

Evaluation of direct medical cost for HIV/AIDS management in Iran

H.B Giwa^{1,2*} A.Giwa¹, M.Davari², M.O Jamiu¹, A.S.A Seyed³, M.Mohraz.³ O.M.Aiyelero⁴

¹Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmaceutical Sciences, University of Ilorin, Ilorin, Nigeria

²Department of Pharmaco-economics and Pharmaceutical administration, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran

³Iranian Research centre for HIV/AIDS, Iranian Institute for Reduction of High Risk Behaviours, Tehran University of Medical Sciences, Tehran Iran

⁴Department Of Pharmacology and Toxicology, Faculty of Pharmaceutical Sciences, University of Ilorin, P.M.B. 1515, Ilorin, Kwara State, Nigeria

*Corresponding Author's Email: hbfgiwa@yahoo.com. GSM: (+234) 7043502592

Abstract

Background: Although Iran has a low prevalence of HIV/AIDS, government budgets and developmental assistance in the management of the disease have reduced over the years. Accurate knowledge of direct medical costs is key to developing and prioritizing healthcare policies and interventions, as well as allocating healthcare resources within budget constraints, to achieve policy efficiency.

Objective: To evaluate direct medical costs for the management of HIV/AIDS Patients in Iran.

Method: A one-year retrospective review of 2000 case notes of HIV/AIDS patients of Imam Khomeini Hospital Tehran (Iranian Research Centre for HIV/AIDS) out of which 322 were selected as the sample size for both Pre-ART and ART patients between January and December 2019. Subsequently, systematic sampling was done, with sampling interval offive . Prevalence rate method is used to determine direct medical costs.

Results: Annual cost for management of 322 Pre-ART and 322 ART patients was found to be \$191,718 with components of \$ 141,492.58 (74%), \$48,582.77(25%) and \$1,612.92(1%) representing the cost of medications, diagnostic tests and personnel respectively. The main cost driver was found to be medications. The annual cost per prevalent case for HIV/AIDS for Iran was found to be \$599.25, with \$129.25 representing cost for pre - ART care and \$470 for ART care.

Conclusion

Annual cost per prevalent case of HIV/AIDS was 55% of annual expenditure per capita. This is quite enormous considering other diseases of high burden. The annual National cost for Iran is \$ 4.9 Million.

Key Words: Direct medical costs, Iran, HIV/AIDS

INTRODUCTION

Iran, along with 18 other middle east and north African (MENA) nations, experienced an increase in the number of new Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) cases and AIDS-related deaths between 2010 and 2015, despite declining global trends¹. The country has a low overall prevalence of the disease (0.1%), but most at-risk populations (MARPs) have higher prevalence rates than the general population, namely: injecting drug users (IDUs) (65.5%), sexual contact (including female sex workers and men that have sex with men (19.6%), mother to child transmission (1.5%), and blood/ blood products (0.7%)². Such epidemics with a prevalence > 5% among specific populations are known as concentrated epidemics, and if ignored and not combated with effective measures, they will most likely evolve into widespread epidemics³. Additionally, the number of infected females and children has been rising². High numbers of youth engaging in risky behaviours have also been reported⁴.

Recent modeling/trends studies have predicted an increase in the disease's prevalence in Iran in the coming years.⁵ All of these worries highlight the importance of taking proactive steps to combat this disease and avoid potential hardship.

Likewise, Iran is an upper-middle income country with a GDP per capita of \$5305 and health expenditure per capita of \$1082⁶. This is a country having high financial commitments in managing its conditions of highest burden such as transportation

accidents, natural disasters, non-communicable diseases and many more^{7,8}. HIV spending has also been colossal over the years. For instance, in 2012, Iran spent \$129,650,000 on the management of HIV/AIDS which was 0.37% of the total health expenditure for that year. Public funds constituted 57%, external funds 8% and private funds 35% of this total spending. Ninety-eight percent of these external funds were sourced from multi-lateral agencies servicing earmarked grants and other international sources⁹. There has also been a reduction in foreign aid that was previously useful, as well as a reduction in earmarked government budgets for HIV management in recent years¹⁰.

Since the judicious allocation of resources to the health sector is getting more and more pertinent¹. The pharmaco-economic approach can be used to analyse the value of health services to the public, as opposed to the traditional market place scenario where values are measured by the prices that the patient or patron is willing to pay. The use of valid economic evaluation methods to measure the value and impact of new services can increase acceptance of such programs by the medical profession, third party payers and consumers^{2,3}.

The objective of pharmaco-economic study is to influence policy formulation and effect decision making, that is to make a person or a group of people change their behaviour and persuade them that a new course of action is a "better" one, "better" simple means that in economic terms, it is more efficient⁴.

Cost of illness analysis measures the magnitude of resources utilized in the management of illness. Knowledge as to the magnitude of these resources will enable planning and cost containment measures.

As illness consumes resources, thus, it has a cost. The cost of an illness is the sum of three components: The medical resources used to treat the illness (direct cost) e.g. hospital care, professional services, drugs and supplies, the non-medical resources associated with it (direct cost) e.g. transportation to the treatment site and hiring of home care and lost productivity due to illness or disability (indirect cost). A fourth category, the intangible cost of pain and suffering is often unquantifiable.⁵

Estimation of direct medical costs of HIV/AIDS was conducted in *Imam Khomeini Hospital Tehran (Iranian Research Center for HIV/AIDS)* with a view of guiding resource allocation decisions to improve the effectiveness of drug therapy and efficiency of health service.

METHODOLOGY

Setting

Imam Khomeini Hospital Tehran (Iranian Research Centre for HIV/AIDS) Iranian Research Centre for HIV/AIDS (IRCHA), as the first academic research centre for research on basic and community based HIV/AIDS research in Iran- affiliated to Tehran University of Medical Sciences (TUMS)- officially started its activity since 2005, and received its approval from Ministry of Health and Medical Education (MOH & ME) of Iran in 2007).

Strengthening IRCHAs research infrastructures, focusing on HIV/AIDS research with an emphasis on preventive, epidemiologic, social, cultural, and psychological aspects of HIV/AIDS, high risk behaviours among sentinel populations and drug abuse, expansion of regional, national and international relationship for information exchange and intersectoral research and contribution in national developmental programs are among global aims of this research centre.

Definition of Pre ART and ART care

Pre ART(Antiretroviral therapy) care is a package of services for patients infected with HIV but has not been initiated to ART care because investigations are still being carried out to determine the appropriate care for the individual patients. Pre ART care includes basic health investigations, management of health related issues, and referral to required service: these could be medical, psychological or social. In Imam Khomeini Hospital Tehran (Iranian Research centre for HIV/AIDS) this period lasts for an average of 1-2 months depending on patients' adherence to instructions. ART care involves the use of Antiretroviral therapy to treat HIV/AIDS disease

Study Population and sample

HIV/AIDS patients that were registered with and attended the Iranian Research Center for HIV/AIDS at the *Imam Khomeini Hospital Tehran* were the subjects for the study. Their population was 2000 for both the Pre ART and ART groups of patients. Fischer's formula was applied to determine sample size from this estimate ²² The required

minimum sample size was thus 322 for the two groups of patients.

Inclusion criteria for the two groups of patients were all HIV/AIDS out-patients who presented for treatment at Imam Khomeini hospital IRCHA clinic regardless of sex and concurrent illness. Patients old or new, aged 18 or above. However HIV in-patients, pregnant women and patients less than 18 year old were excluded from this study.

Study design

The study was a one year retrospective review of 322 case notes of 322 ART and PRE ART patients. Systematic random sampling method was adopted using sampling interval of five for case notes until a total of 322 cases that fits the inclusion criteria were obtained. Excluded case notes were skipped along the sampling process.

Data Instrument

A pre-tested, standardized data collection form (Appendix I) was designed for both PRE –ART and ART patients with columns for Code Number, drugs prescribed with duration on each visit and cost, diagnostic/monitoring tests on each visit and cost, personnel cost and total cost.

The Cost Measure

Only the direct costs were considered. These include

- The cost of drugs
- Diagnostic/monitoring tests
- and personnel costs

Economic perspective

Economic perspective of the hospital were considered since the drugs, diagnostic and personnel costs were borne by the Hospital Management.

Average cost of ART per patient

Socio demographic data of patients and identities of the diagnostic tests, medications, vaccines and their duration of therapy were obtained from the patient case notes using at the centre, while the prices were obtained from the Iranian food and drug administration and markup for public sector was added. The total annual ART cost per prevalent case was then computed after conversion from the Iranian rials to dollars based on the current conversion rate of 114,500 IRR to one dollar (2019).

All these costs were added up for each subject. The average cost was (cost per subject) then calculated and recorded.

Statistical Analysis

Statistical analysis was done using the Statistical Package for Social Scientist version 22. Descriptive analysis included mean, standard deviations, percentages and frequencies, which were used to analyse socio-demographics of patients and inferential statistic (students t test) was used to test difference in mean ages of the different groups.

Ethical Consideration

Clearance from Iranian Research Center for HIV/AIDS Ethical was sought and obtained prior to this study. Ethical clearance number was IR.TUMS.VCR.REC.1398.661

RESULTS**Socio-Demographic Information****Age distribution of patients****PRE ART patients**

The mean age of patients in this group was 40 years. Out of the 322 patients in this

category, 104 of whom were 32.3 % were between 34 and 44 years of age, reflecting the age group with the highest number of people. The age group with the lowest population was 76 to 84 years of age, with only 2 people representing 0.6 % of the total population, as shown in Table 1

Table 1 Age Distribution of PRE ART patients

Class interval	Frequency	Percentage (%)
3 -11	7	2.2
11 - 19	4	1.2
19 - 27	23	7.1
27 - 35	92	28.6
35 - 44	104	32.3
44 -52	46	14.3
52 - 60	23	7.1
60 - 68	17	5.3
68 -76	4	1.2
76 -84	2	0.6

ART Patients

The mean age in this category was 39 years. Out of a total of 322 patients 29.8% were found to be within the ages of 35 to 44 years. This represented the age group with

the highest number of people, while the 68-76 (0.6%) and 76-84 (0.6%) age groups had the lowest number of patients receiving ART therapy, as shown in table 2 below

Table 2 Age Distribution of ART patients

Class Interval	Frequency	Percentage %
3 -11	10	3.1
11 - 19	10	3.1
19 - 27	21	6.5
27 - 35	87	27.0
35 - 44	96	29.8
44 -52	52	16.1
52 - 60	26	8.1
60 - 68	16	5.0
68 -76	2	0.6
76 -84	2	0.6

Table 3: Comparison of Pre ART and ART patients' age distribution

Paired Differences				t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
			Lower	Upper		
.47826	3.41353	.19023	.10401	.85251	2.514	.012

There was a significant difference in the age distribution of patients at Pre-ART and ART (Table 3). For Pre-ART (M = 40, SD = 12.48) and ART (M = 39, SD = 12.99)

tested, df=321; t = 2.514 with a p-value of 0.012 which is less than the significant level.

Sex Distribution of Patients

For both ART and Pre – ART care the male gender had the highest population with both

categories having a male population of > 70% ,as shown on table 3.

Table 4: Sex Distribution of PRE-ART and ART Patients

^a ART care	Frequency	Percentage
Male	230	71.4
Female	92	28.6
Total	322	100
^b PRE ART care		
Male	230	71.4
Female	92	28.6
Total	322	100

^aART :Antiretroviral therapy, ^bPRE ART: Before antiretroviral therapy initiation

Cost of Pre ART Care

This category of care for this centre involved varied tests and medications. Categories of medications administered included antibiotics, anti-tuberculosis drugs and nutritional supplements. The medication that was

administered most frequently was cotrimoxazole while azithromizcin administered least frequently. The most common diagnostic test was routine test which consists of n 38 investigative tests. Another commonly administered test was chest x-ray. All as indicated on appendix II.

The total cost for this category was found to be **\$129.25**, with cost of diagnostic tests being the major cost driver.

Cost of ART Care

ART care is the use of Antiretroviral therapy to treat HIV/AIDS disease. This has been found to be combined with diagnostic tests as indicated by results from this study (Appendix III). The most administered tests for this category were blood urea nitrogen (BUN) and creatinine clearance tests. The most administered medication was found to be Vonnore (Emtricitabine 150 mg+Tenofovir 300 mg+Efavirenz 600 mg) which was administered to 60% of the

patients that were prescribed anti-retroviral therapy. Other administered ART medications were Truvada (Emtricitabine 150 mg + Tenofovir 300 mg), Cobavir (Lamivudine 150 mg+Zidovudine 300 mg), Kaletra (Lopinavir 200 mg+ Ritonavir 50 mg) and Atazanavir among others. The total cost for Pre ART care was found to be **\$129.25** and for ART care it was **\$470** making a total of **\$599**. The annual per prevalent case cost of HIV/AIDS for Iran is therefore **\$599** (Table 5) with the main cost driver found to be medications as indicated on table 5.

Table 5 Annual cost per prevalent case for management of HIV/AIDS at IRCHA

Component	Annual Cost (IRR)	Annual Cost (\$)	Annual Cost per prevalent case (\$)
Pre ART care			
Medications For Pre ART	8,845,379.70		
Diagnostic test and vaccines for Pre ART	4,918,662,468.00		
Personnel	15,298,630.14		
Cost Pre - ART Care	4,942,806,477.84	43,168.62	129.25
Cost of ART Care			
Diagnostic test and vaccines for ART	644,064,736.00		
Medications For ART	16,192,054,402.00		
Personnel	169,380,821.88		
Cost of ART Care	17,005,499,959.88	148,519.65	470.00
GRAND TOTAL	21,948,306,437.72	191,688.27	599.25

^aART :Antiretroviral therapy, ^bPre - ART: Before antiretroviral therapy initiation: ^cIRR – Iranian Rials : ^d\$ - United states dollars

Table 6 : Drivers of Direct medical Cost for Iran

Component	Annual Cost (IRR)	Annual Cost (\$)	Percentage
Medications	16,200,899,781.70	141,492.58	73.81
Diagnostic test and vaccines	5,562,727,204.00	48,582.77	25.34
Personnel	184,679,452.02	1612.92	0.84
Total	21,948,306,437.72	191,718	100

^cIRR – Iranian Rials;\$ - United states dollar

Discussion

The annual cost per prevalent case of HIV/AIDS in the current study represent about 55% of annual health expenditure *per capita*. This average cost of illness(COI) takes into account only the direct costs of therapy. Spending 55 % of per capital on only HIV/AIDS is a great burden. In this case, indirect cost (cost due to morbidity, disability, premature mortality and loss of productive output) was not included in the study. This vast amount of resources dedicated to HIV/AIDS management could be used to manage other diseases conditions, such as noncommunicable diseases, and many others, all of which have a high prevalence in Iran^{7,8}.

With the annual cost per prevalent case of \$599,in a country with a population of 82,055,928² with HIV/AIDS prevalence of 0.1% ² the annual national cost for management of this disease may be as high as \$ 4.9 billion. This, which is believed to be under estimated because of non inclusion of indirect cost is a lot. Indirect costs are difficult to evaluate, but gray Chang *et al* 2012 has shown that it may be as high as the direct cost.

Similarly, comparable studies conducted in 2010–2011 in the same center estimated the per prevalent therapeutic cost to be \$782 however, when research and training costs were combined, the per prevalent case cost

was \$1494¹⁷.Differences between reports of this study and the previous study could be explained by reduced foreign aid ¹⁸ and reduced budgets allocated for the management of these patients by the government of Iran ¹⁸. As mentioned earlier, financial spending for the management of HIV/AIDS for Iran was found to consist of three major components; Public/government funds constituted 57% external funds 8% and Private funds 35%,this is an indication that reduction in public/government funds plays significant role in determining per prevalent case estimates. 98% external funds were found to be from multi-lateral agencies servicing earmarked grants and other international sources¹⁹.

Another study providing estimates for the management of this disease for all countries found estimated costs for management of this disease for middle upper income countries for which Iran belongs to be \$1,454²⁰ Deviations from this cost could also be adduced to decreased foreign aid and government budgets¹⁸ and also the fact that also other components cost such as training, research and services were included for the reference study. In agreement to similar studies^{17,21}this report found the cost drivers of management of this disease to be medications

Only direct medical cost were put into consideration for the measurement of this cost as indirect medical and also intangible costs were not part of the consideration, although this two category of cost has been found to contribute to a large extent to decrease in productivity.

The fact that prevalence of 0.1% resulted into the use of 55% of health expenditure per capital is a clarion call to the Iranian health authorities to intensify preventive interventions to all Iranians. Most especially to most at risk populations and also continue to promote the programs already being practiced in Iran such as establishment of drop-in centres shelters, outreach teams, methadone treatment centres, most-at-risk women's counseling centres, counseling posts, voluntary counseling and testing centers (triangular clinics), telephone hotlines and positive clubs²

Results of socio demographic information obtained from the Iranian HIV / AIDS Research Center at Imam Khomeini Hospital Iran which revealed that the age group with highest prevalence of the disease is between 15 – 49 years was similar to earlier studies for middle east and north Africa region (MENA) and also other epidemiological studies that have been conducted in Iran². This is due to the fact that this age group engaged in more risky behaviors like being highly sexually active, not using protection while engaging in intercourse, having polygamous relationships, having untreated sexually transmitted diseases, injection drug use among others ¹⁶. What makes the disease more devastating is that this age group

engages more in productive activities and higher prevalence related to this age group of translates to profound productivity declines.

Reports for this study revealed that more males were infected than females. This was in agreement with a recent studies that found that most of the infected females are known to have acquired the disease from their male sexual partners who were people living with injection drug use (PWID)². This is more so since the most common route of transmission for Iran is injection drug use (65.8%) and about 1,100 new HIV infections occur annually among sexual partners of PWID, putting them as the second-rank of HIV affected population in Iran”²

Prevalence rate by sex for Iran is contrary to the findings for Nigeria for which it was discovered that the number of females having the disease was 58% of the total number of patients²³. This could result from cultural practices that restricts most females' access to formal education and other forms of gender inequality²³. This leads to information asymmetry among the females regarding this disease as a result more infections occurred among females. This is bearing in mind the background that the major route of transmission for Nigeria is heterosexual intercourse²³.

Conclusion

Annual cost per person HIV/AIDS in Iran was found to be \$599.25 with \$470 representing ART cost and \$129.25 representing Pre ART cost. The main cost driver was found to be medications.

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