodular opacity							
Yes	40	42.1	55	57.9	95	0.4	<b>0.000</b>
No	51	35.4	140	60.6	231	99.6	
Miliary pattern							
Yes	35	47.3	39	52.7	74	31.9	<b>0.000</b>
No	56	35.4	102	64.6	158	68	
Calcification							
Yes	0	0.0	1	100.0	1	16.7	<b>0.000</b>
No	91	39.4	140	60.6	231	99.6	

**Diagnosis and outcome in the study population**

The majority (65.2%) of pulmonary tuberculosis were found in adolescents. Pleural TB was more common among adolescents (71.8%), while ganglionic TB was observed more frequently in children (66.7%) (Table VI). Concerning outcome, most patients survived the disease. The mortality in the study population was 4.3% with more deaths occurring in children (70.0%) than adolescents (30.0%).

**Table VI: Study Participants' Diagnoses**

Variable	Children (n=91)		Adolescent (n=141)		Total (n=232)	
	n (%)		n (%)		n (%)	
Pulmonary TB						
Yes	91 (39.2)		141	60.7	232	100
Extra-pulmonary involvement						
Pleural	11 (26.1)		31	73.8	42	18.1
TB* adenitis	11 (64.7)		6	35.3	12	5.1
CNS* involvement	2 (66.6)		1	33.3	3	1.3
Abdominal	1 (33.3)		2	66.6	3	1.3
Laryngeal	0 (0.0)		2	100.0	2	0.9
Peritoneal	3 (100.0)		0	0.0	3	1.3
Miliary	0 (0.0)		1	100.0	1	0.4
Cutaneous	1 (100.0)		0	0.0	1	0.4
Pericardial TB*	2 (66.6)		1	33.3	3	1.3
Ophthalmic-ocular TB*	1 (50)		1	50	2	0.9
Splenic TB*	0 (0.0)		1	100.0	1	0.4
Pott's disease	0 (0.0)		1	100.0	1	0.4

**DISCUSSION**

This study compared the clinical and radiological features of pulmonary tuberculosis (TB) in children (0–9 years) and adolescents (10–19 years) diagnosed at Laquintinie Hospital, Respiratory Disease Centre, Douala, between January 2024 and March 2025. Fever and cough were the most common presenting symptoms across both age groups, consistent with findings by Vukugah et al in Cameroon (8) and by Aygun et al in Turkey (10). Chest

pain and hemoptysis were more frequent in adolescents, reflecting the chronic and reactivated nature of TB in this age group, whereas children more often presented with acute or subacute symptoms. Tachycardia was observed predominantly in adolescents, while rhonchi were more common in children. Most children were normothermic but severely underweight, highlighting the impact of malnutrition on TB susceptibility.

Diagnostic testing revealed important age-related differences. Although children were more likely to undergo Gene Xpert testing, two-thirds had negative results, whereas adolescents were more frequently positive on microscopy. Elevated C-reactive protein (CRP) was observed in 83% of participants, with significantly higher levels in adolescents. Radiographic findings also varied: interstitial opacities were the most frequent abnormality overall, but less common in children. Cavitory lesions were markedly more prevalent in adolescents, consistent with adult-type TB, while bronchial wall thickening was more often seen in children, in line with previous reports (6,11).

Sociodemographic factors may have influenced disease presentation. Male predominance in adolescents could be linked to lifestyle risk factors such as alcohol use and smoking, which were significantly associated with TB in this group. The sex ratio (1:1.09) was comparable to prior studies in Cameroon (8) and Turkey (10). Most participants resided in densely populated districts of Douala, and parental unemployment was common, reflecting socioeconomic vulnerabilities that may contribute to TB transmission. BCG vaccination coverage was high (84.9%), but slightly lower than reported in Tunisia (12), suggesting gaps in vaccine uptake due to supply issues, migration, or parental decisions. Children were more likely to report TB contact history, supporting the predominance of primary TB in this group, whereas adolescents more often developed reactivated TB. These findings align with studies in Turkey (13,14).

Laboratory and imaging findings further underscored age-specific differences. Adolescents had higher rates of positive microscopy and elevated CRP, while children more often had normal radiographs. Pleural effusion was rare but observed in younger children, consistent with earlier reports from Mozambique, Nigeria and Bangladesh (11,15,16). Mediastinal lymphadenopathy occurred in both groups, though bilateral involvement was more frequent in adolescents. Inter-observer variability in radiological assessment, as highlighted by Elsinger et al. (6), may partly explain discrepancies across studies. Nodular opacities and tuberculomas were more common in adolescents, whereas calcifications were rare, likely reflecting the relatively short duration of infection in this cohort (11,15,17).

#### Strengths and Limitations

The main strength of this study is its novelty: to our knowledge, it is the first to directly compare clinical and radiological features of pulmonary TB between children and adolescents in Central Africa. Conducted in a major referral centre in Cameroon's economic capital, the study population reflects diverse social backgrounds, enhancing generalizability. Stratification by age groups helped reduce confounding bias.

Limitations include incomplete data for certain variables (vital signs, WBC, granulocyte count, haemoglobin), which may have constrained analysis. Additionally, the single-centre design may limit external validity, and exclusion of asymptomatic cases could underestimate the true burden of TB in these populations.

## CONCLUSION

This study highlights clear age-specific differences in the presentation and diagnosis of pulmonary tuberculosis among children and adolescents in Cameroon. Children more often exhibited acute or subacute symptoms, airway compression signs, and fewer radiological abnormalities, while adolescents presented with chronic disease, chest pain, hemoptysis, tachycardia, and parenchymal destruction. Gene Xpert was less sensitive in children, whereas sputum smear microscopy proved more useful in adolescents. These findings underscore the importance of tailoring diagnostic approaches to age groups in order to improve early detection and management of pediatric TB in high-burden settings.

## DECLARATIONS

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### Competing interest's statement

The authors declare that they have no competing interests.

### Authors' contributions

EMLM, AAMK and DFS conceived and designed the study, supervised data collection, and drafted the initial manuscript. AAMK, DPY, MNJ, FTK and ONM contributed to data collection, performed statistical analyses, and assisted in interpretation of findings. DFS and JT participated in radiological review and validation of imaging data. EMLM, DFS and MNBH provided critical revisions to the manuscript and ensured compliance with journal formatting and reference standards. All authors contributed to the interpretation of results, reviewed successive drafts, approved the final version of the manuscript, and agree to be accountable for all aspects of the work.

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