

**Tuberculosis contact tracing in primary health care facilities in Francistown,
Botswana.**

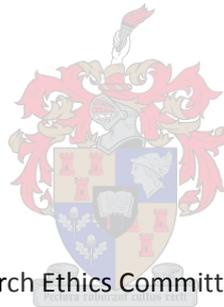
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Research Ethics Committee approval

University of Stellenbosch Human Research Ethics Committee (Reference number N



Authors' contribution

Dr Baagi Motshereganyi conceived and conducted the research study and completed the manuscript. Dr Michael Pather was the supervisor and granted authorization for ethics approval and final submission for publication of the manuscript, which was read and approved by both authors.

Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my original work and that I have not previously submitted it, in its entirety or in part, at any university for a degree. I also declare that approval for the study was obtained from the University of Stellenbosch Human Health Research Ethics Committee (Reference number N11/05/161).

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Abstract

Background

Tuberculosis (TB) is a big health concern in Botswana. High numbers of new and retreatment tuberculosis cases are still being recorded every year. This calls for implementation of more effective ways of investigating and managing tuberculosis to control its spread.

Methods

This descriptive study was conducted in four clinics in Francistown, Botswana where a high number of cases were recorded in previous years. The objectives of the study were to determine the frequency and adequacy of tuberculosis contact tracing conduction in Francistown primary health care facilities and to describe factors contributing to the failure to implement TB contact tracing.

The study design was a descriptive study using the data that was collected at the four clinics where direct observational therapy was administered. The information on how TB contact tracing was done and factors contributing to lack of adherence to TB programme guidelines was collected over a 5 months period. In one part of the study, sputum positive patients on anti-tuberculosis treatment (ATT) were asked questions as stated in the questionnaire, while in the second part health care workers conducting contact tracing were interviewed at Directly Observed Therapy (DOT) administration points. The findings were compared to the national guidelines on tuberculosis contacts tracing recommendations.

Results

A total of 61 sputum positive subjects were identified. A total of 51 (84%) patients had some contact tracing done. Of the 51 patients, 44 (86%) had inadequate contact tracing and only 7 (14%) had adequate contact tracing done. Of the 51 that had contact tracing done, 6 (12%) were identified to have contacts with signs and symptoms of TB. Of the 61 subjects who were AFB positive and currently treated for TB, 12 (20%) of them were previously treated for TB. Patients' movement, insufficient transport, confidentiality and privacy were noted to be factors hindering effective tuberculosis contact tracing in primary healthcare facilities in Francistown.

Conclusion

This study highlights the large number of sputum positive TB patients whose contacts are not effectively investigated and therefore remain untreated. Adequate assessment of contacts may identify active TB cases which could otherwise go unnoticed. Successful tuberculosis contact tracing at Francistown primary healthcare facilities is hindered by a number of challenges which include, highly mobile contacts, transport issues, confidentiality and privacy, limited health care workers communication and counselling skills, homelessness and patients' refusal to produce sputum. The effective evaluation of TB contacts may therefore contribute to the successful implementation of TB prevention programmes in this area

Tuberculosis contact tracing in primary health care facilities in Francistown, Botswana.

Literature review

At the end of the 1980s, official bodies began to report a dangerous increase in the incidence of TB cases and the urgent need for improvement in, or implementation of, control programmes¹. The World Health Organization (WHO) has intensified its efforts to control tuberculosis worldwide after declaring it a health emergency in 1993. This followed the WHO guidelines that were drawn up in 1978 for the evaluation of TB programmes². In many developed countries the numbers of tuberculosis (TB) cases have fallen considerably in recent years^{3,4}. The high numbers are still noticed in certain communities like prisons and continue to be composed of individuals whose risk of contracting this disease is high⁴. These include intravenous drug abusers and patients with human immunodeficiency virus co infection. However, the incidence and prevalence of Tuberculosis in developing countries, including Botswana remains high^{5,6}. With the TB prevalence rate of 363/100 000, Africa has the highest rate in the world. In Botswana, TB prevalence rate is 380/100 000. TB contact tracing investigation is one of the measures that have been used to detect latent TB infection and TB disease⁷.

Local data on studies looking at the investigation and control of TB is very scarce. Data reported here is mostly based on international studies. A review of contact investigations carried out in low-income and middle-income countries showed that 4.5% of identified house hold contacts of new PTB cases had TB at the time of evaluation, of which 2.3% had bacteriologically-confirmed TB⁸. When properly applied, TB contact tracing can impact on morbidity and mortality especially among high risk groups. The improvement in prevalence of TB infection logically coincides with the fall in TB incidence⁹. With the improvement in contact tracing, in particular among smear-positives, its benefit will go a long way in the control of the spread of this infection. The cost benefit of TB contact tracing is high in developed nations with low incidence but it is still very helpful in high incidence countries¹⁰. This can help detect some of the cases that could otherwise go without being detected.

There are many new and relapse pulmonary TB patients who present to our health care facilities despite measures in place to try and reduce the incidence and prevalence of TB¹¹. Some patients are suspected to be re-infecting each other within the same families. When a child presents with TB, there is a high chance that they contracted it from an adult at home, so it needs to be traced back^{12,13}. Close contact is generally accepted to occur in the household, and the source case of a child with tuberculosis is presumed to be a parent, care-giver, close relative or household member^{14,15}. For this reason, contact tracing of children aged less than five years living in the same household as an infectious adult with TB is an important component of many tuberculosis control programmes. The scientific rationale for household contact tracing is based on large epidemiological surveys assuming transmission of infection and development of disease rather than on proof of transmission of specific organisms causing disease^{16,17}. Although the thinking is that these children had household transmission, it is not possible to demonstrate that it did not take place outside the house within the community from other tuberculosis cases harbouring the same strain. It is commonly accepted that children, and specifically those aged under five years, are infected in the

household, however, it is known that transmission of *M. tuberculosis* to children can occur in the community. Contact tracing has the potential to help reduce the disease burden, prevalence and health service cost^{18,19}. Next to treating all identified infectious TB cases, tracing contacts effectively is an important component of TB control, and an improved understanding of epidemiology in high incidence settings is required. Without the formal study, it may not be possible to identify and address certain obstacles hindering contact tracing. Contact tracing has significant resource implications, and public health authorities should establish screening strategies for individuals at higher risk of TB to balance the potential non-detection of at-risk subjects with the need to avoid unnecessary screening. There are some challenges impeding TB contact tracing in primary health care facilities in Francistown. This study aimed to describe the challenges facing the implementation, the frequency and the adequacy of TB contact tracing.

Methods

Study design:

This study was conducted using a descriptive cross-sectional design and qualitative component.

Research setting:

Data was collected at Masego, Gerald, Tshwaragano and Lapologang primary health care facilities, in Francistown between January 2012 and May 2012.

Subject selection and data collection instrument

A descriptive study was used to collect data on adults with acid fast bacilli positive sputum and children under the age of five years with tuberculosis. A questionnaire was used to interview subjects. The idea was to determine if TB contact tracing was performed according to the Botswana National TB guidelines. A close contact was defined as a member of the same household as the notified case who shared the house or a close associate such as a relative who visited frequently, a girlfriend or a boyfriend or a work colleague who spend a greater part of the day together. Data collection was done by completing a questionnaire which included the subjects' demographics, past history of tuberculosis and date, how the TB was diagnosed, treatment period, whether the healthcare worker just asked about someone in the family or workplace with signs and or symptoms of TB. We also wanted to determine whether they actually went out to do home or workplace assessment of such people and finally if there was anyone currently in the family or workplace with signs or symptoms suggestive of TB.

Health care workers at the four clinics where the study was conducted were also interviewed using semi-structured interviews. This was mainly to establish if they were aware of the criteria for triggering TB contact tracing and to explore their perceptions of the barriers to conducting effective TB contact tracing.

Results

Phase 1-quantitative

We intended to study 80 subjects with AFB sputum positive and child under the age of 5 with TB but could only get 61 subjects (76%), who were all adults. The original number could not be attained as some of the patients receiving ATT during the 5 months of data collection were either sputum negative or had extra pulmonary TB and were therefore excluded from the study. In addition the researcher could not find any subjects under the age of 5. The majority of the under 5 year category received treatment at the referral hospital so during the period of the study none were being treated at the 4 sites selected. Of the 61 subjects studied, 51 (83%) had contact tracing done and 10 (16%) did not have any contact tracing on their close contacts. Of the 51 that had contact tracing done, 8 (15.6%) exhibited signs and /or symptoms suggestive of TB. A total of 6 (75%) subjects were confirmed AFB positive and therefore started on ATT while the remaining 2 (25%) were started on ATT on clinical/radiological grounds. Table 1 summarises the above details.

Table 1-Number of patients who tested sputum positive, those who had contact tracing done and those who did not have it done at the 4 clinics

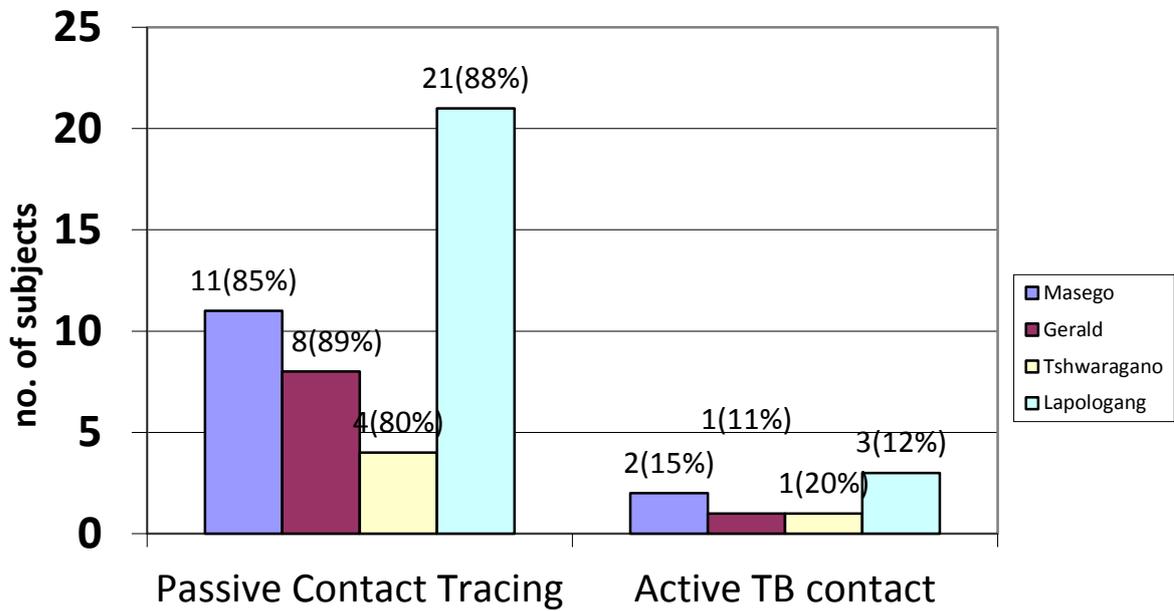
Name of facility	Number of sputum positives	Contact tracing done	Contact tracing not done	Contacts with TB signs/symptoms identified
Masego clinic	16	13	3	3
Gerald clinic	12	7	5	1
Tshwaragano clinic	7	5	2	0
Lapologang clinic	26	26	0	2

Out of the 51 subjects that had TB contact tracing, 44 (86%) had passive TB contact tracing done on them, i.e., only asked if there was someone with listed signs or symptoms suggestive of TB at home or the workplace. Only 7 (14%) out of the 51 subjects had active TB contact tracing, i.e., after asking about the sign or symptoms, the health worker actually then went to their house or work place to establish whether indeed there was no-one with signs or symptoms of TB. Of the 51 subjects who had contact tracing done, 6(12%) of them had signs or symptoms suggestive of tuberculosis. These findings are summarized in Table 2 and Figure 1.

Table 2- Passive and active contact tracing per facility

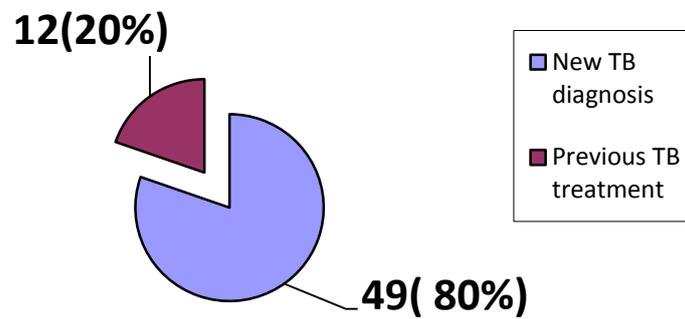
Name of facility	Passive contact tracing	Active contact tracing
Masego clinic	11	2
Gerald clinic	8	1
Tshwaragano clinic	4	1
Lapologang clinic	21	3
Total	44	7

Figure 1: Passive vs Active TB contact tracing



Of the 61 subjects who were AFB positive and currently treated for TB, 12 (20%) were previously treated for TB, i.e., were on the category 2 regimen. See Figure 2.

Figure 2: New vs Retreatment TB cases



Phase 2-qualitative

We interviewed 8 health care providers at the Direct Observation Therapy (DOT) points, two from each facility. We could not interview more because only two people are assigned to administer DOT at one point per facility per year. While one remains in the clinic, the second one goes out to the community to follow up on those getting ATT in the community. All the 8 interviewed health care workers knew what the criteria are for initiating a contact tracing; any sputum AFB positive individual and all children under five years of age. They mentioned several factors which they attributed to poor contact tracing implementation which included: patients' movement, lack of appreciation of TB as a serious disease, transport problems, patients' confidentiality and privacy, limited health care workers communication and counselling skills, homelessness of patients and refusal or denial to produce sputum.

Discussion

The Botswana National TB Programme guidelines are used by all the health facilities in Botswana to formulate protocols for TB contact tracing. This serves as a standard against which local performance standards are measured.

Published studies of tuberculosis contact tracing use different structures, processes and outcome of the service delivery, depending on the burden of the disease. In some papers on contact tracing, issues such as adherence to the tracing protocol, the proportion of contacts inadequately screened and the consequences of data inadequacy vary^{20,21,22}. We assessed the frequency of tuberculosis contact tracing, the level of adherence to the guideline and barriers to effective contact tracing.

A significant proportion, 84 %, of the sputum (AFB) positive adults had their close contacts screened for tuberculosis in the four primary healthcare facilities visited. This shows that the healthcare workers seeing these patients are aware of the fact that they are supposed to screen close contacts and that there is a standardised form which is completed to collect information from the contacts or the source case in case of a child less than five years. There is however uncertainty with regard to the clear definition of who a close contact is. The recommendation in the Botswana National Tuberculosis guideline refers to close and prolonged contact but does not go into the exact time scale. The Centre for Disease Control and prevention talks about arbitrary 8 hour period but according to the literature there are other factors that come into play²³. Some people exposed to highly infectious patients get infected in short periods of time while others do not get infected after long periods of exposure^{23,24}.

A total of 44 (86%) out of 51 subjects did not have adequate tuberculosis contact tracing. When looking at the proportion of subjects asked about someone at home with TB symptoms, 14.75% (CI 95%, 5%-26%) of the subjects were not asked while at work, 81.97% (CI 95%, 71%-91%) were not asked. This is because instead of the healthcare worker actually visiting the household or work place of a subject with sputum which is AFB positive, they just took a history from the subject. If they reported that no one has signs or symptoms suggested in the contact tracing form, they then did not visit such a place to confirm that indeed such contacts are asymptomatic. Research has shown that a significant proportion of subjects with active tuberculosis will be missed with this practise^{25,26}. In our

study, only 7 (14%) of the subjects had adequate tuberculosis contact tracing in which the healthcare worker physically visited the household or work place of the index case. This was in cases where the subject has actually reported that there was someone with symptoms or signs suggestive of TB as indicated on the contact tracing form. This is low given the fact that active or adequate tuberculosis contact tracing is effective in identifying tuberculosis in the community^{27,28,29}. The 51 subjects who had tuberculosis contact tracing led to identifying 6 (12%) people with active tuberculosis. Some studies have shown that an average of 2–3% of close contacts will already have active disease at the time of initial screening, and over the next 2 years between 5–12% of newly infected contacts will develop active disease³⁰.

Out of the 7 subjects who had adequate contact tracing, 6 (87%) were found to have signs or symptoms suggestive of tuberculosis and were investigated extensively for that. If one considers that 6 (12%) out of 51 subjects were found to have symptoms or signs suggestive of TB then the percentage obviously goes lower but we know that the majority of the subjects did not have adequate contact tracing. As the incidence of TB in our setting is high, this figure is still higher than studies done in low incidence area like Spain where it was found to be 3.4% during a contact tracing study³¹.

A total of 12 (20%) of the subjects studied were on a retreatment category of tuberculosis meaning that they were previously treated for TB of some kind. The reverse of that is, 80.33% (CI 95%, 70%-90%) of the cases were new TB. This tells us that this proportion of, 20% (CI 95%, 10%-30%) of the subjects could be cases of reinfection, relapse or treatment failure. If contact tracing is not adequately implemented, more active tuberculosis cases will be missed and the reinfection rates may increase. Cases at risk of multi drug resistant TB in the community may also increase because of previous ATT exposure^{32,33}. The vast majority of the subjects, 80% (CI 95%, 70%-90%), had inadequate contact tracing. This was a result of some of the reasons or challenges discussed below.

Challenges or barriers to effective TB contact tracing

Thematic analysis was used to analyse the qualitative part of the study. Only themes that recurred and were deemed important and were similar or connected to each other were reported. These included patient movement, transport issues and confidentiality and privacy, limited health care workers communication and counselling skills, homelessness of patients, refusal or denial to produce sputum. In this analysis themes that did not recur were not reported.

Patients Movement and lack of appreciation of TB as a serious disease affects TB contact tracing

One of the challenges common to the four clinics visited was that their patients are highly mobile. They reported situations where they would make an appointment with a patient to screen for contacts but every time they arrived at their household they would not find anyone or being told that the person in question has travelled to some other place. This was more common with the immigrants who normally go around looking for jobs³⁴. Some patients think it is not important to sit and wait for questioning because they do not feel sick. One of them was quoted as saying,

“If I sit here waiting for you, my friends will take all the half-jobs and I will have no money to send home. When I fall sick I will come to the hospital”.

Even with citizens we found cases where it was reported that the person in question has gone to visit their relatives. This is what one of the subjects was reported to have said,

“I had to go and look after my aunt’s house while she was out of town”.

Quite a number of subjects reported that they will be available after-hours but this time of day was not suitable for health workers in terms of the working hours and their safety after sunset. The patients’ movement between facilities is actually reflected on their small TB cards which they carry around. It shows that they rarely get their anti-tuberculosis treatment at the same facility consistently.

It is evident that both patients and health care workers appreciate that high mobility of the patients is a challenge when it comes to following TB contacts. Patients seem to prioritize other things before TB contact tracing. This may be exacerbated the healthcare workers’ lack of effective counselling skills as mentioned below.

Transport issues impeding TB contact tracing

Health workers also reported that at times they would make appointments for contact tracing but because of transport issues, they arrive at a different time from the one agreed with the patient. This lead to them missing some cases as it can take as long as 2 weeks before they could visit some places. At times when they got to addresses they were given, the cases or their contacts would have moved houses. The problem is that most of the time health care workers share transport with other people working at these facilities like administrative staff and acute case referrals. One of the health workers reported that the car that was allocated to them went for service and it has been a month since they have been without transport.

“The sad thing is that we can’t borrow from another facility as they are struggling just like us”, she stated.

At times the healthcare worker came so late that they found the contact already dead. This was probably because they would have been very sick or they were the source case. Many suggested that the TB programme should run with its own resources including human resources for it to run successfully.

The nurse in charge of one of the clinics said: *“The Anti-Retroviral Programme was well resourced and therefore running more efficiently than the TB programme”.*

Insufficient transport coupled with high patient mobility make it even more difficult to follow TB contacts. The longer it takes to identify these people means that we will catch them when they are already sick.

Patients’ Confidentiality and privacy negatively affects TB contact tracing

There are incidents where patients did not want to disclose that they have TB to relatives or colleagues at work. Various reasons were quoted including fear of rejection, stigmatization and dismissal from work in some instances³⁵. Stigma may hinder free flow of information. A patient working in one of the main chain stores reported that one of her colleagues lost his job because he

reported late to work as he had to collect his ATT before he reported for duty and was simply deemed unfit by the employer .

One of the subjects mentioned that his housemate asked him to look for another house after learning that he had TB and was on treatment. This demonstrates that if patients sense that their diagnosis of TB will be revealed to other parties they are more likely not to disclose their contacts. Healthcare workers felt it is a challenge to assure patients confidentiality when it comes to TB because one needs to look out for more contacts that may be having the same disease. This obviously led to breach of confidentiality.

Health care workers' counselling skills are inadequate to deal with counselling in TB contact tracing

Being subjected to the contact investigation interview before patients are able to digest and understand their diagnosis and its implications would seem to explain their reports of fear and confusion surrounding the whole process. Staff reported that they do not regularly assess patients' emotional readiness or level of understanding, and do not feel prepared to address patients' personal concerns, such as stigma, social alienation, and fears of losing income and housing. Sufficient staff training in listening, culturally appropriate interviewing techniques, and a consistent practice of re-interviewing patients after initial fears and confusion subside might help getting more patients who initially decline contact tracing, accepting it³⁶.

Homelessness and language barriers in TB contact tracing

Some health care workers reported that homeless subjects were difficult to trace. They were more likely to be diagnosed late, and usually took treatment intermittently. They often got lost to follow up. These factors increase the risk of reinfection within the families. Most of these are foreigners and some cannot speak local languages and this makes it difficult to communicate with them.

Patient refusing or denying sputum production-a challenge in TB contact tracing

These patients are usually started on ATT on clinical grounds and therefore their contacts would not be traced and investigated. Some lose the sample bottles, others bring saliva or just don't submit despite efforts to get them submit samples. This implies that if they have AFB in the sputum, chances are their close contact will also have TB and will be missed as a result. Part of the reason why this is happening is because of the aforementioned ineffective communication or counselling health worker skills.

The above mentioned factors hinders the effectiveness of TB contact tracing and leaves the healthcare workers resorting to just questioning subjects about the presence of anyone with TB signs or symptoms at home or the work place and not necessarily visiting those places to actively look for people with presentations that may be consistent with TB.

Study limitations

Lack of standardization of the data collection tools, that is, the questionnaire and the semi-structured interviewing tools may have affected the quality of this study. The questions that were on these data collection tools were mainly informed by what was found in literature and the context in which the study was conducted. Data tool standardization could have improved the quality of the study. Another factor that could have improved the quality of the study is the depth of the questions that were posed to the healthcare providers. This actually could have elicited some of the issues that would have added value to the information gathered. Fewer than the intended 80 subjects were studied. . That number could not be attained as some of the patients receiving ATT during the 5 months of data collection were either sputum negative or had extra pulmonary TB and therefore excluded from the study. In addition no subjects under the age of 5 years could be found during the actual conduct of the study.

Recommendations

To improve the effectiveness of tuberculosis contact tracing, health workers should engage in active adequate TB contact tracing both at home and the work place. TB contact tracing and the TB programme should be well resourced. This could be a cost effective measure in the fight against tuberculosis as the efforts are focused on screening for those at greatest risk of developing tuberculosis, not just those with active TB. It may be important to run regular workshops and training to sensitize health care workers conducting TB contact tracing on the importance of this investigation approach. Further definitive research with adequate power should be conducted in another setting. Such research may influence the change in strategy with regard to the conduct of the TB contact tracing in particular and the implementation of national TB programme as a whole.

Conclusion

This study highlights the large number of sputum positive TB patients whose contacts are not effectively investigated and therefore remain untreated. Adequate assessment of contacts may identify active TB cases which could otherwise go unnoticed. Successful tuberculosis contact tracing at Francistown primary healthcare facilities is hindered by a number of challenges which include, highly mobile contacts, transport issues, confidentiality and privacy, limited health care workers communication and counselling skills, homelessness and patients' refusal to produce sputum. The effective evaluation of TB contacts may therefore contribute to the successful implementation of TB prevention programmes in this area

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