Academic Sciences

International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 6, Issue 2, 2014

Research Article

COST-COST ANALYSIS OF ANTI-DIABETIC THERAPY IN A TERTIARY HEALTHCARE INSTITUTION, NORTH-EASTERN NIGERIA

***GIWA ABDULGANIYU[1], TAYO FOLA[2]**

[1]Department of Clinical Pharmacy and Pharmacy Pharmacy Practice, Faculty of Pharmaceutical Sciences, University of Ilorin, P.M.B 1515, Ilorin, Nigeria, [2]West African Postgraduate College of Pharmacy, Yaba, Lagos, Nigeria. Email: folatayo2001@gmail.com

Received: 16 Jan 2014, Revised and Accepted: 28 Feb 2014

ABSTRACT

Objective: To conduct cost-cost analysis of anti-diabetic therapy in a Tertiary Healthcare Institution, North-Eastern Nigeria in 2010.

Methods: A cross-sectional study of 1,200 systematic randomly sampled subjects (Sampling Interval =1) and their prescriptions, and retrospective review of their case-notes was conducted. A Standardized data collection form was designed and used to collect data generated from prescriptions and case notes. Cost-Cost Analysis was conducted by World Health Organization Defined Daily Dose Method.

Results: One Thousand Two Hundred and Forty Two (78.6%) out of 1580 anti-diabetic drugs prescriptions were in branded names while 338 (21.4%) were in generic. The mean cost per DDD of generic and branded metformin (1.5mg daily) were respectively 15.0 ± 0.15 and 30.0 ± 1.9 while those of chlopropamide (250mg daily) were 7.50 ± 0.1 and 30.0 ± 2.5 and for glibenclamide (5mg daily) were 5.0 ± 0.2 and 12.50 ±2.8 respectively. All, 1580 (100%) prescribed branded and generic equivalent anti-diabetic drugs were available, none were out of stock. Subjects were able to afford more prescribed generic anti-diabetic drugs, 329 (97.3%) out of 338 times compared with 802 (64.6%) out of 1242 times for branded. The difference was statistically significant.

Conclusion: Branded products were more frequently prescribed than generic equivalent products for all anti-diabetic drugs used. Generic products were lower cost options to branded equivalents for all anti-diabetic drugs analyzed. Generic and branded anti-diabetic drugs were largely available but the Generics were more affordable than branded equivalents.

Keywords: Cost-Cost Analysis, Cost-Minimization Analysis. Anti-Diabetic Therapy, Pharmaco-Economics, Availability, Affordability.

INTRODUCTION

Millennium development goal 7 emphasizes equitable access to essential drugs. One third of world population (1.7-2.1 billion) lacked access to essential drugs [1]. A major obstacle to achieving equitable access to drugs is price [2], especially in countries where drugs are paid out of pocket. Drug financing in Nigeria, for example, is generally out of pocket, with 70.2% people living below poverty line of less than 1USD per day [3]. Strategies which would contain and moderate drugs' prices are needed to improve access to drugs. One of such strategies is the efficient use of generic drugs to foster competition in drugs market and therefore provide lower priced drugs in the health system [4], [1].

Generic drug is a drug product that compares with pioneer, reference (innovator) drug product in dosage form, strength, route of administration, quality, performance characteristics and in intended use. It could be generic-branded, semi-branded or unbranded generic. Generic medicines are available in all medicine outlets in Nigeria but branded products were found to cost 2 to 7 times the lowest priced generic equivalent [3]. High volume of generic prescriptions does not necessarily translate to maximal cost savings accruable by use of generic medicines [5]. Savings generated by generic drugs in the last ten years was US 734 billion [6]. Generic drugs generate savings of 25 billion pounds each year for EU healthcare [7].

Branded antimicrobials were prescribed even when generic equivalents were available. This was common in public and private hospitals in Lagos State despite the much more expensive nature of branded products [8]. There is need to establish whether anti-diabetic prescription follow the same pattern. This become very crucial because diabetes mellitus is of public health importance since it has no known cure, affects 1 to 2% of global population and the prevalence is increasing with a wide range of complications that have clinical, social and economic implications [9]. Upon consideration of the impact of anti-diabetic therapy on the overall cost of healthcare of diabetic patients who uses this class of drugs for lifetime from time of diagnosis, effort designed to reduce expenditure on this class of drugs as well as use them more effectively would be advantageous [9]. This group of drugs is also faced with problems of availability, affordability and non-use of generic names. Cost-Cost Analysis (CCA) otherwise known as Cost-Minimization Analysis is a useful pharmaco-economic tool that could provide evidence-based information for policy enforcement to alleviate these problems. CCA involves calculating the cost of two or more alternatives that have the same outcome to identify the lowest cost option e.g. in branded and generic equivalent products [10]. It compares the costs of different interventions that are assumed to provide equivalent benefits. The aim is to decide the least costly way of achieving the same outcome [11]. This study was aimed at conducting Cost-Cost Analysis of Anti-Diabetic Therapy in North-Eastern Nigeria in 2010.

METHODS AND DISCUSSION

Choice and Description of Study Area

The study was conducted at the University of Maiduguri Teaching Hospital (UMTH), Maiduguri, Borno State, Nigeria. The Hospital was chosen because it was the only University Teaching Hospital in North-Eastern Nigeria, serving the six catchment states of North-Eastern Nigeria. Diabetes Mellitus cases were usually referred to UMTH from these catchment states.

Ethical Consideration

Ethical Approval was obtained from Research and Ethics Committee of UMTH.

The selected diabetic patients were told that they would be interviewed and that their prescriptions and case-notes would be examined and used for research purposes. Their consent was sought and obtained at the point of exit from the pharmacy, before interview and data collection.

Study Population and Sample Size Determination

Type II diabetes mellitus patients that were registered with and attended the Diabetes clinic of UMTH were the subjects for the study. Their population from inception of UMTH in 1983 to December 2009 was obtained from Medical Record Department and

was assumed /used as the estimate of the population size of serviced Type II diabetes mellitus patients. This was 2,528. Fischer's Formula [12] was applied to determine sample size from this estimate. The required sample size was 351. However,

1, 200 of estimated population were studied due to availability of resources and to reduce error.

Study Design and Subjects Selection

A cross-sectional study of old and new cases of Type II diabetes mellitus by systematic random sampling (Sampling Interval=1) of diabetic patients and their prescriptions at the point of exit from out-patient pharmacy was carried out on diabetes clinic days until a total of 1,200 cases that fall within the inclusion criteria were obtained. This was carried out on diabetes clinic days, which had pool of the cases. A retrospective review of their case-notes was also carried out.

Treatment Options

Branded and their generic equivalents used in UMTH were the two options available for each of 5mg glibenclamide tablet, 500 mg metformin tablet and 250 mg chlopropamide tablet.

Innovator products were considered as branded while others were assumed to be generic for each of these anti-diabetic drugs used in UMTH.

The equivalents were evaluated using the same dosage form, equal strength and the same frequency of dosing for all the drugs considered.

Objective

To determine which anti-diabetic options (generic or branded) is a lower cost option and compare frequency of their prescription in 2010 in UMTH.

Economic Perspective

Economic perspective of the patients was considered since the drug cost was borne by them.

Data Instrument

A pre-tested, standardized data collection form (Appendix I) was designed with columns for code number as the patients' hospital number, diagnosis, weight, height, age of onset (year of first diagnosis), prescriptions (generic/branded), duration of present regimen, relevant diagnostic/monitoring test result [fasting blood sugar (FBS) and glycosylated haemoglobin (HbAlc)], blood pressure (B.P), physician's remark/comments, number of anti-diabetic drugs on prescription, total number of prescribed anti-diabetic drugs available in the pharmacy, number out of stock, number of anti-diabetic drugs that is affordable, number of the available anti-diabetic drugs the subjects did not buy due to cost (not affordable), defined daily dose (DDD) and cost/DDD.

Data Collection

Filled prescriptions at the point of exit from out-patient pharmacy was used to extract information for the section of the designed data collection form relating to the code number, number of anti-diabetic drugs on current prescription, total number of currently prescribed anti-diabetic drugs available in the pharmacy, number out of stock indicated by o/s written against the anti-diabetic drug on the prescription sheet by the pharmacist, number affordable (assumed to be anti-diabetic drug a subject paid for immediately after costing at the out-patient pharmacy) indicated by a tick against the anti-diabetic drug on the prescription sheet by the pharmacist, number not affordable (assumed to be anti-diabetic drug a subject did not buy immediately after costing at the out-patient pharmacy) indicated by having no mark against anti-diabetic drug on the filled prescription. DDD and cost/DDD was also entered as subjects come to fill their prescriptions consecutively at the out-patient pharmacy.

Patients' code number from the selected prescriptions was used to trace their case-notes at Medical record department to obtain other relevant information required in the data collection form that were not available on the filled prescriptions for each of the subject whose prescriptions have been sampled for this study (n=1,200).

The information include weight, height, diagnosis, year of first diagnosis, duration of present regimen, physician's remark on glycemic control and regularity on medication, relevant diagnostic/monitoring test (latest FBS, HbAlc) and blood pressure.

Data collection continued in a systematic random sampling (Sampling Interval =1) on diabetes clinic days (Tuesdays) until 1,200 anti-diabetic prescriptions and their case-notes within the inclusion criteria were obtained.

Cost Measure

Cost per defined daily dosage (DDD) units, as recommended by World Health Organization for analysis of drug use was applied [13]. DDD represents usual dosage of a drug per day [13], [14]. This was applied to the branded and generic equivalents that were used in UMTH.

Mean cost/DDD of branded and generic equivalents anti-diabetic drugs available at UMTH was used.

Cost-Cost Analysis

Cost-Cost Analysis (CCA) was carried out by calculating and comparing the mean cost per defined daily dose (DDD) of two options that have the same outcome (branded and generic products) to identify the lowest cost option [10], [13] [14]. This was carried out for all the oral anti-diabetic drugs for branded and generic equivalents. Cost per defined daily dosage (DDD) units are recommended by World Health Organization for analysis of drug use. DDD represents usual dosage of a drug per day. Being chemically equivalent, it was assumed that branded and generic anti-diabetic drugs were bioequivalent and therapeutically equivalent, hence, the same outcome.

Sensitivity Analysis

Sensitivity analysis was performed to test whether decision changes when specific variables (e.g. cost/DDD) were altered within reasonable range (10-25%) in favour of higher cost option as follows:

Data Analysis

The collected data were analysed using EPI- INFO software version 3.4.1 2007. Data were presented as frequency distribution tables. Chi-Square analysis was used to compare proportions and students't-test was used to compare mean and hypothesis testing.

P-Values < 0.05 were considered significant.

RESULTS

Anti-Diabetic Drugs Utilization: Prescriptions, Availability and Affordability

One Thousand Two Hundred and Forty Two (78.6%) out of 1580 anti-diabetic drugs prescriptions were in branded names while 338 (21.4%) were in generic names. There was a significant difference in these proportions*.

All, 1580 (100%) prescribed branded and generic equivalent anti-diabetic drugs were available, none were out of stock in UMTH Pharmacy. Subjects were able to afford more prescribed generic anti-diabetic drugs, 329 (97.3%) out of 338 times compared with 802 (64.6%) out of 1242 times for branded. The difference was statistically significant**.

Table 1: It shows sensitivity analysis for cost-cost analysis of anti-diabetic drugs

Alteration in variable	Mean Cost per DDD (Naira)
i. Increasing the mean cost/DDD of generic chlopropamide tablet by 25% (N1.88)	Mean Cost/DDD = N7.50 + N1.88 = N9.38
ii. Decreasing the mean cost/DDD of branded chlopropamide tablet by 25% (N7.50)	Mean Cost/DDD = N30 - N7.50 = N22.50
iii. Increasing the mean cost/DDD of generic glibenclamide tablet by 25% (N1.25)	Mean Cost/DDD = N5 + N1.25 = N6.25
iv. Decreasing the mean cost/DDD of branded glibenclamide tablet by 25% (N3.13)	Mean Cost/DDD = N12.50 - N3.13 = N9.37
v. Increasing the mean cost/DDD of generic metformin tablet by 25% (N3.75)	Mean Cost/DDD =N15+N3.75 =N18.75
vi. Decreasing the mean cost/DDD of branded metformin tablet by 25% (N7.50)	Mean cost/DDD = N30 - N7.50 = N22.50

Table 2: It shows anti-diabetic drugs utilization: prescriptions, availability and affordability

	Frequency of Prescription			Available				Affordable			
				Generic	Branded	Generic	Branded	Generic	Branded	Generic	Branded
Drug Prescribed	**Generic**	**Branded**	**Total**	**Yes**	**Yes**	**No**	**No**	**Yes**	**Yes**	**No**	**No**
Metformin	148	568	716	148 (100%)	568 (100%)	0 (0%)	0 (0%)	148 (100%)	362 (63.7%)	0 (0%)	206 (36.3%)
Chlopropamide	16	66	82	16 (100%)	66 (100%)	0 (0%)	0 (0%)	16 (100%)	42 (63.6%)	0 (0%0	24 (36.4%)
Glibenclamide	174	608	782	174 (100%)	608 (100%)	0 (0%)	0 (0%)	165 (94.8%)	398 (65.5%)	9 (5.2%)	210 (34.5%)
Total	338	1242	1580	338	1242	0 (0%)	0 (0%)	329	802	9	440
Chi-square	(21.4%)	(78.6%)	(100%)	(100%)	(100%)			(97.3%)	(64.6%)	(2.7%)	(35.4%)
	χ^2 =64.98; df=1; p =0.000							χ^2 =31.22; df=1; P =0.000			

*(χ^2 =64.98; df=1; p =0.000)

**(χ^2 =31.22; df=1; p = 0.000).

Table 3: It shows prescription pattern of identified treatment options for cost-cost analysis in type II diabetes mellitus Multiple Response n=1580

Anti-Diabetic Drug	Option I Generic Frequency of Prescription	Option II Branded Frequency of Prescription	Total Frequency of Prescription	Chi- square
a. Metformin	148 (20.7%)	568 (79.3%)	716 (100%)	* χ^2 =64.98; df=1; P=0.000
b. Chlopropamide	16 (19.5%)	66 (80.5%)	82 (100%)	** χ^2 =74.42; df=1; P=0.000
c. Glibenclamide	174 (22.3%)	608 (77.7%)	782 (100%)	*** χ^2=60.50; df=1; P=0.000

Table 4: It shows comparison of mean cost/DDD of generic and branded anti-diabetic drugs

	DDD	Mean Cost /DDD (Naira)		Students' t-test
		Generic	Branded	
a. Metformin	1.5gm daily	15.0 ± 0.15	30.0 ± 1.9	t=185.87; df=714;
b. Chlopropamide	250mg daily	(n =148)	(n=568)	P<0.05
c. Glibenclamide	5mg daily	7.50 ± 0.1	30.0 ± 2.5	t=72.08; df=80;
		(n=16)	(n=66)	P<0.05
		5.0 ± 0.2	12.50 ±2.8	t=66.08; df=780;
		(n=174)	(n=608)	P<0.05

Table 5: It shows sensitivity analysis for cost-cost analysis of anti-diabetic drugs

Alteration in Variable	Mean Cost/DDD (Naira)
i. Increasing the mean cost/DDD of generic chlopropamide tablet by 25% (N1.88)	9.38
ii. Decreasing the mean cost/DDD of branded chlopropamide tablet by 25% (7.50)	22.50
iii. Increasing the mean cost/DDD of generic glibenclamide tablet by 25% (N1.25)	6.25
iv. Decreasing the mean cost/DDD of branded glibenclamide by 25% (N3.13)	9.37
v. Increasing the mean cost/DDD of generic metformin tablet by 25% (N3.75)	18.75
vi. Decreasing the mean cost/DDD of branded metformin tablet by 25% (N7.50)	22.50

Identified Treatment Options for Cost-Cost Analysis in Type II Diabetes Mellitus in UMTH

Out of 716 metformin tablets prescripotion, 148 (20.7%) were in generic while 568 (79.3%) were in branded name. Sixteen (19.5%) and 66 (80.5%) out of 82 Chlopropamide prescriptions were in generic and branded names respectively. One hundred and seventy four (22.3%) and 608 (77.3%) out of 782 glibenclamide prescriptions were in generic and branded names respectively.

Branded products were more frequently prescribed than generic equivalent products for all anti-diabetic drugs used. There was a statistically significant difference in the frequency of prescription of branded and generic anti-diabetic drugs for Metformin*, Chlopropamide** and Glibenclamide*** respectively.

Mean Cost/DDD of Anti-Diabetic Drugs

The mean cost per DDD of generic and branded metformin (1.5mg daily) were respectively 15.0 ± 0.15 and 30.0 ± 1.9 while those of chlopropamide (250mg daily)were 7.50 ± 0.1 and 30.0 ± 2.5 and for glibenclamide (5mg daily) were 5.0 ± 0.2 and 12.50 ±2.8 respectively. Students't-test showed that there was a statistically significant difference in the mean cost per DDD of branded and generic equivalent product for all anti-diabetic drugs applicable for cost-cost analysis.

Sensitivity analysis for cost-cost analysis of anti-diabetic drugs

Sensitivity Analysis was performed to test whether the decision changes when specific variables (e.g. Mean Cost/DDD) were altered within reasonable range in favour of higher cost options. Sensitivity Analysis (what 'if' analysis) indicates that the decision is still valid, showing that generic products are lower cost options to branded equivalents for all anti-diabetic drugs applicable for cost-cost analysis analysis.

DISCUSSION

Anti-Diabetic drugs utilization studies for cost-cost analysis in UMTH shows that branded products were more frequently prescribed for all categories of oral hypoglycemic agents used than their generic equivalents. This is in agreement with a previous study that reported that branded anti-microbial drugs were more frequently prescribed even when generic equivalents were available in hospitals [15], [16], [17]. It however, conflicts with the National Drug Formulary, the essential drugs decree and the National Drug policy [18] that specifically stipulate that generic products should be prescribed. Lack of assurance in efficacy/effectiveness of some generics may be a factor for this trend due to chaotic drug distribution system in Nigeria which facilitates faking and counterfeit products [19]. There was no rational for branded drug to be used if generic equivalent is available and there is guarantee of its effectiveness (outcome). Due to assumed identical outcome of the two options, it is important that generic products are properly analyzed to ensure their bioequivalence with acceptable standards. Branded Products can be substituted when generic products are not available, but they must also be of acceptable standards.

Appendix I: Data Collection Form for Cost-Cost Analysis

S/N	Date	Patient's Code Number	Diagnosis and FBS at diagnosis	Weight in kg at diagnosis	Height in Metres at diagnosis	Relevant Diagnostic/Monitoring Test (Latest FBSin mmole/litre)	Relevant Diagnostic/Monitoring Test (Average HbAlc %)	Year of First Diagnosis (Age at Onset in Years)	Concurrent Illness	Prescriptions (Generic/Branded)	Duration of Present Regimen (Month)	Physician's Remark on Glycemic Control and Regularity on Medication	B.P(mm Hg)	Number of Antidiabetic Drug on Prescription	Number Available	Number Out of Stock	Number of Available ones that are Affordable	Number not Affordable	Defined Daily Dose (DDD)	Cost/DDD	Duration of Therapy	Total Cost of Drugs

The use of generic names for drug purchasing as well as prescribing carries considerations of clarity, quality and price. Proponents of drug purchasing and prescribing point out that generic names are more informative than branded names, facilitate purchasing of products from multiple suppliers (competitive bidding) and facilitates products substitution whenever appropriate (reduce inventory). In addition, generic drug products are often cheaper than branded products [20]. Generic substitution has long been applied in formulary system. It has the benefit of discouraging the use of less than optimal drug therapy, encourages competitive bidding and reduce inventory. These benefits have in some cases been quantified as direct drug and inventory saving [21]. Generic drug programme are today probably the most relevant economic strategy for drug supply [22]. If generic substitution does not exist, price competition will not exist either and price of drugs will swell [22]. Generic substitution which applied CCA stimulates bioequivalence comparisons and help to prevent the stocking of less than optimal products.

The result of this study is evidence-based information that can be used to influence prescription practice: irrational prescription of branded anti-diabetic drugs which are used for lifetime from diagnosis of a patient than cheaper generic equivalents, by using the information for educational intervention at prescribers' and managerial level.

This work can form the basis for educational and managerial interventions on prescribing habit to conform to the requirements of the Nigeria essential drug policy [18]. This can be facilitated in

collaboration with drug regulatory agency such as National Agency for Food, Drug Administration and Control (NAFDAC).

A mechanism for comparing costs, such as CCA can lead to more rational prescribing and limit the number of drug products included in each therapeutic class. Cost of drug would be reduced as well as patients drop out of treatment because of cost. This is an established fact [23], [24]. Brand name drugs are often dispensed when generic alternatives are available resulting in an estimated $8.8 billion in excess expenditure per year in the United State [25]. This irrational use of brand name drugs may reflect physician and patient beliefs that brand name drugs are superior to their generic counterparts [26].

Habitual use of brand name terminology may also play an important role in the dispensing of brand name products, as the name recorded on a prescription can impact

on whether a drug is dispensed in brand or generic form even when the physician would accept the generic version and the pharmacy is empowered to provide it [27], [28]. However, generic substitution is not mandated in most states, can be overridden by the prescribing physician and does not universally occur when allowed by the physician [27], [28].

The use of brand names also has consequences for communication between physicians and patients. Confusion over drug terminology can result in adverse drug events. For example, a patient may inadvertently be given a second formulation of a drug because the prescribing physician fails to recognize that the patient was already taking the medication under a different name [29], [30]. In addition, use of brand names in communication by physicians can undermine efforts to minimize commercial influence on medical practice. The use of branded rather than generic names for medications can increase health care costs. Physicians refer to most medications by their brand names, including drugs with generic formulations. This however, leads to higher healthcare costs [31].

All prescribed branded and generic equivalent oral hypoglycemic agents were available in all cases. This trend would be profitable to the health care institution, relatively reduce cost of drugs to patients with respect to retail pharmaceutical premises and enhance public confidence in government hospitals.

In the present study, subjects could not buy 28.4% of available oral hypoglycemic agents because of cost. This is in agreement with results of a similar study which found that patients could not afford 35% of available prescribed medicines in a tertiary healthcare institution in Nigeria due to cost/poverty [32].

Subjects were able to afford more prescribed generic anti-diabetic drugs compared with branded. They were unable to afford more branded compared with generics. The difference was statistically significant. Millennium development goal 7 emphasized equitable access to essential drugs. One third of world population (1.7-2.1 billion) lacked access to essential drugs [1].

A major obstacle to achieving equitable access to drugs is price/affordability [2], especially in countries where drugs are paid for out of pocket. Drug financing in Nigeria, for example, is generally out of pocket, with 70.2% people living below poverty line of less than 1USD per day [3]. Strategies which would contain and moderate drugs' prices are needed to improve access to drugs. One of such strategies is the efficient use of generic drugs to foster competition in drugs market and therefore provide lower priced drugs that can be afforded in the health system [4], [1].

Cost-Cost Analysis revealed that the mean cost/ DDD of branded anti-diabetic drugs were significantly higher than that of their generic equivalents in use in UMTH. This was so for all the anti-diabetic drugs analyzed. This is evidence that generic anti-diabetic drugs are cheaper than branded ones. This is consistent with a finding that use of branded anti-microbial drugs was common in hospitals despite the more expensive nature of branded over generic anti-microbial drugs [15], [116], [17]. The cost implication is more important for anti-diabetic drugs which are used for lifetime from period of diagnosis of a patient.

Generic medicines are available in all medicine outlets in Nigeria but branded products were found to cost 2 to 7 times the lowest priced generic equivalent [3].

Savings generated by generic drugs in the last ten years was USDS 734 billion in the USA [6]. Generic drugs generate savings of 25 billion pounds each year for EU healthcare [7].

CONCLUSION

Branded products were more frequently prescribed than generic equivalent products for all anti-diabetic drugs used. Generic products were lower cost options to branded equivalents for all anti-diabetic drugs analyzed. Generic and branded anti-diabetic drugs were largely available but the Generics were more affordable than branded equivalents.

The result of this study is evidence-based, and be used to change prescription practice through educational intervention at prescribers and managerial levels. These two should be used to enhance and/or support regulatory intervention.

REFERENCES

1. World Health Organization. The World medicines situation. WHO Document (WHO/EDM/PAR 2004.5) 2004; 1-104.
2. World Health Organization. Measuring medicines prices, availability, affordability and price components. WHO/PSM/PAR/2008.3) 2008; 1-48.
3. Federal Ministry of Health. Medicine Prices in Nigeria: Prices people pay for medicines. Publication of Federal Ministry of Health in collaboration with World Health Organization, Department for International Development and European Union 2006; 1-38.
4. De-Jonchere K, Rietveld, HA, Huttin C. Experiences with generics. Int J Risk Saf Med 2002; 15: 101-9.
5. Mrazek, M, Mossialos E. Increasing demand while decreasing costs of generic medicines (commentary). Lancet 2000; 356: 1784-90.
6. Generic Pharmaceutical Association (GPhA). Economic Analysis of Generic Pharmaceuticals:1999-2008 USD 734 billion in healthcare savings. *http://www.gphaonline.org accessed 9.25 a.m. 25th* August, 2009.
7. European Generic Medicines Association. How to increase patient access to generic medicines in European Healthcare system. http://www.egagenerics.com/doc/ega_increase-patient-access-update-072009.pdf accessed 25th August, 2009.
8. Suleiman IA, Tayo F. Pharmaco-Economic evaluation of anti-bacterial utilization in primary, secondary and tertiary hospitals in a developing economy. Nig Qt.j.Hosp Med 2003; 13 (1-2): 75-9.
9. Cantrill JA. Diabetes Mellitus In: Walker R, Edward C, editors. Text Book of Clinical Pharmacy and Therapeutics. 2nd ed. USA: Mc Graw-Hill companies Inc; 1999. P. 633-52.
10. Bootman JL, Townsend RJ, Mc Ghan WF. Pharmacoeconomics In: Bootman, JL, Townsend RJ. Text Book of Principles of Pharmacoeconomics. 2nd edition. Cincinnati Ohio: Harvey Whitney Books; 1996. p. 1-98.
11. Napper M, Newland J. Health Economics Information Resources, Self Study Course. Bethasda: United State National Library of Medicine; 2003. p. 1-106.
12. Araoye MO. Sample Size Determination In: Araoye MO (Eds) Text Book of Research Methodology with Statistics for Health and Social Scientists. Ilorin- Nigeria: Nathadex; 2003. p. 117-20.
13. World Health Organization. Defined daily dose approach to economic evaluation of drug therapy. WHO Health economics and Health sector reform document WHO/HE/HSR 2007; 1-176.
14. Nertheimer AL. The defined daily dose system (DDD) for drug utilization review. Hospital Pharmacy 1986; 21: 233-41.
15. Giwa A, Osagbemi GK, Atata RF, Giwa HBF. Comparative Pharmacoeconomic Analysis of Benzathine Penicillin and Procaine Penicillin in the treatment of early syphilis in a University Teaching Hospital in Nigeria. Journal of Pharmacy and Bio 2008; 5(2): 41-6.
16. Giwa A, Osagbemi GK, Olayinka BO and Giwa HBF. Pharmacoeconomic Evaluation of Doxycycline and Tetracycline in the Treatment of Chlamydia Implicated Non-Gonococcal

Urethritis in a Tertiary Healthcare institution in Nigeria. Afr. J. Cln. Exper. Microbiol 2009; 10 (1): 38-46.
17. Giwa A, Osagbemi GK, Olayinka BO, Giwa HBF. Comparative Cost Effectiveness Analysis of Streptomycin and Ethambutol in the Treatment of Tuberculosis in a University Teaching Hospital in Nigeria. Afr. J. Cln. Exper. Microbiol 2009; 10 (I): 47-55.
18. Federal Ministry of Health. National Drug Policy Document.2005. p. 1-30.
19. Giwa A, Osagbemi GK, Atata RF, Giwa HBF. Cost-minimization Analysis of Antimicrobial Therapy in A Tertiary Healthcare institution in Nigeria. Journal of Pharmacy and Bio 2008; 5(2): 47-51.
20. Swift RG, Ryan MR. Potential economic effects of a brand standardization policy in a 1000 Bed Hospital. Am J Hosp Pharm 1995; 32: 1242-50.
21. Rubin H, Kellar D. Improving a pharmaceutical purchasing and inventory control system. Am J Hosp Pharm 1983; 40: 67-9.
22. World Health Organization. Task force on health economics and health sector reform report (WHO-TF/HE/HSR/75) 1996. pp. 1-56.
23. La-Ruche G, Lorougoon F, Digdeu N. Therapeutics for the management of sexually transmitted diseases at the peripheral level in Cote d'ivoir: assessment of efficacy and cost. Bulletin of the World Health Organization. 1995. 73: 305-13.
24. Gomo E. *In Vitro* activity of several anti-microbial agents against neisseria gonorrhea and comparison of cost of treatment. Cent Afr J Med 1995; 41: 83-6.
25. Haas JS, Phillips KA, Gerstenberger EP, Seger AC. Potential savings from substituting generic drugs for brand-name drugs: medical expenditure panel survey 1997–2000. Ann Intern Med 2005; 142: 891–97.
26. Banahan BF, Kolassa EM. A physician survey on generic drugs and substitution of critical dose medications. Arch Intern Med 1997; 157: 2080-87.
27. Suh DC. Trends of generic substitution in community pharmacies. Pharm World Sci 1999; 21: 260–65.
28. Mott DA. Cline RR. Exploring generic drug use behaviour: the role of prescribers and pharmacists in the opportunity for generic drug use and generic substitution. Med Care 2002; 40: 662–74.
29. Anton C, Cox AR, Ferner RE. Using trade names: sometimes it helps. Arch Intern Med 2002; 162: 26-36.
30. Schwab M, Oetzel C, Morike K, Jagle C, Gleiter CH, Eichelbaum M. Using trade names: a risk factor for accidental drug overdose. Arch Intern Med 2002; 162: 1065–66.
31. Steinman MA, Mary-Margaret C, Landefeld CS. What's in a Name, Use of Brand Versus Generic Drug Names in United State out-patient practice. J Gen Intern Med 2007; 22 (5): 1-15.
32. Giwa A. Pharmacoeconomic considerations in a depressed economy: influence of poverty. M. Pharm Thesis, University of Lagos. 2001. p. 95-9