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Research Article

Predictors of Tuberculosis Contact Tracing Yield: A Cross-sectional Study in 55 Diagnostic and Treatment Units in Eastern Uganda

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Abstract

Background: Tuberculosis (TB) remains a critical global health challenge, causing over 3,500 deaths daily despite being preventable and treatable. Contact tracing is a key public health intervention for detecting additional TB cases among individuals exposed to an active case. However, the effectiveness of contact tracing in Uganda remains suboptimal, with only 1.7-5.3% of contacts of index TB cases diagnosed with active TB. The variability in contact tracing yields necessitates a deeper understanding of the factors influencing its effectiveness, particularly in resource-limited settings like Uganda.

Objective: To determine factors associated with a positive contact tracing yield among index TB patients and contacts in Eastern Uganda.

Methods: This cross-sectional study utilized secondary data from the online contact tracing application and electronic Case-Based Surveillance System (eCBSS). The study population comprised all contacts of index TB patients evaluated for TB between April and June 2024 across 55 diagnostic and treatment units in the Bukedi and Bugisu regions of Eastern Uganda. Data on contacts' demographic, clinical, and exposure characteristics were extracted from the contact tracing database and linked to index TB cases using unique identifiers. Descriptive statistics were obtained and multivariate logistic regression analysis was conducted to determine factors associated with positive contact tracing yields and adjusted odds ratios were obtained with 95% confidence intervals. STATA 14.2 was used.

Results: Out of 1806 contacts evaluated, 401 (22.2%) were classified as having presumptive TB, and 42 (2.32%) were confirmed with active TB. The likelihood of detecting a positive contact was significantly influenced by several factors. Index cases with clinically diagnosed TB were 4.75 times more likely to yield a positive contact compared to those with bacteriologically confirmed TB. Early contact tracing (within 0-8 weeks) significantly increased the detection odds, with increases ranging from 6.9 to 8.4 times compared to later tracing. Contacts aged 45-60 years and those over 60 had 3.90- and 3.93-times higher odds, respectively, of yielding a positive case compared to younger contacts. Contacts with a known positive HIV status had 12.26 times higher odds of being identified with TB. Socializing with the index case (versus living together) was associated with 2.46 times higher odds of positive yield. Awareness of the index case's TB status was protective, reducing the odds of being identified as an additional TB case by 68%.

Conclusion: This study highlights the importance of timely contact tracing and broader inclusion criteria for TB control. Clinically diagnosed TB cases showed greater transmission potential than bacteriologically confirmed cases, indicating a need for their inclusion in contact tracing efforts. Older adults and HIV-positive individuals were identified as higher-risk groups, emphasizing the necessity for targeted interventions. Additionally, extending contact tracing beyond household members to include social interactions can enhance TB detection. These findings advocate for revising traditional TB control approaches to improve effectiveness in high-burden settings.

Keywords: Tuberculosis; Contact Tracing; Index Cases; Contacts; Eastern Region-Uganda

Abbreviations

eCBSS: electronic Case-Based Surveillance System; DTU: Diagnostic and Treatment Unit; TB: Tuberculosis;

NTLP: National Tuberculosis and Leprosy Program

Introduction

Tuberculosis (TB) continues to present a major public health challenge worldwide, claiming over 3,500 lives each day despite being preventable and treatable. As the second leading cause of death from a single infectious agent, only behind COVID-19, TB's enduring threat underscores the urgent need for innovative and effective interventions. TB, caused by *Mycobacterium tuberculosis* (*M. tuberculosis*), primarily affects the lungs (pulmonary tuberculosis) but can also involve other organs (extrapulmonary tuberculosis) [1]. It is transmitted through airborne particles released when an individual with active TB coughs, making it highly contagious. Approximately a quarter of the global population is infected with M. tuberculosis, with 10-15% at risk of developing active TB [2]. In 2022, the incidence of TB rose to 10.6 million new cases, reversing a previous downward trend, and over 80% of these new cases and deaths occur in low- and middle-income countries (LMICs) [3].

Although global efforts have led to a gradual decline in TB burden, this reduction is insufficient to meet the World Health Organization's (WHO) End TB strategy target of a 50% reduction by 2025 [4]. In Africa, which accounts for 23% of global TB cases and 33% of TB deaths, progress has been made, yet over 30% of TB cases remain undiagnosed and untreated. Without timely treatment, one TB patient can infect 10 to 15 people annually, with 10% of those infected developing active TB during their lifetime. Meeting the goal of ending the TB epidemic by 2030, supported by all United Nations (UN) member states and the WHO, requires immediate and effective action [5].

One such strategy is contact tracing—systematically identifying and screening individuals exposed to an active TB case. This public health intervention facilitates early detection and timely treatment of additional cases, helping to interrupt disease transmission [6]. The WHO recommends contact tracing for household and close contacts of index cases with sputum-positive pulmonary TB, drug-resistant TB, HIV co-infection, or those who are children under five years. However, the effectiveness of contact tracing, measured as the proportion of contacts subsequently diagnosed with active TB, varies widely based on contextual and epidemiological factors [7].

In LMICs, the prevalence of active TB among contacts of index cases is only 3% [8,9]. Research conducted in settings like South Africa has identified factors such as the infectiousness of the index case, including smear positivity, cavitary disease, and bacterial burden, as key determinants of transmission risk and contact tracing yield [10,11]. Additionally, the nature and intensity of contact—such as the duration of exposure and whether the contact occurred in a household or community setting—significantly impact TB transmission and case detection [10,12]. Understanding these factors is essential for designing context-appropriate strategies to improve TB case identification and treatment.

In Uganda, recently identified as one of the 30 countries with a high TB and TB/HIV burden, contact tracing performance remains suboptimal, with only 1.7-5.3% of contacts of index TB cases found to have active TB [7,13,14]. Research in Uganda has primarily focused on contact investigation methods and presumptive contacts in urban settings [14,15]. Previous studies in Uganda have reported variable yields in TB contact tracing, ranging from

1.7% to 5.3% [15,16]. These studies, which explored the complex interplay of factors influencing TB contact tracing yields, reported mixed findings. Factors such as being a retreatment case and being male [7,14] as well as the evaluation of presumptive cases [8] were identified as significant influences on TB contact tracing yield. However, HIV status showed inconsistent results among children under 5 and adults [7,14]. None of the studies examined the clinical characteristics of the index TB case, the timing of contact tracing, the level of exposure to the index case, or the type of contact.

There is a critical need to understand factors influencing contact tracing effectiveness in programmatic and resource-limited settings, which poses significant logistical and financial challenges. This study addresses these gaps by examining factors associated with a positive contact tracing yield among index TB patients and contacts in Eastern Uganda. This region has experienced a notable decline in contact tracing yields from 4.3% to 0.6% over the past three years [17], emphasizing the need for targeted interventions. The findings will contribute to the existing body of knowledge to enhance TB detection and treatment, supporting Uganda's national TB control program and aligning with global eradication goals.

Materials and Methods

Study area and population

Bugisu and Bukedi are two of the 15 health regions in Uganda, located in Eastern Uganda. With an approximate population of 4.5 million, it encompasses a mix of urban and rural communities with an average household size is 5.5 in Bukedi and 5.1 in Bugisu. The regions have 210 DTUs. The target population consisted of all contacts of index TB patients evaluated for TB between April to June 2024 across 55 diagnostic and treatment units in the Bukedi/Bugisu region. These DTUs are distributed across several districts, including Mbale, Sironko, Tororo, and others within the Bukedi/Bugisu regions.

Study design

This was a cross-sectional study using secondary data from the online contact tracing application and electronic case-based surveillance systems (eCBSS).

Sample size determination and sampling procedure

The whole population represented in the online contact tracing database from April to June 2024 was used and no sample size was calculated. All secondary data collected that met the inclusion criteria and none of the exclusion criteria were analyzed.

Data collection procedure and tools

During primary data collection, upon TB diagnosis, health workers elicited household and social contacts of index cases through a face-to-face interview conducted at the health facility. Thereafter, health workers contacted the contacts via telephone or through a VHT (village health team member) to schedule a visit at the home or workplace of the contact for evaluation. Contacts were screened for TB symptoms: cough for ≥ 2 weeks or any duration for people with HIV, persistent fevers, weight loss or anorexia and night sweats; using the online contact tracing application. Any contact with any of the symptoms above was designated as having presumptive TB. Presumptive TB cases identified through a home or workplace visit were evaluated for TB. A contact diagnosed with bacteriologically confirmed TB was considered to be a "positive yield".

This study used data from the contact tracing application (an online project database for TB contact tracing in Eastern Uganda). Health workers use the application installed on their mobile phones during field visits. This is mirrored to have all the parameters in the HMIS tool, but also to collect additional information about the contacts' exposure to the index case and socio-demographic characteristics and to enable geo-location of the contacts, which is not readily captured by the paper-based HMIS tools. This was then triangulated using unique identifiers (index name, unit TB number, age, sex and health facility) with data from the electronic Case-Based Surveillance System (eCBSS) to capture additional information about the Index TB case, thereby linking each contact to an index case. In 2020, Uganda adopted eCBSS for TB and leprosy surveillance, monitoring and program reporting.

Data on contacts' demographic, clinical, and exposure characteristics were extracted from the online contact tracing application using a data abstraction tool. These were triangulated using fuzzy lookup in Excel to match unique identifiers (index name, TB unit number, age, gender and health facility) of the contact to the data on the index in the eCBSS. Index demographic and clinical data variables were generated. The time from index diagnosis to contact tracing was referred to as time to contact tracing.

Study variables

The Outcome/dependent variable was Contact tracing yield, defined as contact tracing of an index that yielded a positive TB case. This was a categorical variable (yes=Index for those whose contact tracing yielded a positive and no=Index for those whose contact tracing didn't yield a positive TB case).

Predictor variables of the index case included age, gender, disease class, diagnostic test type, health facility level, number of contacts, and time to contact tracing. Contact characteristics included age, gender, type of connection to the index case, occupation, HIV status, any underlying medical condition, length of time the index was known, type of interaction with the index, knowledge that the index had tuberculosis, and if they were presumptive.

Data management and analysis

Secondary data were abstracted from a password-protected eCBSS and the online contact tracing systems. Raw data were checked for inconsistencies, cleaned for missing variables, inconsistent data, and ambiguous information, coded, double-entered into an Excel spreadsheet, cleaned again, and exported to Stata version 14.2 for analysis.

Categorical variables were summarized using frequencies and proportions while numerical variables the median, and the interquartile range (IQR) were used.

Bivariate analysis (simple logistic regression) was conducted to examine the association between each predictor variable and the contact tracing yield, reporting unadjusted odds ratios (OR) with their 95% confidence intervals (CI) and p-values. Variables that had a p-value ≤ 0.25 at bivariate analysis, and those that were considered biologically plausible were selected to be included in the multivariate model. Multicollinearity was assessed where variables that were highly correlated (with r≥0.4) were dropped. Through these two processes, only 10 of 16 variables were included in the multivariate analysis. A stepwise method of model building was adopted. The Wald's test was used to test the significance of dummy variables and overall variables in the model (health facility level and length of time the index was known were found to be the only unimportant variables). The final model had 8 independent variables, and its goodness of fit Prob>chi (2) was 0.2476 which means that this final model is not different from a perfect fit/model. Significance was tested at 5% alpha thus 95% confidence interval. Adjusted Odds ratios, their 95% confidence interval and significance were reported and presented in tables. Data was analyzed using STATA version 14.2.

Ethical considerations

The study did not involve human subjects, so informed consent was not obtained, but patient anonymity was preserved as we used unit TB numbers to extract patient-level data on demographic and clinical variables from the eCBSS system and the online contact tracing system. Approval was obtained from the hospital's Medical Director and the USAID LPHS-E project M&E director; they provided a password that was kept confidential at all times and not accessible to unauthorized persons.

Results

Data were extracted between April and June 2024. After matching, a total of 1806 contacts were included. 593 contacts were excluded due to inconsistency with the index TB patient in the eCBSS and 306 were excluded due to inconclusive results (samples were pending analysis). Figure 1 shows the study flow.

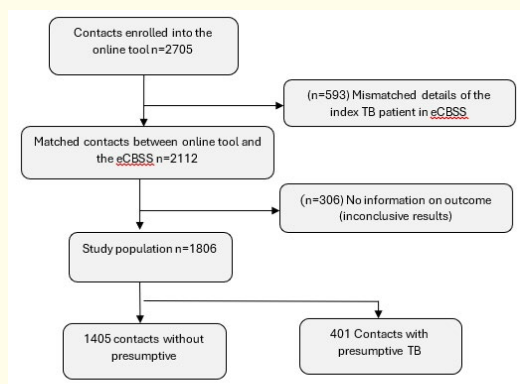

Figure 1: Study Flow Diagram.

Characteristics of study participants (Index TB patients and their contacts)

Index TB patients.

A total of 1,806 index tuberculosis (TB) patients had an average age of 41.11 years (SD = 18.83), with a predominance of males (58.14%). Majority of these patients (95.57%, or 1,725) had pulmonary bacteriologically confirmed TB, whereas a smaller percentage (4.43%, or 80) were diagnosed based on clinical symptoms alone, without bacteriological confirmation. GeneXpert was the primary diagnostic method, utilized in 83.78% (1,513) of the cases. The distribution of index TB cases across health facility levels revealed that Level III facilities were the most common, managing 41.97% (758) of the cases.

In terms of contact tracing, the median duration from the diagnosis of the index TB case to the start of contact tracing was 11.25 weeks, with an interquartile range (IQR) of 3.67 to 23.52 weeks. On average, each index TB case had 7 contacts (IQR: 4 to 9), indicating the typical number of individuals potentially exposed to each index case, as detailed in Table 1.

Variables	Summary measure, n (%)
Age of index, Mean (SD)	41.11 (18.83)
≤24	394 (21.82)
25-44	616 (34.11)
45-64	582 (32.33)
>=65	214 (11.85)
Sex of index	
Male	1050 (58.14)
Female	756 (41.86)
TB disease class	
PBC	1726 (95.57)
PCD	80 (4.43)
Type of Diagnostic test	
Genexpert	1513 (83.78)
Microscopy	63 (3.49)
LF TB LAM	150 (8.31)
No test done	80 (4.43)
Type of test	
GeneXpert	1,331 (86.48)
Microscopy	60 (3.90)
TB LAM	148 (9.62)
Health Facility Level	
Hospitals	503 (27.85)
Level IV	545 (30.18)
Level III	758 (41.97)
Time to contact tracing (weeks), Median (Q1, Q3)	11.25 (3.67, 23.52)
0-2	399 (22.09)
3-8	364 (20.16)
9-24	606 (33.55)
≥25	437 (24.20)
Number of contacts, Median (Q1, Q3)	7 (4, 9)
<6	888 (49.17)
≥7	918 (50.83)

Table 1: Characteristics of Index TB patients.

Contacts

The contacts of index TB cases predominantly consist of a young population, with a median age of 16 years (IQR 8 to 32). Among the 1,806 contacts, 44.35% (801) were under 15 years old. Females made up 51.72% (934) of the contacts, slightly outnumbering males at 48.28% (872). Most contacts were either children or spouses of the index TB patients (41.14%), followed by other household members (39.87%). Of the 1,806 contacts, 22.2% (401) had presumptive TB. HIV status was known for many contacts, with 45.24% (817) testing negative and 2.10% (38) positive, but 52.66% (951) had an unknown HIV status, indicating a need for intervention. Interaction types varied, with 72.31% (1306) living with the index case and 27.69% (500) socializing with them. Additionally, 64.28% (1161) of contacts were aware that the index had TB, and about 30.7% (555) reported using PPE when interacting with the index as seen in table 2.

Variables	Summary measure, n (%)
Age of contact, Median (Q1, Q3)	16 (8, 32)
0-14	801 (44.35)
15-29	473 (26.19)
30-44	252 (13.95)
45-60	178 (9.86)
>60	108 (5.65)
Sex of contact	
Male	872 (48.28)
Female	934 (51.72)
Connection to Index patient	
Child/spouse (Close HH contacts)	743 (41.14)
Other Household members	720 (39.87)

Neighbors	251 (13.90)
Social contacts	92 (5.09)
Occupation	
Unemployed	144 (7.97)
Child/student	981 (54.32)
Businessperson	123 (6.81)
Farmer	508 (28.13)
Other	50 (2.77)
HIV status	
Unknown	951 (52.66)
Positive	38 (2.10)
Negative	817 (45.24)
Underlying medical condition?	
Yes	39 (2.16)
No	1767 (97.84)
How long have you known the index case?	
Less than 1 year	603 (33.39)
≥ 1 year	1203 (66.61)
How do you interact with the index?	
Live together	1306 (72.31)
Socialize	500 (27.69)
Awareness that the index has TB	
Yes	1161 (64.28)
No	645 (35.71)
Do you use PPE while interacting with case	
Yes	555 (30.73)
No	1251 (69.27)
Presumptive TB	
Yes	401 (22.2)
	1405 (77.80)

Table 2: Characteristics of contacts of index TB patients.

The Yield of contact tracing among index TB patients in Eastern Uganda

Of the 1806 contacts evaluated during the study period, 401 (22.2%) had presumptive TB. 42 contacts were found to have active TB (Bacteriologically confirmed), a yield of 2.32% (42/1806).

Characteristics of the index TB case that influence the yield of contact tracing

The odds of detecting a positive contact were significantly influenced by both the TB disease class and the time to contact tracing. For TB disease class, index cases with a clinical diagnosis (PCD) were 4.75 times more likely to yield a positive contact compared to those with bacteriologically confirmed TB (PBC) (adjusted odds ratio=4.75, 95% CI: 1.36, 16.6).

Regarding the time to contact tracing, the likelihood of detecting a positive contact was markedly higher when tracing was initiated sooner. Specifically, if contact tracing was performed within 0-2 weeks, the odds of detecting a positive contact were 6.9 times greater compared to when tracing began 25 weeks or more after diagnosis (adjusted odds ratio=6.9, 95% CI: 1.83, 25.91). Similarly, initiating contact tracing within 3-8 weeks after diagnosis increased the odds of identifying a positive contact by 8.4 times compared to tracing that started after 25 weeks (adjusted odds ratio=8.4, 95% CI: 2.23, 31.49) as seen in Table 3.

Variables	Yield of contact		cOR (95%CI) P-value	aOR (95%CI) P-value
	Positive, n (%)	Negative, n (%)		
TB disease class				
PBC	4 (9.52)	76 (4.31)	1.00	1.00
PCD	38 (90.48)	1688 (95.69)	2.34 (0.81, 6.72) 0.115	4.75 (1.36, 16.6) *
Time to contact tracing (weeks),				
0-2	14 (33.33)	385 (21.83)	5.26 (1.50, 18.44) **	6.9 (1.83, 25.91) **
3-8	16 (38.10)	348 (19.73)	6.65 (1.92, 23.01) **	8.4 (2.23, 31.49) **
9-24	9 (21.43)	597 (33.84)	2.18 (0.59, 8.10) 0.244	3.2(0.80, 12.49) 0.102
≥25	3 (7.14)	434 (24.60)	1.00	1.00
Key: *** p < 0.001, ** p < 0.01, *p < 0.05				

Table 3: Characteristics of index TB case that influence the yield of contact tracing.

The association between contact characteristics and likelihood of identifying additional TB cases

Contacts aged 45-60 years had 3.90 times the odds of yielding a positive case compared to those aged 0-14 years (adjusted odds ratio=3.90, 95% CI: 1.48, 10.26), and contacts over 60 years had 3.93 times the odds (adjusted odds ratio=3.93, 95% CI: 1.19, 12.99). Contacts with a known positive HIV status had 12.26 times higher odds of being an additional TB case compared to those who were HIV-negative (adjusted odds ratio=12.26, 95% CI: 3.92, 38.39).

Interaction type with the index case was another significant factor. Contacts who only socialize with the index case had 2.46 times higher odds of yielding a positive case compared to those who live together (adjusted odds ratio=2.46, 95% CI: 1.24, 4.88). Awareness of the index case's TB status impacted the likelihood of identifying additional cases. Contacts who were aware of the TB status had 68% lower odds of being identified as additional TB cases compared to those who were unaware (adjusted odds ratio=0.32, 95% CI: 0.14, 0.78) as seen in Table 4.

Variables	Yield of contact		cOR (95%CI) P-value	aOR (95%CI) P-value
	Yes, n (%)	No, n (%)		
Age of contact				
0-14	11 (26.19)	790 (44.78)	1.00	1.00
15-29	9 (21.43)	464 (26.30)	1.39 (0.57, 3.39) 0.465	1.38(0.53, 3.57) 0.506
30-44	5 (11.90)	247 (14.00)	1.45 (0.50, 4.22) 0.492	1.16 (0.35, 3.85) 0.811
45-60	12 (28.57)	166 (9.41)	5.19 (2.25, 11.97) ***	3.90 (1.48, 10.26) **
>60	5 (11.90)	97 (5.50)	3.70 (1.26, 10.88) *	3.93 (1.19, 12.99) *
HIV status				
Unknown	18 (42.86)	933 (52.89)	0.91 (0.47, 1.77) 0.777	0.97 (0.46, 2.04) 0.941
Positive	7 (16.67)	31 (1.76)	10.63 (4.11, 27.49) ***	12.26 (3.92, 38.39) ***
Negative	17 (40.48)	800 (45.35)	1.00	1.00
Underlying medical condition?				
No	40 (95.24)	1727 (97.90)	1.00	1.00
Yes	2 (4.76)	37 (2.10)	2.33 (0.54, 10.02) 0.254	1.29 (0.27, 6.24) 0.75
How do you interact with the index?				
Live together	20 (47.62)	1286 (72.90)	1.00	1.00
Socialize	22 (52.38)	478 (27.10)	2.96 (1.60, 5.47) **	2.46 (1.24, 4.88) *
Are you Aware that the index has TB?				
Yes	18 (42.86)	1143 (64.80)	0.41 (0.22, 0.76) **	0.32 (0.14, 0.78) *
No	24 (57.14)	621 (35.20)	1.00	1.00
Do you use PPE while interacting with case?				
Yes	10 (23.90)	545 (30.90)	0.70 (0.34, 1.43) 0.328	1.98 (0.74, 5.31) 0.177
No	32 (76.19)	1219 (69.10)	1.00	1.00
Key: *** p < 0.001, ** p < 0.01, *p < 0.05				

Table 4: The association between contacts characteristics and the the likelihood of identifying additional TB cases.

Discussion

This study aimed to determine the factors associated with a positive contact tracing yield among index TB patients across 55 DTUs in Bukedi/Bugisu regions in Eastern Uganda. We observed that the proportion of contacts diagnosed with presumptive TB was 22% (401) within 10-30% range reported from other studies [7,11,14]. Similarly, a significant proportion of presumptives had inconclusive test results (306) and this could explain why the yield from our study was very low. It follows that contact tracing should aim to evaluate all contacts to an index TB case who are bacteriologically confirmed, HIV coinfected and under 5 years of age to increase the yield from contact tracing [7]. The yield from our study is within the estimate (1.7-5.6%) reported from similar studies in Uganda [7,18] and the 3% reported globally [8,19].

The study's findings emphasize the critical importance of timing in TB contact tracing. Contacts traced within the first eight weeks of the index case's diagnosis had significantly higher odds of being diagnosed with TB. This reinforces the established understanding that prompt contact tracing is essential for early detection and treatment, thereby reducing TB transmission rates. A study [20] also highlighted that rapid initiation of contact tracing results to higher yields in identifying secondary TB cases, underscoring the necessity for TB control programs to prioritize timely interventions.

Another notable finding is that index cases with pulmonary clinically diagnosed (PCD) TB were more likely to result in positive contact tracing outcomes compared to those with pulmonary bacteriologically confirmed (PBC) TB. This suggests that clinically diagnosed cases may have a higher transmission potential, possibly due to more extensive disease manifestations [21], or in children, it could result from an undiagnosed adult case continuing to transmit the infection. This finding diverges from the traditional focus on bacteriologically confirmed cases, as seen in studies by [19,22,23] and indicates a need for further research into the transmission dynamics of clinically diagnosed TB cases. This suggests a gap in the existing literature and indicates a need for further studies to explore the transmission dynamics and characteristics of clinically diagnosed TB cases.

The only demographic variable found to significantly influence the likelihood of diagnosing additional TB cases was the age of the contact. Older contacts, particularly those aged 45 years and above, and contacts with a positive HIV status were at higher risk of TB. This finding aligns with studies like [24,25], which noted the increased susceptibility of older adults due to weakened immune systems and comorbidities. Similarly, the strong association between positive HIV status and increased TB risk found in our study is well-documented in the literature. Studies have consistently shown that HIV-positive individuals are at a significantly higher risk of developing TB due to immunosuppression [26-28]. Our findings reinforce the necessity of integrated TB-HIV services to ensure that HIV-positive individuals are regularly screened for TB and receive appropriate prophylactic treatment.

Contacts who socialized with the index case were more likely to be diagnosed with TB compared to those living together, challenging the traditional focus on household contacts. This finding aligns with observations by [29,30], who emphasized the role of social and community interactions in TB transmission. Expanding contact tracing to include non-household interactions can enhance the identification of secondary TB cases and improve the overall effectiveness of TB control strategies.

Awareness of the index case's TB status was found to be protective, with informed contacts exhibiting lower odds of being diagnosed with TB. This highlights the critical role of education and awareness campaigns in TB control efforts. Research also found that informed contacts are more likely to engage in protective behaviors and seek timely medical intervention [31,32]. Public health authorities should prioritize educational interventions to promote awareness and reduce TB transmission. Collectively, these findings provide actionable insights for enhancing TB control programs through timely contact tracing, targeted interventions for high-risk groups, and comprehensive educational initiatives.

Conclusion

This study aimed to determine the factors associated with the positive contact tracing yield among index TB patients across the Bukedi and Bugisu regions of Eastern Uganda. The results demonstrate that the overall contact tracing yield was within expected ranges, yet hampered by a considerable number of inconclusive test results. Importantly, our findings emphasize the critical role of timing in contact tracing, with contacts traced within the first eight weeks of the index case's diagnosis showing significantly higher odds of TB diagnosis. This underlines the need for timely interventions to maximize the effectiveness of contact tracing programs.

Contrary to the traditional focus on bacteriologically confirmed cases, clinically diagnosed TB cases in our study were associated with a higher transmission potential, which points to the need for a broader inclusion of clinically diagnosed cases in tracing efforts. Additionally, older adults and HIV-positive contacts were at higher risk of TB, affirming that targeted interventions should focus on these vulnerable populations. The study also revealed the significance of social interactions in TB transmission, suggesting that contact tracing efforts should extend beyond household members to capture a wider network of potentially exposed individuals.

In conclusion, the findings from this study challenge certain conventional approaches in TB control, such as the sole focus on bacteriologically confirmed cases and household contact tracing. Expanding the scope of tracing to clinically diagnosed cases, ensuring prompt tracing within the critical window post-diagnosis, and targeting high-risk populations such as older adults and HIV-positive contacts are pivotal to enhancing TB control efforts. These results offer valuable insights that can inform and optimize TB control strategies in high-burden settings.

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Conflict of Interest

No conflict of interest exists.

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