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Costing of Antiretroviral Treatment in Mbagathi District Hospital, Kenya

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Abstract:
Kenya has made positive progress towards achieving Millennium Development Goals and Vision 2030; however, HIV and AIDS remains a major challenge, causing premature mortality and morbidity and unless its impacts are controlled the country may not achieve its development goals. Antiretroviral therapy is one of the response mechanisms that are being implemented globally to mitigate the impact of HIV. The objectives of this study was to estimate the unit costs of labour, laboratory and imaging services, average cost per inpatient day and the average cost of outpatient visit per quarter in Mbagathi District Hospital. The cost and health service utilization data was collected retrospectively for a period of 24 months from the electronic medical records and patient charts of 351 HIV-positive adults who were enrolled on ART treatment in Mbagathi. Using micro-costing and gross-costing methods, we estimated the economic cost of the comprehensive HIV treatment. The average cost of outpatient visit per quarter was estimated to be Ksh9,044 (USD120.83)during the three months of treatment debut. This decreased over the two years of follow-up to Ksh5,818 (USD77.73) while the average cost per outpatient visit stood at Ksh2,001 (USD26.73). The average outpatient cost per annum was Ksh26,040 (USD347.90)and Ksh20,506 (USD273.96) in the first and the second year of treatment, respectively. The average cost of treatment per inpatient day was Ksh1,691 (USD22.59). The average labour cost per outpatient visit was Ksh465 (USD6.21) while that of inpatient per day was Ksh575 (USD7.68). Generally, ART accounted for the highest proportion of costs followed by the labour and laboratory test. The study provides new and relevant information in terms of the unit costs of inpatient and outpatient care, labour, laboratory and imaging.

1. Introduction

Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) have posed the greatest global public health and socioeconomic challenges over the past quarter century (Strauss and Thomas, 2008). Kenya, like many other developing countries, has experienced the major burden of HIV pandemic. In 2012, the adult HIV prevalence rate was6% and approximately 1.6 million people were living with HIV, while 1.5 million had died since the HIV virus was first detected in Kenya in 1984 (NASCOP, 2012). HIV prevalence in the country is characterized by regional, gender and age disparity with counties along Lake Victoria, women, and 45-54-year olds having the highest prevalence rates (NASCOP, 2012). HIV remains the greatest cause of morbidity and mortality in Kenya, accounting for 29% of mortality while unsafe sex is the greatest risk of mortality (WHO, 2010). It increases the dependency ratios hence increasing poverty, inequality, vulnerability, and demand for welfare support. In addition, AIDS not only destroys human capital stock, but also reduces the likelihood of investment in human capital (Bell, Devarajan and Gersbach, 2003, 2006). AIDS, therefore, reduces economic growth through reducing labour and agricultural productivity, increased consumption (health sector expenditures, dependants, etc.) and increased poverty levels.

The Government of Kenya, in partnership with bilateral and development partners, has rolled out a robust and comprehensive care treatment providing free antiretroviral therapy (ART), treatment of opportunistic infections and psychosocial support to HIV-positive patients. The number of adults in need of ARVs increased from 213,000 in 2005 to 760,000 in 2013 (NACC and NASCOP, 2014). However, the government relies heavily on donor funding for HIV interventions. According to Oxford Policy Management (2013), the total resource need for sustainable financing of HIV and AIDS in Kenya annually was estimated at Ksh4 billion (USD554million) in 2009/10.This figure was projected to increase to Ksh112 billion(USD1,057million) and Ksh166 billion(USD1,433million) in 2020/21 and 2029/30, respectively. HIV services in the health sector was expected use 80% of these resources. The resources used to provide health care are scarce (Drummond et al, 2005; Hoch and Smith, 2006; Gafni, 2006) hence the need for costing of the provision of ART in Mbagathi District Hospital for budgeting, priority setting, identification of avenues for saving costs and data for health economic evaluation.

1.1. The Statement of Need for Costing Analysis of HIV and AIDS Care

The main objective of this study was to estimate cost per outpatient visit and inpatient day of treatment ofHIV-positive adulton ART treatment in Mbagathi District Hospital, from the health providers' perspective, to inform the budgeting andthe planning and optimize service delivery. In addition, this study findings were used for economic evaluation of Mbagathi District Hospital, inform efficient resource utilization and sustainable financing.

2. Methodology

2.1. Study Settings

This study was carried out in Mbagathi District Hospital (MDH), which is a public hospital situated on the outskirts of the Kibera informal settlement in Nairobi County, Kenya, and has been considered a hospital for the poor (MSF, 2008). The hospital in collaboration with the Médecins Sans Frontières (MSF) Belgium initiated HIV and AIDS treatment and care in 1997. It was not until 2003 that the hospital initiated provision of ARVs and introduced a comprehensive care package, with the objective of increasing access to quality medical and psycho-social services to people living with HIV and AIDS, free of charge (MoH and MSF, 2008). A total of 15,000 HIV-positive patients were on treatment follow-up in February 2010. Mbagathi Hospital also acts as a centre for government staff HIV training, complicated ART clients, a specialist centre in paediatric and adolescent HIV care, an information centre and a spring-board for People Living with HIV groups.Mbagathi was one of the pioneer HIV treatment hospitals in the country and was selected not only because it had the appropriate data, but also the hospital administration granted access to the data.

2.2. Study Population

To achieve its objective and minimize the missing data problem, this study collected data from patients who were 18 years and above at treatment debut, who had initiated their treatment in Mbagathi Hospital. The patients who were known to have transferred from or to other hospitals were excluded from the study. Random sampling was used to identify eligible patients.

2.3. Health Intervention

Mbagathi District Hospital provides comprehensive care and treatment for HIV positive patients. This care is composed of provision of ARVs, treatment of opportunistic infections and other conditions, prophylactic medication, tuberculosis (TB) screening and treatment, nutritional support, treatment education, psychosocial and adherence counselling, reproductive health and family planning support and referral, referral to speciality clinics e.g. skin clinics.In addition, regular laboratory testing and radiology services were provided. The hospital provided two main types of treatment intervention: ART and no ART. The ART treatment group received a standard ARV, regular clinical and laboratory monitoring to assess treatment progress and drug-related complications. Subject to approval by the ART treatment committee established by the hospital, the patients transitioned to alternative first or second line treatment regimen due to treatment failure, adverse side effects or availability of drugs. The treatment supports services included treatment of opportunistic infections and other related conditions, nutritional support, adherence counselling, treatment education and community-based care interventions. The no ART patients received support services that were similar to the ART group except that they did not receive ARVs and were not taken through regular laboratory or imaging procedures. The ARV costing was based on whether the patient was on first or second line treatment regimen, the treatment cycle that is 0 to 3 months, 3 to 6months, etc.To estimate the cost per inpatient day and per outpatient visit of HIV and AIDS care and treatment, the study identified, measured and valued all the resources that were used in the provision of comprehensive HIV and AIDS care and treatment in this hospital.

2.4. Perspective and Costing Methods

Although the societal costing perspective is most preferred in economic evaluation of health care intervention (Luceetal,1996; Brouwer et al,2001; Drummondetal, 2005), the study adopted the health care provider's perspective due to resource constraints. The cost and health care utilization data were collected from the provider's perspective, hence the private patient and societal costs like travel costs and time, anxiety, stress, out of hospital medications, community/home-based care and productivity losses were excluded from the study.Besides direct service provision costs, the study included hospital management and administration costs.

The individual patient cost data, overhead recurrent and capital costs data were collected for an average period of two years. The study employed both micro-costing and gross-costing methods(Drummond etal,2005). Micro-costing entailed the determination of a production function with all the arguments of the function identified, measured and valued, while in gross-costing the production function was estimated on more general cost items such as overhead recurrent and capital costs;these costs were then distributed to individual patients.To obtain a comprehensive cost estimate, the study estimated unit costs, average costs per outpatient visit, average costs per inpatient day, quarterly costs and annual costs.

To determine the human resource for health utilization and costs for HIV outpatient and inpatient treatment and care, micro-costing approach was used. For outpatient treatment, an observation study was conducted and the amount of time spent by each patient during each stage of treatment recorded. However, for inpatient treatment, the doctors and nurses were interviewed and asked how much time they spent with each patient per day. In addition, focus group discussion involving two doctors, four nurses and four clinical officers was conducted. The time was estimated based on patient contact time during the daily clinical rounds and the rest of the day. The factors considered included average number of occupied beds per day, the number of personnel working in each ward per day and the individual patient condition.

The cost of each health personnel was estimated based on the Government of Kenya's Ministry of Health salary scale (Cite). Due to ethical issues, we were unable to get the exact income level of each employee; thus, we used the lowest rate within each grade. However, we also carried out sensitivity analysis assuming an average increase in salary by 10% and 20% within each grade. The laboratory and radiology costs were inclusive of their labour costs. We assumed that on average, nutritional consultation and education was provided once per patient per admission.

To calculate the annual economic costs of capital goods including furniture, equipment, vehicles and buildings, and capture both the opportunity cost and depreciation, we computed the equivalent annual costs (EAC) (Drummondet al, 2005). The useful life of the various capital goods ranged from one year for some equipment to 30 years for buildings. The 2005 replacement values of capital goods[1] were used and annuitized over their life years using 10% discount rate, which was Kenya's real interest rate in 2010[2]. The donated resources were valued at market prices to capture opportunity cost of the intervention. This was divided by the average number of visits to estimate capital costs per patient per visit. As recommended (Luceetal,1996; Brouwer et al,2001; Drummondetal,2005), the overhead costs were allocated using the direct allocation method, with the floor size, clinic patient volume (adjusted for the duration of patient visits) and interviews with service providers. All costs are presented in Kenya shillings (Ksh) and its equivalent in US dollars (USD).

3. Data Collection

This study used both primary and secondary data. These data were collected through a retrospective record review. The individual patient's cost data was collated from the hospital's electronic medical records and the patient charts for a follow-up period of two years after treatment debut. However, duration of survival was estimated for seven years, that is, from 2003 to February 2010.A total of 351 patients were randomly sampled and their data collected. The outpatient data was collected from 301 patients while the inpatient data was collected from 50 patients. Due to inconsistent inpatient and outpatient patient records, the inpatient data was collected from HIV-positive patients who were not necessarily on treatment follow-up. The data collected included types of health care services provided, the quantities of resources used in health care service provision and the cost of these resources. Number of outpatient visits, laboratory tests, radiology procedures, prescriptive drugs, opportunistic infections and the drugs, psychosocial support, number of outpatient visits and treatment outcome were captured. The inpatient data collected included length of hospital stay, hotel and non-hotel components of treatment.

Hospital recurrent and capital overhead costs were obtained from the hospital's accounts records. The financial data, including exchange rates, prices of various factors of production including drug prices, human resource for health costs, laboratory and radiology services, were obtained from various sources, including the hospital's supplies and purchase records, accounts and human resource departments, Kenya Medical Supplies Agency (KEMSA), the Missions for Essential Drugs (MEDS), the Central Bank of Kenya and WHO website. Key informant interviews were conducted to identify programme activities to which resources were devoted and develop a comprehensive description of HIV treatment at the hospital. The data analysis was based on per unit, three-month periods (treatment cycles) and annual costs.

3.1. Ethical Approval

The study involved access to confidential medical records of the patients hence needed – and received – ethical approval by Moi Teaching and ReferralHospital and Moi University Ethical Committee. In addition, we received approval from the Medical Superintendent of Health at Mbagathi District Hospital and the Ministry of Higher Education, Science and Technology.

4. Results

4.1. Demographic and Clinical Characteristics of the Patients

Of the 301HIV-positive patients on treatment follow-up, 280 were on ARVs while 21 were not on ARVs. This imbalance was due to data constraints. Table 1 summarizes the demographic characteristics of the cohort studied. Of all the patients sampled, 57% were female while 43% were male. The median age of patients at the start of the treatment was 37 years (range 18–69). Thirty-five per cent of the patients were using condoms and slightly over 30% had CD4 count 50 and below at the onset of the treatment.

[1]Replacement values of capital goods were obtained from http://data.worldbank.org/country/kenya, on 21 September 2011

[2]Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator, this was obtained from http://data.worldbank.org/country/kenya, on 21 September 2011

Demographic variable		N=301
Sex	Male	129 (42.9%)
	Female	172 (57.1%)
Dead	Yes	106 (35.2%)
	No	195 (64.8%)
Baseline CD4 strata	0-50	100 (33.2%)
	51-250	201 (66.8%)
Condom use	Yes	105 (34.9%)
	No	196 (65.1%)
Income level (KSh)	0-2,500	131 (43.5%)
	2,501-10,000	126 (41.9%)
	>=10,001	44 (14.6%)
Highest level of educational		
	None	6 (2%)
	Primary	126 (41.9%)
	Secondary or above	169 (56.1%)
Employment state	Yes	157 (52.2%)
	No	144 (47.8%)
Marital status	Married	143 (47.5%)
	Not Married	158 (52.5%)
Baseline CD4 count (mean)		98.8
Number of dependants		3
Piped water	Yes	223 (74.1%)
	No	78 (25.9%)
Age -Median age (years)		37.6
Total time at risk (quarters)		4350
Median follow-up duration (months)		15
Ever_ARV	Yes	280 (93%)
	No	21 (7%)

Table 1: Demographic and clinical information of the patients (n=301)

4.2. Laboratory and Imaging Services Utilization and Costs

The study identified 37 different types of laboratory tests that were provided to the 301 sampled HIV-positive patients. All these tests were measured and valued irrespective of whether they were HIV related. The ingredients method of costing was used and for each of these tests, the consumables, equipment, machinery, reagents, labour etc. were measured and valued with the assistance ofthe University of Nairobi Microbiology Unit. Due to resource constraints, the imaging costs were based on the Kenyatta National Hospital's charges. As shown in Table 2, the most costly was HIV viral load test at Ksh3,273 (USD43.70) per unit cost, followed by HIV DNA test atKsh2,185 (USD29.19). The CD4 count test was the fourth most expensive procedure at Ksh771 (USD10.30). The least costly test was the random blood sugar test going for Ksh64 (USD 0.86) per test.

Laboratory Test	Cost per test (Ksh)	Cost per test (USD)	Laboratory test	Cost per test (Ksh)	Cost per test (USD)
CD4 count	771	10.30	FNA Lymph node	760	10.15
Viral load	3,273	43.73	CSF	864	11.54
SGPT/ALT	223	2.98	Protein plasma	162	2.16
SGOT/AST	225	3.01	Albumin	146	1.95
Creatine	192	2.57	Urea	146	1.95
LFTS	641	8.56	Therapeutic Tap*	700	9.35
VDRL	309	4.13	Serum crag	864	11.54
FHG/ESR	300	4.01	Rectal swab	237	3.17
HIV Eliza test	261	3.48	U/E/C	645	8.62
HIV DNA	2,185	29.20	Urinalysis	122	1.63
Sodium (NA+)	356	4.76	MCV	300	4.01

Potassium (K+)	238	3.18	PDT (Pregnancy test)	78	1.05
Chloride (cl)	292	3.91	Biopsy-histology	900	12.02
Electrolytes	550	7.35	Blood grouping	386	5.16
Platelets	300	4.01	BS (malaria test)	197	2.63
AFB	450	6.01	Widal	193	2.57
Asatic Cytology + Zn stain	1,003	13.40	Lactic acid levels	210	2.81
RBS (Random blood sugar)	64	0.86	HBs ag	356	4.76
Stool o/c (microscopy)	276	3.69	ALC	771	10.30

Table 2: The Laboratory costs/test

TheHIV and AIDS treatment guideline provides clinical protocol for routine laboratory tests and procedures for each patient on ART for monitoring treatment progress and early detection of any ART-related complications.However, this study established that due to resource constraints, the hospital subjected thepatients on ART to laboratory tests when they were either unwell or were suspected to have developed drug complications. The average quarterly utilization and costing of laboratory services was estimated for 24 months and was based on this practice and not the recommended guidelines. The frequency of utilization of laboratory services was highest during the first threemonths of treatment, and then gradually decreased in each of the subsequent cycles. During the first treatment cycle (quarter), full blood count test was the most frequently done test on 82% of the patients, followed by CD4 count and creatinine tests, which were carried out on 77.4% of the patients. The ALT/SGPT (liver test) was the third most frequent test carried out on 68.7% of the patients.

Figure 1 shows the variation in laboratory and imaging costs based on the 10most frequent tests and follow-up period over the eighttreatment quarters (twoyears).The average costs of the various laboratory and imaging procedures per outpatient visit per quarter was highest during the first three months of treatment and gradually decreased in the subsequent quarters. The CD4 count test remained the most costly laboratory test during the 2-yeartreatment period. The average cost of the CD4 count test per outpatient visit during the first quarter of treatment was approximately Ksh600 (USD8.02), followed by ALC test at Ksh441 (USD5.89), full blood count and TB test at around Ksh250 (USD3.34).The CD4 countremained the most costly test during the 2-yearfollow-up period. Generally, the average costs per procedure per outpatient treatment quarter significantly decreases after the first quarter. This reduction reflects the decrease in proportion of patients who received the various procedures and not reduction in unit prices. Although the average CD4 count test cost decreases, it slightly increases after every 6-month period, showing that the proportion of patients whose CD4 count were tested slightly increases during the said periods.

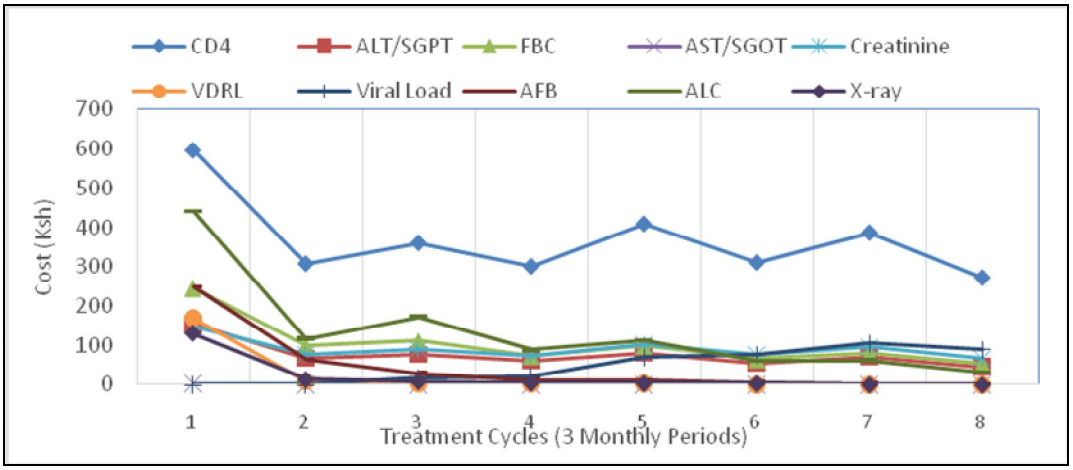

Figure 1: Average Laboratory and Imaging Costs per Cycle

The average cost of outpatient laboratory and imaging procedures for the first quarter of treatment is Ksh2,136 (USD28.54), however this significantly reduces during the subsequent treatment cycles, averaging at Ksh750 (USD10.02).

4.3. Outpatient Service Utilization and Costs

During the first three months of treatment,patients initiated on ARVs had an averageof 4.37 outpatient visits.However, the frequency of these visits decreased gradually during the subsequent follow-up periods to 2.26 outpatient visits per quarter during the 21-24 months of follow-up. This is because during the first three months of treatment debut, patients were subjected to various laboratory tests, clinical observations, psychological support and treatment education,hence the need for more frequent outpatient visits. Once the treatment process had stabilized, the outpatient visits decreased. Table 3 shows the average number outpatient visits per quarter.

	Patients on ARVs				Patients not on ARVs			
Cycle	**No. of observations**	**Mean (Std. dev)**	**Min**	**Max**	**No. of observations**	**Mean (Std. dev)**	**Min**	**Max**
0	2222	4.37 (1.744)	1	11	1798	2.26 (1.405)	1	10
1	1991	3.08 (1.123)	1	8	245	1.94 (1.003)	1	7
2	2013	2.91 (1.060)	1	11	159	1.96 (0.977)	1	5
3	2022	2.79 (1.103)	1	12	108	1.96 (0.937)	1	5
4	2048	2.74 (1.078)	1	8	90	1.89 (0.880)	1	4
5	2065	2.58 (1.068)	1	8	73	1.96 (0.920)	1	4
6	2054	2.46 (1.038)	1	10	58	1.91 (0.864)	1	4
7	2061	2.33 (1.038)	1	10	55	1.84 (0.877)	1	4

Table 3: Average number of visits per treatment cycle (quarter)

Using the observation method and key informant interview, the study found that the doctor, clinical officers and nurses spent an average of 20, 25 and 15 minutes with one patient per outpatient visit, respectively(Table 4).The average labour (clinical and non-clinical) cost per outpatient visit was estimated at Ksh465 (USD6.21) with the main contributor beingpsychosocialsupport (treatment and adherence counselling, treatment education, community health workers support) at 34%,followed by medical/clinical officer costs at 17%. Figure 2 shows the percentage labour costs of various health care services. The laboratory and imaging costs were inclusive of the human resource costs. We assumed that nutritional consultation and education wereprovided once per patient per admission.

	Contact time/patient (minutes)	**Cost per outpatient visit**
Doctor*	20	112.21
Clinical officers*	25	69.76
Pharmacist*	4	24.71
Interns/pharmacist	13	28.81
Nurses	15	55.66
Nutritionist	20	43.61
Social worker	30	65.42
Peer educators	4	5.81
Community health workers	4	5.81
Lay counsellors	30	81.60
Laboratory technician	5	13.60
Data clerks	22	48.01
Radiology	4	9.60
Tea girl	4	5.29
Cleaner	4	5.29

Table 4: Average labour costs and contact time per outpatient visit

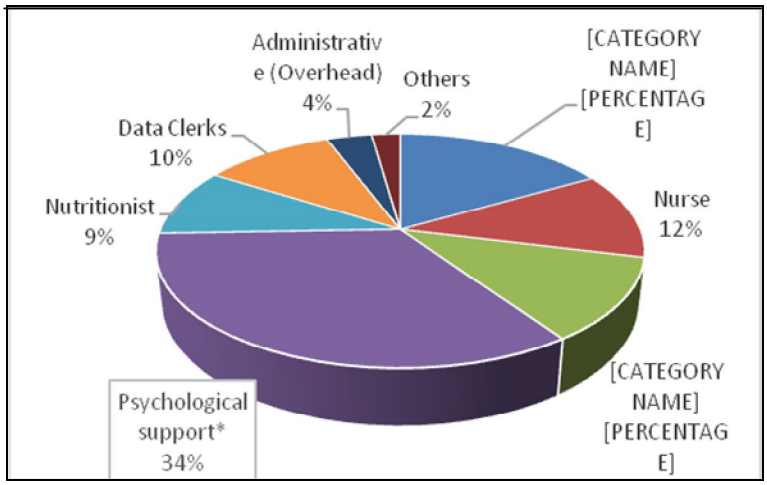

Figure 2: Health care workers cost per outpatient visit (percentage)

The study identified 13 different combinations of generic first and secondline ARVs that were prescribed to the patients. The unit cost of each of these combinations is shown inTable 5.

ARV combinations	Price/ Quarter (US$)	Price/Quarter (KSh) $1=Ksh74.85	ARV combinations	Price /Quarter (US$)	Price/Quarter (KSh) $1=Ksh74.85
3TC+ABC+NVP	21.90	1,639.22	3TC+D4T+NVP	22.51	1,684.87
3TC+AZT+EFV600	64.85	4,854.02	3TC+EFV600+TDF	152.90	11,444.57
3TC+AZT+LPV/r	153.82	11,513.43	3TC+LPV/r+NVP	139.13	10,413.88
3TC+AZT+NVP	42.58	3,187.11	3TC+LPV/r+TDF	65.76	4,922.14
3TC+D4T+EFV600	47.94	3,588.31	3TC+NVP+TDF	37.78	2,827.83
3TC+D4T+LPV/r	136.91	10,247.71	ABC+DDI400+LPV/r	130.14	9,740.98
			ABC+LPV/r+TDF	219.15	16,403.38

Table 5: The ARV prices
Source: Missions for Essential Drugs S (MEDs) drug price list, 2009 and KNASP III, 2009

Using the ARV unit prices, we estimated the average costs of first and second-line ART per patient per treatment cycle (Table 6). On average, the first and secondline ART regimen cost Ksh2,320 (USD30.99) and Ksh10,476 (USD139.96) per patients per treatment cycle respectively.

Cycles	Cost of 1st line ARV per cycle (Ksh)	Cost of 1st line ARV per cycle (US$)	Cost of 2nd line ARV per cycle (Ksh)	Cost of 2nd line ARV per cycle (US$)
0	2,298.47	30.71	9,496.39	126.87
1	2,297.08	30.69	10,593.86	141.53
2	2,453.18	32.77	10,597.46	141.58
3	2,297.92	30.70	10,601.07	141.63
4	2,297.86	30.70	10,604.67	141.68
5	2,297.80	30.70	10,608.27	141.73
6	2,338.23	31.24	10,594.78	141.55
7	2,297.80	30.70	10,594.78	141.55
8	2,297.80	30.70	10,594.78	141.55

Table 6: The average cost of ART per treatment cycle (KSh/US$)

Figure 3 shows the percentage costs of various health care interventions during the first quarter of treatment. The three main contributors of the costs are first line ARVs, laboratory and imaging, and labour, accounting for 25%, 24% and 23%, respectively. However, if the average salary per health care worker increased by 10% and 20%, then the personnel cost will be the largest cost item accounting for 24% and 26% of the total treatment cost respectively.

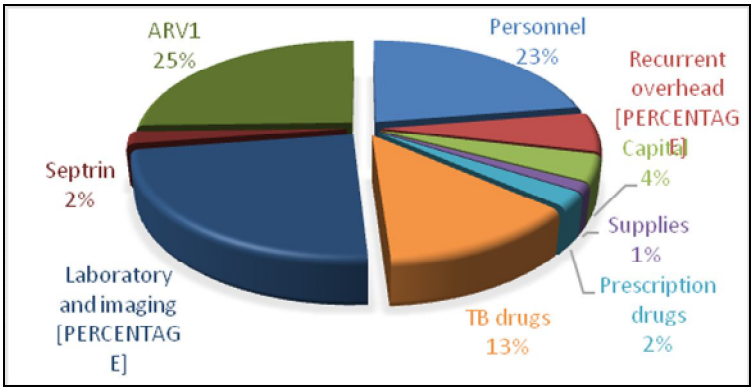

Figure 3: Outpatient percentage costs for 0 to 3 months of treatment

The analysis of trends shows that after the first three months of treatment, as expected, the average cost of ARVs per quarter remains constant. However, the laboratory costs decrease sharply from Ksh2,136 (USD28.54) toan average of Ksh752 (USD10.05)per quarter for the 2- The personnel costs also decrease slightly,from Ksh2,032 (USD27.15) to Ksh1,255 (USD16.77),becoming the second largest cost item.

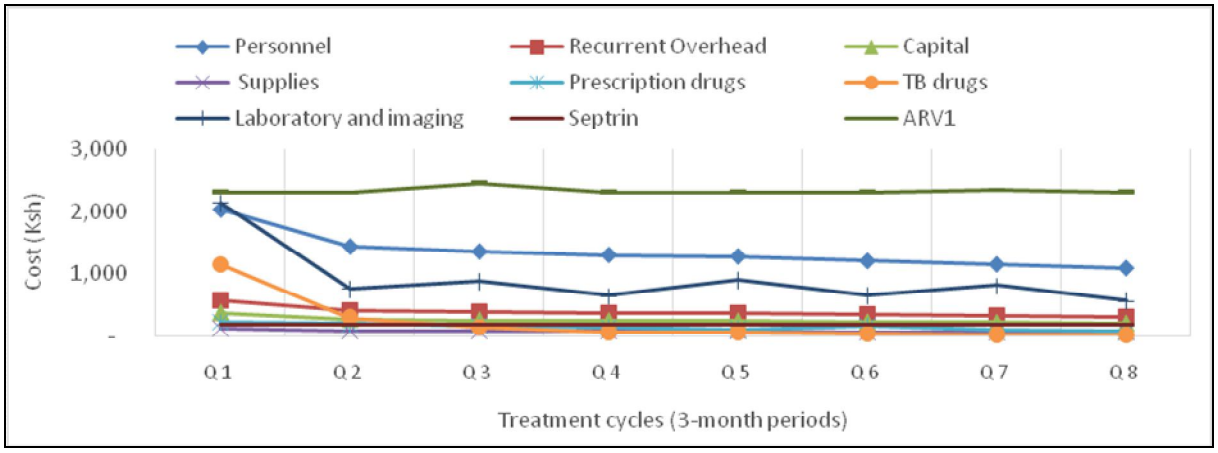

Figure 4: Outpatient cost of treatment per quarter

The total outpatient cost per quarter also varied. It was highest during the first treatment quarter at Ksh9,044 (USD120.83).This reduces significantly during the subsequent quarters of treatment. The average outpatient cost per patient was Ksh26,040 (USD347.90) in the first year of treatment and decreased to Ksh20,506 (USD273.96) in the second year. This is in line with the reduction in the laboratory and imaging costs. As shown in Figure 5,the share of total costs contributed by TB treatment, laboratory and imaging services decreases while that of ARV increases; however, the percentage costs of personnel, capital, recurrent overhead, supplies and drugs remained largely constant.

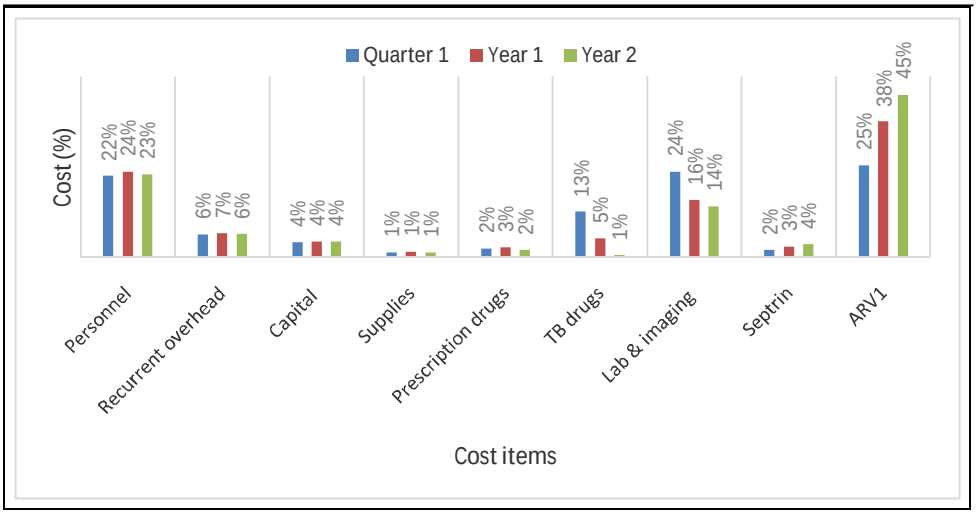

Figure 5: Total outpatient cost of treatment

4.4. Cost per Inpatient Day

In the first three months of treatment debut, 23.4% of the patients received inpatient treatment. This reduced to 2% in the second quarter, averaging at 1% during the two years. The overhead costs were based on hotel costs[3] and the costs of capital good. The patient specific inpatient service utilization and costs were collected from 50 HIV-positive patients admitted at Mbagathi District Hospital who may not have been on treatment follow-up. The study found that, on average, each clinical provider spent 20 minutes with each patient during the daily clinical rounds. The average occupied beds per day were 24 patients per ward, resulting in576 inpatient hours per day. On average, there were seven nurses, four medical officers (two being on internship) and 10clinical officers (two being on internship) working in each ward per day. In addition, two consultants visited the ward once a week and when there was a need. On average, the daily contact time per patient rangedfrom22 minutes to 27 minutes. This was used to cost the patient specific human resource for health time. The time for laboratory tests, imaging and other procedures were based on specific procedures and those that were done for each patient. The total cost of labour per inpatient day was Ksh574 (USD7.67) shows the proportion of the labour costs associated with the different health care professionals.

[3] WHO definition

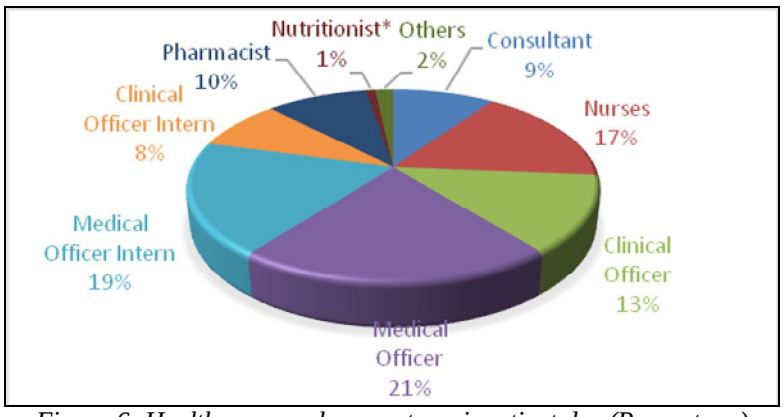

Figure 6: Health care workers cost per inpatient day (Percentage)

The study found that 44% of the patients admitted at Mbagathi were diagnosed with active TB. The costing of TB medications were done and distributed to all the admission days. TB treatment accounted for 29.31% cost of medication per inpatient day. The total cost per inpatient day was estimated at Ksh1,691 (USD22.59). The health care workers, hotel costs, recurrent, and medical expenditures were the four main cost items, accounting for 34% (Ksh575 or USD7.68), 22% (Ksh374 or USD5), 18% (Ksh309 or USD4.13) and 9% (Ksh157 or USD2.10) respectively. The costs associated with treatment regimen change and inpatient outpatient transitions were calculated based on the data of ongoing inpatient days adopted from Clearly et al (2004). This was due to difficultiesin estimating transitions probability given the data constraints.

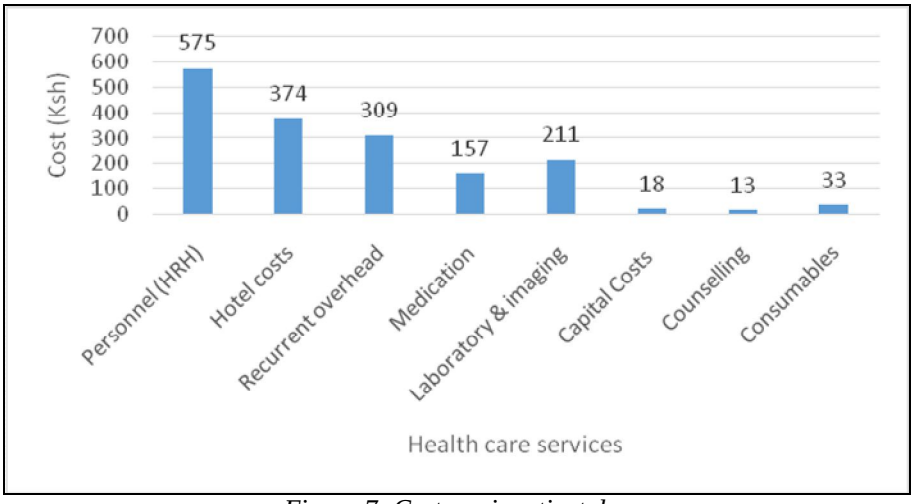

Figure 7: Cost per inpatient day

5. Discussion

The study provides a detailed description and costs of ART treatment in Mbagathi District Hospital. Among the main contributions of this study are the estimates of the unit laboratory and imaging costs, human resource utilization and costs per inpatient day, outpatient visits per quarter and per year. The study finds that psychosocial care and support accounts for the largest proportion of labour costs per outpatient visit in the first quarter of outpatient treatment. This confirms the fact that the success of HIV treatment relies not only on clinical care, but also psychological and psychosocial support, including treatment, adherence counselling, and treatment education. The proportion of treatment costs associated with TB treatment, laboratory and imaging services decreases as the follow up period increases, reflecting the reduction in the type, frequency and number of tests that patients are subjected to as they stabilize on treatment. However, the proportion of costs associated with ARVs increases. In terms of inpatient costs, the labour costs accounted for the highest proportion of treatment at 34% followed by hotel(22%) and recurrent overhead costs (18%). This is explained by the intensive use of health care workers' time when a patient is admitted. The average outpatient cost of treatment is highest in the first threemonths of treatment, but decreases gradually inthe follow-up period. This is due to reduction in the health service mix used. The average annual cost is higher in the first year than in the second.This study had several limitations. First, it was conducted from the health provider's perspective and hence non-hospital costs were excluded. Second, some hospital services like nutrition and community health care services were not costeddue to lack of data.Thirdly, there is possibility of under costing of treatment services for patients who died during the follow up period since we could not access old mortality data.

6. Conclusion

The cost of HIV treatment is decreasing over time. There is a reduction in probability of admission as ART follow up time increases. Although, there are treatment protocols, these are not fully adhered to especially interms of standard regular laboratory procedures. There is need for studies to compare treatment costs when the protocols are adhered to and when they are adhered to. In addition, there is need for costing ART treatment based on the society's perspective so that both direct and indirect costs of ART can be fully captured. Institutional partnerships between the hospitals and learning institutions are necessary for consistent and comprehensive data collection; this will reduce the probability of under costing the treatment programmes and provide evidence based policy recommendations.

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