

Pediatric HIV & TBC in Brazil & the Netherlands, a comparison

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INTRODUCTION

This report is the final product of an academic internship that started in July and ended in December of 2015. The internship took place in two parts, the first part being a two-month internship in Rio de Janeiro at the *Instituto de Puericultura e Pediatria Martagão Gesteira* (IPPMG) children's hospital and the second part being a four-month research in the Netherlands, during which time numerous conferences were attended and people were interviewed about the topic.

The main focus of the research was to draw comparisons between tuberculosis (TBC) and HIV in children in Brazil and the Netherlands. The first part of the academic internship focusing on Brazil, and the second part focusing on the Netherlands. The goal of the internship was to explore similarities and differences between Brazil and the Netherlands in terms of diagnosis and treatment of children with HIV and TBC.

The choice for the Netherlands and Brazil was made because of the polarity of the two countries. They are different in size, culture, language, and in how they tackle healthcare issues. The healthcare systems in the Netherlands and Brazil are considerably different, which makes it interesting and valuable to juxtapose. This difference allows for ample comparison from of which offers great potential to learn from each other.

The choice for TBC and HIV was made because the HIV/AIDS epidemic was dealt with well, but very differently in the

two countries. TBC is as common comorbidity of HIV and was therefore also included. To look at TBC and HIV will give insights into the difference between a chronic disease, which HIV is today with the availability of Anti-Retroviral Therapy, and a sometimes acute, sometimes chronic disease like TBC.

METHOD

The collection of information for this report was done in two parts. Part one was done in Brazil during the months of July and August, mostly at the IPPMG under the guidance of professor Clemax Sant'Anna (Tuberculosis specialist) and professor Ricardo Hugo Oliveira (HIV/AIDS specialist). During this time, I also consulted guides by the WHO on what was considered standard treatment for pediatric tuberculosis and HIV to be able to put the knowledge I was gaining into perspective.

My main learning method in Brazil was through direct contact with doctors and with patients and their parents on a day-to-day basis. I sat in on consultations at the outpatient clinic, and went along on rounds at the inpatient departments. The IPPMG is very committed to teaching young doctors, and I was invited to sit in on and even participate in the many lectures and other teaching moments they were presented with.

The second part took place in the Netherlands where I visited the Sophia Children's hospital of Rotterdam with the help of Dr. Emmeline Buddingh (pediatric HIV specialist). I also

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attended the monthly tuberculosis meeting at the Erasmus hospital and visited various conferences and master classes from June to November. Most notably, I participated in a master class at the Juliana Children's hospital in The Hague on the children's hospital of the future, I went to a conference in September on zoonoses, or diseases that can be transmitted between species, which had a large focus on tuberculosis, and the annual Dutch HIV conference (NCHIV) in Amsterdam in November.

TBC

Tuberculosis, causes and treatments

Tuberculosis (also known as TB or TBC) is a disease caused by the mycobacterium tuberculosis, a bacterium that mostly affects the lungs. It is spread from person to person when people with lung TBC cough, sneeze or spit. Because tuberculosis is a bacterial infection, it can theoretically be treated with antibiotics.

The most common antibiotic used today to treat TBC is rifampicin (WHO, 2010). There is also a vaccine, called Bacille Calmette-Guerin or BCG. BCG is widely used, especially in infants, with around 80% of the world's population receiving the BCG vaccination in infancy. Unfortunately, although the vaccine provides protection against pediatric non-pulmonary TBC, it is unreliable against adult pulmonary TBC. (WHO, 2013). The WHO states that despite the issues with reaching eradication of TBC "Tuberculosis is curable and preventable" (WHO, 2015b).

Disease burden

Around a third of the world's population has latent TBC, meaning they have been infected with the bacterium but do not feel ill and cannot spread the disease (WHO, 2015a). In 2013, 9 million new cases were reported and every year, TBC causes about 1.5 million deaths (WHO, 2015a). In children, there are about half a million new infections every year, and up to 80.000 deaths a year (WHO, year unknown b).

When a person gets infected with TBC, they do not normally fall ill immediately. The disease may remain hidden in the body for many years, in the lungs, lymph nodes or even brain. This is referred to as dormant TBC. Open TBC, on the other hand, is more easily detected and treated but also much more infectious (WHO, 2015a).

Multi-drug resistance

As mentioned, TBC can normally be treated with rifampicin. Sometimes though, a patient will present with resistant TBC, meaning the bacterium is not affected by the antibiotic prescribed or even multi-resistant. MDR, multi drug resistance, is a problem in all sorts of infections but especially in TBC because of how deadly the infection can be. In a "normal" TBC infection, mortality varies greatly by region and socio-economical background, but mortality seems to average around 10%, whereas, in MDR-TBC, mortality is up to 80% percent. (WHO, 2015c).

TBC and HIV

Since the 1980's TBC has been associated with HIV. At least a third of people infected with HIV are also infected with TBC, because of the effect an HIV infection has on the immune system. HIV-infected individuals 20-30 times more likely to develop active TBC. (WHO, 2015b) It is therefore very important that children with HIV get the BCG vaccination, even if it's not recommended overall in the country they live in.

HIV

HIV, causes, and treatments

HIV, Human Immunodeficiency Virus, is a sexually transmitted disease. If not managed properly the infection with HIV will lead to AIDS, or Acquired Immunodeficiency Syndrome (WHO, 2015d). HIV is transmitted through bodily fluids "such as blood, breast milk, semen and vaginal secretions" (WHO, 2015d). This means those at risk for contracting HIV have to have physical contact with someone who has HIV or AIDS whereby bodily fluids are exchanged, like having sexual intercourse, receiving a blood transfusion or having blood contact in another way. The chance of transmission increases when the person who has HIV has a higher viral load, which means they have more viral particles in their blood.

We assume here that children will have contracted the virus through vertical transmission, meaning they got it from their mothers. There are three possible ways to transmit HIV/AIDS vertically. Firstly, and most commonly, during childbirth, the child could swallow some blood from the mother while in the birth canal and contract HIV from that. Secondly, sometimes a highly contagious mother (one is highly contagious there is a high viral load, or a high count of virus particles, in the blood, as occurs in recent infections or in people that are not on ART and are developing AIDS) will pass the virus on to her unborn child in the first few weeks of pregnancy. Lastly, in some cases, the viral count in the breast milk of an HIV+ mother can be high enough to pass the virus on to the child. (WHO, 2010).

Because the first way of vertical transmission is by far the most common, it is usually assumed that that was the mode of transmission. The three methods of vertical transmission pass the virus on in very different stages of development of the child (from the first weeks after conception to during or even after birth) which impacts greatly how the immune system of the child deals with the virus.

There is no cure for HIV, but it is possible to suppress the viral load and thereby the symptoms of HIV/AIDS. Anti-Retroviral Therapy (ART) does this, using Anti-Retroviral (ARV) drugs. The first ARVs were NRTI and AZT, they were developed in 1987. ART is often referred to as HAART (highly active antiretroviral therapy) because it works best when at least 3 drugs are combined (WHO, year unknown a).

Because of the high prices of ART, some countries like Brazil, India and South Africa made generics, which are provided for cheap or even for free by the government. Generics are drugs that use the same molecular structure as other drugs but bypass the patent on new drugs developed, making them cheap to produce and distribute.

Disease burden

It is estimated by the WHO that 36.9 million people are living with HIV/AIDS today, which means many more are affected by HIV/AIDS daily. Some because they are the adoptive parents or the children of someone with HIV, others because they are health workers supplying treatment. Today, HIV/AIDS is no longer a death sentence. With proper ART (barring side effects, resistance and adherence problems) HIV/AIDS is a chronic disease that is not too noticeable in day-to-day life.

Pediatric HIV

Taking care of children with HIV/AIDS is very different than taking care of adults with HIV/AIDS. Children's immune systems are less developed and side effects of drugs need to be considered more carefully in children. In both Brazil and the Netherlands, it is considered good practice to always start ART directly after diagnosis. However, children cannot be diagnosed with HIV until they are several months old.

It is recommended by the WHO exposed children are tested at 2 and at 4 months old to provide a definite answer as to whether they are HIV positive or not. These children are also recommended to be started on post-exposure prophylaxis immediately after birth. Prophylaxis treatment uses ARVs to hopefully prevent the virus from infecting the exposed person. It is not effective for children who were infected through the second way of vertical transmission, but for those infected through the first or third method it can be very effective.

Brazil

In Brazil, around 800.000 people (15.000 children) are infected with HIV, and around 80.000 are infected with TBC. Around 9000 are co-infected with both HIV and TBC. (WHO, 2015a). The Brazilian healthcare system provides free health care for everyone (Falleti, 2010). Recently, the system has been overhauled to include the General Practitioner as a referral hub and a referral system between hospitals. This referral system, called SysReg, is far from perfect. Because of a lack of academic sources, the only evidence I can offer for this imperfection is anecdotal. In practice, we came across several children who had spent months waiting for an appointment with a specialist after having been referred from another hospital.

For TBC, an entirely different system is in place. Those on prophylaxis treatment or suspect of TBC will often not go to the hospital, but instead be treated by specialists at primary health care facilities. These primary health care facilities differ immensely in size and in the funding they receive, but they all perform the basic functions of maternal and child care,

vaccinations, some elderly care, and tuberculosis treatment and prevention. At the hospital, we saw some children with TBC, most of whom were there having recovered recently, to be checked upon.

Beyond the bureaucracy, the doctors and nurses that drive the system are extremely dedicated to the treatment of their patients. What is beyond their scope of influence though, things like the home situation of these children and their adherence to medication, make managing the HIV epidemic in Brazil tough.

The Netherlands

For the Netherlands, the story goes very differently. In the Netherlands, only 20.000 people are infected with HIV (HIV monitoring, 2015), and only 800 cases of TBC present every year (WHO, 2015a). 23 cases of co-infection are known (HIV monitoring, 2015). Because of the small scale of the Netherlands, the way care for people with HIV and/or TBC is organized is entirely different from Brazil. In Brazil care for both TBC and HIV/AIDS is more integrated into the overall healthcare system, whereas in the Netherlands, the care is very specialized, even more so in pediatrics.

HIV-infected children in the Netherlands get a book with exercises and personal stories when they turn 8, which helps to guide them through "discovering" they have HIV and what that means for the future. The small number of children that has HIV in the Netherlands means that the older ones (around age 10 onward) have a Facebook group together, and they go camping for a weekend every year to exchange stories. These things are unimaginable in a country like Brazil for many reasons.

DISCUSSION

Too look at these four factors, TBC, HIV, Brazil and the Netherlands, in succession, means suggesting they can be compared. I will attempt a comparison of mostly Brazil and the Netherlands here, although it must be noted that to compare a country in Latin America of 200 million people to a country in Europe of 17 million people (World Bank, 2015) is complicated, to say the least.

As table 1 shows, the differences between the Netherlands and Brazil are huge when you look at the figures. When you look at what is really important, however, you see that it becomes impossible to make a neat table describing the similarities and differences between Brazil and the Netherlands. The more holistic approach to differences, what it feels like, how patients are treated, how doctors feel about the system, is not so easily expressed in numbers or academic opinions, especially because of the immersion required to learn about both systems. Considering the major differences between the countries and the systems they both have, I would have to say that the Brazilian system is better for Brazil, and the Dutch system is better for the Netherlands.

This intuitive conclusion has come about after all the field and literature research I did and my main argument in favor of it uses a concept called legibility. Legibility denotes the

Table 1. A comparison between Brazil and the Netherlands (some numbers are approximate. All come from WHO or the World Bank).

Brazil	The Netherlands
200.000.000 inhabitants	17.000.000 inhabitants
800.000 infected with HIV/AIDS	20.000 infected with HIV/AIDS
12.000 HIV/AIDS deaths per year	50 HIV/AIDS deaths per year
15.000 Children infected with HIV/AIDS	200 Children infected with HIV/AIDS
800.000 TBC infections	800 TBC infections
15.000 children infected with TBC	50 Children infected with TBC
Public health spending per capita per year: USD 1000	Public health spending per capita per year: USD 6000

TB = tuberculosis.

ability to be able to read something, in this case specifically the population of a country or region. Populations can have very good legibility when the governing power knows a lot about the population. An example would be a school where the principal has all the information about all the students required to make predictions and conclusions about their academic performance. The Netherlands as a country has exceptionally high legibility, with our use of the internet to communicate between different government organizations and registration of people in municipalities. Brazil does not have this level of legibility. This means that the system in the Netherlands, where everyone has health insurance and those who can not afford insurance get government support

It has been immensely interesting to get a chance to learn about HIV and TBC from experts from both the Netherlands and Brazil and to get to work with patients and their families.

CONCLUSION

To conclude this report, I will revisit the goal stated in the introduction; to explore similarities and differences between Brazil and the Netherlands in terms of diagnosis and treatment of children with HIV and TBC. In this report, I have outlined many factors of HIV and TBC, as well as characteristics of healthcare in both the Netherlands and Brazil. I would like to also point back to the discussion, where we see in table 1 how truly different Brazil and the Netherlands are.

With this in mind, I think we cannot compare the Netherlands and Brazil in a satisfactory way because the differences between the two countries are simply too great. I can only say that in my experience both systems are impressive, the doctors are hardworking and dedicated to their patients, and TBC and HIV do not stand a chance against such a collaboration of system and health care providers.

It has been immensely interesting to be able to learn as much about healthcare in Brazil and the Netherlands (what I have been able to outline here is only a fraction of my knowledge gained), and I am grateful for the experience.

For future research into comparisons of healthcare systems, it would be interesting to also talk to government officials, instead of focusing on doctors and patients. It would also be very valuable to try and draw lessons from these healthcare systems and how they work differently all over the world. If we could bring this knowledge together, many countries, especially the ones struggling with providing healthcare to their people, would be able to learn from other systems.

With an eye on the Sustainable Development Goals, as well as recent outcries about more attention being needed for the TBC epidemic, I hope countries do take the time to collaborate with each other, especially because in this globalizing world, nothing can be contained within borders, especially not pathogens.

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