Sociodemographic Factors and the Management of Trigeminal Neuralgia: A Retrospective Case-Control Study

Lily Do[1,2], Diane Balallo[1,3], Logan Lau[1,4], Samyak Bharwad[1,5], Rachel Lew[1,6], Tate Higashihara[1,6], Vimala Vajjala, MD[1], Enrique Carrazana, MD[1], Jason Viereck, MD, PhD[1], Kore Kai Liow, MD, FACP, FAAN[1,6] Frances Tiffany Morden[1,6], Rachel Gorenflo[1,6]

[1]Clinical Research Center, Hawaii Pacific Neuroscience, Honolulu HI, [2] University of San Francisco, San Francisco, CA, [3] Boston College, Chestnut Hill, MA, [4] Kamehameha Schools, Honolulu, HI, [5]BJ Medical School, Ahmedabad, Gujarat, [6]John A. Burns School of Medicine, University of Hawaii Honolulu, HI.

Background

Trigeminal neuralgia is a chronic neuropathic pain disorder that may be described as "shock-like" or "stabbing" and often affects the right side of the face.[1] This condition most commonly affects women over the age of 50.[2]

Three recognized etiologies of trigeminal neuralgia are classical, secondary, and idiopathic.[3] "Classical" trigeminal neuralgia is caused by neurovascular compression of the trigeminal nerve.[3] "Secondary" trigeminal neuralgia is linked to underlying conditions such as multiple sclerosis, tumors, or trauma to the trigeminal nerve.[3] "Idiopathic" trigeminal neuralgia stems from unknown causes.[3] It is reported that classical trigeminal neuralgia is the most common etiology.[3]

Treatment may include medications, of which the anticonvulsants such as carbamazepine and oxcarbazepine are first-line therapies.[1] Non-pharmacological treatments include microvascular decompression, gamma knife stereotactic radiosurgery, and radiofrequency ablation.[4] Botox is an off-label, non-FDA approved, drug treatment for trigeminal neuralgia; recent studies have shown its efficacy for pain-relief.[5,6]

Although previous studies have noted the occurrence of trigeminal neuralgia across ethnic and racial backgrounds, very few of these have assessed differences in the presentation and treatment of this disorder amongst minorities.[7,8] A study conducted in Michigan found that there were significant racial disparities in the treatment of trigeminal neuralgia.[9] This study thereby focuses on the multi-ethnic population of Hawaii and evaluates possible differences in presentation and management of trigeminal neuralgia.

Objectives

To assess the relationships between sociodemographic variables, medical comorbidities, and treatment outcomes among patients with trigeminal neuralgia.

Methods

Design and Setting

A retrospective case-control study was conducted at a neuroscience institute based in Honolulu, Hawaii. ICD-9 and ICD-10 codes were used to identify patients from clinic inception to June 2021 with possible trigeminal neuralgia. Manual review determined there were 119 patients with a formal diagnosis of trigeminal neuralgia and at least one follow-up. Additionally, 476 unmatched controls and 119 controls matched to sex, age, and self-identified race were collected.

Etiological Classification

Etiology of trigeminal neuralgia was classified based on presence of a diagnosis of multiple sclerosis, magnetic resonance imaging (MRI) results, and history of trauma to the trigeminal nerve. Etiology was determined to be "classical" in the case of vascular causes; "secondary" for trauma to the trigeminal nerve, multiple sclerosis, or a tumor; and "idiopathic" for unknown causes.

Predictor and Outcome Variables

Sociodemographic variables, medical comorbidities, pain characteristics, and treatments were obtained from patient charts. The sociodemographic variables analyzed were sex, age, self-reported race, zip code, employment, marital status, and insurance. Race was separated into the following categories: White, Asian, Native Hawaiian/Pacific Islander (NHPI), Hispanic, Black, Native American/Alaskan Native (NAAN), and Other. For patients of more than one race, the minority among the races was recorded. The determination of the minority race was based on the percentage of population in the United States.[10] As done in a prior study, zip codes were used as a socioeconomic marker.[11]

For medical comorbidities, the Charlson Comorbidity Index was calculated.[12] Pain characteristics included duration, severity, and location. Treatments included pharmacological and non-pharmacological therapies. The pharmacological therapies prescribed for trigeminal neuralgia in this patient population were baclofen, carbamazepine, dextropropoxyphene, divalproex sodium, gabapentin, hydrocodone, indomethacin, lidocaine, lorazepam, lamotrigine, nortriptyline, oxcarbazepine, oxycodone, pregabalin, tizanidine, topiramate, tramadol, and botox. Non-pharmacological therapies given in this population were gamma knife stereotactic radiosurgery, microvascular decompression, and radiofrequency ablation.

Statistical Analysis

All analyses were performed using R Statistical Software (R Foundation for Statistical Computing, Vienna, Austria). For categorical variables, Pearson's chi-squared test or Fisher's Exact Test was used. Continuous variables were assessed using the Wilcoxon Rank Sum Test. Alpha = 0.05 was used to determine statistical significance.

Results

Patient Demographics and Clinical Features

Among the 119 patients, 45 (37.8%) were White, 26 (21.8%) were Asian, 19 (16%) were Native Hawaiian/Pacific Islander (NHPI), 6 (5%) were Hispanic, 1 (0.8%) was Black, 1 (0.8%) was Other, and 21 (17.6%) did not report. There were 85 (71.4%) females and 33 (27.7%) males with 1 (0.8%) patient with no sex specified. The mean age was 56.25 years old and 55.88 years old for females and males, respectively. The median age was 57 years old and 58 years old for females and males, respectively [Table 1]. The distribution of races and ages in the general patient population at this clinic did not display a statistically significant difference when compared to the distribution among the identified cases [Table 2]. However, the odds of a patient being female among the identified cases was 1.96 (p = 0.0034) times greater than in the general clinic's population, whereas for males the odds ratio was 0.51 (p = 0.0034) [Table 2].

For etiology, 18 (16.1%) were classical, 26 (21.8%) were secondary, and 75 (63%) were idiopathic. As for location of pain, 48 (40.3%) had pain on the left side, 61 (51.3%) had pain on the right side, 6 (5%) had bilateral pain, and 4 (3.4%) did not have a location specified [Table 1]. There were statistically significant reduced odds of White patients (0.16; p = 0.018) having classical trigeminal neuralgia. In contrast, Asian patients (6.81; p = 0.0020) had increased odds for classical trigeminal neuralgia [Table 3].

Pharmacological Therapies

There were a total of 20 different pharmacological therapies prescribed [Table 4]. Assessment of the four most commonly prescribed pharmacological therapies (oxcarbazepine, gabapentin, carbamazepine, and pregabalin) for trigeminal neuralgia at this clinic showed that the odds of medication failure were not significantly different across racial groups [Table 5].

Pain Outcomes

There were significantly higher odds of pain staying the same in Hispanics (17.12, p = 0.0075), and significantly lower odds of pain staying the same in Asians (0.22, p = 0.047) [Table 6].

Medical Comorbidities

There was no significant difference between the CCI score for the identified cases and the matched controls.

Table 1. Patient Demographics and Clinical Features of 119 Trigeminal Neuralgia Patients

	Number of Patients (%)					
Demographics						
Sex	**Female**		**Male**		**NA**	
	85 (71.4)		33 (27.7%)		1 (0.8)	
Mean, Median Age (years)	56.25, 57		55.88, 58		57	
Race	**White**	**Asian**	**NHPI**	**Hispanic**	**Black**	**Other**
	45 (37.8)	26 (21.8)	19 (16)	6 (5)	1 (0.8)	1 (0.8)
Clinical Features						
Etiology	**Classical**		**Secondary**		**Idiopathic**	
	18 (16.1)		26 (21.8)		75 (63)	
Location of Pain	**Left**		**Right**		**Bilateral**	**NA**
	48 (40.3)		61 (51.3)		6 (5)	4 (3.4)

Table 2. Odds Ratio for Age, Sex, and Race Within Identified Cases and General Patient Population

	Median (25% Quartile, 75% Quartile)	Wilcoxon Rank Sum Test (estimated difference between groups)
Variable		
Age		
Cases	57.00 (43.50, 68.00)	
Unmatched Controls	61.00 (41.75, 74.00)	-3.00 (95% CI: -7.00 to 1.00), W = 25851, p = 0.1406
	Odds Ratio (95% Confidence Interval)	**Chi-square Test or Fisher Exact Test**
Sex		
Female	1.96 (1.24, 3.15)	χ^2 = 8.59, df = 1, p = 0.0034
Male	0.51 (0.32, 0.80)	
Race		
White	1.16 (0.72, 1.86)	χ^2 = 0.27, df =1, p = 0.60
Asian	0.86 (0.50, 1.46)	χ^2 = 0.21, df =1, p = 0.65
NHPI	0.91 (0.49, 1.64)	χ^2 = 0.032, df = 1, p = 0.86
Hispanic	1.12 (0.36, 3.02)	χ^2 = 3.36e-30, df = 1, p = 0.60
Black	0.70 (0.015, 6.38)	p = 1
NAAN	1.70 (0.029, 32.89)	p = 0.54

Table 3. Odds Ratio for Etiology by Race

	Odds Ratio (95% Confidence Interval)	Chi-square Test or Fisher Exact Test	Odds Ratio (95% Confidence Interval)	Chi-square Test or Fisher Exact Test	Odds Ratio (95% Confidence Interval)	Chi-square Test or Fisher Exact Test
	Classical		**Secondary**		**Idiopathic**	
Race						
White	0.16 (0.017, 0.79)	p = 0.018	2.78 (0.97, 8.59)	χ^2 = 3.55 , df = 1, p = 0.060	1.00 (0.41, 2.46)	χ^2 = 1.82e-30 , df = 1, p = 0.1
Asian	6.81 (1.78, 29.50)	χ^2 = 9.59 , df = 1, p = 0.0020	0.34 (0.059, 1.33)	p = 0.11	0.62 (0.23, 1.72)	χ^2 = 0.63 , df = 1, p = 0.43
NHPI	0.40 (0.039, 2.09)	p = 0.32	0.84 (0.18, 3.10)	p = 1	1.35 (0.79, 0.58)	χ^2 = 0.085 , df = 1, p = 0.77
Hispanic	1.21 (0.024, 12.20)	p = 1	0.25 (0.0057, 1.79)	p = 0.31	1.00 (0.41, 2.46)	p = 1
Black	2.94 (0.049, 48.31)	p = 0.38	2.05 (0.034, 40.32)	p = 0.49	1.23 (0.063, 73.70)	p = 1
NAAN	5.91 (0.074, 471.72)	p = 0.27	3.24 (0.041,257.08)	p = 0.42	0.61 (0.0077, 48.65)	p = 1
Other	2.94 (0.049, 58.31)	p = 0.38	6.73 (0.34, 403.73)	p = 0.14	0.30 (0.0050, 5.80)	p = 0.56

Table 4. Prescribed Pharmacological and Non-Pharmacological Therapies

	Number of Prescribed Therapies			
Pharmacological	**Total**	**Continued**	**Failed**	**New**
Oxcarbazepine	55	24	20	11
Gabapentin	47	23	13	11
Carbamazepine	24	14	7	3
Pregabalin	21	6	10	5
Botox	11	-	-	-
Nortriptyline	8	1	7	0
Baclofen	9	2	5	2
Amitriptyline	8	1	5	2
Indomethacin	5	1	3	1
Tizanidine	3	0	3	0
Lidocaine	3	0	2	1
Oxycodone	2	2	0	0
Lamotrigine	2	1	0	1
Alprazolam	1	1	0	0
Dextropropoxyphene	1	1	0	0
Divalproex sodium	1	1	0	0
Lorazepam	1	1	0	0
Topiramate	1	0	0	1
Hydrocodone	1	0	0	1
Tramadol	1	0	0	1
Non-Pharmacological				
Gamma Knife Radiosurgery	6	0	6	0
Microvascular Decompression	4	0	3	1
Radiofrequency Ablation	1	0	0	1

Table 5. Odds Ratio of Failing (Top Four Prescribed) Medications by Race

	Odds Ratio (95% Confidence Interval)	Chi-square Test or Fisher Exact Test	Odds Ratio (95% Confidence Interval)	Chi-squareTest or Fisher Exact Test	Odds Ratio (95% Confidence Interval)	Chi-square Test or Fisher Exact Test	Odds Ratio (95% Confidence Interval)	Chi-square Test or Fisher Exact Test
	Failed OXC		**Failed GAB**		**Failed CBZ**		**Failed PGL**	
Race								
White	2.59 (0.56, 13.48)	χ^2 = 1.15, df = 1, p = 0.28	0.86 (0.14, 4.89)	p = 1	0.72 (0.0099, 17.65)	p = 1	0.39 (0.18, 235.06)	p = 0.56
Asian	1.06 (0.13, 7.60)	p = 1	0.70 (0.091, 4.35)	p = 1	3.62 (0.15, 264.27)	p = 0.53	0.53 (0.025, 10.81)	p = 1
NHPI	0.50 (0.041,3.72)	p = 0.67	1.48 (0.17, 11.31)	p = 0.68	0.51 (0.0093, 5.79)	p = 1	0.41 (0.0043, 39.17)	p = 1
Hispanic	0.20 (0.0042, 1.82)	p = 0.23	0.87 (0.014, 17.52)	p = 1	3.78 (0.044, 325.72)	p = 0.40	0.46 (0.0054, 39.21)	p = 1
Black	1.39 (0.017, 112.37)	p = 1	1.80 (0.022, 146.06)	p = 1	3.78 (0.044, 325.72)	p = 0.40	0.46 (0.0054, 39.21)	p = 1
NAAN	1.39 (0.017, 112.37)	p = 1	1.80 (0.022, 146.06)	p = 1	3.78 (0.044, 325.72)	p = 0.40	0.46 (0.0054, 39.21)	p = 1
Other	1.39 (0.017, 112.37)	p = 1	3.91 (0.19, 0.24)	p = 0.28	3.78 (0.044, 325.72)	p = 0.40	0.46 (0.0054, 39.21)	p = 1

Table 6. Odds Ratio of Pain Outcome by Race

	Odds Ratio (95% Confidence Interval)	Chi-square Test or Fisher Exact Test	Odds Ratio (95% Confidence Interval)	Chi-square Test or Fisher Exact Test	Odds Ratio (95% Confidence Interval)	Chi-square Test or Fisher Exact Test
	Pain Improved		**Pain Stayed the Same**		**Pain Worsened**	
Race						
White	0.89 (0.33, 2.39)	χ^2 = 0.00077, df = 1, p = 0.98	1.28 (0.39, 4.19)	χ^2 = 0.041, df = 1, p = 0.84	0.52 (0.14, 1.64)	χ^2 = 0.97, df = 1, p = 0.33
Asian	1.41 (0.47, 4.44)	χ^2 = 0.19, df = 1, p = 0.66	0.22 (0.022, 1.036)	p = 0.047	2.06 (0.52, 7.91)	χ^2 = 0.82, df = 1, p = 0.37
NHPI	1.18 (0.31, 5.00)	χ^2 = 2.1448e-30, df = 1, p = 1	0.96 (0.15, 4.34)	p = 1	0.78 (0.075, 4.27)	p = 1
Hispanic	0.15 (0.0029, 1.57)	p = 0.073	17.12 (1.55, 894.63)	p = 0.0075	0.45 (0.010, 3.42)	p = 0.69
Black	0.98 (0.050, 58.96)	p = 1	1.74 (0.029, 34.38)	p = 0.54	2.38 (0.039, 47.13)	p = 0.44
NAAN	0.64 (0.0081, 51.01)	p = 1	3.52 (0.044, 280.56)	p = 0.40	4.72 (0.059, 377.15)	p = 0.32
Other	1.30 (0.067, 78.21)	p= 1	1.74 (0.029, 34.38)	p = 0.54	2.38 (0.039, 47.13)	p = 0.44

Conclusions/Discussion

Hawaii's diverse patient population allows for the assessment of trigeminal neuralgia outcomes among racial groups that are traditionally underrepresented in medical literature.

Our results suggest that patients with trigeminal neuralgia in minority populations may have different clinical outcomes compared to other racial groups. Asians had lower odds of pain staying the same, while Hispanics had higher odds. Hispanics may have had higher odds of pain remaining the same possibly due to patient-provider communication barriers.[13] This would make it difficult to obtain treatment.[13] It is important to consider aspects of patient backgrounds such as culture and language barriers for patients with trigeminal neuralgia because they may play a role in pain management and outcomes.

Additionally, Asians had higher odds of having classical trigeminal neuralgia, whereas there were lower odds for Whites.

Furthermore, trigeminal neuralgia literature states that the "classical" etiology is the most prevalent.[3] Therefore, the data yielded from this study differs from the expected. This may be due to the study methods with etiology classification and limited sample size.

One limitation of this study was the small sample size of trigeminal neuralgia patients. A larger cohort may highlight trends for patient outcomes that were not detected within this study. Another limitation was the retrospective nature of this study. Our study depended on the accurate record-keeping of patient charts.

Future Directions

A future study should be conducted with more patients to further explore possible differences in clinical outcomes for patients with trigeminal neuralgia of various backgrounds. Furthermore, patient descriptions of pain from trigeminal neuralgia could be assessed for cultural differences.

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Disclosure/Correspondence

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Principal Investigator: Kore Liow, MD, FACP, FAAN
Sub-Investigators: (Faculty Mentor) Vimala Vajjala, MD

Correspondence or reprints: kliow@hawa

Sociodemographic and Risk Factors Associated with Traumatic Brain Injury Between Racial Groups in Hawai'i

Michelle Pang[1,2], Kayti Luu[1,2], Ariel Ma[1,3], Nicholas Sims[1,4], Lauren Fujii[1,5],
Kent Yamamoto, MD[1], Jason Viereck, MD, PhD[1], Kore Kai Liow, MD, FACP, FAAN[1,2], Rachel Gorenflo[1,2], Frances Morden[1,2]
[1]Clinical Research Center, Hawaii Pacific Neuroscience, Honolulu HI, [2]John A. Burns School of Medicine, University of Hawaii Honolulu, HI, [3]Rice University, Houston, Texas, [4]University of California, Berkeley, Berkeley, CA,
[5]Santa Clara University, Santa Clara, CA.

Background

Traumatic Brain Injury (TBI) is a major public health concern with an estimated 69 million individuals sustaining a TBI annually worldwide.[1] TBI is associated with a variety of symptoms including cognitive, physical, or psychological defects. These symptoms and their severity may vary dramatically depending on age, sex, social history, income, race, and etiology of injury.

A vast body of literature exists exploring various factors related to TBI. Past studies have shown that males who report alcohol use have a higher incidence of TBI, and that rates of severe TBI are higher in young adults and elderly in rural locations.[2] Generally, studies have shown that minority groups with TBI suffer from higher incidence and worse functional outcomes.[3] However, a recent study found better functional outcomes for Native Hawaiian and Pacific Islander (NHPI) patients with severe TBI in Hawai'i.[4] Additionally, NHPI were found to have a higher prevalence of TBI than Asians and Caucasians, and were more likely to sustain TBI from motor vehicle accidents.[4] Despite this, there have been relatively few studies which explored these factors associated with TBIs of different etiologies and severities specifically in the population of Hawaii. Questions still remain regarding the intersection of socioeconomic factors such as race and TBI.

By collecting information on TBI patients seen at Hawai'i Pacific Neuroscience (HPN), our findings represent a uniquely diverse population of varying demographic and socioeconomic status in Hawai'i. In doing so, we hope to elucidate a better understanding of TBI in Hawai'i for prevention and future treatments.

Objectives

This study aims to clarify the intersection of sociodemographic factors including race, sex, and socioeconomic status, and their relationship in TBI of varying severities or etiology.

Methods

A retrospective chart review was conducted on patients with TBI who visited HPN from 1/1/19 to 6/23/21 via *eClinicalWorks*. 489 patients were identified using ICD-10 codes for TBI. 77 patients were excluded for lack of sufficient medical information or if they were not seen at HPN primarily for TBI.

Demographics including gender, race, marital status, employment status, zip code, and health insurance type were collected. Also collected were factors related to the injury such as presenting symptoms, etiology, hospitalization status, and if imaging was obtained, as well as chronic symptoms as reported on the patient's most recent visit including chronic pain, headaches, and insomnia. Other patient factors including history of previous TBI, body mass index, smoking status, alcohol usage, lifetime alcohol abuse, illicit drug usage, and depression (at diagnosis and at most recent visit) were also collected. Zip codes and data from the US census were used to obtain median household income.

Statistical analyses were conducted using R. Patients were stratified into 5 racial categories for analysis: White, Asian, NHPI, or Other Underrepresented Minorities (OUM) which includes Black and Native American/Alaska Native. Patient characteristics were summarized using descriptive statistics. Wilcoxon rank-sum test, Chi-squared test, or Fisher's exact test were performed to estimate the differences between each group with a p-value < 0.05 considered statistically significant.

Results

- Of the 412 patients included in the study, 231 (56%) were male and 181 (44%) were female.
- 132 (32%) patients were white, 96 (23.3%) patients were NHPI, 86 (20.9%) patients were Asian, 15 (3.6%) patients were Hispanic, 12 (2.9%) patients were OUM, and 71(17.2%) patients did not report their race.
- Most patients lived in suburban (50%) or urban (47%) areas, had private insurance (52%) or Medicaid (30%).

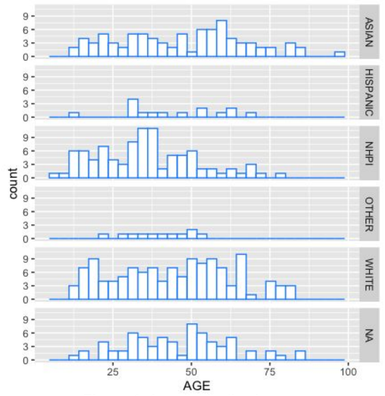


Figure 1. Age distribution by race
Median age for all patients = 42 years; NA = race not reported

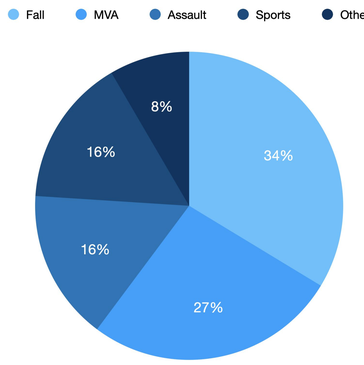


Figure 2. Etiologies of TBI

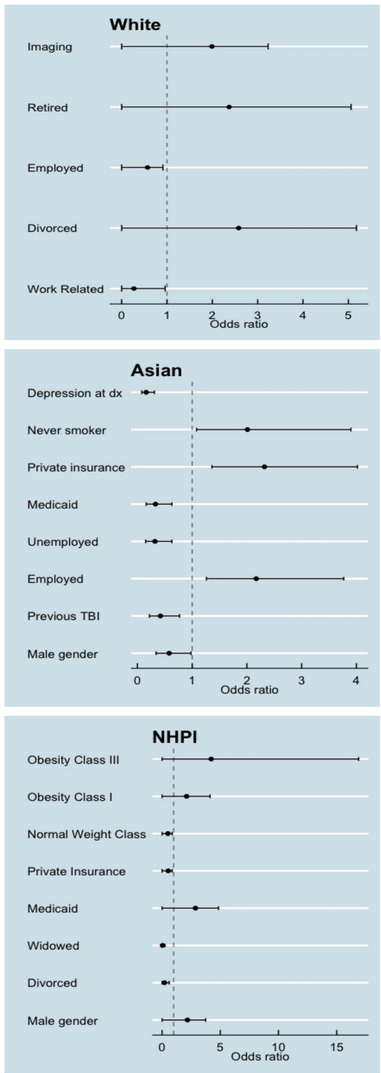
White		
Factor	**Odds Ratio (95% CI)**	**P-value**
Retired	2.37 (1.13, 5.06)	p=0.019
Employed	0.57 (0.35, 0.91)	p=0.018
Imaging	1.99 1.23, 3.23)	p=0.0042
Divorced	2.58 (1.31, 5.18)	p=0.0045
Work-Related TBI	0.27 (0.05, 0.96)	p=0.05

Asian		
Factor	**Odds ratio (95% CI)**	**P-value**
Depression at Dx	0.16 (0.0, -0.31)	p=0.0001
Never Smoker	2.01 (1.08, 3.90)	p=0.0275
Private Insurance	2.32 (1.36, 4.02)	p=0.0015
Medicaid	0.33 (0.16, 0.63)	p=0.00059
Unemployed	0.32 (0.15, 0.63)	p=0.00061
Employed	2.17 (1.26, 3.77)	p=0.004
Previous TBI	0.42 (0.22, 0.77)	p=0.004
Male gender	0.58 (0.34, 0.98)	p=0.040

NHPI		
Factor	**Odds ratio (95% CI)**	**P-value**
Obesity Class III	4.22 (1.18, 16.89)	p=0.019
Obesity Class I	2.11 (1.06, 4.13)	p=0.028
Normal Weight Class	0.50 (0.28, 0.88)	p=0.015
Private Insurance	0.53 (0.32, 0.88)	p=0.014
Medicaid	2.87 (1.70, 4.85)	p0.001
Widowed	0.04 (0.00096, 0.25)	p=0.001
Divorced	0.21 (0.054, 0.62)	p=0.0012
Male gender	2.18 (1.29, 3.75)	p=0.0031

Hispanic		
Factor	**Odds Ratio (95% Confidence Interval)**	**P-value**
Sleep Disturbance	18.23 (1.76, 909.14)	p=0.0049
Class II Obesity	4.71 (0.77, 20.25)	p=0.046

OUM		
Factor	**Odds Ratio (95% Confidence Interval)**	**P-value**
Normal BMI Class	0.15 (0.0033, 1.02)	p=0.035
Self-Pay	61.48 (2.98, 3740.03)	p=0.0034
Depression (most recent)	6.615 (1.05, 71.35)	p=0.022
Factor	**Median (25% Quartile, 75% Quartile)**	**P-value**
Med. Household Income	74,170 (72,090, 83,992)	p=0.018



Discussion and Conclusions

Patients with TBI at HPN had a median age of 42 years old and were more likely to be male, white, single, or employed. This is consistent with previous research that have reported higher incidence rates in the male[4-6]. Patients with TBI at HPN were also more likely to have private insurance and live in suburban areas. Although a previous study comparing population density TBI-related outcomes in Hawai'i reported higher rates of TBI in rural areas,[4] it is likely that HPN's clinic location and patient population attributed to the higher rates of suburban patients that was reported. Another study reported the significance of concussion in Hawaii in relation to various TBI etiologies, specifically combat-related, motor vehicle accident (MVA), and sports-related concussions.[7] We therefore were interested to see if specific etiologies may be associated with particular racial groups. In our TBI population at HPN, we found the etiology of TBI to be most commonly attributed to falls (34%), followed by MVA (27%), assault (16%), sports (16 %), other (8%). Although no statistically significant association was found between race and etiology, our results did find that Caucasians were less likely to have a work-related TBI. We hypothesize this may be due to a higher proportion of Caucasian patients working white-collar jobs and are thus at a lower risk of work related TBI. Additionally, given previous evidence suggesting variable rates of diagnostic imaging studies between racial groups,[8] we included imaging studies performed at HPN as factor of interest and found Caucasians to be two times more likely to receive imaging compared to all other races. However, it is difficult to draw any definitive explanations at this stage due to potential confounding effects of TBI severity.

Our study had several limitations. First, the retrospective nature of chart review resulted in potential for incomplete documentation and variability in documentation between physicians. Second, a number of patients declined to report their race leaving a number of patients to be left unaccounted in the analysis. Additionally, presenting symptoms and pain are self-reported measures which may vary among persons. Third, our data is limited to a single site at HPN which may not be representative of the entire population of Hawaii.

Still, our research is unique in being one of the first studies to compare potential risk factors associated with TBI between racial groups of the population of Hawai'i. We hope this further understanding of TBI will provide future insight to prevention and treatment for TBI cases in Hawai'i.

Future Directions

Future steps in this study will focus on developing a multivariable logistic regression model and completing additional analyes stratifying patients by sex to identify potential differences between sexes. In addition, future studies could include further research to identify interactions between socioeconomic variables and risk factors with TBI recovery and functional outcomes. To achieve this, TBI patients can be surveyed to gather additional information.

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Disclosures/Correspondence

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Principal Investigator: Kore Liow, MD, FACP, FAAN
Sub-Investigators: Kent Yamamoto, MD, Jason Viereck, MD, PhD
Correspondence or reprints: kliow@hawaii.edu

Characteristics of Central Sleep Apnea in Hawai'I Ethnic Groups

Kyung Moo Kim[1,2], Richard Ho[1,2], Anna Fan[1,3], Anna Gan[1,4], Sarah Nakamoto[1,5], Michael Tong[1,3], Sriharsha Vajjala, MD[1], Nick Anderson, MD[1,2], Jason Viereck, MD, PhD[1], Kore Kai Liow, MD, FACP, FAAN[1,2], Rachel Gorenflo[1,2], Frances Morden[1,2]

[1]Clinical Research Center, Hawaii Pacific Neuroscience, Honolulu HI, [2]John A. Burns School of Medicine, University of Hawaii Honolulu, HI, [3]University of Hawaii at Manoa, Honolulu, Hawaii, [4]University of Virginia, Charlottesville, Virginia, [5]Carleton College, Northfield, Minnesota

Background

Central Sleep Apnea (CSA) is a sleeping disorder in which the brain sends improper signals to muscles responsible for consistent and controlled breathing. CSA is characterized by more than five central apneas per hour of sleep with other associated symptoms of sleep disruption. Heart disease conditions, particularly atrial fibrillation, heart failure, and left ventricular remodeling, have been shown to be associated with CSA.[3,4,6]

Common treatments for CSA include continuous positive airway pressure therapy (CPAP), bilevel positive airway pressure therapy (BiPAP), and adaptive servo-ventilation (ASV). In this study, an analysis between CSA patients and the type of treatment, compliance check, and symptomatic improvement was conducted to look at comparisons amongst different races.

A study of central sleep apnea in US veterans has shown that veterans with CSA have a significant association to have cardiovascular disorders such as atrial fibrillation, heart failure, and pulmonary hypertension, stroke, and chronic opioid usage. [8]

Though few previous studies have studied sleep apnea and adherence to treatment among Maori and other ethnic groups in New Zealand, there is a paucity of research on sleep apnea among Native Hawaiians and Pacific Islanders, as well as other demographic groups in Hawaii.[1]

As CSA is an uncommon, complex sleep disorder, a better understanding of various sociodemographic and biological risk factors for CSA is of significance, especially in underrepresented, at-risk populations.

Objectives

To investigate the demographics and comorbidities of CSA in Hawaii and to determine associations of CSA with sociodemographic, cardiovascular, and neurological comorbidities amongst Hawaii Pacific Neuroscience (HPN) patients.

Methods

A retrospective chart review was performed on 36 CSA patient cases from the HPN eClinicalWorks electronic medical records. The HPN electronic health records were retrospectively searched from January 1st, 2009 to June 1st, 2021. The ICD-9 code 327.27 was used for patients visiting from 2009-2014, while ICD-10 codes G47.3 and G47.37 were used for 2015-2021. Matched and unmatched controls were collected in a 4:1 ratio.

Socio-economic variables, demographics, comorbidities, social history, family history, sleep symptoms, medication, neurological conditions, polysomnography results, compliance to treatment, and symptomatic improvement data were collected. Sociodemographic data included insurance and ZIP code. ZIP code was used as a proxy to obtain median household income and percentage of *all people, 18-64 years, and 65 years and older.*

CSA Cases–Inclusion-Exclusion Criteria:
Must be diagnosed with CSA
Patient is 18 years of age or older

Control Cases–Inclusion-Exclusion Criteria:
Must not be diagnosed with CSA or OSA
Patient is 18 years of age or older

Quantile-quantile plots and histograms were used to assess normality distribution and therefore determine the parametric or nonparametric assessment of the data. For continuous variables, the independent Wilcoxon rank-sum test was used and presented with a median and interquartile range, along with the 95th percent confidence interval of the median. For categorical variables, Pearson's chi-squared test or the Fisher's exact test of independence was used and presented as an odds ratio with a 95th percent confidence interval. The non-parametric Kruskal-Wallis test was used to compare CSA therapy, compliance, and symptomatic improvement between races. One-way Analysis of Variance test was used to compare apnea-hypopnea index scores between races. All tests were two-sided and used an alpha level of 0.05 to determine significance. All analyses were performed using R Statistical Software.

Results

- Significant demographic variables include BMI, weight, and insurance. Patients with CSA have a median BMI 3.66 units higher than matched controls (95% CI: 1.24 to 6.03, W = 3405.5, p-value = 0.003644) and median weight was 19.40 pounds higher than matched controls (95% CI: 4.80 to 35.00, W = 3313.5, p-value = 0.009923). Patients with CSA are 2.46 times more likely than matched controls to have private insurance (95% CI: 1.10 to 5.62, p-value = 0.02515). [Table 2]
- Patients with CSA were found to be 5.86 more likely to be male (95% CI: 2.22 to 18.28, p-value < 0.001). [Table 1]
- Biological variables that were found to be significant include atrial fibrillation, history of neurological disorders, hypercholesterolemia, insomnia, periodic limb movement syndrome, and any autoimmune disorder. [Table 2]
- CSA patients were 3.59 times more likely to have atrial fibrillation than matched controls (95% CI: 1.04 to 11.87, p-value = 0.03071), 3.63 times more likely than matched controls to have history of neurological disorders (95% CI: 1.22 to 10.51, p = 0.013), 3.59 times more likely to have hypercholesterolemia (95% CI: 1.04 to 11.87, p-value = 0.031), 3.55 times more likely to have insomnia (95% CI: 1.38 to 8.92, p-value = 0.009985). [Table 2]
- Patients with CSA were 20.34 times more likely to have periodic limb movement syndrome than matched controls (95% CI: 2.99 to 551.28, p-value = 0.0006134) and 6.43 times more likely to have an autoimmune disorder (95% CI: 1.94 to 22.25, p-value = 0.0005198). [Table 2]
- Psychiatric variables including depression, PTSD, anxiety, ADHD, bipolar, and schizophrenia were not found to be significant. Additionally, therapies including the use of barbiturates, tranquilizers, opioids, and sleep medication were not found to be significant.
- Comparisons of CSA therapy, compliance, and symptomatic improvement between races were not statistically significant. AHI-index scores between races were not found to be statistically significant as well.

	Odds Ratio (95% Confidence Interval)	Fisher's Exact Test1 or Chi-Square Test2
Sex		
Male	5.86 (2.22, 18.28)	2= 14.801, df = 1, p<0.0001195
Female	0.17 (0.05, 0.45)	
Race		
Asian	0.86 (0.32, 2.16)	2= 0.0189, df = 1, p< 0.8905
White	1.18 (0.52, 2.70)	2= 0.059712, df = 1, p< 0.807
Native Hawaiian	1.15 (0.42, 2.97)	2= 0.00773, df = 1, p< 0.9299
	Median (25% Quartile, 75% Quartile)	**Wilcoxon Rank Sum Test (estimated difference between groups)**
Age		
CSA	65.5 (57.0, 75.0)	4.00 (95% CI: -3.00 to 12.00) W = 2958.5, p < 0.1905
Unmatched Controls	62.0 (30.5, 93.5)	

Table 1. CSA vs Unmatched Controls Patient Demographics

	Median (25% Quartile, 75% Quartile	Wilcoxon Rank Sum Test (estimated difference between groups)
Body Mass Index (kg/m2)		
CSA	32.34 (26.24, 36.66)	3.66 (95% CI: 1.24 to 6.03) W = 3405.5, p-value < 0.003644
Matched Controls	28.09 (25.10, 30.68)	
Weight (lb)		
CSA	201.8 (180.2, 230.2)	19.40 (95% CI: 4.80 to 35.00) W = 3313.5, p-value < 0.009923
Matched Controls	184.0 (160.0, 207.1)	
	Odds Ratio (95% Confidence Interval)	Fisher's Exact Test1 or Chi-Square Test2
Atrial Fibrillation (n, %)		
CSA (7, 19%)	3.59 (1.04, 11.87)	2= 4.6689, df = 1, p< 0.03071
Matched Controls (9, 6%)	0.28 (0.084, 0.96)	
Hx of Neurological Disorders (n, %)		
CSA (9, 25%)	3.63 (1.22, 10.51)	2=6.2298, df=1, p<0.01256
Matched Controls (12, 8%)	0.28 (0.095, 0.82)	
Hypercholesterolemia (n, %)		
CSA (7, 19%)	3.59 (1.05, 11.87)	2=4.6689, df = 1, p< 0.03071
Matched Controls (9, 6%)	0.28 (0.08, 0.96)	
Insomnia (n, %)		
CSA (10, 28%)	3.55 (1.38, 8.92)	2= 6.6376, df = 1, p<0.009985
Matched Controls (14, 10%)	0.28 (0.11, 0.72)	
Periodic limb movement syndrome (n, %)		
CSA (5, 14%)	20.34 (2.99, 551.28)	2= 11.735, df = 1, p< 0.0006134
Matched Controls (1, 1%)	0.05 (0.0018, 0.33)	
Autoimmune Disorder (n, %)		
CSA (9, 25%)	6.43 (1.94, 22.25)	2=12.043, df = 1, p< 0.0005198
Matched Controls (7, 5%)	0.16 (0.045, 0.51)	

Table 2. Biological Comorbidities. CSA vs Matched Controls

Conclusions/Discussion

- Our findings confirm with previous research studies of risk factors associated with CSA including heart disease, or more specifically, atrial fibrillation. While CSA is an uncommon sleep disorder, it is commonly seen in patients with heart failure, stroke and atrial fibrillation, with recent data suggesting that it may be a risk factor for incident atrial fibrillation and heart failure amongst the older male population.[3,6]
- Higher BMI associations cannot be separated to risk isolated CSA only, as many patients are co-diagnosed with OSA.
- The finding that those diagnosed with CSA are more likely to have private insurance is novel, but there was no significance with household income or other sociodemographic variables. A study done in Ontario found that there was no association between neighborhood income level and the purchase and acceptance of CPAP treatment in CSA patients.[10] Other studies have found CSA patients in lower socioeconomic statuses to be less compliant to CPAP therapy. These studies suggest that access to CPAP therapy may not be the primary obstacle for improvement in CSA patients, but may play other important roles in a patient's compliance.[5]
- CSA patients are more likely to have a history of neurological disease because of the etiology of central sleep apnea.
- Hypercholesterolemia was also found to be significant, in line with CSA's association with heart disease and higher BMI.
- Though a previous study had found an association with CSA with chronic opioid usage, we did not find such significance. Geographical location and the inherent nature of the patient population of a neurology clinic may help explain this finding.
- Contrary to a previous study that found a greater association of Asians with sleep-disordered breathing, we found no statistically significant difference in apneas between Asians, Caucasians, and Native Hawaiian / Pacific Islanders.
- There was no statistically significant difference between races in treatment modality nor compliance. Interestingly, a previous study in New Zealand found that Māori patients demonstrated less CPAP adherence than non-Māori patients, but we found no such differences between Native Hawaiian / Pacific Islanders and non-Native Hawaiian / Pacific Islanders.[2]

Future Directions

- To expand the study to include CSA patients from other hospital systems and clinics
- Examine other variables that may play a role in CSA in ethnically diverse groups
- Patient retention may be an interesting variable for future study, as a number of the observed CSA patients did not return for future appointments.
- Explore associations between collected set of variables with OSA patients

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Disclosure/Correspondence

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Principal Investigator: Kore Liow, MD, FACP, FAAN
Sub-Investigators: (Faculty Mentor), MD, Jason Viereck, MD, PhD

Correspondence or reprints: kliow@hawaii.edu

Identifying Knowledge and Hesitancy of Aduhelm (aducanumab) in Caregivers of Alzheimer's Patients within the Community of Hawai'i

Connor Goo[1,2], Sarvia Aquino[1,3], Kasen Wong[1,3], Jaron Kawamura[1,4], Samantha Masca[1,5], Patricia Borman, MD[1], Enrique Carrazana, MD[1], Jason Viereck, MD, PhD[1], Kore Kai Liow, MD, FACP, FAAN[1,2], Rachel Gorenflo[1,2], Frances Morden[1,2]

[1]Clinical Research Center, Hawaii Pacific Neuroscience, Honolulu HI, [2]John A. Burns School of Medicine, University of Hawaii, Honolulu, HI, [3]University of Southern California, Los Angeles, CA, [4]'Iolani School, Honolulu, HI, [5]University of Notre Dame, Notre Dame, IN

Background

Alzheimer's Disease (AD) is a progressive neurodegenerative disorder characterized by beta-amyloid plaque buildup in the brain which disrupts communication among neurons, resulting in loss of function and cell death. Additionally, dementia symptoms worsen with time upon disease arrival. While there is currently no cure to AD, one treatment, aducanumab (Aduhelm), is the first therapy to demonstrate amyloid removal. In theory, the treatment could reduce cognitive and functional decline in people living with AD.

Aduhelm, a human monoclonal antibody treatment from Biogen, was acceleratively approved by the FDA on June 7, 2021 for its displayed removal of associated beta amyloid deposits in the brain, a surrogate biomarker for the rate of AD progression. Results showed a dose-and time-dependent reduction in beta-amyloid pathology with aducanumab in phase 3 studies of EMERGE but not ENGAGE. As such, its trial results have been described as unreliable with regards to improving cognition, and the FDA's approval has been met with much reluctance and criticism. Additionally, such a recent approval has warranted much media coverage on Aduhelm which portrays it in either a hopeful or dangerous light. Since approval and coverage surrounding this treatment is fairly new, characterizing the nature and scale of treatment hesitancy and likewise willingness is required to better inform effective implementations strategies to address the concerns expressed by AD patients and their caregivers.

Objectives

To identify the key determinants of hesitancy with Aduhelm in current AD patients' caregivers which lead them to accept, reject, or delay the potential of this treatment across 3 different areas: who is hesitant, what are they hesitant of, and why are they hesitant of said concern(s).

Methods

Memory and Brain Health, demographics, MMSE/MoCA, medical history and comorbidity data were collected from the charts of 374 patients with Alzheimer's Disease in the last 2 years (1/1/19 - 6/22/21) in eClinicalWorks 11e software (age range 51-101) at the Hawaii Pacific Neuroscience (HPN) Center for Healthy Aging. Of those, 22 were deceased and thus omitted, and the remaining 352 patients/caregivers were preliminarily included in the study.

A telephone survey was then conducted with 352 Alzheimer's disease patients and their caregivers. Of those, 13 were deceased and 253 were unable to be reached or declined the survey. Due to the erratic nature of cognitive function, surveys were directed towards self-identified caregivers of Alzheimer's patients at HPN who correspondingly make treatment decisions regarding patients' healthcare. Alzheimer's patients who care for themselves were also surveyed as caregivers, as they still decide on their own healthcare and treatments.

The questionnaire was approximately 10 minutes that was meant to target caregivers of Alzheimer's patients. Calls were made between July 17, 2021 and July 31, 2021. The phone survey had several questions that inquired about patient care, hesitancy with Aduhelm, and more demographic data (see supplementary material for full question list). All calls were given in English and started with verbal consent from patients and caregivers to the surveyor.

Results

Of the 339 eligible AD patients and caregivers that were called, 86 (25.4%) responded and answered the survey. Of the 86 responses collected, 54 (62.8%) caregivers were unfamiliar with Aduhelm, while 32 (37.2%) caregivers were familiar with the drug. Caregiver familiarization with Aduhelm was found to be increased for patients with higher MMSE scores (Wilcoxon Rank Sum Test estimated difference between groups = 3.00, 95% CI: 1.00, 6.00, p = 0.022), caregivers who were spouses of their respective patient with AD (4.89 greater odds, $\chi 2 = 9.27$, p = 0.0023), caregivers with patients using stress management as a lifestyle modification (2.89 greater odds, $\chi 2 = 3.96$, p = 0.046), and caregivers with patients who were former smokers (3.78 greater odds, $\chi 2 = 6.17$, p = 0.013).

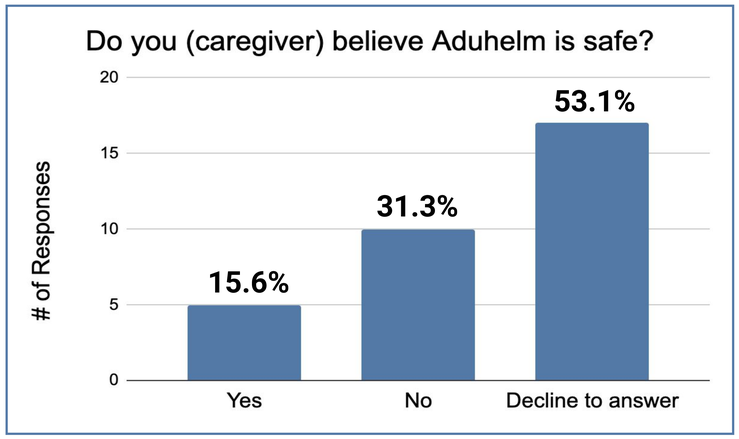

Figure 1. Comparing the beliefs of safety with Aduhelm from AD caregivers.

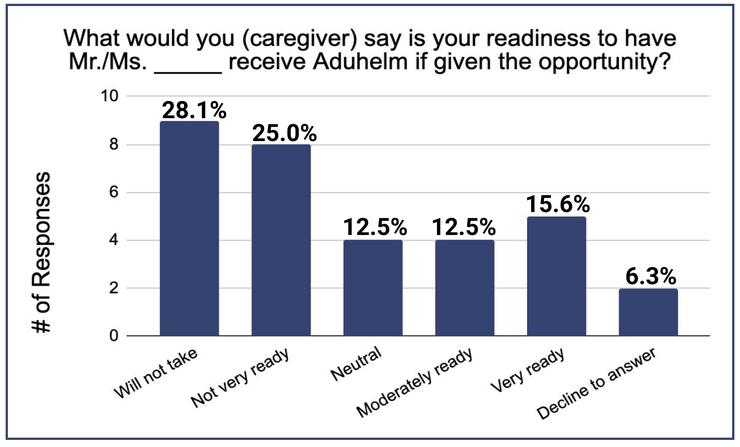

Figure 2. Comparing the readiness of AD caregivers to take Aduhelm.

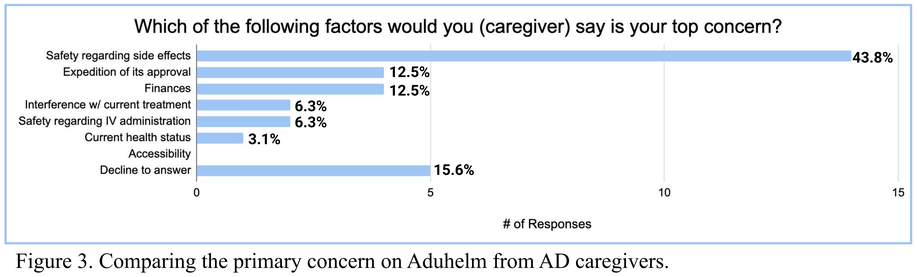

Figure 3. Comparing the primary concern on Aduhelm from AD caregivers.

Conclusions/Discussion

On July 12, 2021, the FDA updated the Aduhelm label to recommend only mild cognitive impairment (MCI) AD patients to use the drug. Despite the announcement occurring during our surveying period, we continued to call all patients, regardless of their level of cognitive impairment. Since all questions were phrased hypothetically, survey respondents were able to answer the survey regardless of the patient's level of cognitive impairment. The calling period was completed before the end of July 2021, minimizing the difference between respondent knowledge of the drug. Additionally, due to the recent approval of the drug, only a fraction of the respondents were aware of it, and it is likely that even fewer were aware of the updated recommendation.

Although Aduhelm provides some hope for AD patients and caregivers, most are not ready to receive the treatment. It is possible that with safety regarding side effects from Aduhelm being reported as the top concern, many are hesitant. Due to the aged population of those diagnosed with AD, additional health concerns could play a larger role in their willingness to take another drug. If their current quality of life is acceptable, they may not wish to risk taking a new drug with side effects that have not been well studied, or in fact, could be damaging.

Future Directions

Although this research found significant data on hesitancy with Aduhelm in the Hawai'i population, it remains limited because the research only included patients in the HPN community. To gain a more accurate assessment of the actual hesitancy in Hawai'i, efforts to survey Alzheimer's patients and caregivers that attend other health centers would be necessary. In addition, the research involved a significant number of Native Hawaiian and other Pacific Islander patients and caregivers, a minority group which is often overlooked in national research. However, few to none of the participants were either Black or Hispanic. It would be important to incorporate more underrepresented groups as much research has failed to do so. Future research should also consider the possibilities of Aduhelm as a proactive treatment rather than reactive. This could benefit patients as it may lead to earlier screening of Alzheimer's disease and opportunities to start treatment earlier rather than too late. Additionally, more research should look into the benefits of incorporating lifestyle modifications into treatment plans with Aduhelm. As patients and caregivers are focusing their energy in changing their lifestyles, they should be able to maintain this treatment even while on Aduhelm.

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Disclosure/Correspondence

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Principal Investigator: Kore Liow, MD, FACP, FAAN
Sub-Investigators: (Faculty Mentor), MD, Jason Viereck, MD, PhD

Correspondence or reprints: kliow@hawaii.edu

Employability, Work Difficulties and Factors Impacting Chronic Migraine Patients of Hawaii: Results of a Quality Improvement Survey

Michelle Stafford[1,2], Tracy Van[1,3], Ashley Ung[1,4], Kara Ushijima[1,5], Emma Inouye[1,6] ,Uiyeol Yoon[1,7]
Vimala Vajjala, MD[1], Jason Viereck, MD, PhD[1], Kore Kai Liow, MD, FACP, FAAN[1,2], Frances Morden[1,2], Rachel Gorenflo[1,2]
[1]Clinical Research Center, Hawaii Pacific Neuroscience, Honolulu, HI, [2]John A. Burns School of Medicine, University of Hawaii, Honolulu, HI, [3]Skaggs School of Pharmacy, University of Colorado, Aurora, CO, [4]Pacific University, Forest Grove, OR,
[5] University of Southern California, Los Angeles, CA, [6]Middlebury College, Middlebury, VT, [7]Hawaii Pacific University, Honolulu, HI,

Background

Migraines are primary headaches characterized by unilateral, localized, throbbing pain, which is often accompanied by nausea, vomiting, and sensitivity to light and sound. They can be further characterized into episodic or chronic, and intractable (IM) or non intractable (NM). Chronic intractable migraines, which are severe migraines lasting greater than 72 hours and refractory to usual therapies, especially have a significant impact on patients' daily lives. This is manifested as reduced work productivity (presenteeism) and cost. There are a variety of tools and questionnaires which measure the impact migraines and headaches have on the ability to function in daily life. However, migraine triggers and work-related difficulties are often inadequately addressed; HEADWORK is a new 17-item, two-scale questionnaire which captures the variety of difficulties and factors that may impact patients at work. This study aims to survey Hawaii's diverse population to identify possible trends in employability and quality of life for chronic migraine patients.

Objective

To evaluate the relationship between work difficulties and other key factors that may impact patients with intractable and non-intractable chronic migraines.

Methods

- Conducted a retrospective chart review of 654 patients at HPN with migraines between April 2021 and June 2021
- Identified patient population through ICD-10 codes for variations of migraines
- Data collected from patients include: demographics, past medical history, employment status, and abortive and preventative medication trials
- Surveyed patients through phone calls using HIT-6 and HEADWORK questionnaire
- Employment data was categorized into the Standard Occupational Classification (SOC) system
- Statistical analyses were performed through RStudio

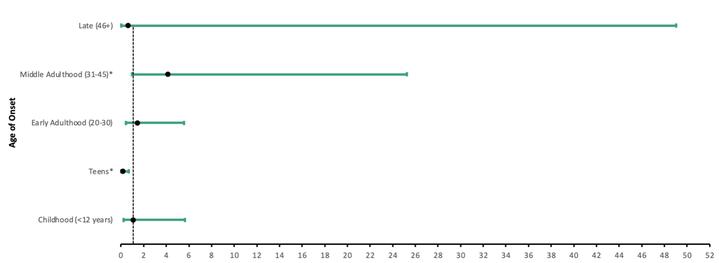

Figure 2. Odds of age of onset for intractable vs non intractable (reference group) employed patients with migraines who completed the survey

Results

Of the 654 patients who were recruited for phone calls, 182 patients completed the survey and their data was collected for analysis. [Table 1]

- 81.9% were female and 18.1% were male
- 64.8% were diagnosed with IM and 35.2% with NM
- IM patients were 0.51x less likely to be employed than NM patients (p=0.05)

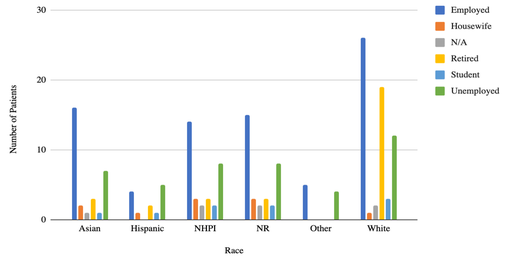

Figure 1. Employment status vs. race analysis (n=182)

Table 1. Basic characteristics of migraine study population

	IM (n = 118)	NM (n = 64)
Sex		
Female	98 (83.1%)	51 (79.7%)
Male	20 (17.0%)	13 (20.3%)
Age		
Mean (range)	44.53 (27.00, 68.00)	48.02 (24.00, 76.00)
Race		
White	41 (34.7%)	22 (34.4%)
Asian	20 (16.9%)	10 (15.6%)
Hispanic	9 (7.6%)	4 (6.3%)
NHPI	19 (16.1%)	15 (23.4%)
NR	23 (19.5%)	10 (15.6%)
Other Minorities (Black, Other, NAAN)	6 (5.1%)	3 (4.7%)

Analysis was conducted for employed patients with migraines who completed the survey to compare age and trial factors. [Table 2]

- The difference in number of years for the median age was found to be seven (p=0.013)
- Patients with NM had one less trial regarding the number of preventative trials compared to patients with IM (p=0.16)

Table 2. Analysis of age and medication

	Median (25% Quartile, 75% Quartile)	Wilcoxon Rank Sum
Age		
Intractable	44 (37.50, 51.00)	-7.00, (95%CI: -13.00, -1.00003) W = 391.5, p = 0.013 *
Non Intractable	35 (27.75, 45.25)	
Number of preventative trials		
Intractable	4 (3.00, 5.00)	-1.00 (95%CI: -2.00, -0.000001) W = 398.5, p = 0.016 *
Non Intractable	3 (1.75, 4.25)	
Number of abortive trials		
Intractable	1 (0.00, 2.00)	0.00003 (95%CI: -0.00003, 1.00) W = 716.5, p = 0.16
Non intractable	1 (1.00, 3.00)	

Analysis was conducted to evaluate the specific number of work-related difficulties patients answered that they dealt with, as well as the number of factors affecting work.

- NM patients who completed the HEADWORK survey had one less factor affecting work compared to IM patients (p=0.043) [Table 3]
- No significance was found for the number of work-related difficulties for surveyed patients employed or in school

Table 3. HEADWORK analysis of total number of work-related difficulties and factors affecting work

	Median (25% Quartile, 75% Quartile)	Wilcoxon Rank Sum
Number of work-related difficulties		
Intractable	7 (5.00, 9.00)	-1.00 (95% CI: -3.00, 0.99) W = 496, p = 0.2111
Non Intractable	5 (3.00, 9.00)	
Number of factors affecting work		
Intractable	4 (3.00, 4.50)	-1.00 (95% CI: -2.00, -0.000036) W = 433, p = 0.043 *
Non Intractable	3 (2.00, 4.00)	

- IM patients were 3.7x more likely to encounter difficulties dealing with work problems than patients with NM (p=0.02) [Table 4]
- The difficulties listed in Table 4 are four of eleven total difficulties presented to patients over the phone survey

- Teens were 0.18x (p=0.0086) less likely to have an initial diagnosis of IM, whereas middle aged adults were 4.15x (p=0.045) more likely to be diagnosed with IM [Figure 2]
- IM patients were 3.7x more likely to encounter difficulties dealing with work problems than patients with NM (p=0.02)

Table 4. Odds ratio for HEADWORK's work-related difficulties for patients either employed or in school

	OR	95% CI	P-value
Work-Related Difficulties			
Paying attention to work tasks	0.5660	0.1364, 2.0358	X-squared = 0.46959, df = 1, p = 0.493
Solving organizational problems at work	2.2236	0.7666, 6.6529	X-squared = 1.9761, df = 1, p = 0.159
Starting a new work task	0.7884	0.2693, 2.2693	X-squared = 0.06265, df = 1, p = 0.802
Dealing with work problems	3.7005	1.1818, 12.2699	X-squared = 5.2833, df = 1, p = 0.021 *

Conclusions/Discussion

Overall, there were significantly more employed patients with NM compared to patients with IM. As seen in the results of the HEADWORK questionnaire, factors such as "dealing with work problems" were significantly more burdensome in IM patients than in NM patients. These findings are expected; IM patients experience more severe, debilitating migraines that result in more difficulty dealing with work problems, thus resulting in lower rates of employment.

Interestingly, employed teens were significantly less likely to be diagnosed with intractable migraines, whereas those who were employed and middle aged (31-45 years old) were more likely to initially present with intractable migraine.

These findings correspond to the definition of intractable migraine: refractory to usual therapies. Patients in middle adulthood are more likely than teens to have spent a long amount of time going through trials of different migraine medications, resulting in diagnosis of intractable migraine.

A limitation of our study could be that we surveyed patients solely from HPN, a clinic with migraine specialists. Patients with intractable chronic migraine are probably more likely to visit a specialist compared to a non-intractable chronic migraine patient who might just seek treatment from their general practitioner. This small sample size could have been skewed compared to the true distribution of migraine patients in Hawaii.

In a study of first-time patients at a headache clinic, only 5.1% of patients were diagnosed with refractory, or intractable migraine[1]. Our sample study included patients who had been visiting the clinic for years, making it more likely that more patients would have intractable migraine.

Future Directions

Future studies with a larger sample size and inclusion of social factors in the determination of employment status should be conducted to obtain more representative results.

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Disclosure/Correspondence

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Principal Investigator: Kore Liow, MD, FACP, FAAN
Sub-Investigators: Vimala Vajjala, MD, Jason Viereck, MD, PhD
Correspondence or reprints: kliow@hawaii.edu

An Investigation into the Potential Risk Factors Influencing Lumbar Radicular Pain in Hawai`i

Johanna Linna[1,2], Alexandra Masca[1,3], Raksana Kayumova[1,4], Jonathan Ragheb[1,5], Charissa Tan[1,6], Ilana Buffenstein[1,6], Jason Chang, MD[1], Jason Viereck, MD, PhD[1], Kore Kai Liow, MD, FACP, FAAN[1,6], Rachel Gorenflo[1,6], Frances Morden[1,6]

[1]Clinical Research Center, Hawaii Pacific Neuroscience, Honolulu HI, [2]Princeton University, Princeton, New Jersey, [3]University of Notre Dame, Notre Dame, Indiana, [4]University of Hawai'i at Mānoa, Honolulu, Hawaii, [5]Harvard University, Cambridge, Massachusetts, [6]John A. Burns School of Medicine, University of Hawaii Honolulu, HI.

Background

Lumbar radiculopathy (LR) is a pain syndrome caused by a compressive force causing irritation on the nerves in the lower back. It causes low back pain that can be described as sharp, piercing, or burning and the pain may radiate into the lower extremities in a dermatomal pattern. It is a very common diagnosis with a 3-5% prevalence and roughly 1-2% incidence in the general population. Recently, there has been very large increases in medicare expenditures for the diagnosis and treatment of chronic back pain, putting a toll on the economy and healthcare system.[1] However the risk factors for LR and the impact of LR on people in Hawai`i are not well understood. Studies have looked at possible risk factors for LR, which include age, sex, race, occupation, obesity, smoking, psyhological factors, and genetics. However, these studies have contradictory conclusions and use small, homogenous sample sizes.

This study uses a patient population in Hawaii to 1) identify possible demographic and lifestyle risk factors for the development of lumbar radiculopathy in the Hawaii population. This study also 2) explores how those risk factors affect the severity of pain that LR patients experience.

Objectives

This study aims to investigate potential demographic and lifestyle risk factors that may influence how patients with LR in Hawai`i experience pain.

Methods

A single-centered, retrospective medical chart review was conducted using the *EClinicalWorks* data of patients treated at HPN from 2009-2021. Patients were identified using the ICD-10 code for lumbar radiculopathy M54.16. Patients were chosen using inclusion/exclusion criteria as listed below. Contrrols were collected for each LR patients collected with the same age, sex, and race/ethnicity. Variables collected include age, gender, race/ethnicity, biological and psychiatric comorbidities, MRI/EMG findings, self-reported pain scale (0-10), and socioeconomic status (0-1). Further statistical analysis was conducted using RStudio software using Mann-Whitney U/Wilcoxon Sum of ranks, Chi-squared, Fisher's, and Paired t-test tests.

Include

- Patient has lumbar radiculopathy ICD-10 code M54.16
- Patient has both lower extremity EMG and lumbar MRI
- EMG is positive for LR
- Patient presents with LR symptoms at initial visit

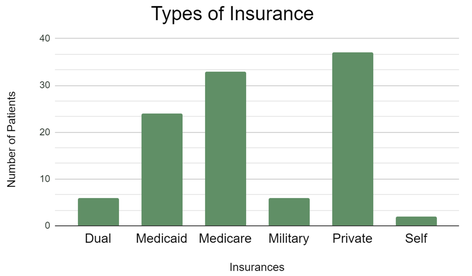
Exclude

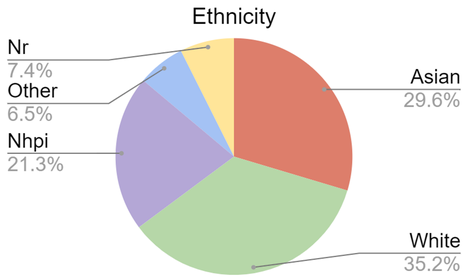
- Patient came in to HPN for reason other than LR or LR symptoms
- LR not patient's primary diagnosis or reason for seeking treatment
- Patient has limited data in chart (i.e. did not receive full work up)

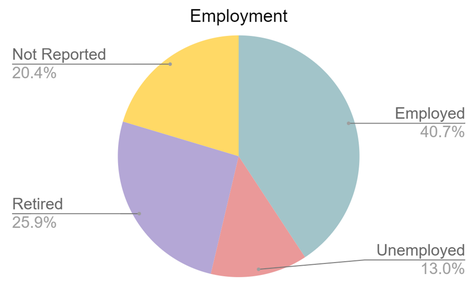
Results

Included

- 108/539 patients
- 57 females + 51 males
- Positive EMG & any MRI
- Inconclusive EMG & positive MRI
- NP visit has low back pain, LR, numbness, tingling, weakness as chief complaint







LR vs General Population

	Odds Ratio (95% Confidence Interval)	Chi-Square Test
Sex		
Male	1.32 (0.84, 2.07)	$\chi^2 = 1.4405$, df = 1, p = 0.2301
Female	0.75 (0.48, 1.17)	
Race		
White	1 (0.62, 1.58)	$\chi^2 = 0$, df = 1, p = 1
Asian	1.32 (0.80, 2.16)	$\chi^2 = 1.1358$, df = 1, p = 0.2865
NHPI	1.44 (0.81, 2.51)	$\chi^2 = 1.5273$, df = 1, p = 0.2165
Other	0.76 (0.81, 0.78)	$\chi^2 = 0.00207$, df = 1, p = 0.9637
NR	0.0019 (0.0024, 0.0033)	$\chi^2 = 7.7719$, df = 1, **p = 0.005306**

	Insurance					
	Dual	**Medicaid**	**Medicare**	**Military**	**Private**	**Self**
Difference Between MRI and Patient Report						
Same	0.59	0.76	1.00	1.00	1.00	1.00
Less	1.00	0.78	0.81	1.00	0.76	1.00
More	1.00	**0.04**	0.24	0.07	0.21	1.00
NA	0.37	**0.04**	0.52	0.17	0.60	0.09

Conclusions/Discussion

These findings suggest that demographic and lifestyle risk factors influence how patients in Hawai'i experience and report LR. While 23.1% of the patient population was not treated their LR, Asians and NHPIs were more likely to not receive treatment. Results also show that 11% of the patient population received only medication for their lumbar radicular pain, with whites making up the majority of this medication only treatment. Similarly, Asians were more likely to be referred to physical therapy (32%) as their only treatment. Further analysis of the effects of social determinants did not yield statistically significant relationships. The lack of a statistically significant relationships found between race and other variables is inconsistent with other literature. Thus, it is worth noting that Native Americans, Native Alaskan, Blacks and Hispanics were significantly underrepresented in our patient population, making up only 6.5% when combined into "other." We also investigated the difference between the severity of the patient's reported pain and the severity of their stenosis based off the MRI finding. We tested the the relationships between patient severity differences and each of the following variables: employment, sex, marital status, race, number of followup appointments, smoking, depression, alcohol use, and drug use. Each of these relationships produced a p-value >0.05 which indicates that the relationships were not statistically significant. However, our analysis indicates a statistically significant relationship between patients who have medicaid but don't report their pain. This suggests that either medicaid patients fail to report their pain scale, or that providers are less likely to ask about a medicaid patient's pain scale. Additionally, medicaid patients would report that they were experiencing more pain than the severity of their stenosis from the MRI finding.

Future Directions

While our research found statistically significant relationships between types of insurance and various other variables, we did not investigate any explanations or potential causes for these relationships. Thus, more research must be conducted to investigate why these relationships exist. Additionally, our findings of various statistically insignificant relationships, especially those that include race, are inconsistent with other literature, so more research must be done in order to determine the cause of this inconsistency.

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Disclosure/Correspondence

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Principal Investigator: Kore Liow, MD, FACP, FAAN
Sub-Investigators: Jason Chang, MD, Jason Viereck, MD, PhD
Correspondence or reprints: kliow@hawaii.edu

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