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ORIGINAL RESEARCH

Factors Affecting the Integration of Pediatric TB Screening in Kabale District of Uganda: A Cross Sectional Study

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Video abstract

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Background: Globally, >1.1 million children had tuberculosis (TB) and >214,000 died in 2022. The integration of pediatric TB screening should help in the identification and management of cases among children attending clinics at entry points. This study aimed to establish the extent of integrating pediatric TB screening into mainstream childcare activities and the factors affecting integration of TB screening among children.

Methods: A cross-sectional design using both quantitative and qualitative methods. Simple random sampling was used to select and observe 40 participants for integration of TB screening in the routine assessment of children. Twenty key informants were interviewed and two focus group discussions conducted on the integration of pediatric TB screening.

Results: Of the 302 children assessed, only 41.1% underwent pediatric TB screening integrated in their assessment. A binary logistic regression model using Wald chi-square showed that a cadre having worked at outpatient department (OPD) and young child clinic (YCC) significantly affected integration, with a p-value of 0.002 and 95% CI (1.040–1.152) and a p-value of 0.002 and 95% CI (1.000–1.519). Participants who had 3 to 5 years in service were 7.05 times more likely to integrate pediatric TB screening at the OPD and Cadres who had over 6 years in service were 6.32 times more likely at the YCC. Being a nurse or a midwife was associated with an increased likelihood of integrating pediatric tuberculosis screening. Knowledge, skills, and confidence gaps in screening and assessing for tuberculosis in children among staff and lack of necessary logistics were identified barriers.

Conclusion: The integration of pediatric TB screening in routine assessments at the OPD/YCC was low. Focus more on HC IIIs to improve health workers' involvement and capacity to integrate TB screening at entry points in health facilities and provide logistics.

Keywords: Pediatric, tuberculosis, integration and screening

Background and Rationale

Tuberculosis (TB) is the leading cause of morbidity and mortality among children worldwide.[1] About 1.25 million children and adolescents below the age of 15 years suffered from TB, with more than 214,000 deaths by 2022.[2] Pediatric TB cases in sub-Saharan Africa account for one-third of all global cases.[3] TB incidence in these countries is double the global average.[3] Uganda is one of the top 30 countries with a high burden of TB, with an estimated 91,000 infected people, and 15% of the cases are in children below 15 years of age.[4] In a study published in 2024, where 5789 children in western Uganda were enrolled, the prevalence of tuberculosis was 9.6% among children aged between 1 and 17 years.[5]

Systematic integration of pediatric TB screening at entry points is vital for early diagnosis and effective treatment.[6] Integration of pediatric TB screening into routine child health services increases the opportunity to reduce missed opportunities for undiagnosed childhood TB.[7] There is evidence that integrating TB screening in primary healthcare results in the referral of children at risk of TB and increased case detection rates.[8] In Ethiopia, pediatric TB screening is integrated into

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maternal and child health services, and 80% of children are screened for TB at entry points.[9] Pediatric TB screening in highly burdened countries is affected by an inadequate capacity to identify presumptive TB, coupled with limited access to diagnostic equipment.[7] World Health Organization recommended four symptom screen measure, which includes fever, cough, night sweats and weight loss, which make up the intensified case finding form and stamp for TB screening.[10]

The government of Uganda introduced the policy of service integration more than 10 years ago (MoH, 2010). While HIV/TB is fully integrated, the integration of other services, including pediatric TB screening, does not meet expectations.[7] The pediatric TB notification rate in Kabale District was 5%, far below the national target of 12%, increasing the proportion of undiagnosed children (Kabale District TB registers, 2022). The integration of pediatric TB screening at all entry points may be feasible for identifying new cases and increasing TB detection rates.[11]

There is a paucity of data about studies done on the integration of pediatric TB screening in this region. If this trend continues, the number of undiagnosed, unreported, and untreated children will increase, leading to increased morbidity and mortality.

This study aimed to establish the extent of integration of pediatric TB screening among children attending outpatient and young child clinic services and the factors affecting the integration of pediatric TB screening in HC IIIs, HC IVs, and Hospitals of Kabale District of Uganda.

Materials and Methods

The study was carried out in Health Center IIIs, HC IVs, and the Hospital of Kabale District, which is 560 km southwest of Kampala City, Uganda. Kabale has an estimated population of 285,097 people UBOS,2024. It is comprised of eight sub-counties and three town councils. More than 80% of the population comprises peasant farmers. Data collection began in October 2022 and ended in January 2023. Data was collected from a cross section of health workers, including clinical officers, nurses, and midwives, in outpatients with HCIIIs, HCIVs, and hospitals in Kabale District, Southwestern Uganda, regardless of public or private ownership.

A cross-sectional study design using quantitative and qualitative methods was used to collect data from health workers on integration of WHO recommended TB screening tools at entry points such as ICF and Stamps by clinical officers, nurses, and midwives, in outpatients of HCIIIs, HCIVs, and hospitals in Kabale District, Southwestern Uganda irrespective of public or private ownership. HC IIs were excluded because of operational guidelines that require them to refer all patients with prolonged signs and symptoms of tuberculosis to the next level of HC IIIs. Both urban and rural facilities were included in the study.

The sample size was calculated using the Krejcie–Morgan table to determine the sample size for which a specific sample size was assigned to the assigned population.

$$n = \frac{N}{1 + N(e)^2}$$

N = 50 (Estimated population of staff handling TB), e = Degree of precision (0.05), n = 50/1+ 50 (0.05), n = 44.

We interviewed 40 staff; non-response rate was 9%.

Participants were purposely selected. Owing to limited resources, we aimed to observe at least one staff member in the OPD and YCC. Two staff members were observed per facility, namely, clinical officers, nurses, and midwives, bringing the total to 40. In addition, 17 hCIII, HCIV in-charges and 3 TB focal point persons in the hospitals were recruited as key informants. Fourteen health staffs were enrolled in two focus group discussions with six and eight participants, respectively. We used a random Selection approach to observe 40 health care workers while managing children at OPD/YCC. Using registration numbers, we observed all children with odd numbers beginning with the first to register until 302 children were reached at the OPD and YCC. Quantitative data was collected using an observation checklist from 40 participants directly involved in managing children at the OPD and YCC, and 20 key informant interviews, while qualitative information was obtained using focused group discussions. The collected data were checked for accuracy and completeness, adjustments, and corrections made daily, and stored under a password. Quantitative data on the integration of pediatric TB screening and associated factors was entered into Excel and then exported to SPSS to be analyzed. Logistic regression was used to test factors affecting integration of pediatric TB screening. Qualitative data was analyzed using a thematic approach and later triangulated with quantitative findings.

This research project was approved by the Mbarara University of Science and Technology's Institutional Review Board. We got informed consent from all the participants to participate in the study and publication thereafter the findings of the study.

Results

According to the findings, majority of the children 166 (55%) were managed at HC IIIs, 60 (19.9%) at HC IVs and remaining 76 (25.1%) at hospitals. The proportion of children attending OPD not screened for TB were 89 (58.9%), while those screened were only 62 (41.1%). At YCC, 91 (60.3%) children attending the clinic were not screened for TB, while the proportion of those screened were 60 (39.7%).

The Kabale District TB notification in 2022 was 385 cases and only 18 of these were children below 12 years accounting for 5%. Most of the facilities 14 (70%) referred children for TB investigation. Six (30%) facilities (Health centre IVs and Hospitals) did not refer children for TB investigations. The latter had functional laboratory services for TB investigations.

A binary logistic regression model was used to ascertain the effect of *cadre seeing patients at the outpatient department* (Cadre_OPD), *years in service* (Year_OPD), *in recurrent pneumonia, provider assesses children for TB at OPD* (Pneumonia_OPD), and *Proportion of children attending OPD screened for TB* (Proportion_screened_OPD) on the likelihood that participants (children) attending the OPD are integrated for pediatric tuberculosis screening. The binary logistic regression model was statistically significant [$\chi^2(2)$ = 34.402, p < 0.0005]. The model (Table 1B) explained

Table 1 Multivariate Analysis

(A)								
	B	**S.E.**	**Wald**	***df***	**Sig.**	**Exp(B)**	**95% C.I. for EXP(B)**	
							Lower	**Upper**
Cadre_OPD	0.085	0.027	9.132	1	0.002	1.087	1.040	1.152
Years_OPD(1)	0.006	0.022	0.059	1	0.789	1.003	0.959	1.051
Years_OPD(2)	1.950	0.842	5.355	1	0.038	7.056	0.1.346	35.632
Pneumonia_OPD(1)	−0.099	0.049	4.272	1	0.023	0.902	0.897	997.
Propotion_screened_OPD	0.073	0.048	4.651	1	0.007	1.170	0.998	35.089
Constant	−1.647	4.635	0.000	1	0.591	0.187		
Cadre_YCC	0.085	0.031	8.201	1	0.002	1.077	1.000	1.519
Years_YCC(1)	0.001	0.018	0.077	1	0.801	1.006	0.904	1.996
Years_YCC(2)	1.671	0.811	6.171	1	0.030	6.324	1.457	27.903
Guide_entry(1)	−0.065	0.051	3.987	1	0.049	1.059	0.917	1.702
Assess_thriving_YCC(1)	0.083	0.042	4.021	1	0.027	0.881	0.0201	0.979
Propotion_screened_YCC(1)	0.068	0.029	1.337	1	0.060	1.082	0.903	2.001
(B)								
Step	**Chi-square**	***df***	**Sig.**	**Step**	**−2 Log likelihood**	**Cox & Snell R Square**	**Nagelkerke R Square**	
1	34.402	2	0.005	2	34.296[a]	0.686	0.915	

Notes: Variable(s) entered on step 1: Cadre_OPD, Years_OPD, Pneumonia_OPD, Propotion_screened_OPD and Variables (s) entered in Step 2: Cadre_young child clinic (YCC), Years_YCC, Guide_entry, Assess_thriving_YCC, Propotion_screened_at YCC. [a]The binary logistic regression model was statistically significant [$\chi^2(2)$= 34.402, p < 0.0005]. The model explained 91.5%[12] of the variance in the integration of pediatric tuberculosis screening at the OPD and correctly classified 71.5% of the cases and the model explained 90.8%[12] of the variance in the integration of pediatric tuberculosis screening at the YCC and correctly classified 94.7% of the cases (Table 1B).[12]

91.5%[12] of the variance in the integration of pediatric tuberculosis screening at the OPD and correctly classified 71.5% of the cases.

Cadres who had spent 3 to 5 years in service were 7.05 times more likely to integrate pediatric TB screening at the OPD than their counter parts who had only worked for 1 to 2 years. Increasing the number of nurses was associated with an increased likelihood of integrating pediatric tuberculosis screening at the OPD. However, an increase in recurrent pneumonia as the provider-assessed children for TB at the OPD was associated with a reduction in the likelihood of a child being integrated for pediatric tuberculosis screening at the OPD (Table 1A).

The binary logistic regression model was statistically significant [$\chi^2(2) = 32.815^a$, $p < 0.0005$]. The model explained 90.8%[12] of the variance in the integration of pediatric tuberculosis screening at the YCC and correctly classified 94.7% of the cases. Cadres who had spent over 6 years in service were 6.32 times more likely to integrate pediatric TB screening at the YCC than their counterparts who had worked for only 1–2 years. Being a midwife was associated with an increased likelihood of integrating pediatric tuberculosis screening at the YCC. However, the absence of an intensified pediatric case-finding guide at the entry points was associated with a reduction in the likelihood of a child being integrated for pediatric tuberculosis screening at the YCC. An increase in the assessment of TB in children thriving poorly (low weight for age) at the YCC was associated with an increase in the likelihood of a child being integrated into pediatric tuberculosis screening at the YCC.

Focus Group Discussions

Two Focus Group Discussions were held with the health workers involved in TB screening in the two health units. One was held at Health Center IV, and the other at Health Center III (to establish factors affecting the Integration of Pediatric Tuberculosis screening). Fourteen participants were engaged in focus group discussions with six and eight participants from health centers IV and III, respectively.

The focus group discussion was guided by an FGD guide that focused on the following issues: availability of tools and logistics for pediatric TB screening, obtaining and testing sputum in facilities, and the TB screening process. A number of themes and sub-themes were generated from the focus group discussions. Regarding availability of tools and logistics, there was limited use of tools to screen TB at entry points thus affecting integration of TB screening in OPD and YCC, as stated by one staff from a health center III who said

> We have MUAC tapes and ICF guides are available only at OPD and another staff from the same facility said that, "We use active case finding forms". and Stamp at OPD

In a health centre IV a staff stated that "Like for the stamp we have one at the OPD and ART". *We screen clinically"*.

While discussing how to obtain and test sputum for TB, it was revealed that considerable task shifting was used to avoid performing sputum collection and testing. As stated by a staff from M1 that "For the children 3 years and plus, we ask the parents to help the children get us sputum in the container".

It was also found that staff lacked knowledge and skills to obtain sputum samples for testing as stated by a staff at health center III, "I have Limited skills as for me am not trained to obtain sample".

It was further discovered that staff lacked initiative to participate in sputum sample collection as evidenced by verbalized statement from staff of health center III "We refer the children below 3 years. "Because there is no NGTs and skill to obtain samples in facility". Whereas, a staff from health centre IV said that, "We take the sputum for Gene Xpert". Another staff from health center III had this to say "we refer children, it's hard for these children to cough out sputum due to inability to collect sample using NG tubes". Another from the same facility health center III said that "For these children are not able to give sputum".

Regarding the screening process, it was found that the staff had knowledge, confidence, and skill gaps in performing TB screening and materials for the activity as verbalized by staff from K1 and M1 that "We depend on symptoms which are sometimes not there". Staff in K1 stated that'. No logistics to use eg Nasal Gastric Tubes and ICF guide" and another KI staff stated that "we lack capacity to screen and assess children for TB".

Discussions

We determined the extent of integration of pediatric TB screening in routine OPD and YCC services in the Kabale District Southwestern of Uganda and the factors affecting the integration of pediatric TB screening. Our study found that 180 (59.6%) children were not screened at the OPD and YCC, and pediatric TB notification was 18 (5%) by review of TB registers of Kabale District Health Facilities. Our findings provide a different picture from those of other studies. For example, we[9] found that 80% of children attending maternal child health services in Ethiopia were screened for TB, whereas in Kenya, pediatric TB screening was reportedly performed at the primary healthcare level at all entry points for children and adults.[11]

The limited screening in this study may be attributed to vertical programs with limited linkages to other programs such as acute malnutrition and pneumonia, integrated management of neonatal and childhood illnesses, or integrated community case management at entry points. Integration of TB in other services is encouraged by.[13] On the other hand, the staff interviewed lacked knowledge, skills and confidence in screening for TB among children and this was made worse by absence of ICF forms at entry points as echoed by the staff in K1 who stated that. "No logistics to use eg Nasal Gastric Tubes and ICF guide" and another KI staff stated that "we lack capacity to screen and assess children for TB". Further more, the staff at facility did not prioritize active TB search among children as compared to those working in nongovernmental organization like Elizabeth Glaser pediatric and Aids Foundation (EGPAF).[14,15]

The striking observation here is that pediatric TB screening is partially integrated into outpatient department services in the Kabale District health facilities, as opposed to earlier findings by Nansera D et al,[16] who found that HIV and TB services were fully integrated in Uganda. The integration of services reduces missed opportunities costs, and increases access.[17] Majority of the key informants, 12 out of 20 acknowledged that Knowledge gap was the main barrier to the integration of TB screening, followed by attitudes 5 (25%) then 2(10%) lack of equipment as the barrier and only 1(5%) mentioned space as a barrier to integration. All staff members from the two FGD acknowledged this knowledge gap as a major challenge. "If we trained with a good attitude". We can offer the service, and another group said 'We need Continuous Medical Education (CME) now". Staff training is significant in ensuring that services are integrated and quality care is given as observed by.[17]

This study further found that, the failure to screen children from the two entry points was associated with absence of intensified case finding tools and lack of nasogastric tubes as re-echoed by K1 who stated that, "No logistics to use eg Nasal Gastric Tubes and ICF guides" a similar finding by Nansera D et al.[16] The staff acknowledged gaps in knowledge, skills, and confidence in assessment and screening for TB and sputum collection among children. This finding underscores the need to enhance the capacity of different entry points in the integration of pediatric TB screening. For example, the study revealed that children below 3 years of age were referred for sample collection and were not followed up.[6]

In addition, suspicion of TB among children was not very common, which could have resulted in missed opportunities to integrate, screen, diagnose pediatric TB and under-reporting. Similar findings were reported by Vasiliu A et al,[18] who noted that a large proportion of children with TB were either undiagnosed or unreported. For example, our study found that sputum samples for pediatric TB were not collected in 12 out of 20 facilities, and only eight out of 20 reported having collected samples for investigation. This was echoed in the focus group discussion as well, "For the children three years and plus, we ask the parents to help the children get us sputum in the container. Others said for children below three years, "They are referred, it's hard for these children to cough out sputum due to inability to collect a sample using NG tubes". *We refer children below three years*. "Because there are no NGTs". These factors partly contribute to failure to integrate, missed opportunities, undiagnosed, unreported, or untreated TB in children, as well observed by.[19]

We also found that a cadre who had worked for five to 6 years was 7 times more likely to integrate pediatric TB screening at the OPD and YCC compared to their counterparts who had worked for less than 2 years. Being a nurse or midwife increased the likelihood of integrating pediatric TB screening at the OPD and YCC. This observation has not been reported in other studies. Triage is commonly done by nurses at OPD and midwives screen children routinely for malnutrition and infections at YCC. This could, therefore, explain why nurses and midwives had increased likelihood to integrate children for TB screening.

Conclusion

In conclusion, profoundly, the study about integration of pediatric TB screening performed below 41.1% at OPD/YCC. We suggested that integration of pediatric TB screening should be performed at all entry points in health facilities and hospitals. Efforts should be made to integrate children for TB screening at all entry points in health facilities and hospitals. Training and mentorship of staff on integration of pediatric TB screening with focus on HCIIIs, where majority of the community access services is recommended and provision of logistics like intensified case finding forms and stamps alongside regular TB focused supportive supervision to lower-level facilities (HC IIIs) mainly.

Ethical Issues

This research was approved by Mbarara University of Science and Technology (MUST) Institutional Review Board (IRB) number MUST 2022-430 since Kabale University had no functional IRB.

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Disclosure

No competing interest for carrying out the study.

References

1. Martinez L, Cords O, Horsburgh CR, et al. The risk of tuberculosis in children after close exposure: a systematic review and individual-participant meta-analysis. *Lancet*. 2020;395(10228):973–984. doi:10.1016/S0140-6736(20)30166-5
2. Verkuijl S, Bastard M, Brands A, et al. Global reporting on TB in children and adolescents: how far have we come and what remains to be done? *IJTLD OPEN*. 2024;1(1):3–6. doi:10.5588/ijtldopen.23.0529
3. Glaser E. Catalyzing Pediatric Tuberculosis Innovations (CaP TB): implementation and Integration of New TB Care and Treatment Models. *Infection*. 2018;3(4):5.
4. World Health Organization. *WHO Consolidated Guidelines on Tuberculosis: Module 5: Management of Tuberculosis in Children and Adolescents: Web Annex 3: GRADE Evidence to Decision Tables*; 2022.
5. Kakande E, Ssekyanzi B, Abbott R, et al. Prevalence and Predictors of Tuberculosis Infection in Children and Adolescents in Rural Uganda: a Cross-sectional Study. *Pediatr Infect Dis J*. 2024;2024:10–1097.
6. Zulu DW, Silumbwe A, Maritim P, Zulu JM. Integration of systematic screening for tuberculosis in outpatient departments of urban primary healthcare facilities in Zambia: a case study of Kitwe district. *BMC Health Serv Res*. 2022;22(1):1–11. doi:10.1186/s12913-022-08043-w
7. Ehrlich J, Garcia-Basteiro AL, Brands A, et al. Integration of TB into child health policies in Africa's high-burden countries: a normative analysis. *Public Health Action*. 2021;11(4):167–170. doi:10.5588/pha.21.0052
8. Zawedde-Muyanja S, Reuter A, Tovar MA, et al. Provision of decentralized TB care services: a Detect–Treat–Prevent Strategy for children and adolescents affected by TB. *Pathogens*. 2021;10(12):1568. doi:10.3390/pathogens10121568
9. Ketema L, Dememew ZG, Assefa D, et al. Evaluating the integration of tuberculosis screening and contact investigation in tuberculosis clinics in Ethiopia: a mixed method study. *PLoS One*. 2020;15(11):e0241977. doi:10.1371/journal.pone.0241977
10. Dhana A, Hamada Y, Kengne AP, et al. Tuberculosis screening among HIV-positive inpatients: a systematic review and individual participant data meta-analysis. *lancet HIV*. 2022;9(4):e233–e241. doi:10.1016/S2352-3018(22)00002-9
11. Powell L, Denoeud-Ndam L, Herrera N, et al. HIV matters when diagnosing TB in young children: an ancillary analysis in children enrolled in the INPUT stepped wedge cluster randomized study. *BMC Infect Dis*. 2023;23(1):1–10. doi:10.1186/s12879-023-08216-w
12. Bujang MA, Sa'at N, Bakar TMITA, Joo LC. Sample size guidelines for logistic regression from observational studies with large population: emphasis on the accuracy between statistics and parameters based on real life clinical data. *Malaysian J Med Sci MJMS*. 2018;25(4):122. doi:10.21315/mjms2018.25.4.12
13. Organization WH. *Roadmap Towards Ending TB in Children and Adolescents*. 2018.
14. Mbah TA, Rogers A, Honoré NJH, Ngend LE. A Review of Index Case Testing Induced Intimate Partner Violence and Electronic Management of Information in HIV Care. *ETSN*. 2023;12(4):61–77. doi:10.4236/etsn.2023.124005

15. Vasiliu A Designing a community intervention for tuberculosis household child contact management and assessing the feasibility of its evaluation in Cameroon and Uganda. Doctoral Thesis, Université Montpellier, 2021.
16. Nansera D, Bajunirwe F, Kabakyenga J, Asiimwe PK, Mayanja-Kizza H. Opportunities and barriers for implementation of integrated TB and HIV care in lower level health units: experiences from a rural western Ugandan district. *Afr Health Sci*. 2010;10(4):312–319.
17. Milford C, Greener LR, Beksinska M, Greener R, Mabude Z, Smit J. Provider understandings of and attitudes towards integration: implementing an HIV and sexual and reproductive health service integration model, South Africa. *African J AIDS Res*. 2018;17(2):183–192. doi:10.2989/16085906.2018.1478314
18. Vasiliu A, Salazar-Austin N, Trajman A, et al. Child contact case management—a major policy-practice gap in high-burden countries. *Pathogens*. 2021;11(1):1. doi:10.3390/pathogens11010001
19. Malik AA, Amanullah F, Codlin AJ, et al. Improving childhood tuberculosis detection and treatment through facility-based screening in rural Pakistan. *Int J Tuberc Lung Dis*. 2018;22(8):851–857. doi:10.5588/ijtld.17.0736