

Estimated Direct Cost Of Treating Epilepsy Per Month In Southeast Nigeria.

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Citation

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Abstract

In the developing world an estimated 8 million (80%) are not receiving treatment. The management of epilepsy in Nigeria is primarily based on use of antiepileptic drugs. The direct cost of treatment is important in developing countries because economic factors are important determinants of clinical decision making as it affects the level of adherence to treatment in most patients. OBJECTIVES: The aim of this study was to estimate in financial terms, the direct health care costs of treating epilepsy per month of clinic attendance and to relate these costs with the individual patients monthly income. To identify the principal cost drivers and to estimate based on monthly costs the total cost per patient per year. METHODS. This is a cross sectional study conducted among outpatient attendees at the specialist neurology service provided in three tertiary hospitals in Enugu south east Nigeria from September 2008 to April 2010. RESULTS. A total of 120 patients were interviewed. The majority had secondary school education-62.3%; 24 (20%) had regular employment. The total direct medical cost/month was N461,820.00 ((\$3,947.2), the biggest contributor was drug cost N375,350.00(\$3208.10) or 81.3% of the cost burden. The total estimated direct cost/ year was N5,541,840.00 (\$47,366.15) with a mean cost/ year of N46,182.00(\$394.70); 25% of those who worked spent more than 50% of their monthly income of seeking care for epilepsy CONCLUSION. Medication costs contributed the most to the direct costs of treating epilepsy. More than 25% of patients on regular income spend 50% or more of their income in the treatment of epilepsy. Efforts towards reducing the direct cost of treating epilepsy should be directed towards mitigating the cost of the medications, transportation and service charges through appropriate policy interventions.

INTRODUCTION

Epilepsy is the most prevalent and serious neurological disorder¹ occurring in more than 50 million people worldwide. WHO estimates that 10 million people in Africa live with epilepsy, and 8 million (80%) are not receiving adequate treatment.² The prevalence of epilepsy in Nigeria is 6/1000.³ This high prevalence reflects the high incidence of several public health-related diseases complicated by brain damage which may latter result in epilepsy. The management of epilepsy in Nigeria is primarily based on use of antiepileptic drugs (AEDs). The choice of drugs varies considerably among physicians both within hospital and across the country. The cost of treatment should be an important consideration in developing countries because of high levels of poverty. Economic factors are important determinants of clinical decision making at any level as it affects the level of adherence to treatment in most patients.

OBJECTIVES

The aim of this study was to estimate in financial terms, the direct health care costs of treating epilepsy per month of

clinic attendance and to relate these costs with the individual patients monthly income. To identify the principal cost drivers and to estimate based on monthly costs the total cost per patient per year.

METHODS

This study had a cross sectional design and was conducted among outpatient attendees at the specialist neurology service provided in the medical outpatient department of University of Nigeria Teaching Hospital, Ituku-Ozalla, the Federal Neuropsychiatric Hospital Enugu and the Parklane Hospital in Enugu. The patients were interviewed from September 2008 to April 2010. Only patients with good or satisfactory seizure control were recruited (no seizure or 1 seizure in 2 months). The sample consisted of consecutive patients recruited from the pool of waiting patients that had appointment in the Neurology Clinic. Only consenting patients who had diagnosis of epilepsy were included in the survey. The participants were interviewed using a structured interview questionnaire. Information collected included socio-demographic item (age, sex, level of education,

occupation, etc.) and clinical variables including: duration of epilepsy, medications prescribed, interval since the last seizure episode, etc. Also, the patients were asked about the costs of transportation, consultation fees and other hospital charges. The cost of the medications was obtained from the hospital pharmacy and computed for the patients interviewed. The costs of EEG and CT scan and other investigations were excluded because they did not contribute to the cost per month. Comorbid medical and psychiatric conditions were determined and their cost were removed. Data and analysis was undertaken using SPSS package (Version 16) and entailed the calculation of rates, percentages and measures of central tendency and dispersion for the cost related variables.

RESULTS

Sample demographic and clinical characteristics.

A total of 120 patients were interviewed, 74 (61.7%) males, and 46 (38.3%) females. The age range was 15-80 years. The mean age was 31.4± SD 13.17 (32.3 SD15.8 males, 29.9 SD9.8 Females) $p=0.354$. Table1. Seizure duration was between 3 months and 37 years with a mean duration of 9.30(SD 8.32) years. Table 2. The majority had secondary school education-62.3%; while primary and tertiary education 27.3% and 10.4%respectively. Twenty four (20%) of the patients were employed and received regular income which ranged from N4,800.00 –N80,000.00(\$41.02-\$683.76) per month(pm). The total income was N500,000.00 (\$4,273.50), whereas the mean income was N20,833.33(\$17.81) (SD±1.177)pm. The remaining 80% did not have any regular income of their own. The data related to employment status is shown table 3. Sixteen(21.6%) (66.7% of employed patients) were males and 17.4% (33.3% of the employed) were females. Thus the percentage of unemployed men was 78.4% and that of women was 82.6%. Only 21.6% of patients aged 20-69 years were working.

Figure 1

Table 1. Sex and Age distribution of Patients.

Age range	<20	20-29	30-39	40-49	50-59	60-69	≥70	Total
Males	11(14.9)	32(43.2)	14(18.9)	6(8.1)	4(5.4)	2(2.7)	5(6.8)	74(61.7)
Females	1(2.2)	28(60.9)	13(28.3)	2(4.3)	-	2(4.3)	-	46(38.3)
Total	12(10)	60(50)	27(22.5)	8(6.7)	4(3.3)	4(3.3)	5(4.1)	120

Figure 2

Table 2. Duration of Epilepsy

Duration	N	Frequency
<6 Months.	11	9.2
6 Months-1 year	10	8.3
1 -5 years	30	25
5-10 years	21	17.5
>10 years	48	40
Total	120	100

Figure 3

Table 3. Employment status of patients.

Age range	<20	20-29	30-39	40-49	50-59	60-69	≥70	Total
Employed	-	7(11.7)	7(25.9)	4(50)	3(75)	1(25)	2(6.8)	24(20)
Unemployed	12(100)	53(88.3)	20(74.1)	4(50)	1(25)	3(75)	2 (50)	96(80)
Total	12(10)	60(50)	27(22.5)	8(6.7)	4(3.3)	4(3.3)	4(4.1)	120

ANTI- EPILEPTIC DRUG PRESCRIPTION PATTERN

Ant-epileptic drug monotherapy using various drugs was used in 104(86.7%) and multidrug therapy in 16(13.3%). Carbamazepine was the most prescribed AED followed by sodium valproate (70.8% and 14.2% respectively). Table 4

Figure 4

Table 4. Prescription pattern.

Drugs	Number	Frequency	Total cost	Mean cost
Carbamazepine	85	70.8	236400(63%)	2781.2
Valproate	17	14.2	49250(13.1%)	2897
Carbamazepine/Valproate	12	10	72150(19.2%)	6012.5
Carbamazepine/Phenytoin	2	2	7200(1.9%)	3600
Phenytoin	1	0.8	3600 (1%)	3600
Phenobarbitone	1	0.8	900(0.2%)	900
Carbamazepine/Phenobarbitone	1	0.8	2700(0.7%)	2700
Phenytoin/Phenobarbitone	1	0.8	3150 (0.8%)	3150
Total	120	100	375350	3127.9

COST AND EPILEPSY TREATMENT.

Drug and administrative costs were computed for all the patients. Transport and feeding costs were computed for 113 and 65 respectively. The total direct medical cost was N461,820.00 ((\$3,947.2) by 2008/2009 official exchange

rate of \$1=N117).The biggest contributor was drug cost N375,350.00(\$3208.1) which accounted for 81.3% of the cost burden. The mean monthly cost per person (mmp) for each domain of cost burden is depicted in table 5. The data showed that the mean monthly cost (mmc) of epilepsy care was N3,845.50(\$32.9) per person per month(pp/m). Extrapolating using this data, it would appear that the estimated cost per year(c/yr) (calculated by multiplying the mmp) by twelve months would be N5,541,840.00 (\$47,366.15) with a mean cost per year of N46,182.00(\$394.70). Table 5.

Figure 5

Table 5. Mean Cost of Treatment of Epilepsy (Total cost, Transport, Feeding)

	Total cost(120)	Drugs(120)	Transport(113)	Admin.	Feeding#(65)
Total cost/month	461,820	375,350(81.4%)	57,880(12.3%)	22,200(4.8%)	390(1.3%)
Range (N)	1220-9870.	750-8200	30-3000.	-	15-300
Mean cost/month	3,848.5	3,127.9	482.3	185	53.3
+Total cost per/ year	5 541 840	45 042 000	694 560	266.4	76.680

#including accommodation where applicable

+ Estimated cost per year.

INCOME AND COST OF TREATMENT

Among the working persons, the percentage of their individual monthly income spent on seeking medical care per month ranged from 3.3% to 94.2%. Twenty five percent of those who worked spent more than 50% of their monthly income of seeking care for epilepsy. Table 6.

Table 6. proportion of income spent on treatment of Epilepsy.

COST AND PRESCRIPTION PATTERNS.

The most frequent prescribed AED, carbamazepine also consumed most of the resources spent on drugs. They constituted 70.8% of the prescription and 63% of the total drug cost. Multidrug therapy with carbamazepine and valproate constituted 10% of all prescriptions however consumed 19.2% of drug cost. The mean cost of treatment in 104 patients with mono therapy-N2789.9(\$23.5).This value was twice less than the mean cost of treatment with more than one drug N5325(\$45.5) in 16 patients. Table 4 above.

DISCUSSION. This study has explored the direct cost aspects of treating epilepsy in a tertiary referral centers in South East Nigeria. The direct cost of treating patients with epilepsy per month in 120 patients was N461, 820.00 (\$3 947.2) or N3,845.50 (\$32.9) pp/m amounting to N5, 541,

840.00 (\$47, 366.15) or N46,182.00 (\$394.7) per person per year(pp/yr). One of the principal cost driver in this study is transportation. It is not uncommon for people in rural areas to travel long distances to hospitals for treatment. Sometimes people who wish to attend clinics may leave a day or two before the clinic days. In such cases the extra cost of accommodation increases the cost of treatment.

The findings in this study reveals the huge cost of treating epilepsy in a setting where most of the patients are unemployed, dependent, and have no access to any form of public financial assistance or support. Only 20% of the patients were working and 25% of them were spending more than 50% of their income on treatment for epilepsy. Added to the high incidence of common infectious diseases in Sub-Saharan Africa, the added burden of care in epilepsy is easily appreciated when one remembers that 80%(78.4% men and 82.6% women) of the patients were totally dependent on others for payment for treatment. Furthermore, 25% of those working spent more than 50% of the monthly income alone on treating epilepsy. With more than 60% of people in the developing world living on less than \$1 per (\$30) per month the added burden of monthly cost of epilepsy on meager family budget is immense. (UNDP 2001).⁴

The mean direct cost of epilepsy care determined from this study (N3,845.50 (\$32.9) pp/m) probably reflects an underestimate since it did not include certain direct care costs like laboratory and radiological investigations and represents a fraction of the full cost of the condition. The estimation of the latter would include calculating the indirect costs of treating the condition, including lost productivity, cost of absenteeism, unemployment, and stigma and lost opportunity resulting from the condition.⁵

The Pennsylvania Medicaid patients study⁶ measured direct costs, and derived a cost of \$2,011 pp/yr (1992 dollars) much higher than our findings. The direct costs of epilepsy care contributed only 39% to the total cost in a German study.⁷ . In India⁸ the mean drug cost per patient per year varied between USD 27.5 at secondary level to USD 47.7 to 53.7 in the two university hospitals similar to our findings. However drug costs only contributed 56% of the total direct cost which is lower than in our study. A systematic review of the cost of epilepsy in 2008⁹ showed that the mean direct cost of epilepsy ranged from \$40 per year in rural Burundi to \$4748 in a German epilepsy center. The mean direct cost of treatment in our study is almost 10 times the cost in rural

Burundi and 12 times less than the cost in Germany. Our finding is similar to the direct cost of treating epilepsy in China (\$372 in China vs \$394.7)¹⁰ and in studies from Oman¹¹ and Hong Kong¹² showed that the AEDS costs were only about one fourth of the total direct medical costs.

The cost of AEDS was the single most important direct cost contributor in the group of patients studied, similar to the findings in other studies.^{7,13,14} It has been observed that the costs of treating epilepsy may vary with the seizure type, severity, and frequency.¹⁵ The highest cost was in patients receiving carbamazepine alone. The mean cost of using monotherapy was N2,789.90, compared to N5,325.00 in those who received multidrug therapy revealing the cost implications of multidrug therapy in epilepsy. The most commonly used AEDS were carbamazepine, and valproate. Because these are among the oldest of the available drugs for the treatment of epilepsy, this is not an unexpected finding. However, absence of newer agents is noteworthy. The reasons for these may include both cost, availability and physicians personal experiences. The proportion of patients on monotherapy in India^{16,17} (75%-93%) were similar to our finding (85.6%). In tertiary (two university) hospitals,^{16,17} carbamazepine was the most common AED used (44%-50%), followed by phenytoin (22% - 33%) a pattern that differs from our findings. Studies from Oman¹¹ and Hong Kong¹² showed that monotherapy use was as high as in our study. In US,¹⁵ the first choice AED was phenytoin (48%) and carbamazepine (31%) whereas it was more variable across Europe (generally valproate acid and carbamazepine were preferred).¹⁵

A cost minimization analysis of monotherapy with three agents published in 1995¹⁷ determined that phenytoin was least costly, followed by carbamazepine, and Sodium Valproate sodium, however a WHO^{2,19} report recognized Phenobarbitone as the least expensive in contrast to this the two most prescribed drugs in this study were those considered by the WHO report as the most expensive. Though it is expected that doctors should prescribe cheaper drugs, several factors may affect their choice such as seizure severity, side effect profile and personal experience. Being referral centers, most patients in our series might have been referred because of poor control with cheaper drugs in primary care setting. It has been shown⁸ that prescription patterns do vary between secondary and primary healthcare centers.

As high as 80% of patients with epilepsy can be controlled

with one drug in the developing world.^{8,19} In this study, 85.6% received monotherapy and 14.4% were treated with multidrug therapy similar to earlier reviews in the region. The mean cost of treating patients with carbamazepine and sodium valproate was much higher than that for treating with older drugs like phenobarbitone or phenytoin. The cost will be higher still where the controlled release and/or branded forms rather than generic drugs were prescribed. The lower mean cost of monotherapy raises the issue of judicious use of AEDS in a resource poor areas of Africa without compromising care.

Most patients (80%) were unemployed at the time of this study. The high rate of unemployment among epileptic patients is a global phenomenon;²⁰ although, it is related to severity and frequency of seizures as well as stigma and workplace discrimination.^{21,22} The high level of unemployment in the continent, may be contributory.

Epilepsy provides the clearest example of a neurological disorder in which an effective and cost efficient treatment is available, however relative high cost in the developing world has left almost 80-90% of patients in the 'treatment gap'.² On the background of high unemployment, poor remunerations out-of-pocket payment for treatment contribute to poor adherence and 'secondary treatment gap'.²

The findings on this study has raised several important disease management issues. Based on the literature, the high proportion of costs for drugs was not unexpected however, transportation and administrative charges contributed a smaller but definite proportion of the direct cost in treating these patients. Improving infrastructure reducing service charges for patient with epilepsy will reduce the direct cost of treatment. There was a relative over prescription of the two most expensive drugs based WHO reports in these tertiary institutions.

LIMITATIONS

Small sample size may limit the generalization of the findings of this study. Tertiary hospital-based studies such as this are unlikely to reflect the cost of treating epilepsy in the community. Besides, some epilepsy patients seen in a teaching hospital are not optimally treated so direct cost of treatment might be higher. Tertiary hospital setting bias may also have resulted in the inclusion of severe cases of epilepsy. The computation of the direct costs of treating the condition did not include new patients who may have a higher cost.

CONCLUSION

Medication costs contributed the most to the direct costs of treating epilepsy and this tended to be higher for patients receiving the multi drug treatment. Factors such as transportation contributed small but definite percentage of the cost. More than 25% of patients on regular income spend 50% or more of their income in the treatment of epilepsy. Efforts towards reducing the direct cost of treating epilepsy should be directed towards mitigating the cost of the medications, transportation and service charges through appropriate policy interventions.

Author's contributions: EABA conceived the study, collected the data and analyzed the data, EABA, AJU wrote the manuscript and did the literature review; EABA, AJU, OIO designed the study; EABA, AJU, ESO, OIO, OJU reviewed parts of the manuscript. All authors read and approved the final manuscript. EABA is the guarantor of the paper.

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CONFLICTS OF INTEREST

Non declared.

ETHICAL APPROVAL

Ethical approval was obtained from the three institutions.

References

1. Scott RA, Lhatoo SD, Sander JW. The treatment of epilepsy in developing countries: Where do we from here? *Bulletin of the World Health Organization* 2001; 79 (4): 344-351
2. EPILEPSY IN THE WHO AFRICAN REGION: Bridging the Gap. The Global Campaign Against Epilepsy Out of the Shadows" World Health Organization 2004.
3. Osuntokun BO, Scoenberg BS, Nottige VA, et al. Research protocol for measuring the prevalence of Neurologic Disorders in Developing Countries. Result of a Pilot Study. *Neuroepidem* 1: 143-153 (1982).
4. United Nations Development Program (UNDP). Human Development Indicators. 2001
5. Johnson WG The costs of epilepsy and cost-based evaluations of anticonvulsants. *Pharmacoeconomics* 1997; 12: 446-459
6. Edward P. Armstrong and Catherine Cone. The Cost of Treating Seizure Patients in a Managed Care Organization. *COMPARATIVE RESEARCH. J Managed Care Pharm* 1999: 351-56
7. Hamer HM, Spottke A, Aletsee C, Knake S, Reis J, et al. Direct and indirect costs of refractory epilepsy in a tertiary epilepsy centre in Germany. *Epilepsia* 2006; 47 (12): 2165-2172.
8. Krishnan A R, Chowdhury D. Cost of antiepileptic drugs in India. *Neurology Asia* 2007; 12 (Supplement 1) : 42 – 43
9. Strzelczyk A, Reese JP, Dodel R, Hajo M, Hamer HM. Cost of Epilepsy: A Systematic Review *Pharmacoeconomics*. 2008;26(6):463-476 <http://pharmacoeconomics.adisonline.com>
10. Hong Z, Qu B, Wu XT, Yang T. H, Zhang Q, Zhou D. Economic burden of epilepsy in a developing country: a retrospective cost analysis in China. *Epilepsia*. 2009;50(10):2192-8
11. Al-Zakwani I, Hanssens Y, Deleu D, Cohen A, McGhan W, Al-Balushi K, Al-Hashar A. Annual direct medical cost and contributing factors to total cost of epilepsy in Oman. *Seizure* 2003; 12(8): 555-60.
12. Mak W, Fong JK, Cheung RT, Ho SL. Cost of epilepsy in Hong Kong: experience from a regional hospital. *Seizure* 1999; 8(8): 456-64.
13. Tetto A, Manzoni P, Millul A, Beghi E, Garattini L, Tartara A, Avanzini G. The costs of epilepsy in Italy: A prospective cost-of-illness study in referral patients with disease of different severity. *Epilepsy Research* 2002; 48: 207-216
14. Beghi E, Garattini L, Ricci E, Cornago D, Parrazzini F. Direct cost of medical management of epilepsy among adults in Italy: A prospective cost-of-illness study (EPICOS). *Epilepsia* 2004; 45: 171 - 178.
15. Kotsopoulos I A W, Evers S M A A, Ament A J H A, de Krom M C . Estimating the costs of epilepsy: An international comparison of epilepsy cost studies. *Epilepsia* 2001; 42 (5): 634-640.
16. Krishnan A, Sahariah SU, Kapoor SK. Cost of epilepsy in patients attending a secondary-level hospital in India. *Epilepsia* 2004; 45(3): 289-91.
17. Radhakrishnan K, Nayak SD, Kumar SP, Sarma PS. Profile of antiepileptic pharmacotherapy in a tertiary referral center in South India: a pharmacoepidemiologic and pharmacoeconomic study. *Epilepsia* 1999; 40(2): 179-85.
18. Chisholm D. WHO-CHOICE. Cost effectiveness of first-line Anti-epileptic drug treatments in the developing world: A population level analysis. *Epilepsia* 2005; 46(5): 751-9.
19. Onwuekwe IO, Onodugu OD, Ezeala-adikaibe BA. Aguwa EN, Ejim EC. Ndukuba K, et al. Pattern and presentation of epilepsy in Nigeria Africans: a study of trends in the southeast. *Trans R soc trop Med Hyg* 2009, doi: 10.1016/j.2009.04.010.
20. Fisher RS. Epilepsy from the patients perspective: Review of results of a community-based survey. *Epilepsy & Behavior* 2000; 1 (Suppl 1): S9-S14
21. Chaplin JE, Wester A, Tomson T. Factors associated with the employment problems of people with established epilepsy. *Seizure* 1998; 7: 299-303.
22. Heaney D. Epilepsy at work: Evaluation the cost of epilepsy in workplace. *Epilepsia*, 1999; 40 (Suppl 8): S44-S47.

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