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Auditing the Cost of Treating Hypertension in a Tertiary Health Facility in Yobe State, North-Eastern Nigeria

Ahmed Balami[1], Dahiru Hassan Balami[2], Musa Mohammed Baba

1 London School of Hygiene & Tropical Medicine
2 University of Maiduguri

Funding: No specific funding was received for this work.

Potential competing interests: No potential competing interests to declare.

Abstract

Background: Studies quantifying the financial burden of hypertension are lacking, despite the high prevalence of this disease among Nigerian adults, together with its huge associated costs.

Aim: The aim of this study was to estimate the cost of hypertension treatment and blood pressure control among patients attending a tertiary health centre in Yobe, Nigeria

Methods: The study utilised a cross-sectional study design, using interviewer-administered questionnaire to collect information from the respondents. Data on the cost of medications and laboratory investigations were collected from the hospital's billing unit, while other costs were based on self-reporting by the patients. Overall cost of blood pressure control as well as cost-effectiveness for the different drug combinations were calculated.

Results: Most of the respondents were unemployed (62.2%), and out of those who were employed, 43.9% earned below the Nigerian minimum wage of ₦18,000. About a third (36.62%) of the respondents had their blood pressures controlled. The overall average cost of treating hypertension per patient per month was ₦3,374.00; and was ₦3,474.00 for those who were employed, for whom it corresponded to 12% of their monthly income. The average cost of achieving one blood pressure was ₦9,082.14. Mono-therapy with thiazide diuretics was the most cost-effective treatment option.

Conclusion: The cost of treating hypertension in this study was on the high side, with a sub-optimal level of blood pressure control. Considering the high rate of unemployment, as well as the low income among those who were employed, there is the need for government to subsidise hypertension treatment.

Ahmed Dahiru Balami[1,*], **Dahiru Hassan Balami**[2], and **Musa Mohammed Baba**[3]

[1] *Department of Clinical Research, London School of Hygiene and Tropical Medicine, United Kingdom.*

[2] *Department of Economics, University of Maiduguri, P.M.B. 1069, Maiduguri, Nigeria.*

[3] *Department of Internal Medicine, Federal Medical Centre, Nguru, Yobe State, Nigeria.*

[*]**Corresponding Author:**

Ahmed Dahiru Balami

Department of Clinical Research,
London School of Hygiene and Tropical Medicine, United Kingdom
Phone number: +2348065995665
E-mail address: ahdahiru@yahoo.com

Keywords: Hypertension, blood pressure control, cost of treatment, cost-effectiveness, Nigeria.

Introduction

An estimated 1.13 billion people world-wide have hypertension[1], with prevalence ranging from 4% to 78%[2]. In Nigeria, despite the slight variation among communities, the figures have generally been high[3][4][5][6]. A systematic review puts the estimated prevalence of hypertension in Nigeria as at 2010, at 30.6%, with an estimated 20.8 million persons aged at least 20 years affected[7]. Hypertension is associated with severe complications like chronic renal failure[8], ischaemic heart diseases and stroke[9]. A review of epidemiological studies on hypertension conducted in Nigeria revealed that less than half of those who were aware of their hypertension status were on medications, and less than half of those who were on medications had their blood pressures controlled.[10]

In Nigeria, a range of costs have been reported by patients for the treatment of their hypertension. In a teaching hospital in the north-central, patients spent between ₦200 to ₦2,000 monthly on medications alone; and 22.7% of them had stated high cost of medications as the reason for having to stop their treatment at some point in time.[11]. In another teaching hospital the south-South, the cost of anti-hypertensive medications was over ₦4,000 per patient per month.[12] In a rural community in the south-west, the mean cost for hypertension treatment per patient per month was ₦1,440 with 52.8% of them spending over 10% of their monthly income on treatment[13]. An illness could have direct, indirect, and intangible costs.[14]. However, most of the previous studies have not taken into account important costs such as those incurred from laboratory investigations and man-hours of productive work lost. This study aimed at estimating the cost of hypertension treatment and blood pressure control among patients attending a tertiary health centre in Yobe state, north-eastern Nigeria. The results of this study would guide clinicians in individualising their patients, taking into consideration each patient's peculiar socio-economic status. It would also inform policy makers on the necessary measures to take to improve treatment outcomes and minimise costs of treatment.

Methodology

The study was conducted over a period, from 28 December, 2017 to 8 February, 2018 at the Federal Medical Centre, Nguru, a tertiary health centre in Yobe State, North-eastern Nigeria. Nguru is a local government area in Yobe state with

an area of 916 km[2] and a population of 150,632 according to the last census in 2006.[15] A cross-sectional study was conducted among registered hypertensive patients attending the hospital's medical out-patient clinic. To be included into the study, patients must have had at least three clinic visits, and payment for treatment should be out of pocket. Patients who presented as medical emergencies, were excluded from the study, as well as patients with other co-morbidities such as diabetes mellitus. A minimum sample size of 326 respondents was obtained using the one-proportion formula[16] with 0.305 substituted for the anticipated proportion of controlled blood pressure.[17]. The systematic random sampling technique was used to select the respondents, taking 2 as the Kth element.

This study covers the costs borne by the patients (not the government) in terms of cost of medications, laboratory investigations, transportation from home to the clinic, and productive hours of work lost due to the clinic visit. A structured questionnaire was used to collect data from the respondents. It consisted of three sections: Section one asked of respondents' socio-demographic characteristics; section two recorded respondents' clinical profile, while section three assessed the costs incurred from expenditure on blood pressure management (including transportation and man-hours of productivity lost). The Cost of folder, medications and laboratory investigations were obtained from the hospital's billing unit. Information on medications used and laboratory investigations undergone were obtained from patients' case notes, while other information were based on self-report by the respondents. For practical purposes, it assumed in this study that a new folder had to be bought each year. During the study period, the official exchange rate of the US Dollar was ₦305.55.[18]

The data collected was analysed using IBM Statistical Package for Social Sciences (SPSS) version 22. Blood pressure was said to be controlled if the mean of the last two blood pressure measurements were ≤ 140 mmHg systolic and ≤ 90 mmHg diastolic, and uncontrolled once the figures were otherwise [19]. Frequency and percentage were used to summarise categorical data, while mean, was the measure of central tendency used to determine average cost. The average cost of hypertension treatment per patient was calculated by dividing the total cost incurred by all the respondents by the total number of respondents, while the average cost of controlling one blood pressure was obtained by dividing this total amount by the number of respondents with controlled blood pressures. Cost-effectiveness in this study was defined as the cost of achieving one blood pressure control, and the cost-effectiveness of each drug combination was obtained by dividing the total amount spent on that combination by the number of respondents receiving that combination who had their blood pressures controlled.

Ethical clearance as well as permission to conduct the research were obtained from the Health Research Ethics Committee of the Federal Medical Centre, Nguru (FMC/N/CL.SERV/355/VOLiii/169). Informed consent was also obtained from the respondents, after they had been taken through the respondent information section at the cover page of the questionnaire.

Results

The socio-demographic characteristics of the respondents are presented in Table 1. Their median (IQR) age was 54

(20.5) years, most of whom were married (76.9%), had no formal education (62.2%), and were unemployed (62.2%). Out of those who were employed, 43.9% earned below the Nigerian minimum wage of ₦18,000.

Table 1. Respondents' socio-demographic characteristics (N=325)

Socio-demography	Frequency	Percentage
Age		
Median (IQR)	54 (20.50)	
Range	19 to 107	
Gender		
Male	153	(47.1)
Female	172	(52.9)
Total	325	(100.0)
Marital status		
Single	75	(23.1)
Married	250	(76.9)
Total	325	(100.0)
Ethnicity		
Hausa	111	(34.2)
Kanuri/Manga	81	(24.9)
Fulani	53	(16.3)
Bade	43	(13.2)
Others	37	(11.4)
Total	325	(100.0)
Education status		
None	202	(62.2)
Primary	39	(12.0)
Secondary	54	(16.6)
Tertiary	30	(9.2)
Total	325	(100.0)
Employment status		
Unemployed	202	(62.2)
Civil servant	51	(15.7)
Private employment	24	(7.4)
Self-employed	48	(14.8)
Total	325	(100.0)
Monthly income		
None at all	202	(62.2)
Below minimum wage	54	(16.6)
Minimum wage and above	69	(21.2)
Total	325	(100.0)

Around a third (36.62%) of the respondents had their blood pressures controlled. The types of medications and frequency of their prescription is presented in Figure 1. Angiotensin-converting enzyme inhibitors (ACEI) were prescribed for 79.4% of the respondents, making them the most frequently prescribed anti-hypertensive medication, while Angiotensin-receptor blockers (ARB) were the least prescribed (6.5%).

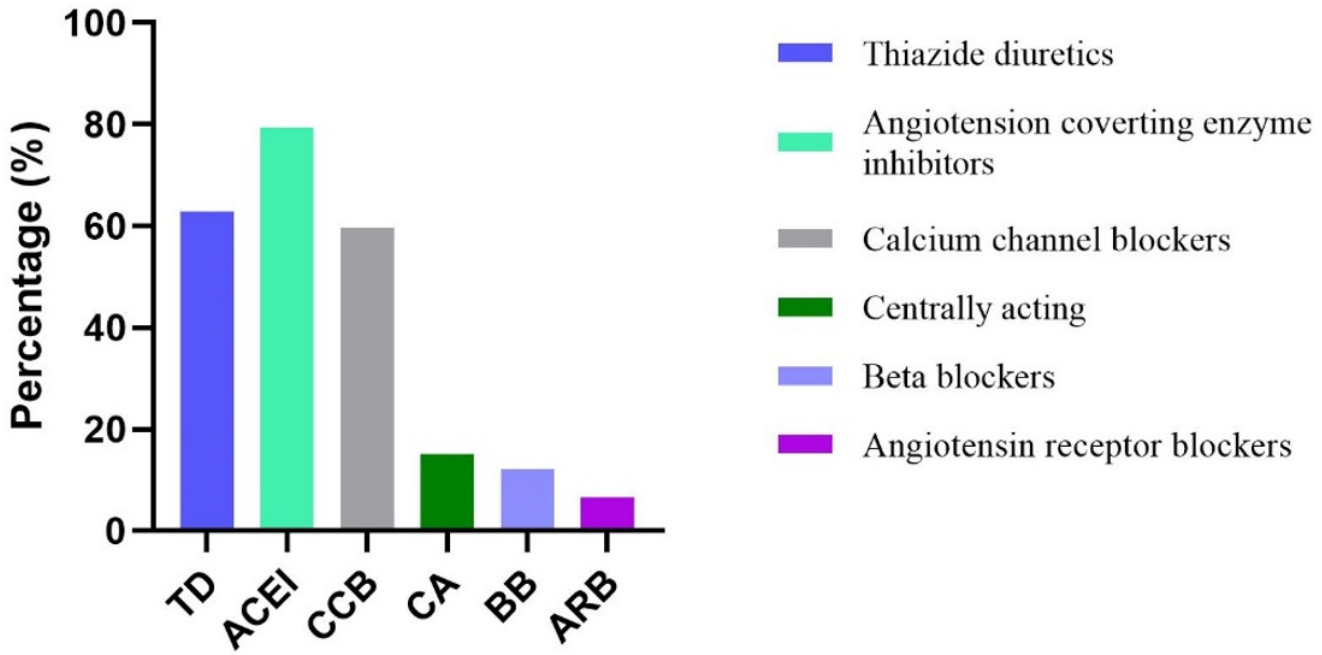

Figure 1. Class and Frequency of Prescribed Anti-hypertensive Medications

Figure 2 illustrates the number of drugs prescribed for the patients. The respondents were predominantly prescribed two or three medications (42% and 36% respectively). Four respondents were only on lifestyle modification and had not been commenced on any medications, while one respondent was on five medications.

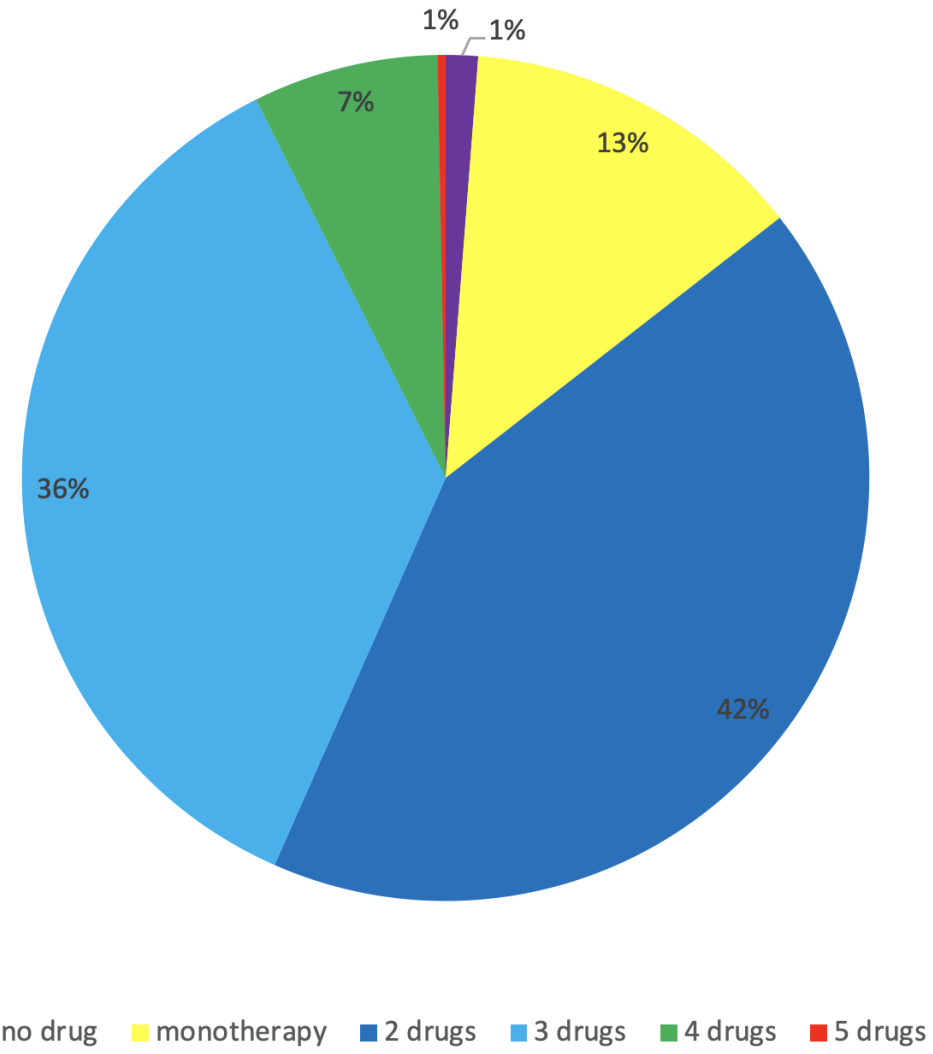

Figure 2. Number of Drugs Prescribed to the Respondents

The laboratory investigations requested for patients during their clinic visits are presented in Table 2. At first visit, serum electrolyte, urea, and creatinine was the most frequently requested investigation (75.1%), followed by fasting blood glucose (65.8%). At follow-up visits however, fasting blood glucose was the most requested investigation (48.9%).

Table 2. Investigations requested by the physician during clinic visits

Investigation requested	First visit		Subsequent visit		
	n	(%)		n	(%)
Serum Electrolyte, Urea & Creatinine					
Yes	244	(75.1)		49	(15.1)
No	81	(24.9)		276	(84.90
Total	325	(100.0)		325	(100.0)
Full Blood Count					
Yes	63	(19.4)		22	(6.8)
No	262	(80.6)		303	(93.2)
Total	325	(100.0)		325	(100.0)
Fasting Blood Sugar					
Yes	214	(65.8)		159	(48.90)
No	111	(34.2)		166	(51.1)
Total	325	(100.0)		325	(100.0)
Electrocardiography					
Yes	17	(5.2)		8	(2.5)
No	308	(94.8)		317	(97.5)
Total	325	(100.0)		325	(100.0)
Lipid profile					
Yes	25	(7.7)		6	(1.8)
No	300	(92.3)		319	(98.2)
Total	325	(100.0)		325	(100.0)
Liver Function Test					
Yes	12	(3.7)		5	(1.5)
No	313	(96.3)		320	(98.5)
Total	325	(100.0)		325	(100.0)
Serum Uric acid					
Yes	9	(2.8)		7	(2.2)
No	316	(97.2)		318	(97.8)
Total	325	(100.0)		325	(100.0)

The costs of medications and laboratory investigations are presented in Table 3. Cost of medications are presented as average monthly cost. Alpha Methyldopa was the most costly anti-hypertensive medication prescribed (₦3,600), while Bendroflumethiazide was the cheapest (₦ 225). For the laboratory investigations, liver function test was the most expensive (₦ 2,500), while fasting blood glucose was the least costly (₦ 500).

Table 3. Official cost of medications and laboratory investigations

Item	Cost in Naira (₦)
Folder	500
Bendroflumethiazide	225
Lisinopril	1,800
Captopril	450
Amlodipine	450
Nifedipine	1,500
Alpha Methyldopa	3,600
Propranolol	225
Atenolol	350
Losartan	1,800
Vasoprin	150
Serum electrolyte, urea, and creatinine	2,200
Full Blood Count	1,000
Fasting Blood Sugar	500
Electrocardiography	1,500
Lipid profile	2,000
Serum uric acid	750
Liver Function Test	2,500

The time interval given for the next clinic appointment ranged from one week to 16 weeks, with an average of 0.52 visits per month. For those who were on medications, the minimum cost incurred per month on medications was ₦ 150 while the highest cost incurred was ₦ 6,050. Six of the respondents had not undergone any laboratory investigation. Five hundred naira (₦ 500) was the least amount spent on investigation, while the highest amount spent on investigations was ₦ 13,150. Table 4 presents the average cost incurred per patient for each item. The highest amount expended monthly, was on medications, while the least was on productive man hours lost to clinic visits. An average of ₦ 3,325.46 was spent monthly on blood pressure treatment per patient. Table 5 captures the costs incurred by only respondents who were employed. The total cost per month was a little greater than that for the unemployed patients (₦ 3,474).

Table 4. Average monthly costs incurred per patient

Item	Cost in Naira (₦)	Cost per month in Naira (₦)
Folder	500.00	500 / 12 = 41.67
Medications	2,519.46 per month	2,519.46 * 1 = 2,519.46
Laboratory investigations	2,993.38 per year	2,993.38 / 12 = 249.45
Transport	853.85 per visit	853.85 * 0.52 = 444.00
Productive work hours lost	136.31 per visit	136.31 * 0.52 = 70.88
Total	-	3,325.46

Note: data for all the 325 respondents included

Table 5. Average monthly costs incurred per employed patient

Item	Cost in Naira (₦)	Cost per month in Naira (₦)
Folder	500.00	500.00 / 12 = 41.67
Medications	2,638.01 per month	2,638.01 *1 = 2,638.01
Laboratory investigations	2,786.99 per year	2,786.99 / 12 = 232.25
Transport	722.76 per visit	722.76 *0.52 = 375.84
Productive work hours lost	358.13 per visit	358.13 *0.52 = 186.23
Total	-	3,474.00

Note: data for only the 123 employed respondents included

The percentage of monthly income spent on treating hypertension among those who were employed was:

= (total amount spent per month on hypertension/total monthly income)*100 %
= (₦ 3,474 / ₦ 29,825.81) * 100 = 11.65%

The cost of achieving one blood pressure control was:

= (Average cost per patient * Total number of patients) / Number of patients with controlled hypertension
= (₦ 3,325.46 * 325) / 119 = ₦ 9,082.14

Table 6 presents the cost and cost-effectiveness of the different combinations of anti-hypertensive medications taken by the respondents. Respondents on monotherapy (Thiazide diuretics) had better blood pressure control (66.7%) and monotherapy was found to be the most cost effective treatment. By contrast, the least blood pressure control (14.3%) as well as least cost-effectiveness was among those on a four-drug combination (thiazide diuretic, angiotensin-converting enzyme inhibitor, calcium channel blocker, and a centrally-acting anti-hypertensive drug).

Table 6. Cost-effectiveness of the different drug combinations

Drugs	Frequency prescribed		Monthly cost	Controlled blood pressure		C.E. (₦ / BP controlled)
	n	(%)	(₦)	n	(%)	
TD alone	6	(1.8)	1,350	4	66.7	337.50
ACEI alone	26	(8.0)	32,100	16	61.5	2,006.25
D + CCB	26	(8.0)	50,400	11	42.3	4,581.82
D + ACEI	41	(12.6)	84,825	18	43.9	4,712.50
ACEI + CCB	49	(15.1)	142,950	20	40.8	7,147.50
D + ACEI + CCB	68	(20.9)	216,750	14	20.6	15,482.14
D + ACEI + CCB + CA	7	(2.2)	23,825	1	14.3	23,825.00

Discussion

The study had recruited an adequate number of respondents (325 respondents against 326 minimum sample size calculated). The results also suggest that the respondents were generally of a low socio-economic status, since as many as 62.2% had no formal education, and the same figure were unemployed. The transport fares spent by the respondents for each clinic visit ranged from ₦100 to ₦11,000, depending on the distance travelled by patient to access care, which is a probable indication of poor access to tertiary health services among residents of certain towns or villages in Nigeria. The blood pressure control rate at the clinic (36.6%), though still low, was comparable to findings from other similar centres in Nigeria like Zaria (36.1%),[20] Abeokuta (46.4%)[21] and Abia (35.0%).[22] The low cost from man hours lost (₦70.88) could be explained by the high unemployment rate and the generally low income among the respondents.

In this study, angiotensin-converting enzyme inhibitors (ACEIs), followed by thiazide diuretics (TD), and then calcium-channel blockers (CCB) were the most frequently prescribed antihypertensive medications. This was similar to findings in a centre in Ibadan, with comparable blood pressure control (33.0%), where ACEIs were the most frequently prescribed, followed by CCBs.[23] Majority of the subjects in this study were on combination therapy, as it was previously reported that a lower proportion of hypertensive patients were on monotherapy (2.5%).[24] Monotherapy with TDs appeared to be the most cost-effective in this study. However, it is unlikely that TDs alone were inadequate for blood pressure control in most cases, as can be seen that almost all patients on TDs were concomitantly taking at least one additional anti-hypertensive medication. The lower cost-effectiveness associated with multiple drugs could be attributed to the nature of the illness, as additional drugs kept on getting prescribed due to the difficulty in achieving blood pressure control.

The average monthly cost of anti-hypertensive medications in this study was ₦2,519.46 (US$8.25), which appears to be on the higher side, compared to other centres in Nigeria, where the monthly cost of medications were: ₦ 2,045 (US$10.2)[24] and ₦ 1,784.71 (US$11.3).[23] Also, considering the average number of persons per household in Yobe state, which is five,[25] and the expectation that many of the respondents are likely breadwinners, an illness that costs around 12% of their monthly income is likely to constitute a huge financial burden to them. Since majority of the patients

were unemployed, it means the costs were probably borne by relatives or other close ones. With increasing unemployment and cost of living, optimal blood pressure control becomes a challenge among the low socio-economic class. Funding from donor agencies for hypertension treatment is generally lacking, as such, the government needs to device mechanisms for subsidising hypertension care, and also support health promotion, so as to reduce the incidence of the disease.

One of the strengths of this study was that it had captured a broader scope of cost (cost of transport and productive work hours lost). However, costs borne by the government in form of costs of building, staff salaries and hospital equipment had not been considered.

Conclusions

The cost of treating hypertension in this study was on the high side, with a sub-optimal level of blood pressure control. Considering the high rate of unemployment, as well as the low income among those who were employed, there is the need for government subsidy on hypertension treatment. It is recommended for future studies to expand the scope by considering the financial burden of complications of hypertension like chronic kidney disease, stroke, and other cardiovascular diseases.

Statements and Declarations

Source(s) of funding

Nil

Conflict of interest

The authors declare that they have no conflicts of interests.

Acknowledgements

The authors acknowledge and wish to express their appreciation to the study participants, as well as the research assistants who helped with the data collection.

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