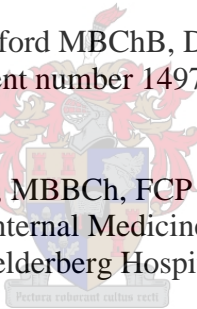


A comparative cross-sectional study of HIV positive and HIV negative medical admissions at Helderberg Hospital, Western Cape, South Africa

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Abstract

Introduction: The HIV epidemic has had a significant impact on the existing inpatient and outpatient health systems. The cost of inpatient care for HIV positive people has been shown to be greater than for HIV negative people and HIV infection has been associated with a higher inpatient mortality. These dynamics, in the face of an established antiretroviral program, have not been studied at district hospital level previously.

Aim: The aim of this study was to describe the clinical patterns and cost implications in medical admissions at Helderberg Hospital, with particular reference to HIV infection and treatment. It includes a comparative analysis of HIV positive and HIV negative admissions.

Methodology: This was a descriptive, quantitative study in the form of a cross-sectional survey. All medical admissions over defined 24 hour periods were recorded and data extracted from the medical records retrospectively.

Results: 165 records were analysed. HIV prevalence was 19% and overall mortality 7%. 23(72%) of the 32 HIV positive patients had not yet accessed HIV services. The median CD4 count was 87cells/microl. The comparative analysis showed the HIV positive admissions to have a longer length of stay (5.9 days versus 3.6 days, $p<0.01$), higher laboratory costs (R717.28 versus R327.23, $p<0.01$) and higher pharmacy costs (R40.69 versus R11.72, $p<0.01$) than the HIV negative admissions. Outcomes for the HIV positive and negative patients were similar ($p=0.64$).

Conclusion: Inpatient cost of care for HIV positive patients in this district hospital is more expensive than for HIV negative patients. Mortality rates in both groups are comparable. Antiretroviral therapy may be contributing to a decreased inpatient HIV prevalence and mortality rate. HIV positive patients are not accessing treatment in time to avoid morbidity requiring costly hospital admission. Further efforts are needed to expand outpatient HIV services, to explore the reasons why people with HIV are not accessing treatment timeously and to encourage rigorous treatment of HIV infected inpatients to ensure optimal outcomes.

Introduction

South Africa has the largest number of HIV infections in the world. The increasing prevalence of HIV infection has been well documented in the antenatal clinic screening program which has seen a rise from 22% to 30% between 1999 and 2005.¹ Although the epidemic appears to be stabilizing, it continues to exert significant pressure on the health care systems. This study explores the extent of HIV infection and antiretroviral therapy (ART) use in the medical admissions at the state run Helderberg Hospital situated in the Western Cape. It also compares specific costs incurred to the hospital by HIV positive patients with that of HIV negative patients and the clinical outcomes of these two groups.

The study was undertaken to gain a better understanding of the clinical patterns and cost implications of HIV at Helderberg Hospital. Although similar studies have been conducted elsewhere,^{2,3,4} they have been done prior to or in the early stages of the ART program and not at a district hospital level with an established national ART service. The findings will provide staff and policy makers with better insight into the profile of the medical admissions and the impact that HIV may have on the hospital resources. It will also emphasize the work that is done for HIV negative patients and the possible impact that the burden of HIV has on this group of patients. Understanding these dynamics empirically will have significance for future planning and budget decisions.

The South African Government implemented a national antiretroviral program in 2004 and, according to a progress report from the Department of Health, by 2007 55% of those HIV infected individuals requiring ART had access to treatment.⁵ Recent figures show that there are 59823 people in the Western Cape who are currently in care, receiving ART. The program is expanding rapidly: in 2004 less than 400 patients were enrolled in the program every month. Five years later this number has increased to more than 1400 people.⁶

In the six months prior to this study an average of 62 people were initiated on ART every month in the Helderberg Hospital drainage area. This amounts to an estimated 73% of those in need of treatment for the area.^{7,8} Although this represents a considerable effort, there are still more than 25% of HIV positive patients who are not accessing ART thus risking severe immunocompromise and opportunistic infections requiring hospital admission. A predominance of such patients in the hospital admissions would justify strengthening the outpatient facilities.

Literature search

The literature search concentrates on African studies which focus on medical admissions, particularly HIV infected patients and compare clinical outcomes and costs between HIV positive and HIV negative admissions.

HIV prevalence in hospital admissions

HIV positive medical admissions have been increasing in hospitals all over East and Southern Africa since the late 1980's.^{9,10} This has been accompanied by changing trends of illness with an increase in infectious diseases and a decrease in

cardiovascular diseases.¹⁰ In numerous studies HIV prevalence amongst inpatients was found to be around 50%^{11,12} including a study in Soweto in 2005 which showed 68% of medical patients to be HIV positive.² In the Western Cape (the province with one of the lowest seroprevalence rates in South Africa⁵), prevalence was 33 – 43% in 2003, in a secondary hospital with an HIV referral unit.¹³ In 2008, the average prevalence of HIV positive medical admissions in the City of Cape Town metropole was found to be 34%. (Point prevalence study of medical admissions, Cape metropole. Vanessa Burch, unpublished data.)

Length of stay

It has been shown that up to 77% of the total costs of hospital admissions are related to the length of stay (LOS).² If the impact of HIV is determined by cost then the length of stay of patients with HIV is a good guide to assess the impact it has on a health care system. The LOS for HIV positive patients compared to HIV negative patients has been determined in numerous studies and findings have differed in different parts of Africa.^{2,11,12,14} This is likely to be influenced by the level of available care, for example those health care systems that have access to ART and special investigations might invest more time in treating patients with advanced AIDS, whereas in areas of limited resources, these patients may die early in their admission or be discharged home for terminal care.³

Costs

Previous studies have reflected on the costs of inpatient care in HIV positive versus negative patients. In Kenya, in 1997, it was found that there was no significant difference in the costs per admission between the two groups.³ Eight years later in Soweto the difference in cost was marked, with HIV positive patients costing the health care system considerably more than the HIV negative patients.² The difference between these two studies may be related to the use of ART which was only established after the Kenyan study. ART has been shown to be a cost effective intervention,¹⁵ however it has added a new dimension to the inpatient costs of patients. In Soweto, those HIV positive patients who were receiving ART incurred greater cost to the hospital and were admitted for significantly longer periods than those who were HIV positive and not on antiretroviral treatment.² Whether this is due to increased survival, drug toxicity, or immune reconstitution is unclear.² This raises important considerations for future budget planning relating to HIV care.

Mortality

HIV infection has been associated with a high mortality. Prior to antiretroviral treatment, mortality was shown to be nearly 70% at two years for stage 4 disease¹⁶ and HIV positive patients were shown to have an inpatient mortality rate of 22 – 35%.^{9,11} Comparative inpatient mortality rates between HIV positive and negative admissions in Africa have shown a higher mortality in the HIV positive patients.^{9,11,12} In New York, following the introduction of ART, the inpatient mortality rate decreased by more than half over a six year period.¹⁷ There has been concern that there is an increased mortality in the HIV negative patients, possibly due to the increased burden of HIV on the health care system.⁹

Aim and objectives

The aim of the study was to describe the clinical patterns and cost implications in medical admissions at Helderberg Hospital, Western Cape, South Africa, with particular reference to HIV infection and treatment.

Objectives

- To collect data from patients' records admitted to the medical wards over defined periods and describe the profile of and HIV prevalence in these patients
- To describe the clinical patterns of disease, including mortality, of HIV positive and HIV negative admissions
- To compare the cost implications of HIV positive and HIV negative admissions including the costs of resources such as laboratory tests, drugs and length of stay in the hospital

Definition of terms:

HIV positive: patients infected with the human immunodeficiency virus as determined by blood testing or by clinical criteria as detailed in the WHO clinical guidelines.¹⁸

HIV negative: patients confirmed to not be infected with HIV through blood testing and those that are untested, but do not meet the clinical criteria.

Medical admissions: those patients admitted via casualty to the department of Internal Medicine.

Methodology

This study was undertaken at Helderberg Hospital. This is a district hospital which drains the Helderberg Basin and, informally, the Grabouw region. Although it is classified as a district hospital, it provides both primary and secondary care. The people who attend this hospital are generally from lower socioeconomic groups, many of whom live in poorly resourced areas, including informal settlements. Patients seen at the hospital are either referred from outlying state run Primary Health Care Clinics or private General Practitioners. Others are self referred and seen as emergencies. HIV management has been established on an outpatient level. There is a state run antiretroviral clinic at the hospital and at two of the clinics. HIV testing is offered at all other government clinics, as is ongoing monitoring and treatment prior to the need for ART. When the patient meets the criteria for ART, they are referred to the designated ART clinics. Should the need for admission arise, these patients are admitted at Helderberg Hospital.

This was a descriptive, quantitative study in the form of a cross-sectional survey. All patients admitted under the medical department of the Helderberg Hospital during specified 24 hour periods were included in the study. Three such periods per week, for seven weeks in November and December 2008, were used. This sampling technique avoided any bias in patient selection. The patient details were recorded at the time of admission and data was collected retrospectively from the patients' files. A spreadsheet (Annexure 1) containing the relevant study variables (Table 1) was completed. These variables were chosen in order to fulfil the study objectives.

- Date of birth
- Sex
- Length of stay (days)
- Laboratory costs (South African Rands)
- Pharmacy costs (South African Rands)
- High Care Unit admission (hours)
- Diagnosis
- HIV status (negative/ positive/ clinically assumed positive (WHO criteria¹⁸) without laboratory confirmation/ clinically assumed negative)
- Clinical staging (WHO staging 1 - 4)
- CD4 count within 6 months of admission if available (laboratory value cells/microl)
- Antiretroviral therapy (on treatment/ not on treatment/ enrolled in the antiretroviral program, but not yet on treatment)
- Outcome (death/ discharged/ transferred)

Table 1. Variables on data collection spreadsheet

One hundred and seventy one patient records were reviewed, of which 165 were suitable for analysis. Pharmacy costs were determined by calculating the cost per dose of each drug given. Drug lists were obtained from each patient's drug chart and the hospital pharmacist provided the costs of the medications according to the Comeds contract (stipulated by the Department of Health). The laboratory costs were obtained from the National Health Laboratory Service. This included all tests which were requested by doctors during the patients' admission. The length of stay, diagnosis and outcome were established through the clinical notes. 19 common diagnoses, determined from previous experience in the medical wards, were listed and assigned to the patients during data collection. The information in the patients' files, recorded by the attending doctors, was used to determine the diagnoses. Patients with comorbidities were assigned more than one diagnosis. Those whose diagnosis did not fit the original list were recorded as 'other'. The High Care Unit register was used to determine the length of any admissions here. Costs such as intravenous fluid and blood transfusions, syringes and needles and radiological investigations were not recorded due to limitations in securing this data. The length of stay was recorded as a comparative tool, rather than to contribute towards actual costs as with the laboratory and pharmaceutical costs. Thus the actual daily cost of admission was not determined, but the length of stay, determined in days from the admission date to the discharge, death or transfer date, was recorded.

HIV testing was not done for study purposes, but doctors working in the medical wards followed existing hospital policy to encourage HIV testing (through voluntary counselling and testing) where appropriate in all medical patients. The recorded HIV status was based on information in the clinical notes and laboratory records. CD4 counts were accepted if they had been done within 6 months of admission and WHO staging and enrolment in the antiretroviral program was assessed through the clinical notes.

Unfortunately not all patient files could be found at the time of data collection, therefore as much information as possible was collected through existing hospital

records, such as laboratory records and ward registers. In such patients the missing information was the diagnosis, pharmacy costs and clinical information regarding HIV status.

The data analysis was done using Statistica. The initial analysis examined all 165 patients. A further comparative analysis was done by dividing the group into HIV positive and HIV negative patients using cross tabulations (with Chi-square test) for nominal data and the non-parametric Mann Whitney test for ordinal data.

Permission to conduct research was requested from the hospital administration and ethical approval was obtained from the Committee for Human Research, University of Stellenbosch, South Africa. Patient confidentiality was maintained at all times as the author collected all the data and was the only person to access these files. Confidentiality was further protected through assigning study numbers to each patient, therefore names were not included in the data collection sheet.

Results

Records from 171 patients were reviewed. 6 records did not fulfil inclusion criteria as the patients were either admitted under the incorrect department or incorrect date. 165 records were suitable for analysis. Of these, 18 patients' recorded data had more than one variable missing due to lost files or pharmacy charts. Calculations for specific variables were based on the total number of values collected for individual variables, not the total of 165 patients analysed, unless the data had been secured in all 165 cases. For example, where only 140 pharmacy records were collected, the median pharmacy cost was based on n=140.

The mean **age** was 44.9 years (range 13 to 88 years) with 52% (n=85) male and 48% (n=80) female. 19% were HIV positive (n=32, including 2 who were untested but clinically fulfilled WHO criteria of AIDS). If those that were admitted for purely psychiatric reasons are excluded, this comes to an HIV prevalence of 22%. The mean **length of stay** was 4.08 days with a median **pharmacy cost** (fig.1) of R17.26 and **laboratory cost** (fig.2) of R278.27 per admission. Overall **mortality** was 7% (n=12) while 10% were transferred to a tertiary institution and 82% discharged home.

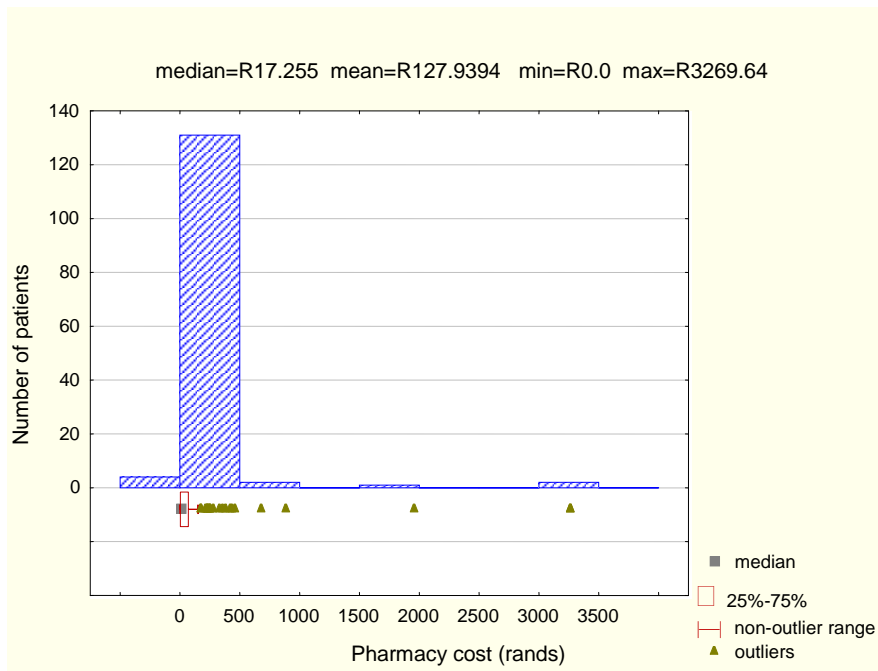


Figure 1. Distribution of pharmacy costs

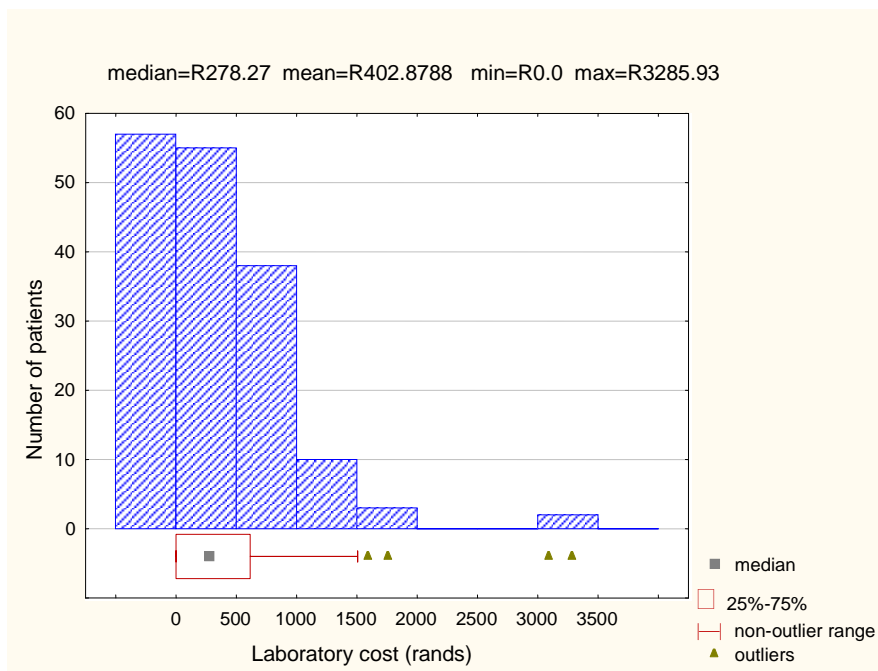


Figure 2. Distribution of laboratory costs

Six (19%) of the 32 HIV positive patients were on **ART**, while a further 3 (9%) had already enrolled in HIV services at a designated ART clinic. 23 (72%) had not accessed treatment yet. The majority (21) of the HIV positive patients had recent **CD4** counts of less than 200/microl (fig.3) and all were assessed as **WHO** stage 3 or 4.

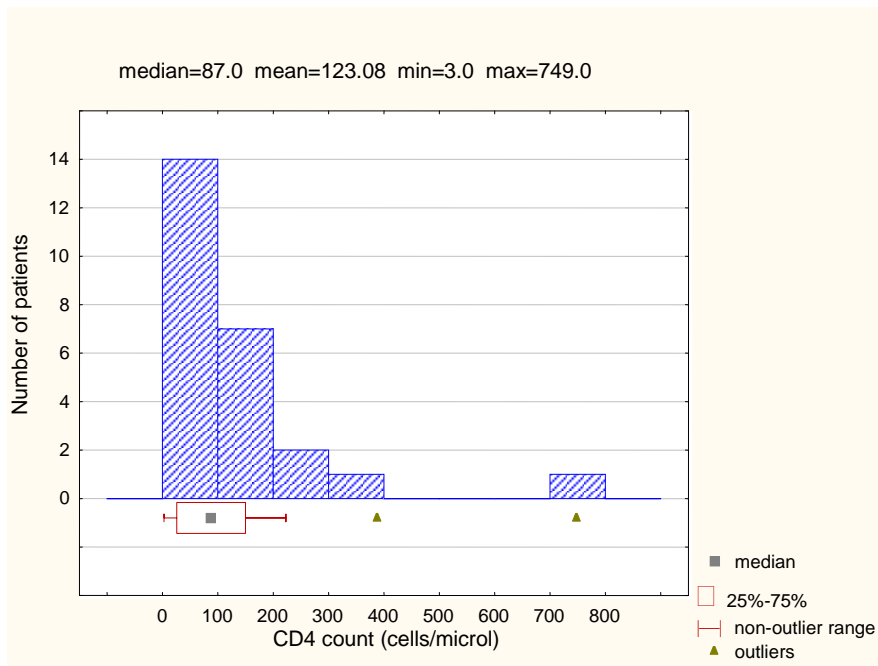


Figure 3. Distribution of CD4 counts amongst HIV positive admissions

Diagnoses: These are illustrated in fig.4 where 36% had an infective illness (tuberculosis, pneumonia, meningitis, urinary tract infection or gastroenteritis), 28% cardiovascular, 15% had a psychiatric diagnosis and 14% had diabetic related problems. There were 5% each of drug overdose, renal failure, asthma/chronic obstructive airways disease and 4% epilepsy. 15% were classified as ‘other’. This group included haematology, neurology and non-specific complaints. 25% of patients had more than one diagnosis.

Tuberculosis was diagnosed in 21% of the patients. The diagnosis of pulmonary tuberculosis (WHO stage 3 disease) was not enough to assume underlying HIV infection due to the high prevalence of tuberculosis in the Western Cape, irrespective of HIV status.¹⁹ If those patients with tuberculosis in the assumed negative group were to be assumed positive then the percentage of HIV patients would increase to 23% (an addition of 6 patients). However, a further 2% were confirmed as HIV negative and also diagnosed with pulmonary tuberculosis.

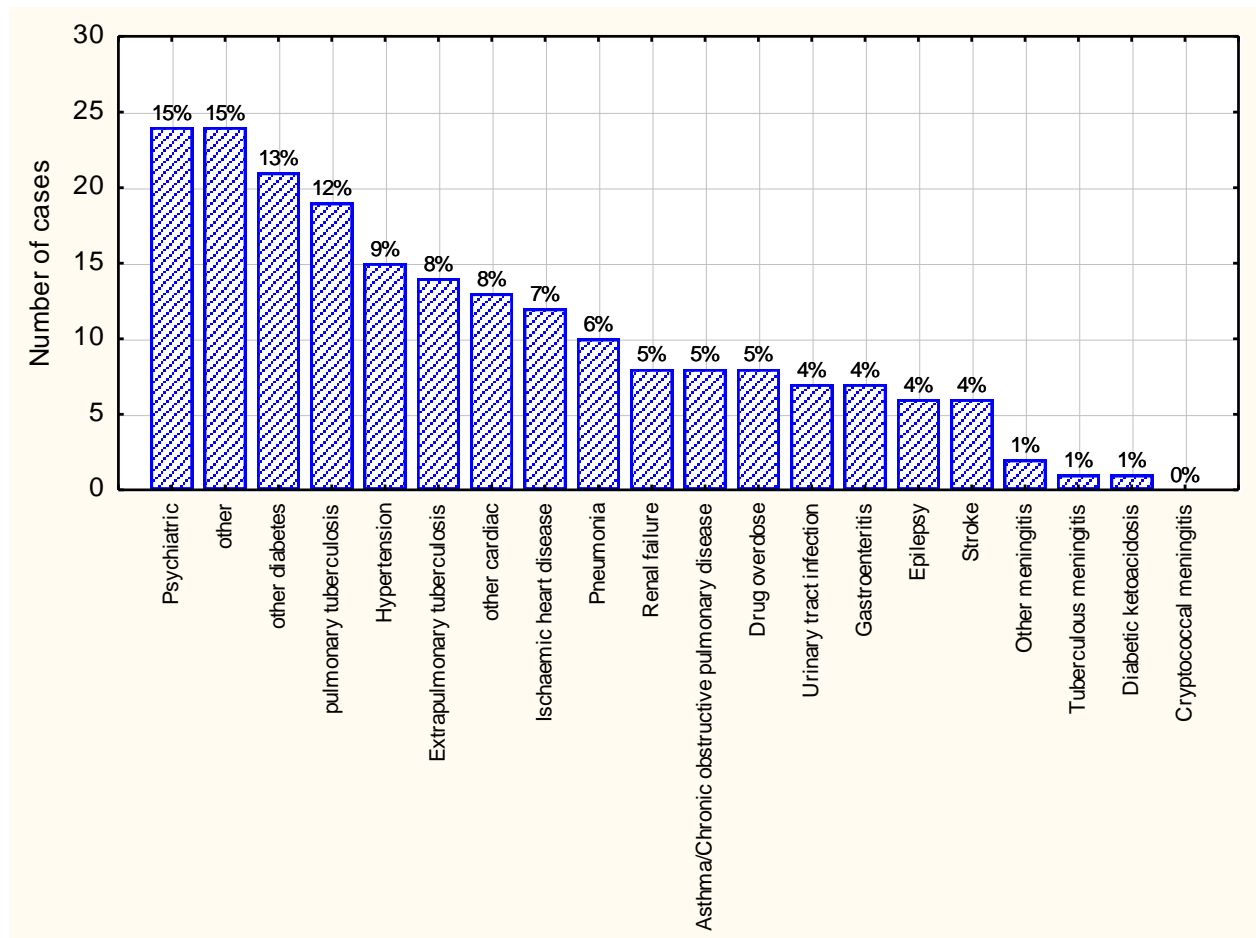


Figure 4. Recorded diagnoses

High Care Unit admissions: 12 patients were admitted to High Care during their admission. 11 of these patients were HIV negative. The mean admission was 46.6 hours. 2 died and 2 were transferred for specialist care or further investigation. The average age was 45 years.

A comparative analysis between the HIV positive group and HIV negative group was done.

Demographics: This revealed an equal distribution of HIV in the males (81% negative; 19% positive) and females (80% negative; 20% positive). The mean age (fig.5) of the HIV positive group was 35.4 years and the HIV negative group 47.2 years. ($p < 0.01$)

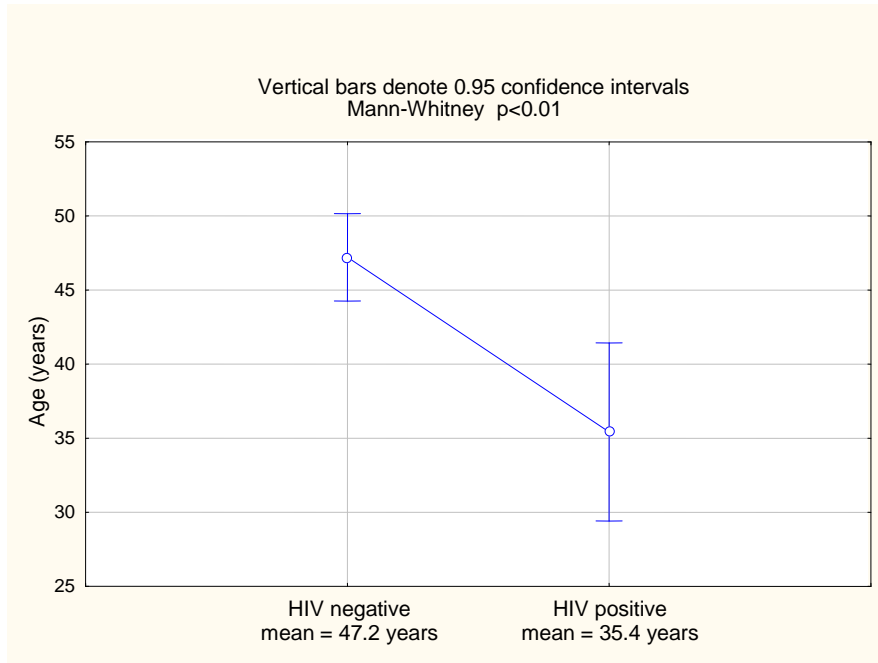


Figure 5. Comparison of the mean age of HIV negative and HIV positive patients

Outcome: 80% of the HIV negative patients were discharged, 8% died and 13% were transferred to a specialist unit, either Tygerberg Hospital (n=9) or Lentegeur Psychiatric Hospital (n=8). None of the HIV positive patients were transferred, 94% were discharged and 6% died. When the patients who were transferred are excluded from the analysis the outcomes of the positive and negative groups are comparable (fig.6) with 6% and 94% discharged respectively ($p = 0.64$).

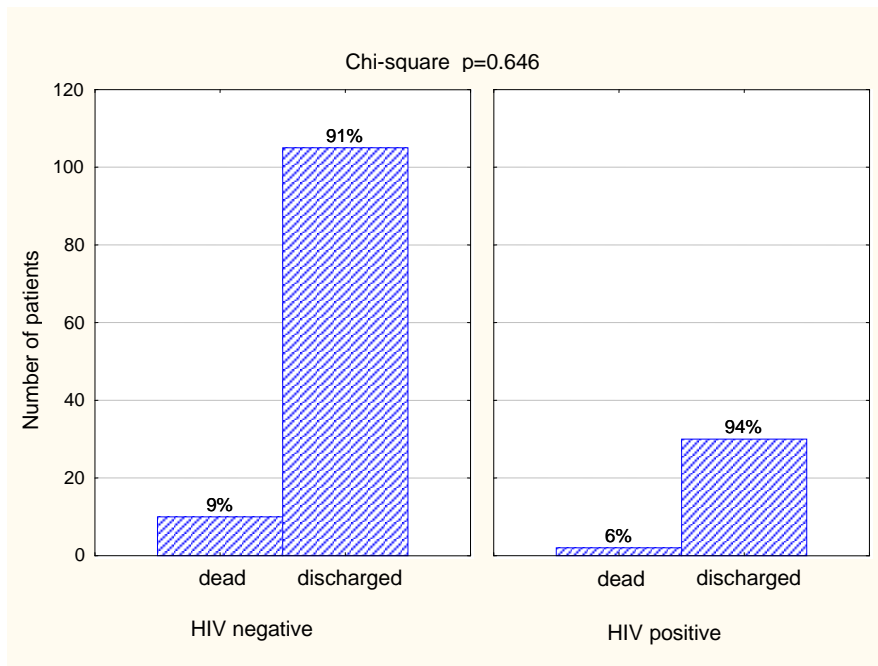


Figure 6. Comparative outcomes of the HIV negative and HIV positive patients

Length of stay: The mean LOS (fig.7) for HIV negative patients was 3.6 days compared to 5.9 days in the HIV positive group ($p < 0.01$).

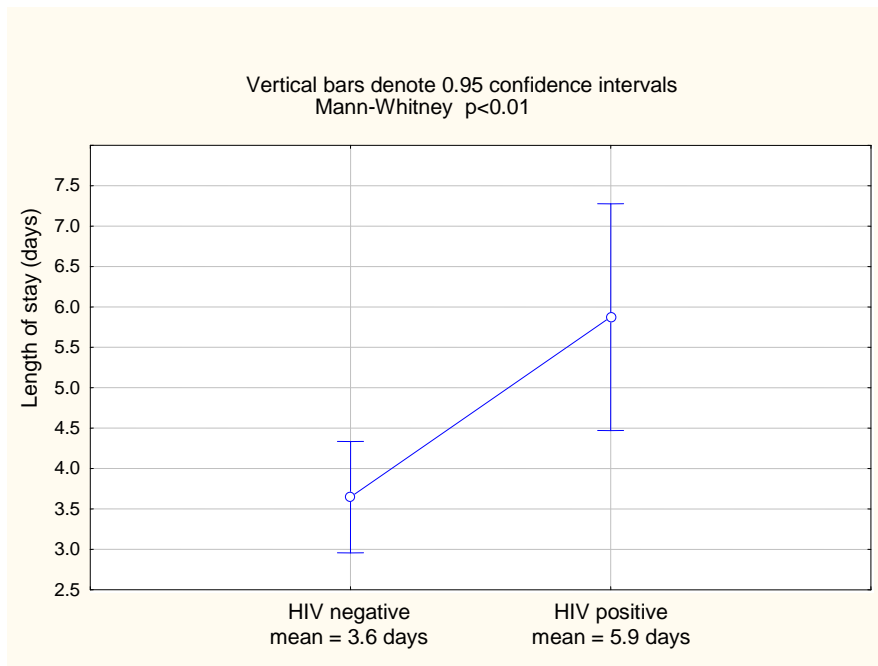


Figure 7. Comparison of the mean length of stay between the HIV negative and HIV positive patients

Costs: The mean laboratory cost per admission (fig.8) for HIV positive patients was R717.28 and R327.23 for the HIV negative group ($p < 0.01$). The pharmacy cost analysis (fig.9) was skewed by an extreme outlier in the HIV negative group therefore the means are not a good reflection of the analysis. The median cost for HIV positive patients was R40.69 and R11.72 for HIV negative patients ($p < 0.01$).

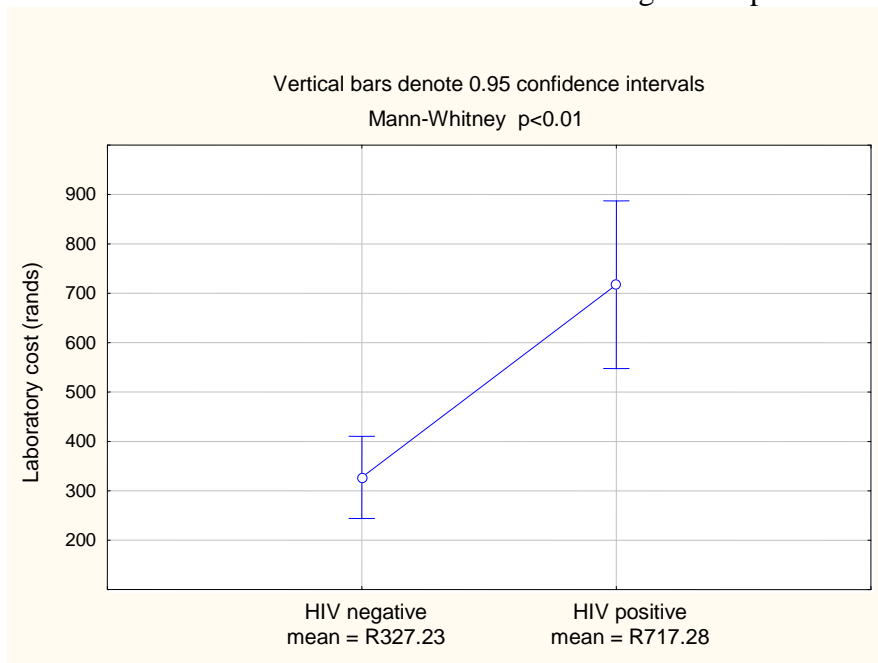


Figure 8. Comparison of the mean laboratory costs of the HIV negative and HIV positive patients

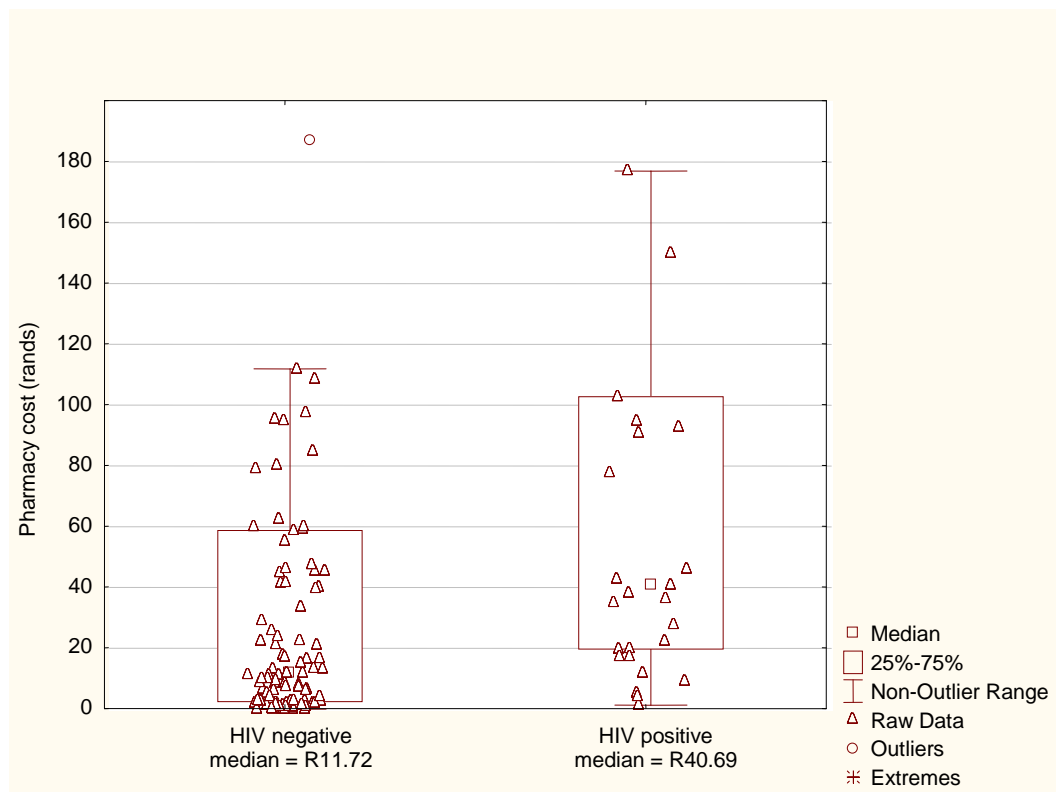


Figure 9. Comparison of the distribution of pharmacy costs of the HIV negative and HIV positive patients

Discussion

The analysis provides some important insights into the medical patients at Helderberg Hospital. The HIV prevalence of 19 - 22% is lower than expected. It is possible that there were some HIV positive patients in the group of assumed negative patients due to the fact that routine testing was not applied and that there were no clinical features of underlying HIV infection.

Previous audits of the medical admissions at Helderberg Hospital have consistently shown an HIV prevalence of 25 - 30% (Katrin Stüve, unpublished data). However, the overnight ward admissions, including most of the psychiatric patients and high turnover admissions, were not included in these figures. It is therefore possible that the inclusion of these patients in this study may skew the overall prevalence.

Many patients who attend Helderberg Hospital, particularly those that live in informal settlements where HIV prevalence is high,²⁰ return to the Eastern Cape in December. It is possible that this may contribute to the unexpectedly low inpatient HIV prevalence in this study. The records of ART initiation rate in the Western Cape show a consistent dip each year in December,⁶ partly due to this December migration.

In terms of cost, the HIV positive patients contribute a significantly greater burden to the hospital than the HIV negative patients. HIV positive patients cost more in both

pharmacy and laboratory costs and spend more days in hospital than their HIV negative counterparts. These findings are in line with other South African studies^{2,4} done prior to or in the early stages of the national ART program.

Despite the extensive ART program operating in the area for the last 5 years, the majority of HIV positive patients had not yet accessed treatment and many were diagnosed during this hospital stay. The incidence of opportunistic diseases increases when the CD4 count is less than 200/microl.²¹ ART is also most effective and associated with less morbidity and mortality when started before this level of immunocompromise has been reached.^{22,23} Considering that the majority of the HIV positive patients had CD4 counts of less than 200/microl and had not yet commenced with ART, it is reasonable to assume that this costly admission could have been averted if ART was commenced before the CD4 count dropped below 200. Indeed it has been shown that it is cheaper to treat HIV patients in the outpatient setting²⁴ than as an inpatient. It is therefore clear that with an improved outpatient facility providing diagnosis, monitoring and treatment of HIV, the immense cost of inpatient care can be decreased. The morbidity associated with advanced immunocompromise could be avoided and limited hospital resources could be diverted to non-HIV related illnesses.

A small audit done in the HIV services of the Helderberg area found that stigma still remains an important reason why people do not access the pre-ART HIV wellness services. There is a perception that the clinic services are of a poor standard with overcrowding and long waiting times. There also appears to be a lack of understanding of the need for regular follow up while HIV positive people are relatively well (Katrin Stüve unpublished data). This may explain why the numbers of patients with advanced HIV infection who have not yet accessed treatment are still high.

The lower than expected prevalence of HIV in the hospital admissions may be a reflection of an ART program that is operating efficiently, diagnosing and treating patients before they reach such an advanced stage. Therefore, the ART program may be keeping patients out of hospital thus reducing the burden of HIV in the inpatient setting.

Although there is an adequate ART program in place to decrease the admissions, there is still a need to expand these services at an outpatient level to ensure that more people are tested and enrolled into HIV care. This will need to include community educational programs to ensure that HIV positive people understand the need to adhere to pre-ART care and there needs to be further efforts to decrease the stigma associated with HIV infection.

This study has revealed that outcome is not related to HIV status. This implies that although the cost of treating HIV positive patients is great, their outcome is on a par with the HIV negative patients. The question can be asked whether this is a reflection of decreased care towards the HIV negative patients due to the increasing burden of HIV, or an improving mortality rate in HIV positive patients due to ART. Importantly, the patients who are HIV positive are younger than the HIV negative patients and therefore are still potentially economically active and are likely to have young children requiring care. This emphasizes the need to support rigorous inpatient treatment for HIV positive patients while simultaneously expanding the ART program

in the province and nationally in a hope to eventually decrease these admissions and the associated mortality.

The reality of only 19% of patients being HIV positive is that 81% of patients were HIV negative, either through testing or through clinical assumption. Experience at Helderberg Hospital is that the overwhelming feeling amongst doctors working in the medical department is that the clinical burden of HIV is extreme. Perhaps this is due to the fact that medical staff spend more time, per patient, on HIV positive patients than HIV negative patients due to their prolonged stay in hospital. However, this study emphasizes the amount of care given to HIV negative patients and dispels the myth that HIV is all that is seen in state sector medical wards.

On completion of the research, the findings were presented to the doctors at Helderberg Hospital to increase awareness regarding hospital costs and HIV treatment within the hospital. This will hopefully translate into improved patient care and improve morale with regards to the outcome of HIV positive patients. The final document will be sent to the hospital administration to assist with budget decisions and planning.

Limitations

Patient sampling was designed to not discriminate between those patients who were HIV positive or negative and it was assumed that the sampling would be a true reflection of the admissions to the medical department on an ongoing basis. Admissions to the hospital are influenced by the casualty doctors. Doctors vary on their thresholds to admit sick patients. It is possible that some doctors may be more or less sympathetic to HIV positive patients. It is hoped that, no matter which doctor was on duty, their threshold for admitting would be constant and therefore there would be equal proportions of negative and positive patients being discharged from casualty who might have been admitted by a different doctor.

The sample size was adequate to comment on the differences within this sample. However, a larger sample may have revealed different trends which may be a better reflection of the current situation at Helderberg Hospital.

The fact that this study was carried out during November and December may have affected the total number of admissions and the HIV prevalence due to the abovementioned annual holidays of many of the patients during this period.

The recorded diagnoses were dependant on the clinical notes. These notes varied in expertise and completeness. Therefore, the diagnoses should be considered a guide and may not reflect accurate numbers or medical information.

Limited variables were used to compare cost. A more inclusive costing analysis may have differed from these findings.

The medical department at Helderberg Hospital provides inpatient psychiatric care. It is not specified whether other studies on this subject have included psychiatric patients, therefore comparisons with their figures may be limited. However, they have

been included in this study as this is a true reflection of the current situation at this hospital. It is possible that their inclusion has skewed the figures, particularly the HIV prevalence, transfer rate and the LOS (the average LOS for a psychiatric patient awaiting transfer to a psychiatric hospital was 8.8 days).

This study was a quantitative analysis. This limits the study's ability to answer all the questions regarding the comparative impact of HIV infection at Helderberg Hospital. It is possible that a qualitative arm could have shed some light on the greater impact of HIV, particularly concerning the perceptions of the staff who provide care to the medical patients.

Conclusion

The prevalence of HIV infection in the medical admissions at Helderberg Hospital is 19% which is lower than expected. Inpatient care for HIV positive patients is more expensive than for HIV negative patients and HIV positive patients spend more days in hospital than HIV negative patients. However, overall mortality rates for these two groups are similar. The ART program may be reducing inpatient HIV prevalence and mortality in the HIV positive patients. HIV positive patients are still not accessing treatment before they develop opportunistic infections despite the existing HIV services in the area. These services will need to expand in order to facilitate early diagnosis of HIV and appropriate initiation of ART to limit the costly admissions of HIV positive people. Further qualitative studies are required to address the reasons why HIV infected people are not accessing the available treatment in the community. Doctors should be encouraged to treat HIV infected patients rigorously to maintain good outcomes.

Acknowledgements

The researcher is not bound by any drug or research company in the form of sponsorship therefore conclusions are not biased by secondary interests. Much thanks is due to the staff at Helderberg Hospital, particularly those in the filing department and the laboratory and pharmacy staff, for their assistance in extracting the relevant information. Thank you to Michael Pather for his guidance in the early stages of the project, to Katrin Stüve for her input throughout the research and to Zarina Patel for her valuable comments. Martin Kidd provided the statistical analysis and accompanying graphs. His patience and explanations were most appreciated.

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Patient number	Date of birth	Sex	Length of stay (days)	Laboratory cost (rands)	Pharmacy cost (rands)	High care hours	Diagnosis	HIV status	WHO stage	CD4 count	ART treatment	Outcome

This data collection table was used in the form of an Excel spreadsheet (Microsoft Office 2003) where the type of variable was pre-programmed to include the different choices per variable. For example, for diagnosis, a number was assigned to each of the 19 predetermined diagnoses and the number which corresponded to the diagnosis was recorded for each patient.

Annexure 1: Data collection spreadsheet