

Tuberculosis:

Control through management, integration and motivation

Katrina Lehmann-Grube
Grade 12, Wynberg Girls' High School

Abstract:

This paper examines the epidemic of tuberculosis in South Africa and its causes. It further examines the repeated failures of the public healthcare system and attempts to provide solutions to these problems by looking at a variety of factors.

The determinants of TB will be focused on separately as socio-economic determinants, the conditions in which transmission occurs; HIV and TB co-infection and the importance of integration and the development of drug resistance which must be addressed with a preventative attitude.

Furthermore, this paper addresses diagnosing, treatment methods and South Africa's public healthcare system. The current systems and programmes are shown by focusing on achievements, failures and alternative methods. This is done by referring to various examples.

This paper concludes by stating the absolute importance of management at all levels through which various programmes can be implemented, the serious attention to poverty on a whole as a societal condition which encourages transmission and the skill, education and training of nurses and community health workers in providing a large and efficient workforce that is also empathetic to the patients.

Introduction:

Tuberculosis (TB) is a disease caused by *Mycobacterium tuberculosis* which initially affects the lungs but can spread to any other organ in the body through the circulatory system. TB causes excessive coughing, fever, weight loss, night sweats, fatigue, coughing up blood and can lead to death. TB is highly infectious if left untreated as the bacterium can be inhaled as tiny water droplets in the air; however only 1 in 10 people who are infected with this bacterium develop tuberculosis². The bacterium can only become active when the immune system is weakened due to stress, lack of exercise, unhealthy diet or HIV, otherwise it will simply lie dormant in the body. Despite its danger, TB can be cured with a combination of drugs, including a variety of antibiotics, which are taken daily over a six month period.

TB has been part of human history since 4000BC and is one of the only epidemics to have spanned centuries. It was very prominent in Europe and America from the 18th century to the late 20th century. From the end of the 20th century and into the 21st, TB has all but disappeared in the developed world since the emergence of highly effective drugs, better immunity and a higher standard of living.

However, in South Africa TB prevalence has increased dramatically since the mid-1990s and is now ranked as the 3rd most affected country in the world⁸. This corresponds directly with the sudden

emergence of HIV at the time which has since severely damaged the immune system of much of the country (fig. 1 and 2). In 2010, approximately 60% of TB patients were also infected with HIV¹¹. Known to be “the disease of poverty” this epidemic is aggravated by cramped, unsanitary living conditions, poor nutrition, lack of exercise, lack of ventilation and a low standard of living; all of which are conditions rife in South Africa.

New strains of TB developed early into the 21st century that have built a resistance to certain drugs. This has caused the fight to keep TB under control to become more difficult. In 2010, approximately 1.8% of new TB patients had a drug resistant strain of TB¹¹ (fig. 4). This number is steadily increasing in most provinces of South Africa.

Unlike HIV/AIDS, TB is curable and it is therefore necessary to look at other factors which have led to South Africa’s repeated failure to keep this disease under control and thereafter attempt to provide solutions to these problems.

Socio-economic determinants:

TB prevalence rates dropped dramatically in the developed world when standards of living improved, rather than when new treatments were introduced¹. This shows that the environment, living conditions, diet and ventilation urgently needed to be addressed on a broader level if TB is to be successfully controlled. Good ventilation should be the easiest one to implement as it can be done at no cost and is simply a matter of education which can be successfully done through the counselling system². Ventilation can be as simple as ensuring that doors and windows are open in houses, especially when many people are living in a small area. This ensures good air flow and reduces the likelihood of transmission dramatically. This, however, is not always easy, especially in winter, as many houses in townships do not have windows that can open and houses are very close together. The other issues need to be addressed as long-term goals by the government and include education and employment which would provide resistance to the underlying problem of poverty.

HIV and TB:

Since its significant emergence in the mid-1990s, HIV has severely impaired the fight to keep TB under control. It has also meant that TB management has had to re-strategise as to how to approach this disease.

HIV is a viral disease and although it cannot be cured, it can be kept under control with the use of anti-retrovirals (ARVs). HIV attacks the immune system making it ineffective in protecting the body from infections that it previously could have fought off. This makes the body extremely vulnerable to opportunistic infections such as TB; an HIV-positive person is 30 times more likely to acquire TB compared to someone who is HIV-negative¹.

This co-infection rate has led to a programme of TB/HIV integration that started in the late 1990s but officially came into being in 2000¹. TB/HIV integration aims to combine the treatment and management of the two diseases so that the patient only needs to go to one clinic, see one nurse, get drugs from one place at one time and receive attention that addresses both diseases together. This system also encourages TB patients to get tested for HIV and visa versa. A programme in Khayelitsha has shown that an ‘opt-out’ strategy resulted in 96% of TB patients agreeing to an HIV test¹⁰. This system is necessary as the past has shown that often patients ‘get lost’ between the two separate programmes as the one has no connection with the other². It also means that neither treatment can work effectively as they both affect each other. However, this system has not been successfully implemented throughout the country. For this system to work all TB clinics must also be able to accommodate HIV-positive patients and visa versa, there needs to be a collaborative attitude between the 2 sectors, training to ensure that all the necessary healthcare workers can diagnose,

manage and treat both TB and HIV and a change in logistics to combine the management and data collection of the two sectors into one².

Drug resistance:

Another change in the TB profile is the emergence of multi-drug resistant and extreme multi-drug resistant TB (MDR and XDR). MDR is defined as TB that is resistant to both isoniazid (INH) and rifampin, two of the strongest drugs². The *Mycobacterium tuberculosis* easily mutates and develops resistance to drugs and it is for the reason that all TB is treated with a variety of drugs. MDR usually occurs due to an incorrect balance of drugs being absorbed into the body². This can be caused by patients not taking their medication for the allocated time frame, incorrect dosing by healthcare professionals, scarring in the lungs leading to an inability to absorb the drugs, vomiting or diarrhoea. It is therefore necessary to minimise these aspects in order to get control over MDR. It is here that one can see that DOTS is a necessary structure to put in place so that the specifics of each patient are recorded, as well as the need for diligent, experienced healthcare professionals.

Multi-drug resistance is partly a man-made situation². Since its emergence, the government and health systems have had to experiment with varying regimes in order to establish one that is efficient and effective. Now, there is a strict regime that the government has put in place of specific drugs to be used over a specified period of time; anywhere between 18 and 24 months².

XDR requires at least a 2 year course of medication. Despite this, it is not clear whether it can be cured as it is still relatively new² so results have not yet been conclusive.

Diagnosis:

In South Africa, TB is usually diagnosed with the sputum test. The sputum test requires the patient to cough into a bottle. The sputum is then examined under a microscope to determine whether the bacterium is present; results can be given after 2 days². Although this test is accurate in that it gives no false positives, it only detects approximately 2 out of 3 people that have TB. Hence, it is extremely necessary to have skilled and observant healthcare workers that can pick up and extract the necessary information out of the patient by engagement and ensure that if they are at high risk, they return in a few weeks to take another test². A more accurate test can be done which involves growing the culture of the bacteria but this can take up to 6 weeks and again only applies to patients whose TB is in the lungs.

X-rays can also be used but are becoming increasingly impractical as they are usually inconclusive if the patient has had TB previously².

There are several new advancements in diagnostic testing. The first is DNA profiling of the bacteria. This could prove to be much more useful as the data can be processed after 1 day, it can immediately pick up if there is any resistance and it has shown to produce positive results where the sputum test has shown false negatives. The second is a urine dip-stick test which would enable the patient and the doctor to know immediately whether the patient has TB. However, this test is also not absolutely accurate so there will be a percentage of people with falsely negative results².

Treatment Strategies:

The strategy that South Africa uses in the treatment of TB is Directly Observed Treatment – Shortcourse (DOTS). Specifically, this requires a healthcare worker to watch the patient take his/her medication every day for the full 6 months of the course. This can be highly impractical for both patients and clinics, especially in areas where clinics are incredibly busy. This has also been impractical in light of the HIV epidemic as ARVS need to be taken twice a day for life² and therefore cannot correlate well with TB treatment. ARV treatment has always been accompanied by

counselling for the patient so that they are made aware of the importance of taking the drugs and how to manage their disease. This has now been applied to TB as well in terms of HIV/TB integration. In some areas patients are given their medication on a monthly basis so it is still managed and controlled but encourages compliance as it is more practical² and encourages independence.

Another effective method was adopted in Site-B, Khayelitsha. This involved the employment of community supervisors that observed patients taking their medication rather than them having to go to the clinic. However, this requires a large amount of management².

Khayelitsha's TB programme has shown many successes in the past decade, of which many can be applied to the rest of the country. Its TB cure rate has gone up from 50% to 72% in 2 years⁹. Site –B clinic has shown particular success which can be attributed to extra staffing, easy and regular access to statistics, motivated staff and streamlined management. Access to accurate statistics enables clinics to quickly identify problem areas and therefore make improvements⁹ readily.

However, if one looks at the broader definition of DOTS as a system which ensures that TB is approached with a strict regime where each patient is monitored and accounted for, DOTS is very necessary as can be seen in countries where there is no stable TB programme². This can also be seen in South Africa's increasing cure rate and decreasing defaulter numbers (fig. 3).

South Africa's Public Healthcare system:

South Africa's healthcare system is largely focused on the epidemic of HIV/AIDS and it is here where most of the government and international funding is aimed. This leaves very little financial resources for other diseases such as TB¹. There is also a severe lack of human resources in the public health system. Nurses and community health care workers are the most needed as it is these professionals that administer most of the care within clinics. It is also necessary for these healthcare workers to be highly skilled, dedicated and diligent as well as empathetic to the patient. These factors are critical for well-managed clinics which are patient-friendly.

One of the problems South Africa faces is getting well-trained health care professionals to work in the public sector, especially in rural areas. This results from a combination of little financial incentive, little supervision for inexperienced healthcare workers², bad working conditions, little infrastructure and development in rural areas and in some cases, a high risk of getting infected with TB⁴.

Studies have shown that healthcare professionals are at a much greater risk of being infected due to greater exposure and high stress levels. In order to combat this, healthcare professionals must be made aware of the risks and how to combat them. They should try to maintain a healthy lifestyle and ensure that there is always good ventilation within working areas and if possible, wear masks which are provided by the government². The masks, however, have proven to inhibit communication between healthcare workers and patients, especially when there is a language barrier². It is greatly advised that healthcare workers who leave the industry should take INH for 6 months as a preventative measure to ensure that no dormant TB becomes active at a later stage⁴.

It is absolutely necessary to ensure that healthcare services and medication is accessible to all areas of South Africa. Comparatively, this is not a problem in the Cape Town area as clinics are usually many and well-situated². This, however, does not apply to most areas in South Africa, especially in the rural areas. Often patients have to walk for hours to get to the nearest clinics to get their medication. This results from a lack of infrastructure, no effective public transport system and centralised treatment facilities. Decentralisation is a programme put in place so that patients do not need to go to a day hospital in order to get treatment but can rather go to a smaller institution

which is closer to the homes of the patient. Here, they will be treated by nurses and community healthcare workers rather than doctors⁷. This system encourages compliance, makes treating patients more efficient and makes it easier for patients to visit and therefore they will come in when they are less ill. However, this system requires lots of management, human resources which face the problems mentioned above and improved infrastructure.

Conclusion:

South Africa has many of the necessary structures and programmes such as DOTS and HIV/TB integration in place in order to control TB. However, it is the effective application of these systems that is lacking due to a variety of reasons.

The human resources within the sector are lacking quantity as well as skill, motivation and empathy. Much of the public healthcare system should be focused on the effective training of large numbers of nurses. It is absolutely vital to address this to ensure good, effective patient care and successful management of the TB/HIV programme. Management has often proven to be the deciding factor as to the success of a programme, clinic or patient's recovery.

Poverty plays a huge part in inhibiting the prevention and treatment of TB. This problem needs to be addressed as a broader issue to improve the social determinants that create the conditions for TB to spread rapidly. Poverty results in many other problems including lack of knowledge. It is immensely important that the broader public is made aware of what TB is, its symptoms, why it is necessary to continue taking the medication, etc.

For these improvements and changes to be made, a lot of funding is required. This must come from both the national budget as well as international aid. It is vital that aid going towards HIV also addresses the issue of TB as the paths to the overcoming these two diseases are inter-linked.

In order to gain control over this curable disease, it is essential that it is tackled with a collaborative, multidisciplinary and striven approach.

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Glossary:

- Circulatory system – the bodily system that transports blood throughout the body by the contractions of the heart
- HIV (Human Immuno-deficiency Virus) – a disease caused by a virus which compromises the immune system by attacking its first line of defence – CD4 cells
- Anti-biotics – medication which kills bacteria in the body
- Epidemic – the rapid, unexpected and wide spreading of an infectious disease within a population or broader region
- Immune system – the system which protects the body from harm in the form of bacteria, viruses, etc. It consists mainly of white blood cells
- Viral disease – a disease caused a virus, a micro-organism, which is not living and simply occurs as it takes over other cells in order to reproduce
- Integration – in this context, integration refers to the combining of the TB and HIV sectors in order to work more effectively in preventing and treating the diseases for the convenience of the patient

- Anti-retrovirals – medication used to treat patients with HIV. Although it does not cure the patient, it stops the progression of the virus at various stages of reproduction
- ‘Opt-out’ strategy – refers to a method by which a patient is not asked whether they would like to do something, but rather the patient has to say no if they do not want to do something
- Mutate – refers to a genetic change in an organism (in this case, the bacteria) that often does not allow it to survive in a particular environment. In some cases, however, the mutation enables the bacteria to be resistant to an external factor when the normal bacteria are not
- Sputum – substance/mucus from a person’s lungs
- Ventilation – good flow of fresh air
- Dormant – refers to a bacteria that has entered the body but has not yet affected the person as it is not ‘active’ and therefore the person is not sick but may become so at a later stage.

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