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A Strategy for Effective Tuberculosis Contact Tracing in Botswana

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Abstract

Botswana has witnessed the highest TB rates in the southern African countries, ranking the fourth after South Africa, Swaziland, and Zimbabwe. In 2012, the TB rate was, on average, 531/100 000 population. About 2 380 contacts out of a possible 8 110 (amounting to 29.30%) were traced nationally (Botswana 2011:8), indicating a potential gap of 5 730, which was yet to be traced in 2011. The TBCT strategies might be inadequate leading to absence of screening and treating TB contacts and reducing PTB related deaths. The purpose of this study was to describe utilisation of current TBCT and develop a strategy for a more effective TBCT in Botswana. Data were collected through a quantitative cross-sectional research design. The study further described the association between TBCT strategies and practices and determined the gaps, challenges, and needs in the TBCT. Results revealed under-tracing of contacts in the number of registered and enumerated TB contacts. The results further established the risk of mixing TB contacts and general patients. The differences in the perceptions and knowledge of the cause of TB, as well as poor utilisation of the current programmes by the PTB patients, denotes the need for aggressive awareness-raising and health promotion strategies. The results were used to develop an alternative plan, the IC-TBCT, which has the potential to trace all TB contacts. The approach encourages participation, active accountability and involvement of the beneficiaries in all efforts aiming at early contact identification and reducing the incidence of PTB.

Keyword: *Integrated tuberculosis contact tracing; pulmonary tuberculosis; tuberculosis contact; tuberculosis contact tracing.*

Introduction

The basis of the severity of PTB was influenced by the magnitude of the disease reported by WHO that the global prevalence of TBHIV in 2013 was 13.0% and that 78.0% were in Africa, mainly sub-Saharan Africa (SSA).[1] Botswana witnessed high TB rates with 531/100 000 population on average in 2012, yet contact tracing accounted for 29.30%.[2] A gap of 5 730 needed tracing in 2011.[3] Kabongo et al., claimed that tracing was not immediate after identification of a TB patient[4]. Tracing strategies were inadequate and led to some absence of screening contacts.[2,5] Puryear et al., traced 163 cases in Gaborone and screened 548 contacts that yielded 2.20% new cases.[6] Puryear et al., suggested that to find one new TB case, the number needed to contact-trace was 13.6, and the number needed to screen was 46.[6] The current study attributed success rate to TBCT strategies and explored potential contribution of alternative TBCT to TB control. Deery et al., Shapiro et al., and WHO urged for the need for a more effective TBCT.[7,8,9] The Health Belief Model (HBM) by Rosenstock, expounded by Ayers et al., Carpenter; Cook et al., Ekwueme et al., Janz et al., Johari et al., Lubkin et al., Omotowo et al., and Parvanta et al., guided conceptual framework.[10,11,12,13,14,15,16,17,18,19] The study aimed to describe utilisation of current TBCT. It described organisational, knowledge, and implementation gaps,

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challenges, and determined needs for developing a strategy for effective TBCT. It constructed an alternative strategy that linked those factors and involved patients in TBCT.

Material and Method

A quantitative, cross-sectional design was used for its appropriateness, explained by Burns et al., and Creswell and the convenience to investigate TBCT.[20,21] It was economical and generated useful data for assessing tracing needs of contacts. It described interrelationships between TBCT strategies and current practice.

The study was conducted in Good Hope and Lobatse Health districts, Botswana. They were accessible among high TB prevalence areas and had adequate patients with PTB for sampling. New TBHIV cases ranged from 14 000 to 17 000 in 2014. According to WHO, the incidence rate of ≥ 0.04% was high.[22]

The study population included persons with PTB and contacts aged ≥21 years, healthy and consenting. The HCWs who worked in TB clinics were included. Persons aged <21 years, mentally ill, and non-consenting were excluded. The intended sample was 1 096 (548 cases and 548 contacts), determined using single population proportion formula. It used the proportion of patients with PTB with 95% CI and margin of error 0.05. It applied probability sampling using:

$$n = \frac{z^2\, p\, q\, D}{d^2}$$

A document checklist was used in phase I to observe the clinics. A structured interview was used in phase II for participants. Quantitative data were entered in MS-Excel 2013 spreadsheet and validated. Statistical Package for Social Scientists v20 was used to analyse data.

Findings: Of 427 patients with PTB, 58.3% (*n*=249) were males and 41.7% (*n*=178) were females (Table 1). The male-female ratio was 1:4. A majority (58.7%, *n*=251) of the participants were aged below 40 years. The median and mean ages were 37 and 40.9 years, respectively. Most of them were in single-cohabiting relationships 44.0% (*n*=188).

Table 1: Distribution of tuberculosis contacts traced by gender of patients with pulmonary tuberculosis (N=427)

Patients with PTB	Gender (%)		Total
	Male	Female	
At household level	41.0	29.3	70.3
At workplace	1.9	0.9	2.8
Not contact traced	15.4	11.5	26.9
Total	58.3	41.7	100.0

Majority (39.6%, *n*=169) of the participants had six to ten household contacts (Table 2), males being 23.2% (*n*=99).

Table 2: Distribution of contacts per patient with pulmonary tuberculosis in Phase II (N=427)

Contacts	Gender of contacts (%)		Total
	Male	Female	
Household			
None	5.9	2.3	8.2
1 – 5	5.9	3.5	9.4
6 – 10	23.2	16.4	39.6
11 – 15	9.8	9.1	19.0
16 – 20	7.5	5.2	12.6
Over 21	6.1	5.2	11.2
Total	**58.3**	**41.7**	**100.0**

Contacts	Gender of contacts (%)		Total
	Male	Female	
Workplace			
None	39.8	30.0	69.8
1 – 5	1.2	0.7	1.9
6 – 10	4.7	2.3	7.0
11 – 15	3.0	3.0	6.1
16 – 20	2.3	1.4	3.7
Over 21	7.3	4.2	11.5
Total	**58.3**	**41.7**	**100.0**

The household contact-case index ratio was 5.4:1 in Phase II (χ^2=13.459, df=5; p=0.665, 0.620 – 0.710). The workplace contact-case index ratio was 1.05:1 in Phase II (χ^2=17.855, df=6; p=0.398, 95% CI: 0.377 – 0.402). Majority (55.5%, n=237), mostly males (34.9%, n=149), reported that their contacts were not screened. From 1 539 contacts in Phase I, 48.3% were not screened (Table 3).

Table 3: Distribution of tuberculosis contact screening and outcome

	Outcome of Screening (%)				
	Screened	With TB	Without TB	Missed screening	Total
PHASE I (*N*=1 539)					
Household contacts	24.5	12.3	8.8	3.3	48.9
Workplace contacts	5.1	1.0	0.0	45.0	51.1
Total	**29.6**	**13.3**	**8.8**	**48.3**	**100.0**
PHASE II (*N*=2 344)					
Household contacts	17.4	8.2	28.3	0.8	54.7
Workplace contacts	5.5	0.7	26.4	12.8	45.3
Total	**22.9**	**8.9**	**54.7**	**13.6**	**100.0**

The household TB contact-case index ratio was 5.4:1 in Phase II and 1.05:1 for the workplace. The average NNT was 2.16. The most common barriers to TBCT included administrative processes (56.3%, n=9). One HCW stated, 'There is no register for… tracing, so I designed this for… follow-up'.

Conclusion

The current TBCT strategy does not effectively trace all contacts. Under-tracing of contacts resulted in missed opportunities for case finding and testing. The challenges included under-tracing of contacts, perceptions, and knowledge deficits about TBCT, stigma, syndemic TBHIV, community participation, communication, and transport. Stigma, fear of medication, and defaulter rate, peer alcohol consumption, smoking were the common barriers for the utilization of the TBCT.[23] The HCWs had gaps in TBCT training. The main findings in the study included the following: The under tracing of the TB contacts showed a gap for missed opportunities of TB case finding and testing. The household TB contact-case index ratio was 5.4:1 and 1.05:1 for the workplace and the number needed to contact trace is 2.16 on average. The current study shows a significant TB contact-case index ratio that must be addressed.

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