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Socio-Demographic Influences on Epilepsy Outcomes in an Inner-City Population

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ABSTRACT

Purpose: Previous studies show anti-epileptic drug compliance and seizure control in people with epilepsy (PWE) to be lower among low-income groups and African-Americans. We examined how socio-demographic factors influence seizure control in an inner-city population.

Methods: The clinic records of 193 PWE were analyzed. Good seizure control was defined as no seizures in the previous year. Bivariate and multivariate analyses were performed to examine the effects of race, age, gender, median household income, medication cost, and insurance status on good seizure control.

Results: There were 69 Caucasians and 124 African-Americans (age 47.8 ± 16.5 years) in the study. African Americans had a significantly lower income than Caucasians ($p < 0.001$); but did not have inferior seizure control ($p = 0.18$). Seizure control was also not affected by gender ($p = 0.82$), AED costs ($p = 0.06$), insurance type ($p = 0.20$), or race-independent household income ($p = 0.75$).

Conclusion: Contrary to prior literature, we find that in our population of PWE there were no significant effects of race or family income on seizure outcomes. Our findings add to the existing literature on socio-demographic disparities in PWE and merit further exploration by other groups

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1. Introduction

Elimination of disparities in health and health care are extremely high public health priorities in the US,[1] but Neurology lags behind other medical specialties in such research.[2] As with other chronic diseases, epilepsy is impacted by various social, economic and cultural factors. However, research on the role of socio-demographic factors such as race/ethnicity, gender, age, and insurance status on medical treatment and outcomes in people with epilepsy (PWE) is lacking, and at times conflicting.[3,4]

Epidemiologic studies have shown higher rates of epilepsy in African-Americans and Hispanics compared to non-Hispanic Caucasians.[5,6] African-Americans have been noted to be less likely to receive anti-epileptic drugs (AEDs),[7] or be compliant with AEDs prescribed,[8–10] and more likely to have visits to generalists [11] and Emergency Rooms[9,11] or to be hospitalized.[11,12] African-Americans are also less likely to undergo epilepsy surgery.[13,14] Status epilepticus[15] and age-adjusted mortality due to epilepsy were also found to be higher in black patients.[16] One study looking into the underlying causes of racial disparity in epilepsy found four major obstacles to optimal care: limited financial resources, lack of knowledge about epilepsy, poor patient-provider communication, and lack of social support.[17] The findings of disparity in epilepsy are not surprising in the context of similar socio-demographic disparity reported in other chronic conditions such as asthma,[18–20] end-stage renal disease,[21] cancer,[22,23] invasive pneumonia,[24] and bariatric surgery [25] among others. On the other hand, there also exists literature which has failed to find racial disparity in epilepsy epidemiology, care or outcomes. In contrast to the above-mentioned reports, some epidemiologic studies did not find a racial difference in the incidence of epilepsy.[26,27] A recent study found increased generalist and emergency room visits among African-Americans compared to Caucasians, and among lower-income compared to higher income PWE, but these effects were seen to be dependent on the center in this multi-center study: controlling for the center in the statistical model negated the significance of these findings.[11]

Based on the previous literature on disparity in epilepsy, we planned to explore the association of socio-demographic variables and epilepsy treatment outcomes in our patient population. In this study we evaluated a racially heterogeneous outpatient epilepsy population to examine different socio-demographic and health-care variables including age, gender, race, family income, cost of medications, and insurance type and their association with treatment outcomes as reflected by seizure control.

Abbreviations: AED, anti-epileptic drug(s); PWE, people with epilepsy.

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2. Methods

The study was approved by the Institutional Review Board at the Drexel University College of Medicine (DUCOM), and was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. Written informed consent was not deemed necessary for this retrospective chart review.

2.1. Recruitment and data collection

The clinic charts of all patients aged 18 and older attending the epilepsy clinic at Drexel University College of Medicine, Philadelphia between 2008 and 2010 were reviewed. A cross-sectional analysis of prevalent cases of epilepsy on anti-epileptic medications was performed. Patients without a clear history of epilepsy, possible non-epileptic seizures or syncope, migraines and patients not on antiepileptic drugs were excluded. Race information was abstracted from the clinical record demographics as self-identified by the patients. Data on race is routinely collected as part of the outpatient demographics at Drexel University. Patients belonging to races other than non-Hispanic Caucasians and African-Americans were also excluded as the numbers were too small for meaningful sub-group analyses. Data collected included age, gender, race, insurance type, current AED, home zip code, age at seizure onset, duration of epilepsy, and seizure control as represented by seizure frequency. The data collected was from the demographic information of the medical record and from the progress note of the treating epileptologist. Ultimately, 193 patients were included for statistical analyses. The primary objective of this study was to determine whether socioeconomic factors specifically race, gender, household income, cost of medications and insurance status are associated with epilepsy control.

2.2. Data coding and calculations

Seizure control as documented in the clinical notes was coded as 'good control' if there were no seizures in the one year prior to clinic visit, and as 'poor control' otherwise in line with previous research.[28] As has been done in previously published health outcomes research, the median household income of patients were calculated from the US census data (2000) of race-specific median household income compared to the patient's zip code.[18,19] Following the methodology of previous research, we calculated the cost of medications based on the generic price for an estimated median dose of AED (available from drugstore.com, Table 1).[29]

2.3. Statistical analysis

To assess the impact of socio-demographic variables on treatment outcomes (good vs. poor seizures control) and race (Caucasian vs. African-American), chi-squared tests (for gender, insurance status) and t-tests (for age, household income, cost of medications) were used. To examine the effect of race-independent income on seizure control, the incomes of all patients were divided into quartiles and compared to the medication costs using ANOVA. Logistic regression of the variables was performed for multi-variable analysis. Statistical analyses were performed using PASW Statistics, Release Version 19.0.0 (SPSS, Inc., 2010, Chicago, IL, www.spss.com).

3. Results

Of the 193 records analyzed, there were 120 females and 73 males with a mean age of 47.8 ± 16.5 years.

Table 1
Monthly calculated expense for anti-epileptic drug generic substitutes used in our patients.

Medication	Median dose	Cost/month
Carbamazepine	200 QID	$19
Gabapentin	800 TID	$73
Lacosamide	150 BID	$437
Lamotrigine	100 BID	$30
Levetiracetam	750 BID	$35
Oxcarbazepine	300 BID	$129
Phenobarbital	60 TID	$12
Phenytoin	100 TID	$32
Pregabalin	200 BID	$176
Primidone	250 TID	$70
Topiramate	200 BID	$50
Valproic acid	750 TID	$54
Zonisamide	300 daily	$180

3.1. Seizure control and socio-demographic variables

The different socio-demographic and health related variables were compared to seizure control (Table 2) and are detailed below.

3.2. Race

There were 124 African Americans and 69 Caucasians included in the analyses. Good seizure control was found in 68 patients (35.2%) and poor seizure control in 125 patients (64.8%). Race did not impact seizure control ($\chi 2$ test, $p = 0.18$; odds ratio 1.54 [C.I: 0.82-2.92]).

3.3. Household income

The household income was not significantly different between patients with good control and those with poor control. Race-specific differences in income and seizure control are detailed below ("Race and socio-demographic/outcome variables"). To examine the effect of race-independent household income on seizure control, the family income of all patients were divided into quartiles of income and seizure control compared between the groups (data not shown). There was no significant difference in seizure control between different race-independent income groups (χ^2 test, $p = 0.75$).

The median household income (±SD) for patients with Medicare ($35,928 ± $13,614), Medicaid ($32,929 ± $11,741) or Private insurance ($32,520 ± $14,057) were not significantly different (ANOVA $p = 0.49$).

3.4. AEDs

Poor seizure control was associated with the use of more AEDs (Figure 1A. $\chi 2$ test, $p = 0.03$) and a non-significant trend toward higher cost of medications ($p = 0.06$). However, the higher cost was likely contributed by outliers as a box and whisker plot showed similar distribution of medication costs between the two groups with a smaller number of patients in the poor control group having a higher medication cost (Figure 1B). The total cost of AEDs did not change as a function of insurance type ($p = 0.60$).

3.5. Race and socio-demographic/outcome variables

The income for African Americans was significantly lower than Caucasians in line with the national census data. The median household income for Caucasians in our group ($44,136) was similar to the national average household income for Caucasians ($44,687) in the 2000 census. The median household income for African-Americans ($26,935) was lower than the national average