



**PRESCRIPTION PATTERNS AND TREATMENT
OUTCOMES OF HYPERTENSION IN URBAN
HOSPITALS OF JOS, PLATEAU STATE**

***L.P. M. Dapar¹, N. N. Wannang², J. C. Aguiyi¹, S. S. Gyang¹,
S. B. Banwat¹ and N.G. Ladep³**

1 Department of Clinical Pharmacy,

2 Department of Pharmacology

Faculty of Pharmaceutical Sciences, University of Jos, Nigeria

3 Department of Medicine, Faculty of Medical Sciences, University of Jos, Nigeria

Abstract

Hypertension has today assumed a public health status, causing extensive mortality and morbidity with cost of treatment worldwide, running into billions of dollars annually as direct and indirect costs. In Africa and particularly Jos, Nigeria, the resources of government (especially the health sector) and individuals are very limited in meeting health care needs. New drugs are daily being introduced to the pharmaceutical market for the management of hypertension in particular and other diseases in general. Therefore, any drug eventually chosen for pharmacotherapy of any disease should be cost effective. The objective of this study was to investigate patterns of drug treatment and costs of anti-hypertensive drugs in the four secondary and tertiary hospitals in Jos city. The study was a qualitative retrospective survey, employing structured questionnaires based on W.H.O methods of drug utilization studies to collect data from patients' case folders. Results of this study revealed several rational and non-rational prescription practices in the hospitals investigated. The use of brand names and injections were high based on WHO-ISH standards but the use of diuretics and calcium channel blockers were seen to be in line with recommendations and similar to patterns observed in other studies within and outside Nigeria. Cost effectiveness in the hospitals studied was averaged at fifteen naira (15.00) per 1 mmHg⁻¹ reduction in diastolic blood pressure. Educational interventions to improve prescription habits will lead to better drug utilization and further enhance cost effectiveness of drug treatment. © 2006: NAPA. All rights reserved.

Keywords: *Prescription; treatment outcome; cost effectiveness; hypertension*

INTRODUCTION

Hypertension represents a major public health issue affecting over one billion people worldwide (Stephanie, 2004) and it is the most common treatable risk factor for cardiovascular diseases in patients over the age of 50 years. Prevalence of hypertension in Nigeria is estimated to be 10.3% of the adult population (Olatunbosun *et al.*, 2000). In sub Saharan Africa, prevalence ranges from 14-33% (Cooper *et al.*, 1997) where, it is the most common cause

of heart failure and ischemic heart disease (Ajayi and Balogun, 2002). High blood pressure per-se does not constitute a disease condition, but it is an important risk factor in other cardiovascular complications of varying morbidity and mortality. The risk of target organ damage and premature death is directly related to the degree of blood pressure elevation, thus, a positive correlation occurs within a diastolic blood pressure range of 70 to 110 mm/Hg. In fact, a persistent difference in

* Corresponding author. Email xwellldapar@yahoo.com Tel: +234-(0)-803-703-6358
ISSN 0189-8434 © 2006 NAPA

diastolic blood pressure of 10 mm/Hg was associated with a 56 and 37 percent reduction in the risks of stroke and coronary heart disease respectively, (McMahon *et al.*, 1990). Hence, a reduction of the elevated blood pressure amounts to significant clinical benefits and offers a good measure of treatment outcome for hypertension.

Hypertension presents a global problem of epidemic proportion with treatment costs running in to billions of dollars annually. Worldwide, hypertension is estimated to account for 6% of deaths (Youfa, 2003). Despite the public health significance of hypertension, control depends primarily on the successful treatment of individual patients. For this reason, the selection of antihypertensive agents is based on their comparative ability to prevent complications and reduce morbidity. Randomised clinical trials have proven the efficacy of beta blockers and diuretics in reducing cardiovascular adverse events (Dahlof *et al.*, 1991). The rapid turn over of new chemical entities for the management of hypertension coupled with aggressive marketing drive by pharmaceutical companies have resulted in new and more expensive drugs in clinical practice resulting in an apparent disparity between evidence based rational use of antihypertensive drugs and what is actually prescribed.

The aim of this study was to determine the pattern of antihypertensive drug use and the cost effectiveness of therapy in urban hospitals in Jos, Plateau State, Nigeria.

MATERIALS AND METHODS

The basic tool of this study was a structured questionnaire designed to extract information from patient case folders. Ethical clearance was sought from the relevant authorities in each hospital prior to data collection.

The study population was drawn from those admitted in the in-patient wards. Patients' records from the hospitals Internal Medicine

Department were randomly selected for data extraction. Only adult patient records that had hypertension as principal diagnosis or those who were being managed for hypertension as a co morbid condition were included in the study population. Pregnant women and patients from surgical wards were included in the study sample only when they were referred to the medicine department for expert management in which case duration of hospitalization and prescription records were only recorded for the period in which the patient was in the medical ward.

These hospitals include : Jos University Teaching Hospital, Evangel Hospital, Plateau State Specialist Hospital, and Our Lady of Apostles' Hospital all in Jos Plateau state, Nigeria. These hospitals represent the major referral centres in Plateau State and surrounding states of Bauchi, Nasarawa, Benue, Taraba, Adamawa as well as the southern parts of Kaduna state (all in central Nigeria).

The sample size for hospitals in this study was limited to the four tertiary institutions in Jos as such all of them were included. However, for confidentiality, the names of the hospitals were blinded in the results. Minimum Sample size of specific cases surveyed was 200 in each facility (WHO 2003). Treatment outcome (benefit) was measured by the level of Diastolic blood pressure reduction (MacMahon *et al.*, 1990)

Direct costs of drugs were calculated from standard price lists in the various hospitals, a combined total cost of the three most commonly prescribed drugs, multiplied by the number of tablets required daily for the duration of hospitalisation was divided by the unit of benefit in each hospital to give an indication of the Cost effectiveness of treatment, (Rational Pharmaceutical Management Plus Programme 2003).

RESULTS

The total number of patients surveyed was 829, made up of 348 (42%) females and 481 (58%) males across the four hospitals (table 1). Mean age of patients were between the brackets 45 and 53 years with no significant difference among male and female patients and also groups of patients in all hospitals ($P = 0.05$). Mean duration of hospitalisation was 7-8 days. Incidence of monotherapy in hypertension was low in all hospitals ranging from 0 to 11.5%.

The result of this study showed that the hypertensive patient population was made up predominantly of moderate and severe hypertension (mean systolic BP ranged from 177 to 208 mmHg⁻¹ while diastolic averaged 115 to 130 mmHg⁻¹). The most prevalent co-morbid conditions were diabetes mellitus, chronic renal

left ventricular hypertrophy and cerebrovascular accidents (stroke).

Tables 2 to 5 present the prescription patterns in each of the four hospitals A to D. Diuretics were the most frequently prescribed class of drugs (36%) followed by calcium channel blockers (35%) and angiotensin converting enzyme inhibitors (19%). Beta-blockers were the least commonly prescribed (5%). Prescription by brand names was quite high ranging from 33% to 57%, so was the use of injections, which, was up to 19% in one hospital (Table 6).

Cost effectiveness ranged from twelve to twenty five naira (12.00- 25.00) for every one millimetre mercury (1 mmHg⁻¹) reduction in diastolic blood pressure figure 1.

Table 1: Summary Of Patient Demographic Information.

HOSPITAL	Mean Age (Years)	IBP (mm/Hg)	FBP (mm/Hg)	Duration of Hospitalization (Days)	Number of drugs prescribed
A n = 209	Female 53.5±10.22	188.9/115±43.4/21.2	126.0/78.0±49.7/29/7	7.8±4.1 7.2±3.4	3.4±1.5
	Male 54.0±10.1	192.5/116±34.6/19	137.5/86.7±32.7/19.5		
B n=208	Female 50.4±25.3	192.0/126±35.6/8.9	112.0/76.0±68.3/43.9	8.2±4.4 8.5±7.8	3.1±1.4
	Male 45.0±12.4	208.2/130±41.6/26.9	102.4/63.5±70.8/43.1		
C n=209	Female 48.1±13.0	189.8/123.8±38.9/20.3	130.5/92.1±27.0/16.3	5.4±2.8 8.1±1.2	3.1±1.2
	Male 50.5±10.6	186.7/120.0±12.1/8.9	131.7/93.3±13.3/5.1		
D n=204	Female 47.1±15.5	185.8/119±23.9/20.1	142.1/91.3±21.2/11.3	8.5±4.4 7.1±3.7	2.8±1.2
	Male 49.3±12.8	176.8/117.1±24.3/20.2	141.6/91.7±19.2/13.6		

IBP = Initial Blood Pressure; FBP = Final Blood Pressure

Table 2: Prescription Pattern in Hospital A

DRUG	NUMBER	GENERIC	BRANDED	INJECTABLES	PERCENTAGE
Diuretics					
Hydrochlorothiazide	290	-	290	-	
Furosemide	100	-	100	40	
Hc + amiloride	10	-	10	-	
TOTAL	400				32.8%
Calcium channel blockers					
Nifedipine	340	340	-	-	
TOTAL	340				27.9%
Angiotensin converting enzyme inhibitors					
Captopril	160	160	-	-	
Lisinopril	40	40	-	-	
TOTAL	200				16.4%
Beta blockers					
Propranolol	50	50	-	-	
TOTAL	50				4.1%
Others					
Alpha methyl dopa	10	-	10	-	
Hydralazine	220	220	-	190	
TOTAL	230				1.9%
Total	1220	810	410	230	100%

Hc = Hydrochlorothiazide

Table 3: Prescription Pattern in Hospital B

Drug	Number Prescribed	Generic	Branded	Injectables	Percentage
Diuretics					
Hydrochlorothiazide	10	10	-	-	
Frusemide	160	50	110	90	
Amiloride + Hc	110	-	110	-	
TOTAL	280				35.4%
Calcium channel blockers					
Nifedipine	140	140	-	-	
Amlodipine	40	10	30	-	
TOTAL	180				22.8%
Angiotensin converting enzyme inhibitors					
Captopril	20	20	-	-	
Lisinopril	130	70	60	-	
TOTAL	150				19.0%
Beta blockers					
Propranolol	10	-	10	-	
Atenolol	40	40	-	-	
TOTAL	50				6.3%
Others					
Alpha methyl dopa	80	20	60	-	
Hydralazine	5	30	20	40	
TOTAL	130				16.5%
TOTAL	790	390	400	130	100.0%

Hc = Hydrochlorothiazide

Table 4: Prescription Pattern in Hospital C

Drug	Number	Generic	Branded	Injectables	Percentage
Diuretics					
Frusemide	60	10	50	20	
Hcl + amiloride	190	-	190	-	
TOTAL	250				31.3%
Calcium channel blockers					
Nifedipine	240	240	-	-	
Amlodipine	40	10	30	-	
TOTAL	280				35.0%
Angiotensin converting enzyme inhibitors					
Captopril	30	30	-	-	
Lisinopril	120	20	100	-	
TOTAL	150				18.7%
Beta blockers					
Atenolol	20	20	-	-	
TOTAL	20				2.5%
Others					
Alpha methyl dopa	70	-	70	-	
Hydralazine	30	30	-	30	
TOTAL	100				12.5%
TOTAL	800	360	440	50	100.0%

Hc = Hydrochlorothiazide

Table 5: Prescription Pattern in Hospital D

Drug	Number	Generic	Branded	Injectables	Percentage
Diuretics					
Frusemide	40	10	30	40	
Hc + amiloride	230	-	230	-	
TOTAL	270				31.4%
Calcium channel blockers					
Nifedipine	270	270	-	-	
Amlodipine	30	-	30	-	
TOTAL	300				34.9%
Angiotensin converting enzyme inhibitors					
Captopril	30	30	-	-	
Lisinopril	60	10	50	-	
TOTAL	90				10.5%
Beta blockers					
Propranolol	10	-	10	-	
Atenolol	10	10	-	-	
TOTAL	20				2.3%
Others					
Alpha methyl dopa	130	-	130	-	
Hydralazine	40	40	-	30	
Minpress	10	-	10	-	
TOTAL	180				20.9%
Total	860	370	490	70	100%

Hc = Hydrochlorthiazide

Table 6: Summary of prescription patterns for all hospitals

Drug class	frequency of prescription (percentage)			
	A	B	C	D
Diuretics	32.8	35.9	31.5	31.4
CCB	27.9	23.0	35.0	34.9
ACE-I	16.4	19.2	18.7	10.5
Beta Blockers	4.1	5.1	2.5	2.3
Monotherapy	0.0	4.8	11.5	3.3
Brands	33.6	50.6	55.0	57.0
Generics	66.4	49.4	45.0	43.0
Injections	18.9	16.5	6.3	8.1

CCB = Calcium Channel Blockers; ACE-I= Angiotensin Converting Enzyme Inhibitors

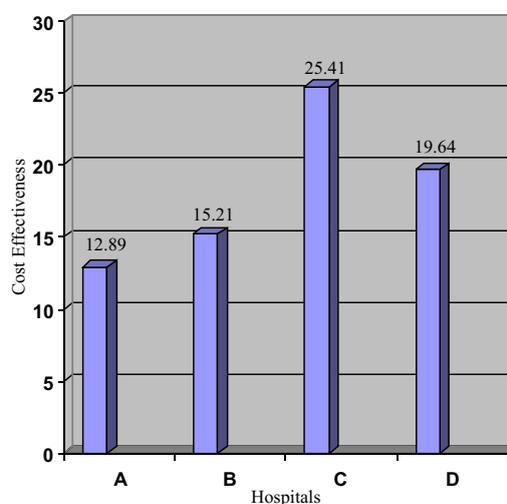


Figure 1: Cost Effectiveness of Drug Treatment of Hypertension Showing Cost in Naira per mm Reduction in Diastolic Blood Pressure.

DISCUSSION

A prescription-based survey is considered one of the most effective methods of assessment and evaluation of the prescribing attitudes of physicians, (Yuen *et al.*, 1998). Several national and international bodies have drawn up recommendations and standard treatment guidelines for the management of hypertension. Unfortunately, attempts by the Nigerian hypertension society in 1996 to produce such a guideline were not successful (Mabadeje, 1999; Soyawo, 2002).

Our findings in regard to the pattern of anti-hypertensive use revealed both rational and some non-rational behaviours of physicians. The low incidence of mono-therapy among the prescribers in all hospitals under study is in line with standard treatment guidelines for hypertension, which, encourage the use of combination therapy. Furthermore, studies have documented the benefit of combination therapy in achieving target blood pressure levels and reducing overall cardiovascular risks, (Hanson *et al.*, 1988; Mancia *et al.*, 1998). The rational combination of drugs seemed to have resulted in adequate blood pressure control in the cases studied as mean blood pressure dropped to values as low as 102 to 142 mmHg⁻¹ systolic and 64 to 92

mmHg⁻¹ diastolic. The cost effectiveness of the respective treatment regimens in each hospital was fair requiring between twelve to twenty five naira (N12.00 - N 25.00) to achieve a one mmHg drop in diastolic blood pressure. Prescriptions by brand names across all hospitals was (33 - 57%) this was mainly due to the high usage of the fix combination of amiloride and hydrochlorthiazide, where almost 100 % of its prescription was under the name moduretic^R even when the brand available in the pharmacy store was not moduretic[®]. The influence of pharmaceutical company representatives also partly explain the widespread use of brand names as we observed that the same generic drug was frequently being prescribed to the same patients under different brand names; especially within the angiotensin converting enzyme inhibitors. We also observed a high proportion of injection use particularly in two hospitals; this could be understood in the light of emergency cases coming to the teaching hospital. However, it is important to remember that sudden drastic reduction in blood pressure is detrimental to the patients as such other means of gradually reducing blood pressure should be adapted as much as possible.

This study revealed on the whole, that diuretics were the most commonly prescribed class of antihypertensive drugs, averaging (33%) followed by calcium channel blockers (30%). This pattern is in line with recommendations of international bodies like the World Health Organization/International Society for Hypertension (WHO/ISH). This pattern is also consistent with the findings of Adigun *et al.*, (2003) and Kazeem *et al.*, (2005) where diuretics were the most commonly prescribed class of drugs in South-western Nigeria. This pattern represents rational choices with well-documented efficacy especially in black hypertensives and those with higher risks of renal complications as reported by Douglas *et al.*, (2003) and Chobanian *et al.*, (2003). However, the negative effect of diuretics on glucose homeostasis and lipid profile should raise some concern especially that diabetes was most prevalent as a co-morbid disease in the patients studied (Prisant *et al.*, 1990).

The low usage of beta-blockers is however, inconsistent with recommendations. Even though this class of drugs has been tested in randomized clinical trials with good efficacy and safety profile as well as affordability, the underutilization in these studies cannot be explained especially since the patient records did not have any documented evidence of adverse effects. The effect of beta-blockers on sexual activity of men cannot account for the low usage seeing that males were more frequently given beta-blockers than females. Moreover, alpha methyl dopa that has both the side effect of disturbed sexual function and a positive combi test was used even more frequently. The use of angiotensin converting enzyme inhibitors is consistent with the trend in diabetic hypertensives and those with renal involvements, (Saunders *et al.*, 1990; Lopes *et al.*, 2002).

The low utilization of beta-blockers and the high proportion of prescriptions in brand names portend some negative economic implications for the patients and in resource

limited settings like ours. The consequences Can not be overemphasized especially with respect to adherence to treatment regimens and the effect of this on outcome (Eraker *et al.*, 1984). There is therefore, the need to introduce interventions that would improve use of generics in order to enhance treatment of hypertension and overall clinical practice.

Notwithstanding that combination therapies are preferred in the management of hypertension, using more than three drugs may be inimical as this would increase the likelihood of side effects, drug-drug and drug-food interactions as well as reduce compliance. Kazeem *et al.*, (2005) had found the prevalence of potentially harmful drug interactions to be in the region of 17.5%. We did not find any recorded evidence of adverse drug effects in patient files; this is quite worrisome especially since there is no institutionalised and well-coordinated adverse drug reaction monitoring, detection and documentation system within Nigeria's health care system leaving such vital documentation at the discretion of the clinician. Studies by Adigun *et al.*, (2003) had similarly recorded a low incidence of documented adverse drug reactions. This points out the clear need for the formulation and implementation of a system of documentation of adverse drug reactions. The current move by the National Agency for Foods and Drugs Administration and Control (NAFDAC) to strengthen pharmacovigilance should be incorporated as part of institutional treatment guidelines for hypertension and other diseases as well.

Conclusion

The prescription patterns of physicians studied in many ways tallied with recommendations of the World Health Organization/International Society of Hypertension, meeting rational pharmacotherapeutic choices of first line regimens for hypertension. Non-rational practices were encountered especially in the

use of injections and brand names. There were no documentations of adverse drug reactions as basis for medication preferences. Overall cost effectiveness was achieved by all hospitals in the therapy of hypertension.

References

- Adigun A.Q, Ishola D.A, Akintomide A.O, and Ajayi A.A.L, (2003): Shifting Trends in the Pharmacologic Treatment of Hypertension in a Nigerian Tertiary Hospital: a real world evaluation of efficacy; safety, rationality and pharmacoeconomics of old and new anti hypertensive drugs. *J. Human Hypertens.* 17(4): 277-285.
- Ajayi O.E, Balogun M.O, (2002): Left Ventricular Diastolic Function in Nigerians with Hypertensive Heart Failure; Abstract in the *ISHIB* programme syllabus. [PUBMED]
- Chobanian A.V, Bakris G.L, Black H.R (2003): Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. *Hypertens.* 42: 1206-52
- Cooper R.S, Ataman S, Mc Gee D. (1997): The Prevalence of Hypertension in Seven Populations of West African Origin. *Am. J. Pub. Health*; 87: 160-168
- Dahlot B, Lindholm L.H, and Hanson L. (1991): Morbidity and Mortality in the Swedish Trial in Old patients with Hypertension (Stop-Hypertension) *Lancet* 338:1281-1285.
- Douglas J.G, Bakris G.L, Epstein M (2003): Management of High blood pressure in African-Americans; Consensus Statement of the Hypertension in African American working Group of the International Society on Hypertension in Blacks *Ann. Int. Med* 163(4). 1744-5
- Eraker S.A, Kirscht J.P & Becker M.H. (1984): Understanding and Improving Compliance. *Ann. Intern Med*, 100:258-68.
- Hansson L, Dahlof B, Gudbrandsson T, Hellsing T, Kullman S, Kuylentierna J. (1988) : Antihypertensive Effect of Felodipine or Hydralazine when added to beta-blocker therapy. *J Cardiovasc. Pharmacol.* 12:94-101.
- Kazeem B. Y, Olumide B. (2005): Physicians' Prescribing of Anti-hypertensive Combination in a Tertiary Care Setting in South-western Nigeria. *J. Pharm. Pharmaceu Sci.* 8 (21): 235-242
- Lopes A. A. (2002): Hypertension in Black People: Pathophysiology and Therapeutic Aspects; *J. Human Hypertens.* 16(1) 1-2
- Mabadaje A. F. (1999): WHO/ISH Guidelines for the management of hypertension complications in Africa: The Nigerian Experience. *Clin. Exp. Hypertens.* 21 (56) 671-681.
- MacMahon S, Peto R, Cutler J (1990): Blood Pressure, Stroke, and Coronary Heart Disease, Prolonged differences in blood pressure: Prospective observational studies corrected for regression dilution bias. *Lancet* 335: 765-774, Mancia G, Grassi G (1998) Antihypertensive Treatment: Past, present and future *J. hypertens.* 16: 51-7
- Olatunbosun S.T, Kaufman J.S, Cooper R.S, Bella A.F (2000): Hypertension in a Black Population: prevalence and biosocial determinants of high blood pressure in a group of Nigerians. *J. human hypertens.* 14(4): 249-57

Acknowledgment

We appreciate the contribution of management of the Hospitals studied especially staff of medical records department. Special thanks to Mr Miri and Mrs Panwal for personally assisting with data collection.

- Olayemi S.O, Mabadeje A.F. (2002): Cost Evaluation of Commonly Prescribed Antihypertensive Drugs and the Pattern of Prescription among Doctors in the Lagos University Teaching Hospital: *Nig. J. Health and Biomed. Sc.* 1 (2): 68-70.
- Prisant L.m, Beall S.p, Nichdads L, Felmand E.B, Carr A.A, Feldman D.s, (1990) Biochemical, Endocrine and Mineral effects of Indapamide in black women. *J. Clin. Pharm.* 30: 121 -126.
- Rational pharmaceutical management plus programme (2003): Drugs and Therapeutics committee Training manual; Evaluating the cost of Pharmaceuticals. Management science for health. Arlington, USA.
- Saunders E, Weir M, Kang W, (1990): A Comparison of the Efficacy and Safety of a Beta-blocker, a Calcium Channel-blocker and a Converting Enzyme Inhibitor in Hypertensive Blacks. *Arch. Intern. Med.* 150: 1707 1713
- Soyanwo M.O. (2002): Issues and non-issues in Hypertension in the Nigerian population. *Afr J. Med Sci.* 31 (2): 179-83,
- Stephanie Laurent (2004): Guidelines from the British Hypertension Society; the lower the blood pressure the better. *Br. med. J.* 328: 593-594
- WHO (2002): Promoting Rational Use of Medicines, Core Components. WHO Policy Perspective on Medicines No.5 Geneva Switzerland.
- WHO (2003): the WHO Manual How to Investigate Drug Use in Health Facilities ; selected drug use indicators. Geneva Switzerland
- Youfa W, Qiong J (2004): The Prevalence of pre-hypertension and Hypertension among U.S Adults According to the new Joint National Committee Guidelines. *Arch. intern. med.*, 164: 2126-2134.
- Yuen YH, Chang S, Chong CK, Lee SC, Critchlev JA, Chan JC. (1998): Drug utilization in a hospital general medical outpatient clinic with particular reference to antihypertensive. *J. Clin Pharm. Ther.* 23:287-294.