

PAEDIATRIC HIV IN SOUTH AFRICA: AN OVERVIEW FOR PHYSIOTHERAPISTS

ABSTRACT: *Paediatric HIV is a major cause of morbidity and mortality in South African children. Physiotherapists working in the government sector are seeing large numbers of HIV infected children on a daily basis. This paper provides a general overview of paediatric HIV. Common conditions associated with HIV infection are highlighted and the possible role of physiotherapy is discussed. Suggestions for research on the role of physiotherapy in the management of children with HIV are made.*

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INTRODUCTION

Over the past two decades HIV has swept across Africa causing economic and social devastation (Jackson, 2002.) Nowhere else in the world has HIV spread as quickly nor had such a widespread impact (Jackson, 2002). According to statistics from UNAIDS, 29.5 million people in Sub-Saharan Africa are infected with HIV, with 2.8 million of these children under the age of fifteen. This accounts for over 85% of HIV infected children in the world (UNAIDS 2002).

The highest prevalence of HIV infection in South Africa is in young women of child-bearing age. Twenty nine percent of women in this age group are HIV positive (UNAIDS, 2002). The mother to child transmission rate remains high at approximately 30% (Meyers et al., 2000), this accounts for the large number of HIV infected children in South Africa. It is important for physiotherapists working within this context to have a thorough understanding of how HIV is transmitted to children and how it presents clinically. To date, very little research has been done to determine what the role of physiotherapy is in the management of children who are HIV infected. This article aims to give an overview of paediatric HIV and to discuss the possible role that physiotherapists may play in the management of various related conditions.

TRANSMISSION OF HIV TO CHILDREN

The main route of HIV transmission to

children in South Africa is via mother-to-child transmission. In the absence of antiretroviral therapy the rate of transmission in South Africa is high at approximately 30% (Meyers et al., 2000, Evian 2000). A further route of infection is via breast milk, which increases the risk of transmission by a further 13-30% (Quinn et al., 1994). In countries where acute infectious diseases are the main cause of infant mortality the World Health Organisation recommends that women continue to breast feed despite being HIV positive (Quinn et al., 1994). The risk of death due to malnutrition and other infectious diseases common in non-breastfed infants is considered to be higher than the risk of contracting HIV.

Many South African children are at risk for contracting HIV through a number of sources. Children face the risk of sexual abuse at home, in school and in their communities (Brookes et al., 2004). Intravenous drug abuse and transmission through blood transfusion are other possible routes of infection.

DIAGNOSIS OF HIV IN CHILDREN

The diagnosis of HIV in children under the age of 15-18 months is complicated by the presence of maternal antibodies in the child's blood stream. These antibodies may lead to false positive results (Falloon et al., 1989; Coovadia and Meyers, 2001).

Serologic testing is the most inexpensive and widely used method of testing for HIV. Two commonly used serologic tests are the ELISA and Western Blot

tests. These tests are unable to differentiate whether the antibodies are maternal or due to the child's own response to HIV infection. The Western Blot test is considered to be more specific, however due to technical difficulties and differing criteria for interpretation, invalid results are common with this test and it is not as widely used as the ELISA (Falloon et al., 1989).

A more accurate method of testing for HIV in children is the Polymerase Chain Reaction test which detects the presence of HIV DNA in the child's leucocytes (Pizzo and Wilfert, 1994). It is the test of choice in children under the age of 18 months but is very expensive and requires specialised laboratory facilities. It is therefore not routinely used in all South African hospitals (Coovadia and Meyers, 2001). Currently diagnosis of HIV in children under 15 months of age is made on two positive ELISA tests as well as the presence of clinical signs and symptoms. This diagnosis is confirmed when the child is 15 months. PCR testing is done where possible (Coovadia and Meyers, 2001).

Physiotherapists should be aware that once the child has been diagnosed with

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HIV this means that the mother is infected as well. It is important to be aware of what services are available to HIV infected individuals in the area and to refer people to the appropriate services as soon as possible. HIV is a disease that affects the family, not just one individual, and a family centered approach to management should be taken. (Brown et al. 2000)

COMMON PRESENTATION OF HIV INFECTION IN CHILDREN

In a study conducted in South Africa by Bobat et al. (1998) diarrhoea and pneumonia were found to be the most common causes of morbidity in HIV infected children, occurring in 78% and 76% of infected children respectively. Lymphadenopathy was found in 70% of infected children. Neurological abnormalities were found in 58% of HIV infected children.

Skin rashes, failure to thrive and candidiasis have also been identified as common presenting signs in HIV positive children in South Africa (Bobat et al., 1998; Coovadia and Meyers, 2001; Meyers et al., 2000).

ANTIRETROVIRAL THERAPY

In April 2004 the South African government commenced the antiretroviral roll out plan. As more people gain access to antiretroviral we can expect to see the transition of HIV from an acute terminal disease to a subacute, chronic disease (Brown et al. 2000). This has significant implications for rehabilitation services (Nixon S and Cott C, 2000).

South African children become eligible to receive antiretrovirals on government programmes only when their CD4 counts are less than 15% of normal (Department of Health, 2003). This implies a severe level of immuno-compromise before treatment can be started.

Antiretroviral drugs are classified by where they act. Nucleoside reverse transcriptase inhibitors prevent HIV RNA being converted to DNA which is used to make more viruses. Protease inhibitors stop protease from cutting virus proteins into shorter useful pieces. When protease inhibitors are taken the HIV copies that are made cannot infect CD4 cells (Kline et al.2002) Children are usually put on combination therapy

which includes nucleoside reverse transcriptase inhibitors as well as protease inhibitors, this helps to minimise resistance to drugs developing.

Side effects of antiretrovirals remain a concern and a topic of ongoing research. Pancreatitis, peripheral neuropathy and bone marrow suppression are some of the more severe side effects that have been documented (Kline et al. 2002)

THE ROLE OF PHYSIOTHERAPY

Although it is already two decades since HIV was first diagnosed and the disease has had far reaching effects on the health and quality of life of millions of children, there has been very little research done to establish the role of physiotherapy in the management of HIV infected children, this is particularly true for developing countries. Three conditions commonly found in HIV infected children will be described and the possible role of physiotherapy in each will be discussed

Pneumocystis carinii pneumonia (PCP)

Severe pneumonia is a common and often devastating result of HIV infection in young infants, pneumocystis carinii pneumonia is often the causative agent (Coovadia and Meyers, 2001).

PCP is spread by airborne transmission. Once it reaches the alveolus it adheres to the cell wall and replicates. Diffuse alveolar damage and a pneumonitis result. The disease process consists of two phases, an exudative phase characterised by interstitial oedema and the formation of hyaline membranes, and a proliferative phase characterised by interstitial inflammation, fibrosis and regeneration of alveolar epithelium (Hughes, 1994).

Infants with PCP infection classically present with severe tachypnoea, dyspnoea, fever and a non-productive cough. On auscultation there are relatively few crackles and decreased breath sounds. Radiologically a diffuse alveolar or interstitial infiltrate is evident. This starts in the perihilar area and progresses peripherally with the apices being the last area affected (Coovadia and Meyers, 2001).

PCP is a progressive disease. Tachypnoea, dyspnoea and cyanosis worsen as the child becomes more hypoxaemic. Death is inevitable in all

cases. Treatment includes supplemental oxygen, co-trimoxazole and prednisone.

Despite being recognised as a common cause of severe and usually fatal pneumonia in children infected with HIV in Africa (Graham et al 2001) the role of physiotherapy in the management of this condition has not been fully investigated. Plebani et al (1997) showed that the use of a Positive Expiratory Pressure (PEP) mask twice a day reduced the number of pulmonary infections in a small group of HIV infected children over a twelve month period. The children all had a history of recurrent bacterial pneumonia, but not necessarily PCP. This study is too small to provide conclusive results but raises the possibility of further research in this area. At present the only role physiotherapists in South Africa are playing in the management of children with PCP is in the collection of induced sputum to assist in the diagnosis. Children infected with PCP often require long-term oxygen therapy and many receive home oxygen. Possible further roles for physiotherapists include education of caregivers on the progression and home management of the disease, management of acute dyspnoea, prevention of secondary infections by maintaining optimal bronchial hygiene and optimising functional abilities as the child's dyspnoea worsens.

Lymphoid interstitial pneumonitis (LIP)

LIP is a slowly progressive interstitial lung disease with unknown aetiology (Coovadia and Meyers, 2001). It has been hypothesised that there is an association with Epstein Barr virus infection and LIP (Pizzo and Wilfert, 1994). LIP is characterised by peribronchiolar lymphoid nodules with germinal centres which cause diffuse infiltration of alveolar septae with lymphocytes, plasma cells and immunoblasts (Connor and Andiman, 1994). LIP is often diagnosed first radiologically where it presents with bilateral reticulonodular infiltrates and mediastinal lymphadenopathy (Coovadia and Meyers, 2001).

The child presents with tachypnoea, a productive cough, wheezing, hypoxaemia and right-sided heart failure. Signs of chronic respiratory disease e.g. clubbing, Harrison's sulcus, become apparent over time. As the condition

progresses widespread bronchiectasis occurs and eventually the clinical picture is similar to that of end stage cystic fibrosis (Connor and Andiman, 1994).

The role of the physiotherapist in the management of children with cystic fibrosis has been well researched and established (Milne et al., 2004). Although the clinical presentation of LIP may be similar to that of cystic fibrosis the differences in underlying pathophysiology do not necessarily mean that the results from the studies done on the role of physiotherapy in cystic fibrosis can automatically be extrapolated to this group of children.

LIP has been identified as a growing problem in Africa (Jeena et al., 1998; Coovadia and Meyers, 2001; Bobat et al., 1998). Additional research needs to be conducted to establish what role physiotherapists may play in the management of this long term, progressive respiratory condition. Studies could investigate the value of traditional chest physiotherapy as well as use of the active cycle of breathing and the "Flutter" as ways of optimising bronchial hygiene, improving ventilation and reducing the risk of secondary chest infections. The possible advantages of a carefully designed and monitored exercise programme should also be determined.

Developmental delay and HIV encephalopathy

The effects of HIV on the developing nervous system have been researched since the late 1980s. A number of studies have shown that 30-40 percent of HIV infected children will present with developmental delay (European Collaborative Study, 1990; Msellati et al., 1993; Belman et al., 1996). A small study done in South Africa found that 40% of HIV infected children under one year of age had developmental delay (Potterton J and Eales C, 2001)

HIV is able to cross the blood brain barrier. The most frequently infected cells within the brain are the macrophages, especially in the white matter, the basal ganglia and around the blood vessels. Monocytes, lymphocytes and astrocytes may also become infected but to a lesser degree (Tardieu, 1998).

Neuronal death is thought to be due to toxic products produced by infected macrophages as neurones and oligo-

dendrocytes appear not to be directly affected by HIV (Tardieu, 1998). Calcification of the basal ganglia is a common finding in children infected with HIV (Tardieu, 1998; Belman, 1988; Schmitt, 1991). Lateral and anterior corticospinal tract degeneration has been noted (Belman, 1988). Neuroradiological findings show cerebral atrophy as well as calcification of white matter especially in the frontal lobes. Enlargement of the ventricles and the subarachnoid space has also been noted (Belman, 1988; Tardieu, 1998).

Lobato et al. 1995 diagnosed HIV encephalopathy in 23% of HIV infected children in their study. They found that the children who had the encephalopathy had more hospitalisations as well as more opportunistic infections than those who did not. Most cases of encephalopathy were diagnosed before the child was three years old. This study confirms that HIV encephalopathy is a common and severe complication of paediatric HIV and the authors advocate that regular developmental and neurological assessments be part of the routine care of HIV infected children.

Developmental delay may be the first sign of HIV infection and may occur in the absence of any other clinical signs or symptoms. It often progresses from mild delay of milestones without any neurological signs to definite signs of neurological involvement. Deterioration may occur rapidly or over a period of several years. Progression may be halted and even reversed with the administration of antiretroviral drugs. Developmental delay may progress to include pyramidal tract signs, ataxia, abnormal muscle tone and pseudobulbar palsy. Acquired microcephaly is common in infants. Ultimately the encephalopathy may result in spastic quadriplegia with dystonic posturing and regression in motor milestones (Tardieu, 1998). The development of severe encephalopathy in infancy has been correlated with serious symptomatic disease and increased and early mortality (Belman, 1992).

Children with HIV infection are vulnerable to neurological complications as a result of the direct effects of the virus as well as a number of co-factors. These include; metabolic and endocrinologic disturbances; maternal illness, malnutri-

tion and substance abuse; complications due to prematurity; psychosocial stressors; iatrogenic problems in response to treatment; other medical conditions, including tumors of the central nervous system (Belman, 1992). Opportunistic infections such as meningitis may also lead to permanent brain damage (Bobat et al., 1998).

Despite the fact that the treatment of children with neurological problems is common practice amongst paediatric physiotherapists, very little research has been done to establish whether HIV infected children with neurological complications benefit from physiotherapy. Only one case report was found (Harris-Copp, 1988) however this had a very low level of evidence and was purely anecdotal. The author describes her experience of treating children infected with HIV and advocates that all HIV infected children who have neurological involvement would benefit from physiotherapy. A further study by Spiegel and Meyers (1991) claims that parents who are given a home management programme by a physiotherapist cope better with the stressors of caring for an HIV infected child, unfortunately the authors are unable to substantiate their claim.

Once again we see a lack of evidence to support the role of the physiotherapist in the management of these children despite the fact that the clinical presentation of these children is not dissimilar to conditions where physiotherapy is traditionally considered to play a vital role. Research needs to be undertaken to determine whether physiotherapists can make a positive contribution to the quality of life of these children. A family centred approach that addresses the child's functional difficulties within the context of their family and home environment may be appropriate.

CONCLUSION

HIV is one of the most significant health issues affecting children in Africa. Many of the conditions commonly seen in these children lend themselves to physiotherapy management, however physiotherapists are not playing as active role as they could in the long term management of HIV infected children. As antiretroviral treatment becomes

more widely available, paediatric HIV infection is set to become a more chronic, rather than an acute condition. Research needs to be done to establish what the role of the paediatric physiotherapist is in the long term management of HIV infected children, especially in the context of a developing country.

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