An approach to the diagnosis, treatment and referral of tuberculosis patients: The family practitioner's role

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Abstract

The family practitioner in private practice is a key role player within the primary health care system and should play a bigger role in national tuberculosis (TB) control. TB training at medical undergraduate level is often not adequate and continuous medical education is necessary to develop capacity among private family practitioners. The Department of Health should also encourage the involvement of especially the private family practitioners in district TB control, which is a long overdue public-private interaction. This article discusses the role of the family practitioner to better diagnose, treat and refer tuberculosis patients.

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Epidemiology of tuberculosis

Tuberculosis, normally referred to as TB, is caused by *Mycobacterium tuberculosis*, which was discovered by a German physician called Robert Koch in 1882. TB exists everywhere around the globe. During the year 2005, 8.8 million TB cases were reported worldwide with 1.6 million deaths attributed to TB, making TB the single most deadly disease. The African continent, with 11% of the world population, reported 28% of global TB cases. Although TB incidence has been shown to be decreasing in six of the nine World Health Organization (WHO) regions, its incidence is still increasing steadily in Africa, especially in the Southern African Development Countries (SADC).

South Africa faces one of the worst tuberculosis epidemics in the world[1]

During the year 2005, South Africa reported 302 467 cases of tuberculosis which translates to an incidence rate of 645 per 100 000 population[2]. The number of reported cases of tuberculosis increased to 342 315 in 2006.[2] In South Africa, TB cure rates for new smear-positive cases (infectious patients) remained low at an average of 51% (ranging from 45.2% in KwaZulu-Natal to 71.9% in the Western Cape)[2] at the end of 2005. The WHO recommends a cure rate of 85% among all smear-positive pulmonary TB patients (infectious) to control TB transmission in any particular country. The rate of patients who defaulted on TB treatment was 10.4% in 2005 against a national target of 5%.[2] The low cure and high defaulter rates have resulted in the increase of Multi-Drug Resistant (MDR)-TB caseload in South Africa. Between January and October, 2007: 4 951 MDR-TB cases and 481 Extremely Drug Resistant (XDR)-TB cases were diagnosed in South Africa. It costs the state R30 000 or more per patient to treat MDR-TB and R300 to treat drug-susceptible TB in South Africa.[1]

The WHO report issued early in 2008 reiterated the point that the treatment success rate for South Africa is low and defaulter rate is high when compared to international standards.[3] Of the 22 high burden countries – defined as those that contribute 80% of the total global TB burden – South Africa is ranked seventh and nine of them are from Africa.[2] A person infected with TB disease in their lungs may release tiny particles containing *Mycobacterium tuberculosis* into the air by coughing,[4] sneezing or laughing. These particles are referred to as *droplet nuclei*. They are invisible to the naked eye and can remain in room air for several hours, until they are removed by natural or mechanical ventilation. A person who inhales droplet nuclei can become infected with TB.[4] Poor socio-economic conditions (poverty, overcrowding, poor nutrition) and compromised immune status promote its spread. The best way of preventing TB spread is to timeously treat all diagnosed cases.

The main challenges of TB control in Africa are the unknown true burden of Drug Resistant (DR)-TB cases, limited laboratory capability for TB and drug susceptibility testing (DST), unavailability of second-line drugs for treatment, high HIV prevalence, inadequate infection control procedures and poor drug-resistant tuberculosis monitoring and evaluation systems.[5] In summary, key challenges facing TB in South Africa are the increased defaulter rates, lack of continuous staff training, non-decentralisation of laboratory services resulting in the

turn-around time remaining far above the target of 48 hours or less, inadequate healthcare systems e.g. poorly organised directly observed therapy and poor TB infection control management.[6]

Transmission of TB[4]

TB affects the lungs commonly but can cause disease in any part of the human body. It spreads by airborne route through inhalation of droplet nuclei and transmission is affected by:

- **Infectiousness of the patient:** This occurs when a patient who is already infected has a productive cough. During coughing, several droplet nuclei (TB bacilli) escape from the mouth into the air and are inhaled by another person.
- **Environmental conditions:** Living with someone infected with pulmonary tuberculosis in a place where there is no cross-ventilation, where windows are small or closed most of the time. A healthy person staying in this environment may be infected with TB.
- **Duration of exposure:** The longer one stays with an infected person who coughs droplet nuclei, the more likely one is to become infected with TB. One TB patient can infect *ten* close contacts in *one* year.

Once inhaled, TB bacilli travel to the lung alveoli and establish infection. Within 2–12 weeks after infection, immune response limits activity; infection becomes detectable but some bacteria survive and remain dormant but viable for years. This is referred to as latent TB infection (LTBI). Persons with LTBI are asymptomatic and non-infectious. The majority of people born and living in Africa have had LTBI before completing primary school. The truth is that they remain asymptomatic mainly because of their good immune status as well as the above factors. LTBI progresses to TB disease in a small number of persons soon after infection. It is worth noting that 5–10% of persons with untreated LTBI will develop TB disease or active TB sometime during their lifetime. However, once a person becomes HIV positive, the risk increases to 10% per year to develop TB.

Symptoms and signs

Pulmonary tuberculosis should be suspected in patients coughing for more than two weeks. The cough is often productive (occasionally blood-stained) but sometimes dry. The symptoms and signs of TB are non-specific to the disease as these may be found in other diseases. Every patient who has been coughing for 2 weeks or more needs to be offered a TB sputum test unless the cause of the coughing is known. It is important to note that TB has been diagnosed among patients coughing for less than 2 weeks. The list of symptoms and signs are listed in Table I.

Table I: Symptoms of tuberculosis

- Cough (more than 2 weeks)
- Unintentional loss of weight (LOW)
- Loss of appetite
- Asthenia
- Nocturnal fever with night sweats for 2 weeks or more
- Shortness of breath
- Chest pain

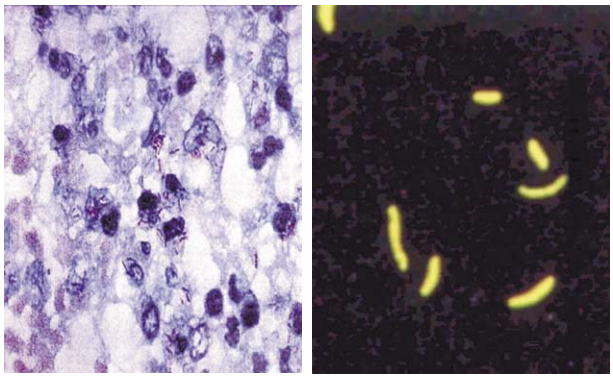
Approach to the diagnosis of tuberculosis

Tuberculosis is suspected if a patient presents with the symptoms and signs in Table I and confirmed by laboratory tests. The main laboratory tests available include TB microscopy, TB culture and TB drug susceptibility tests.

TB microscopy

TB microscopy is the cornerstone of TB diagnosis. The two methods available are the Ziehl-Neelson (ZN) and fluorescent auramine staining. The acid-fast staining procedure depends on the ability of mycobacteria to retain these dyes when treated with acid and alcohol solutions. The auramine is more sensitive than the ZN staining and TB microscopy has a sensitivity of 60%. It may be as low as 37% in patients with advanced HIV (Figures 1a and 1b).

Figures 1a and 1b: ZN stain and auramine stain showing *Mycobacterium tuberculosis* bacilli



It is worth noting that even among patients with advanced HIV, smear-positive TB is more common than smear-negative TB hence TB microscopy still has a role in diagnosing TB. Two sputum samples are required from the patient who is coughing. The first specimen is collected at the first visit, as soon as possible after the medical consultation. The family practitioner needs to educate the patient on how to collect this sputum specimen under supervision within the healthcare facility. Toilets, consulting rooms or corridors are not suitable areas for collection of sputum as these expose other patients to the disease. Sputum collection should take place outside the building or in a dedicated room with all infection control precautions taken to protect the family practitioner and clinic staff from exposure. The second specimen should be collected into a sputum container given to the patient as an early morning specimen at home, the following day. The diagnosis of smear positive tuberculosis is made when acid-fast bacilli (AFB) are found on microscopy.

TB culture

TB culture is more sensitive than smear microscopy in detecting TB among patients with TB symptoms and signs. All specimens with a negative TB microscopy should undergo a TB culture. TB culture is done on a solid medium such as Lowenstein-Jensen, a liquid medium such as the semi-automated radiometric systems (e.g. BACTEC 460), or an automated non-radiometric system (e.g. MGIT). Liquid media have a shorter turn-around time compared to solid media.

TB drug susceptibility test

This test is used to determine susceptibility or resistance of first and second line anti-TB drugs. Family practitioners will generally request a DST for first-line drugs. The following patients must have a DST for at least rifampicin, isoniazid (INH) and ethambutol) routinely[7]:

- All newly diagnosed re-treatment patients
- TB patients who remain sputum smear-positive after two months of treatment (new patients)
- Symptomatic close contacts of confirmed MDR-TB patients
- Symptomatic individuals from high risk groups (healthcare workers including laboratory staff, prisoners)
- HIV patients in MDR-TB high burden areas

Other tests:

Chest X-rays

These are quick to obtain but their findings are not specific for TB. Fungal infections, malignancies, old TB lesions such as lung destruction or fibrosis may be misleading. Chest X-rays may be used to assist a family practitioner if a TB suspect remains TB smear microscopy negative. In addition, it is used as a tool to assess the patient's response to TB or MDR-TB treatment, to help diagnose complications or other lung diseases, and is very useful in the diagnosis TB of in children although it may not be used alone as other parameters have to be considered.

Tuberculin Skin Test (TST)

This test is of little clinical value in our population, which has a high incidence of TB. It measures the delayed type hypersensitivity response to a purified mix of mycobacterial antigens, purified protein derivative (PPD). PPD is composed of antigens found in *Mycobacterium tuberculosis* and *Mycobacterium bovis* (BCG) and other mycobacteria. Hence, a positive TST is non-specific to latent and active TB. Severe immunosuppression, HIV, and malnutrition may lead to decreased sensitivity of TST. Although it remains an important tool for TB diagnosis in children, TST may also be used to determine who should be given INH prophylaxis therapy in order to reduce progression of latent TB to active disease by 60% reduction in progression to active TB in people who test TST positive.

Treatment of TB

The mainstay of treatment in TB is effective multidrug antimicrobial chemotherapy.[8] The treatment has two phases namely the intensive and continuation phases. The first-line drugs are isoniazid, rifampicin, ethambutol and pyrazinamide.

Adherence is critical to prevent resistance.[4]

The strategy used to achieve adherence is the Directly Observed Therapy Short-course Strategy (DOTS). DOTS-Plus was later developed for MDR-TB. DOTS is not just about observing the patient swallowing his/her tablets. It has the following five components:

- Sustained political commitment, which is needed to establish the following four components.
- A rational case-finding strategy including accurate, timely diagnosis through quality-assured culture and DST.
- Appropriate treatment strategies that use second-line drugs under proper case management conditions.
- Uninterrupted supply of quality-assured anti-tuberculosis drugs.
- Standardised recording and reporting system.

For newly diagnosed TB patients, the treatment has two phases:

- **Intensive phase (2 months):** This phase consists of four first-line drugs, which are rifampicin, isoniazid, ethambutol and pyrazinamide. These drugs are taken orally for two months.
- **Continuation phase (4 months):** This phase entails oral treatment using rifampicin and isoniazid for 4 months.

For re-treatment patients (relapses, defaulters), the two phases are longer in duration as follows:

- **Intensive phase (3 months):** Rifampicin, isoniazid, ethambutol and pyrazinamide are given orally for three months plus intramuscular injection of streptomycin during the first two months
- **Continuation phase (5 months):** This phase consists of rifampicin, isoniazid and ethambutol given for 5 months.

The above regimens are standard regimens for patients suffering from the commonest type of TB, which is pulmonary TB.

The classification and grouping of TB drugs are listed in Tables II and III respectively.

Table II: Classification of TB drugs

Class	Drugs
1. First-line drugs	rifampicin, isoniazid, pyrazinamide, ethambutol, streptomycin
2. Second-line drugs:	
a. Injectables	kanamycin, capreomycin, amikacin
b. Orals	ofloxacin, levofloxacin, moxifloxacin and gatifloxacin, ethionamide, protionamide, cycloserine, terizidone, p-aminosalicylic acid
3. Possible reinforcing drugs	amoxicillin/clavulanate, clofazimine, clarithromycin, linezolid, thioacetazone, imipenem, high-dose INH

Table III: Grouping of TB drugs

Group	Anti-TB agents	Drugs
1	First-line oral	isoniazid, rifampicin, ethambutol, and pyrazinamide
2	Injectables	streptomycin, kanamycin, amikacin, capreomycin and viomycin
3	Fluoroquinolones	ofloxacin, levofloxacin, moxifloxacin and gatifloxacin
4	Second-line oral bacteriostatic	ethionamide, protionamide, cycloserine, terizidone, p-aminosalicylic acid
5	Antituberculosis agents with unclear efficacy	clofazimine, amoxicillin/clavulanate, thioacetazone, imipenem, high-dose INH, clarithromycin, linezolid

TB patients' rights

The patient's Charter for Tuberculosis Care makes provision for patient's rights, which are[9]:

- **Care:** TB patients have a right to free and equitable access to TB care, from diagnosis to treatment without discrimination, regardless of their circumstances.
- **Dignity:** TB patients have to be treated with respect and dignity. The environment of their treatment must also be dignified, with moral support from family, friends and the community.
- **Information:** TB patients have a right to information about available health care services for tuberculosis, responsibilities, engagements and direct as well as indirect costs. They also need to get information about their prognosis meaning an opinion as to the likely future course of the illness, treatment, and risks attached and appropriate alternatives. Medicines names, dosages and side-effects need to be communicated. Access to medical information related to the patient's condition and treatment is a right.
- **Choice:** TB patients have a right to a second opinion, with access to previous medical records. They have a right to accept or refuse surgical interventions if chemotherapy is possible. They may choose to take part in research programmes or not. TB patients have a right to be informed of the likely medical and statutory consequences within the context of a communicable disease.
- **Confidence:** TB patients have the right to have their personal privacy, dignity, religious beliefs and culture respected. They have the right to information relating to their medical condition being kept confidential, and released to other authorities contingent upon the patient's consent.

- **Justice:** TB patients have a right to make a complaint through channels provided for this purpose by the health authorities and to have any complaint dealt with promptly and fairly. They have the right to appeal to a higher authority if the above is not respected, and to be informed in writing of the outcome.
- **Organisation:** TB patients have the right to join or to establish organisations of people with or affected by TB. They have the right to participate as stakeholders in the development, implementation, monitoring and evaluation of TB policies and programmes with local, national and international health authorities.
- **Security:** This is about the right to job security after diagnosis or appropriate rehabilitation upon completion of treatment. TB patients have the right to nutritional security or food supplements if needed to meet treatment requirements.

In addition to rights, patients have the responsibilities to share as much information as possible with healthcare workers about past illnesses including relevant details, to follow up prescribed treatment, contribute to community health by encouraging those who exhibit TB symptoms to seek medical advice and to show solidarity with other patients.

The role of private family practitioners in managing tuberculosis

Case finding

The health sector is divided into three sectors: popular sector, folk sector and professional sector.[10] Some patients would have shopped around between the popular sector and the folk sector (e.g. traditional healers, faith healers etc.). Family practitioners operate at the entry point of patients into the professional sector. They are more likely to be the first to see TB patients, hence early awareness of TB issues, early suspicion and diagnosis are crucial in the control of TB. The private family practitioner has a public health role to play by notifying the appropriate local clinics and health centres of any suspected TB case. Their non inclusion in the fight against TB in South Africa needs to be addressed to stem the tide of the high TB incidence in the country.

Patient education

Private family practitioners often live in their area of work; they know the customs and beliefs of their patients as well. They are much-respected members of the community. Their patients will take patient education on TB transmission and control conducted by them seriously. Family practitioners spend most of their time motivating people for behaviour change. The following communication skills are a requirement for family practitioners[11]:

1. Asking questions and listening
2. Demonstrating a caring, respectful attitude
3. Praising and encouraging the patient
4. Speaking clearly and simply
5. Encouraging the patient to ask questions
6. Asking checking questions

Beckman and Frankel studied medical consultations and found that on average patients were allowed to talk for a total of eighteen seconds before the doctor interrupted them during opening statements.[12] They also found that most patients who were allowed to complete their opening statement without interruption took less than sixty seconds to tell their story and that the serial order of presenting issues was not related to their clinical importance. It is therefore difficult to educate someone who is not being listened to because in order to educate it is better to assess the level of knowledge of the patient by listening to him or her.

In New York City, USA, in a review of 8 000 patients with TB, regulatory orders were issued for less than 4%. Of the 4% that needed regulatory intervention, 10% were people with injection-drug use, 16% had alcohol abuse problems, 17% were homeless, 29% used cocaine and 38% had history of incarceration.[13] This review shows that most patients do not require legal action but those few that are detained for treatment have the right to an attorney and could challenge an order for detention in court. Even if a patient did not contest the order, judicial authorisation for detention was required after 60 days. Thereafter, detention must be justified to court every 90 days. Patient education is one important component that will lead to treatment adherence.

Good communication enhances the doctor-patient relationship. A study conducted by the Medical Research Council (MRC) of South Africa showed that "poor relation between the health care worker and the MDR-TB patients" was one of the major causes of poor adherence to MDR-TB treatment.[14] Effective verbal communication is desired but has its limitations. Up to 80% of patients forget what their doctor tells them as soon as they leave the consulting room and nearly 50% of what they do remember is recalled incorrectly.[15] Family practitioners therefore need to use pamphlets, videos, DVDs, magazines and various forms of educational material in addition to their own interaction with the patients.

TB education needs to focus on educating patients on key issues such as:

- What is TB?
- How is it spread?
- How to protect the family from getting TB?
- The link between poor adherence and MDR-TB.
- Patient reassurance.

TB patient referral and follow-up

Referral is a two-way process. Family practitioners have to refer patients who are suspected or diagnosed with TB to their nearest provincial clinics or local government healthcare facilities to confirm and commence TB treatment. It is important to establish a good working relationship with identified facilities. Family practitioners in turn need to request feedback and arrange with these facilities so that patients are seen every two months by the referring family practitioner. It will be a good idea to see the national or provincial department of health provide accreditation and anti-tuberculosis medication to selected private family practitioners to enhance TB treatment and control.

Contact tracing

The use of TB patients' genograms and ecomaps helps to identify close contacts to be screened for TB. The home visit is an option because of busy schedules and the increasing number of TB patients; all close contacts may need to come to the practice for examination. This is possible if the contacts do not pay consultation fees. Contributing to the fight against TB by screening TB contacts free of charge is the right thing to do in reducing TB incidence in the community.

Voluntary HIV counselling and testing in TB patients

Any confirmed TB patient should be offered an HIV test. It has been shown that only one in three TB patients is offered an HIV test in South Africa. In Rwanda, the proportion of TB patients tested for HIV increased from 82% (138/169) in 2004–2005 to 93% (240/259) in 2005–2006 ($P < 0.001$).[16] This is another area where South African family practitioners can assist the National TB Control Programme as

strong, harmonious relationships exist between family practitioners and their patients.

Role of a multi-disciplinary team in managing TB

The family practitioner is part of a community wide network. S/he understands the need to involve other healthcare professionals such as physiotherapists, social workers, pulmonologists, laboratory technicians, nurses etc. There are many HIV, TB/HIV non-governmental organisations interested in working with TB and/or HIV patients. This multi-disciplinary team is crucial for the success of the TB control programme in any country.

Conclusion

Primary health care is the backbone of the South African healthcare system and the district health system is the vehicle through which primary health care is delivered. The family practitioner is a key role player within the primary healthcare system and should play a more important role in TB control, if the high incidence is to dramatically reduce. TB training at medical undergraduate level needs to improve, continuous medical education is necessary to develop capacity among family practitioners and the health department should encourage the involvement of especially the private family practitioners in district TB control, which is a long overdue public-private interaction.

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