

Racial and Sex Disparities in Migraine Treatment

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Abstract: Objective: To evaluate racial and sex-based differences in route of medication administration for emergency department migraine treatment, using parenteral versus oral medication administration as a proxy for more rapid acute treatment. **Background:** Each year, migraine affects over 1 billion people and are the second leading cause of disability worldwide. Of those affected, migraine are present in women nearly 3 times more than men, leading to the stigma of migraine being “a woman’s complaint”. This sexual disparity is compounded by racial inequality. Studies have found that African American patients are often undertreated for pain. However, there is a gap in the literature about how this disparity translates to migraine treatment, specifically considering patient sex. **Methods:** This was a retrospective database analysis, extracted from the Cerner Health Facts database (Cerner Corporation, Kansas City, MO), consisting of patients aged 12-25 who presented to the emergency department for migraine treatment within the years 2015 and 2016. Among the dataset of 1000 randomly de-identified patients, 729 patients presented to the emergency department only once within the time frame. Additionally, we conducted a statistical analysis to determine the significance of the association between more rapid acute treatment with race and sex. **Results:** African American patients were 37% less likely to receive parenterally administered medication compared to Caucasian patients (Odds ratio, 0.63; 95% confidence interval, 0.45-0.88; P=0.01). Furthermore, female African American patients were 46% less likely to receive parenterally administered medication compared to their female Caucasian counterparts (Odds ratio, 0.54; 95% confidence interval, 0.37-0.78; P=0.001). Our results indicated no statistically significant difference in route-based treatment differences between African American males and Caucasian males. **Conclusions:** Significant racial disparities exist in the administration of parenteral migraine medication, with African American patients, particularly female African American patients, being less likely to receive parenteral treatment compared with their Caucasian counterparts. By establishing where racial disparities exist in the health setting, we can work towards closing the gap and moving towards equity. **Plain Language Summary:** Migraine is a common and disabling condition, but little is known about whether race and sex influence how rapidly patients receive treatment in the emergency department. In this retrospective study of patients aged 12–25 years with migraine-related emergency department visits, African American patients, especially African American female patients, were less likely than Caucasian patients to receive parenteral administered medication. These findings suggest that racial and sex disparities may affect acute migraine treatment and highlight the need for more equitable emergency department pain-management practices.

Keywords: Migraine, Emergency Department, Racial Disparities, Sex Disparities, Pain Management, Parenteral Therapy.

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INTRODUCTION

Each year, migraine affect over 1 billion people and are the second leading cause of disability worldwide [1, 2]. Of those affected, migraine are present in women

nearly 3 times more than men, leading to the stigma of migraine being “a woman’s complaint” [3]. This sexual disparity is compounded by racial inequality. In general, pain is undertreated in African American patients due to physician bias and assumed biological differences [4]. In

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fact, there is a 13% decrease in prescription rates for migraine treatments in African Americans versus White Americans [5].

When it comes to medical treatment of migraine, there are two main options for the route of medication administration: parenteral or oral. Parenteral administration describes the delivery of medication that bypasses the gastrointestinal tract, most commonly through intravenous, intramuscular, or subcutaneous injection. The parenteral route of administration provides the most rapid pain reduction when compared to other routes, such as oral administration, for patients with migraine [6]. This is because parenterally administered pain medications do not undergo the “first-pass” phenomenon, unlike oral medications, which are first metabolized by the liver. The first-pass effect is experienced by all drugs taken orally and decreases the active drug’s concentration reaching the systemic circulation and eventually its site of action [7]. Because parenteral medications lack this characteristic, they have a more rapid onset of action and a higher bioavailability when compared to their oral counterpart. For these reasons, patients who receive medication from a parenteral route were given rapid treatment than those who receive medication from an oral route.

Migraine are more prevalent in women, with a 1-year migraine prevalence nearly three times higher than in men and a lifetime incidence over two times as high.³ Studies show that until puberty, migraine affects both sexes equally, but post-menarche, this prevalence in women increases significantly. During menstrual cycles, migraine attacks in women are longer, more severe, more likely to relapse, less responsive to treatment, and associated with greater disability [8]. Compounding these disparities, African American women are shown to receive less aggressive pain management compared to women with similar conditions, including post-surgical care, metastatic cancer pain, AIDS, and other disease processes [9]. We see this disparity in the field of obstetrics as well, where African American women received less morphine after C-sections despite higher mean pain scores [10].

Additionally, African American patients are 35% less likely to receive pain medication in over 7,000 U.S. emergency departments, exacerbating disparities and distrust in healthcare [6-8]. Another example of this disparity is seen in lumbar spine surgery, where African Americans were more likely to receive conservative therapy than White Americans despite increased disease severity.¹² African American patients are also more likely to receive morphine with neurotoxic metabolites, contributing to chronic kidney disease.¹³ Interestingly, African American patients are more likely to be

prescribed opioids for longer periods; however, this can harm long-term healing and is associated with a lower quality of life. This often exacerbates bias since many individuals are given treatments that are not suitable for them.

Disparities in pain management have been well-documented; however, there are few studies examining the quality of pain management for migraine. The objective of our study is to investigate the disparity of medication administration routes in migraine pain in African American patients using retrospective database analysis. The difference in how rapid the onset of action of a medication that a patient receives when they present with a migraine is the measure of racial bias in our study. We hypothesized that African American patients, particularly African American female patients, would be less likely to receive parenteral (versus oral) medication for acute migraine treatment in the emergency department compared with Caucasian patients.

METHODS

This retrospective analysis's data was extracted from the Cerner Health Facts database (Cerner Corporation, Kansas City, MO). Health Facts includes national de-identified data from hospitals across the U.S., specifically focusing on ED visits for migraine from 2015 to 2016. Our dataset consisted of 1000 randomly selected, de-identified patient profiles aged 12 to 25 who presented to the emergency department from 2015 to 2016. The dataset included demographic information and detailed descriptions of migraine treatments, including medication dosages, brand and generic names, and modes of administration. We queried the data using ICD-9 codes 346.02, 346.03, 346.12, 346.13, 346.90, G43.001, and G43.101 to identify relevant cases. The University of Missouri–Kansas City Institutional Review Board determined that this study using de-identified Cerner Health Facts data was non-human subjects research and exempt from IRB approval. Because the data were de-identified, informed consent was not required. Sex was recorded as documented in the Cerner Health Facts database and categorized as male or female.

To examine the relationships between variables, we selected race (Caucasian, African American), sex (male, female), and the route of medication administration (parenteral vs. oral) as our primary variables of interest. To control for variability in migraine treatment based on severity, we included only patients who presented to the emergency department a single time within the given timeframe as our constant variable. This approach resulted in a final analytic cohort of 729 patients as seen in Figure 1 and Table 1.

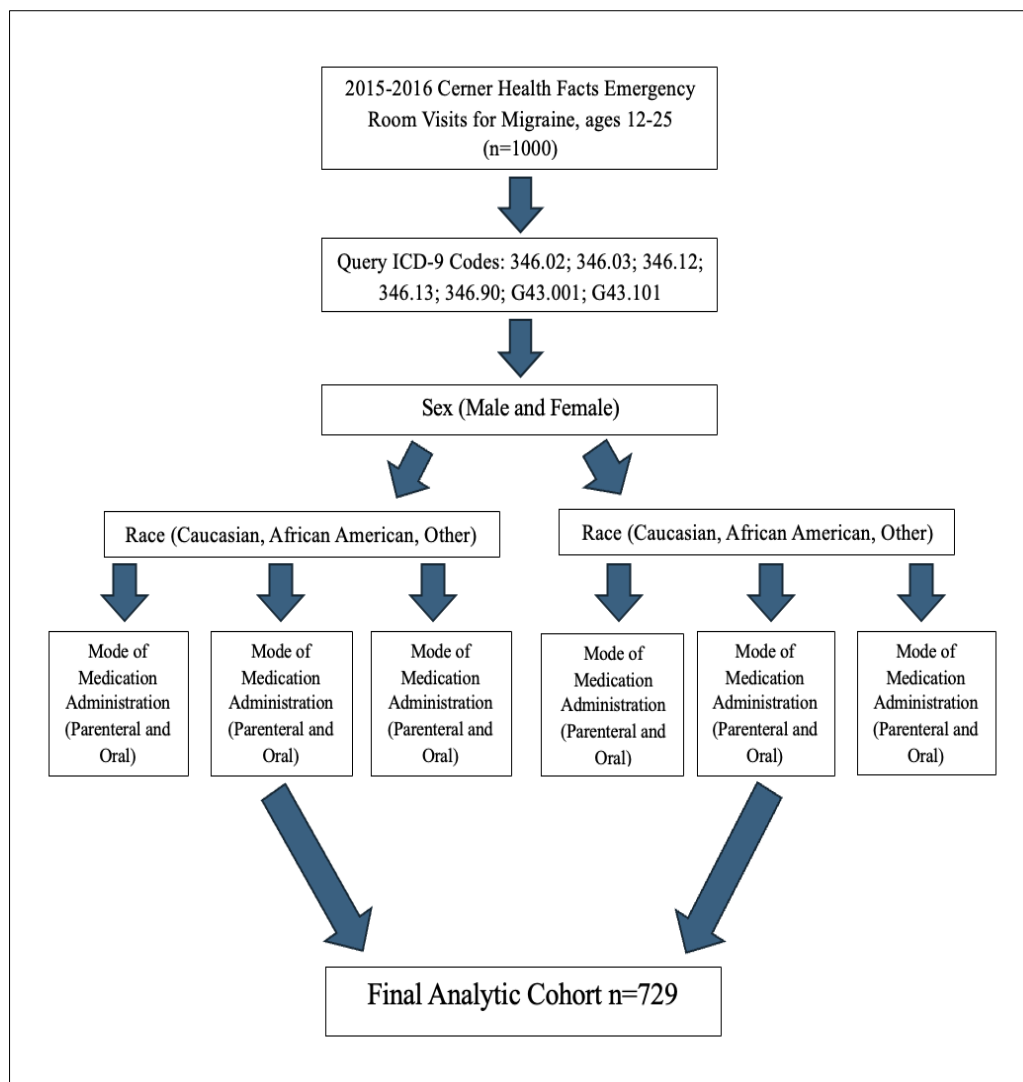


Figure 1: Cohort selection flow diagram

Table 1: Route of Migraine Medication Administration by Race and Sex

Race/Sex	Oral (%)	Parenteral (%)	Total count
Caucasian Females	23.8 (n= 89)	76.2 (n= 284)	373
Caucasian Males	38.3 (n= 36)	61.7 (n= 58)	94
African American Females	40 (n= 53)	60 (n= 79)	132
African American Males	28.2 (n=9)	71.8 (n= 23)	32
Other Females	34.7 (n= 25)	65.3 (n=47)	72
Other Males	46.2 (n= 12)	53.8 (n= 14)	26

We used a multivariable logistic regression model to determine the association of the rapid acute treatment with sex and race. The primary outcome was receipt of parenteral versus oral medication, used as a proxy for more rapid acute migraine treatment. We calculated the statistical significance, Odds ratios, and 95% confidence interval (CI). All comparisons were two-tailed, and a p-value <0.05 was considered statistically significant. R (version 4.2.0; R Foundation for Statistical Computing) was used to compute all analyses. We used the STROBE reporting checklist when editing this manuscript.

RESULTS

This cohort consisted of patients aged 12-25 who presented to the emergency department (ED) for migraine treatment between 2015 and 2016. Among the dataset of 1000 random de-identified patients, 729 patients presented to the emergency department only once within the time frame. Most patients were female (n=577), with males comprising the remaining portion (n=152). The racial distribution indicated that the majority were Caucasian (n=467) followed by African American (n=164), and other races (n=98). The study aimed to examine the relationship between the receipt of

parenteral vs oral migraine medication in the ED and the variables of sex and race.

Table 1 provides a summary of the demographic characteristics of this cohort as well as the percentage of each group that was prescribed parenteral or oral medication. 76.2 % (284/373) of Caucasian female patients have prescriptions for parenteral medications to treat migraine at ED compared with 60% (79/132) for African American female patients and 65.3% (47/72) for females of other races; 23.8% (89/373) of Caucasian female patients have prescriptions for oral medications to treat migraine at ED compared with 40% (53/132) for African American female patients and 34.7% (25/72) for female patients from other races. On the other hand, 71.8% (23/32) of African American males have prescriptions for parenteral medications to treat migraine at ED compared with 61.7% (58/94) of Caucasian males and 53.8% (14/26) of male patients from other races. Oral medications were prescribed to

28.2% (9/32) of African American male patients, 38.3% (36/94) of male Caucasian patients, and 46.2% (12/26) of males from other races.

Our logistic regression analysis revealed significant racial disparities in the administration of parenteral migraine medication. African American patients were 37% less likely to receive parenteral medication compared to Caucasian patients (Odds ratio: 0.63; 95% CI: 0.45-0.88; P=0.01) as seen in Table 2. Furthermore, female African American patients were 46% less likely to receive parenteral medication compared to their female Caucasian counterparts (Odds ratio: 0.54; 95% CI: 0.37-0.78; P=0.001) as seen in Table 2. Finally, male African Americans were 59% more likely to receive parenteral medication compared to male Caucasians; however, our results indicated no statistically significant difference between the two groups (Odds ratio: 1.59; 95% CI: 0.66-3.81; P=0.30).

Table 2: Association between Sex and Race of Parenterally Administered Migraine Medication

Model	Race	Odds Ratio	95% CI	P-Value
Difference Between Race	African American	0.63	0.45–0.88	0.01
	Caucasian (Reference)	1.00		
Female Patients	African American	0.54	0.37–0.78	0.001
	Caucasian (Reference)	1.00		
Male Patients	African American	1.59	0.66-3.81	0.30

Significant racial disparities exist in the administration of parenteral migraine medication, with African American patients overall and female African American patients being less likely to receive such rapid treatment compared to their Caucasian counterparts.

DISCUSSION

Our findings reveal significant racial disparities in the administration of parenteral migraine medication. African American patients, especially female African American patients, are less likely to receive such rapid acute treatment compared to their Caucasian counterparts. This supports our hypothesis that African American patients generally receive less rapid-acting medication in response to reported pain. Our findings continue to support existing data on racial bias within medicine [4]. The importance of these findings lies in highlighting the unequal treatment in healthcare, which aggravates existing disparities and distrust in the medical system.

Looking at racial bias from a historical standpoint, multiple fields of medicine have all factored race into their practice, oftentimes negatively affecting the African American population. Studies show that individual biases and inequalities eventually shape systems and institutions. Many factors go into developing racial bias, including power and privilege disparities, cultural narratives and values, segregated communities, shared stereotypes, and nonverbal messages [14]. These systems are not only all reflections

of each other, but principles in one individual can have profound effects on systemic bias. The systemic bias compounds and may eventually lead to decreased quality of treatment for populations. Limiting this systemic bias through education and studying inclusive literature is an important way to combat this bias.

When comparing male patients, we found that a slightly higher percentage of African American males receive parenteral medication compared to the percentage of Caucasian males. Although the data shows that men have significantly fewer migraine when compared to women, it might be worthwhile to explore to what extent there is reporting bias and how much is due to physiological differences.

Overwhelmingly, we see that there are clear racial and sex disparities when it comes to pain treatment, even if that means over-prescribing certain medications like opioids and morphine. These disparities are supported by studies showing that inherent biases in medical students and professionals affect the assessment and treatment of African American patients [4].

This study has a few limitations that can be expanded upon in future studies to aid in our understanding of this disparity of parenteral medication administration based on race and gender. The size of the cohort and the data being pulled between 2015 and 2016 could have impacted our results in sex- and race-specific subgroups. Additionally, our analysis did not take into

account insurance status, socioeconomic factors, and access to healthcare, which could impact the relationship we identified between race and the administration of parenteral migraine treatment, highlighting a gap that future research should directly tackle.

Furthermore, performing more thorough analysis to take into account the different coding mechanisms providers use from a larger base would be another route to pursue; exploring the differences in ICD-9 coding and delving into the possibility of doctors identifying “migraine” as “headaches”. If coding methods vary systematically by race, gender, or institution, it may have added further bias and can be an additional future direction for this study. Additionally, understanding the ICHD-3 criteria for a migraine versus a headache and how this discrepancy may have affected the results of the study is also important to further our research. Another comparison to explore is migraine with aura versus migraine without aura. In our study, we exclusively explored migraine without aura; including migraine with aura to determine the impact it has would be of future interest. These new subsets of research may provide a larger database for retrospective research.

A final factor to consider in future research is that his study included patients from hospitals in both rural and urban areas, meaning results could be different when examining the accessibility of medications. Hospitals in these areas may also have their own patterns of prescribing certain routes of medications based on their availability. This fact could have potentially skewed the results towards either oral or parenteral medications.

Future research should continue to identify the extent of racial disparities in different specialties and treatment indications. Future studies should also consider whether these results are consistent throughout different regions of the US. More data across the U.S. and specialties are needed to combat implicit and explicit physician biases effectively. Addressing these disparities is crucial for improving healthcare equality and outcomes for all patient populations affected by such biases. This begins with education. Whether that might be public education, patient advocacy, community outreach, or provider training, taking the steps to mitigate disparities will be a great step forward for inclusivity in the healthcare field.

CONCLUSION

In this retrospective analysis of emergency department migraine treatment, African American patients, particularly African American female patients, were less likely than Caucasian patients to receive parenteral medication. These findings suggest that racial and sex disparities may influence the route and rapidity of acute migraine treatment. Future studies should examine whether these patterns persist across broader datasets and identify interventions to reduce inequities in emergency migraine care. Because this was a

retrospective observational study, these findings demonstrate associations and should not be interpreted as proving provider-level bias or causality.

Data Availability

The data used in this study were derived from the Cerner Health Facts database and are not publicly available because of licensing restrictions. Study-related materials may be available from the corresponding author upon reasonable request and subject to applicable data use agreements, institutional approvals, and permission from the data provider. There were no missing data throughout the duration of the study.

Author Contributions

Shravani Khisti: Conceptualization, Writing – Original Draft, Writing – Review & Editing.

Anisha Konduru: Writing – Original Draft, Writing – Review & Editing.

Indraneel Desphande: Writing – Original Draft, Writing – Review & Editing.

Shreya Kosuru: Writing – Original Draft, Writing – Review & Editing.

Praneet Khanna: Writing – Original Draft, Writing – Review & Editing.

Saad Khan: Writing – Original Draft, Writing – Review & Editing.

Samuel Kim: Writing – Original Draft, Writing – Review & Editing.

Yahia Mohamed: Methodology, Formal Analysis – Review & Editing.

Alex Luke: Supervision, Writing – Review & Editing.

Rola Mahmoud: Supervision, Conceptualization, Writing – Review & Editing.

Abbreviations:

ED, emergency department; IV, intravenous; OR, odds ratio; CI, confidence interval; IRB, Institutional Review Board; STROBE, Strengthening the Reporting of Observational Studies in Epidemiology.

Conflicts of Interest: Shravani Khisti, Anisha Konduru, Indraneel Deshpande Shreya Kosuru, Praneet Khanna, Saad Khan, Samuel Kim, Yahia Mohamed, and Alex Luke report no conflicts of interest. Dr. Rola Mahmoud has received personal compensation for serving as a consultant for TG Therapeutics, Genentech, Biogen, Horizon, EMD Serono, Amgen, and Sanofi, and has received personal compensation for serving on a speakers bureau for EMD Serono.

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REFERENCES

1. Amiri P, Kazeminasab S, Nejadghaderi SA, et al. Migraine: A review on its history, global epidemiology, risk factors, and comorbidities. *Front Neurol*. 2022;12:800605. doi:10.3389/fneur.2021.800605

2. Pescador Ruschel MA, De Jesus O. Migraine Headache. In: StatPearls. Treasure Island, FL: StatPearls Publishing; 2024.
3. Allais G, Chiarle G, Sinigaglia S, Airola G, Schiapparelli P, Benedetto C. Gender-related differences in migraine. *Neurol Sci*. 2020;41(Suppl 2):429-436. doi:10.1007/s10072-020-04643-8
4. Hoffman KM, Trawalter S, Axt JR, Oliver MN. Racial bias in pain assessment and treatment recommendations, and false beliefs about biological differences between Blacks and Whites. *Proc Natl Acad Sci U S A*. 2016;113(16):4296-4301. doi:10.1073/pnas.1516047113
5. Nicholson RA, Rooney M, Vo K, O’Laughlin E, Gordon M. Migraine care among different ethnicities: do disparities exist? *Headache*. 2006;46(5):754-765. doi:10.1111/j.1526-4610.2006.00439.x
6. Tamayo-Sarver JH, Hinze SW, Cydulka RK, Baker DW. Racial and ethnic disparities in emergency department analgesic prescription. *Am J Public Health*. 2003;93(12):2067-2073. doi:10.2105/AJPH.93.12.2067
7. Herman TF, Santos C. First-Pass Effect. In: StatPearls. Treasure Island, FL: StatPearls Publishing; 2023.
8. Sacco S, Ricci S, Degan D, Carolei A. Migraine in women: the role of hormones and their impact on vascular diseases. *J Headache Pain*. 2012;13(3):177-189. doi:10.1007/s10194-012-0424-y
9. Lee P, Le Saux M, Siegel R, et al. Racial and ethnic disparities in the management of acute pain in US emergency departments: meta-analysis and systematic review. *Am J Emerg Med*. 2019;37(9):1770-1777. doi:10.1016/j.ajem.2019.06.014
10. Staton LJ, Panda M, Chen I, et al. When race matters: disagreement in pain perception between patients and their physicians in primary care. *J Natl Med Assoc*. 2007;99(5):532-538.
11. Telusca N, Gaisey J, Woods C, Khan J, Mackey S. Strategies to promote racial healthcare equity in pain medicine: a call to action. *Pain Med*. 2022;23(7):1225-1233. doi:10.1093/pm/pnac041
12. Louis R, Boorman DW, Rogers A, Singh V. Racial and ethnic disparities in inpatient interventional pain management for lumbar radiculopathy. *Pain Physician*. 2023;26(5):E517-E527.
13. Meghani SH, Kang Y, Chittams J, McMenamin E, Mao JJ, Fudin J. African Americans with cancer pain are more likely to receive an analgesic with toxic metabolite despite clinical risks: a mediation analysis study. *J Clin Oncol*. 2014;32(25):2773-2779. doi:10.1200/JCO.2013.54.7992
14. Skinner-Dorkenoo AL, George M, Wages JE III, Sánchez S, Perry SP. A systemic approach to the psychology of racial bias within individuals and society. *Nat Rev Psychol*. 2023;2:392-406. doi:10.1038/s44159-023-00190-z