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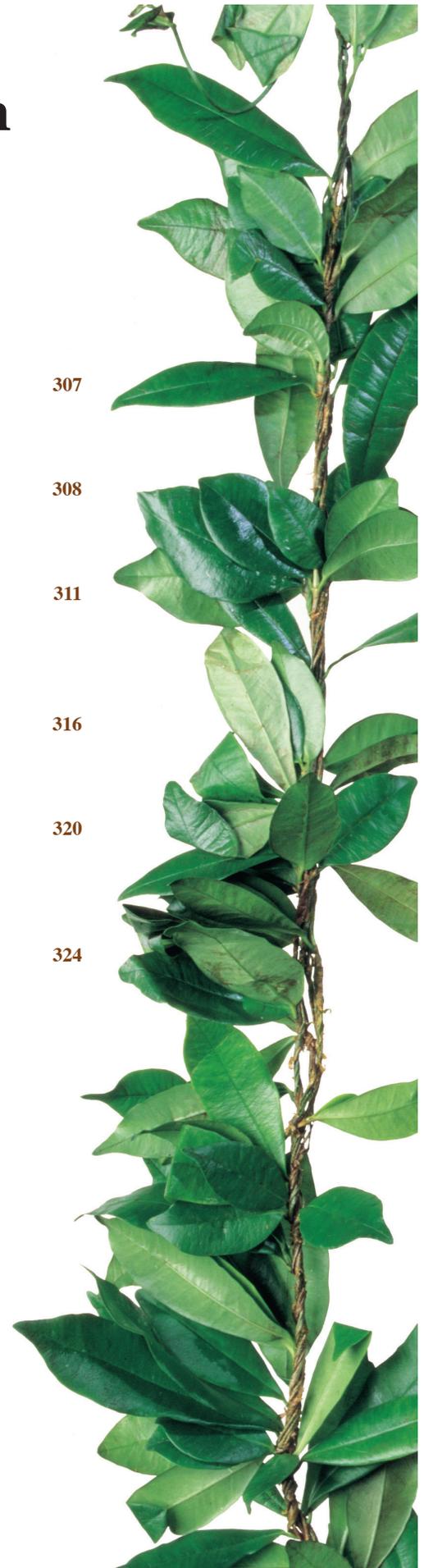
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Aim:

The aim of the Hawai'i Journal of Health & Social Welfare is to advance knowledge about health and social welfare, with a focus on the diverse peoples and unique environments of Hawai'i and the Pacific region.

History:

In 1941, a journal then called The Hawai'i Medical Journal was founded by the Hawai'i Medical Association (HMA). The HMA had been incorporated in 1856 under the Hawaiian monarchy. In 2008, a separate journal called the Hawai'i Journal of Public Health was established by a collaborative effort between the Hawai'i State Department of Health and the University of Hawai'i at Mānoa Office of Public Health Studies. In 2012, these two journals merged to form the Hawai'i Journal of Medicine & Public Health, and this journal continued to be supported by the Hawai'i State Department of Health and the John A. Burns School of Medicine.

In 2018, the number of partners providing financial backing for the journal expanded, and to reflect this expansion the name of the journal was changed in 2019 to the Hawai'i Journal of Health & Social Welfare. The lead academic partners are now the six units of the UH College of Health Sciences and Social Welfare, including the John A. Burns School of Medicine, UH Public Health, the Myron B. Thompson School of Social Work, the School of Nursing and Dental Hygiene, the UH Cancer Center, and the Daniel K. Inouye College of Pharmacy. Other partners are the Hawai'i State Department of Health and the UH Office of the Vice Chancellor for Research. The journal is fiscally managed by University Health Partners of Hawai'i.

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HAWAII JOURNAL WATCH

KAREN ROWAN MS

Highlights of recent research from the University of Hawai'i and the Hawai'i State Department of Health

CANCER IN THE PACIFIC

To improve cancer outcomes in the Pacific islands, a new paper calls for greater collaboration across the region. About 16,200 new cancer cases and 9,800 cancer deaths are reported yearly in the region. The people of this region face a “double burden” of having cancers such as cervical cancer that are linked to poverty and infections, as well as cancers associated with obesity and tobacco use, such as lung cancer. Researchers, including Neal Palafox MD, MPH, of the UH Cancer Center, examined cancer control in the Pacific and noted that few islands have comprehensive cancer control plans. In addition, due to a lack of health infrastructure, it is difficult to establish population-based screening programs for cervical cancer, colon cancer, and oral cancers. The region has seen some improvements, such as decreases in smoking and in hepatitis B prevalence, and improved survival of children with cancer. But access to diagnostic tests and surgical interventions are lacking in many places. According to the paper (PMID: [31395476](#)) published in *Lancet Oncology*, the countries of the Pacific are greatly resource-constrained, but their close relationships provide opportunity for collaborative approaches to controlling cancer.

HOMELESSNESS AND SOCIAL ISOLATION CAN BE TRACKED IN HOSPITAL RECORDS

The social factors of patients' lives such as living alone and homelessness can be documented in electronic health records (EHRs) and used in predictive models of acute care outcomes, new research shows. Researchers led by Emiline LaWall PhD, as part of her dissertation at the Office of Public Health Studies, examined EHR data collected on 21,274 patients at 2 Honolulu hospitals from May 2015 through April 2017. Results showed that 4.2% of hospitalizations had a 30-day potentially preventable readmission (PPR), and in the multivariable model, neither living alone nor homelessness predicted PPR. However, the use of an assistive device and a high number of co-morbid conditions predicted PPR. The researchers concluded that further research is needed to investigate methods of collecting and applying data on social factors in hospital EHRs as these are complex, multidimensional factors. The paper (PMID: [30730829](#)) is published in *Preventing Chronic Disease*.

CAMPUS-LEVEL FACTORS LINKED TO SEXUAL ASSAULT RATES

Research on sexual assault and intimate partner violence (IPV) on college campuses is often focused on finding risk and protective factors at the student level, but a new study looks at campus-level factors. Researchers led by Carrie Moylan PhD, of Michigan State University and including Rebecca L. Stotzer PhD, of the Myron B. Thompson School of Social Work, examined data gathered from 2011 to 2015 from students on 474 US campuses that participated

in the National College Health Assessment survey. In the researchers' full model of the data, the strongest campus-level predictors of higher sexual assault rates were higher levels of binge drinking and higher percentages of students who were non-heterosexual. Students who are non-heterosexual tend to experience higher rates of dating violence and sexual assault, the researchers noted. Other campus-level predictors were a lower percentage of students who received educational information about sexual and relationship violence, and a higher percentage of students who reported discrimination. For campus IPV rates, the strongest predictor was students' average number of sexual partners as a measure of “hook up culture” at the school. Schools with older students and those with higher percentages of students living on campus had lower IPV rates. The findings show that campus and community factors play a crucial role in risk, the researchers concluded. The paper is published in the *Journal of the Society for Social Work and Research*.

NURSING RESEARCHERS DEBATE THE ETHICS OF PARTICIPATION IN EXECUTIONS

In an opinion paper, senior nurses from several countries offer individual responses to a landmark 2003 paper that discussed the ethics of nurse participation in executions. Ellen Ben-Sefer PhD, RN, of the School of Nursing and Dental Hygiene, co-authored the new paper and noted that television and social media have increased the exposure of the global community to executions. Several opinions gathered in the new paper held the view that nurses are caregivers who may offer support and comfort to prisoners at the end of life and/or may have an ethical duty to provide prisoners the same care provided to any patient at the end of life. Another perspective that emerged was that the ethical codes of nursing organizations hold that nurses should never actively participate in the taking of life, and that it is wrong to use one's nursing skills to cause harm. The aim of the article was to generate debate. The authors noted that the article is not representative research. Rather, the range of opinions offered suggests a need for further discussion. The paper (PMID: [30407143](#)) is published in *Nursing Ethics*.

NEW CEPI METHOD FOR FAST fMRI

Functional magnetic resonance imaging (fMRI) is an imaging technique widely used in neurology and neuropsychology to study and map brain activity. In fMRI experiments a series of hundreds of brain images are obtained to track fluctuations in the brain. Most fMRI methods are based on a rapid sampling strategy called echo planar imaging (EPI) which enables image acquisitions at high speed. In a recent publication, researchers including Christoph Rettenmeier PhD, of the John A. Burns School of Medicine describe a new EPI method referred to as circular EPI (CEPI) which is a more efficient way to acquire fMRI data. The researchers wrote that this new CEPI method provides better maps of brain activity possibly leading to more accurate studies and diagnoses of disease. Besides fMRI, the CEPI method has great potential for other types of fast MRI applications, such as diffusion tensor imaging (DTI). The article (PMID: [30273963](#)) is published in *Magnetic Resonance in Medicine*.

The “Blown Pupil”: Imminent Death or Harmless Contamination?

Nash A.K. Witten MD and Peter J. Di Rocco MD

Abstract

Acute anisocoria and unilateral mydriasis is physically alarming to patients and diagnostically worrisome to clinicians. We report the case of a 14-year-old girl who presented to the pediatric emergency department with acute anisocoria and unilateral mydriasis after contacting an Angel’s trumpet plant and who had complete resolution of symptoms four days following eye contamination. The Angel’s trumpet plant contains three active components which can result in mydriasis: hycosamine, atropine, and scopolamine. The three active components occur in different parts of the plant, including on the small glandular hairs that cover the entire plant. This likely explains why even brief contact with the plant can result in unintentional contamination of the eye and in mydriasis. It is critical when obtaining a history from a patient with such a presentation to ask explicitly about any contact with plants prior to onset of symptoms. Although eye contamination with the Angel’s trumpet plant is self-limited and resolves within a week, the appearance of a persistently unilateral mydriatic eye can be alarming to patients and clinicians, which too often results in an unnecessary, costly workup.

Keywords

anisocoria, mydriasis, Angel’s trumpet, pediatric emergency medicine

Introduction

Anisocoria, or unequal pupil sizes, and mydriasis, pupil dilation, with acute onset can be caused by anatomical abnormalities, pharmacological contamination, or can be seen in a clustering of abnormal findings. In this case, a 14-year-old girl presented to the pediatric emergency department with acute anisocoria and unilateral mydriasis after contacting an Angel’s trumpet plant. Numerous warm to tropical weather plants found in Hawai‘i contain tropane alkaloids, such as atropine, scopolamine, and hycosamine, as seen in Table 1.¹

The first Angel’s trumpet plant, at that time listed as *Datura arborea*, was brought to Hawai‘i in 1825, aboard the HMS Blonde.² The *Datura* and *Brusmansia* genera of plants are often

used interchangeably due to all member plants initially being included in the genus *Datura*. In the 1970s taxonomist Tom E. Lockwood separated the genus *Datura* into two sub-genera: *Datura* and *Brusmansia*.³ There continues to be confusion regarding what genus member plants belong to; therefore, case reports and poison control reports of contamination and ingestion interchange the genera. *Brusmansia x candida*, one of the many *Brugmansia* plants commonly referred to Angel’s trumpet, is the most commonly cultivated species within this genus.⁴ Despite the high number of plants cultivated, between 2014 and 2018 only eleven events of human exposure to members of these genera were reported to the Hawai‘i Poison Center, out of the total 44 anticholinergic plant exposures that were reported.⁵ Also, only one case report of acute anticholinergic toxicity related to Angel’s trumpet tea ingestion has been published from Hawai‘i.⁶ In this case report, we examine the case of a 14-year-old female who presented to the pediatric emergency department with acute anisocoria and unilateral mydriasis after contacting an Angel’s trumpet plant and who had complete resolution of symptoms four days following eye contamination. The case presentation was submitted to the Hawai‘i Pacific Health Research Institute for review and was deemed not needing institutional review board approval, study number 2019-003.

Case Presentation

A 14-year-old girl with a non-contributory past medical history presented to the pediatric emergency department with chief complaint of “right pupil very dilated and not changing with light changes.” She woke up that morning in her usual state of health, went outside to film a video for a school project, and 30 minutes later developed right eye photophobia and right unilateral temporal headache with exposure to bright light. She rated the headache pain as 7/10 with exposure to bright light and 0/10 when in a dark room; neither eye was painful. She denied wearing contacts or placing eye drops in either eye. The patient initially denied touching anything unusual prior to touching her eyes. Subjectively, associated symptoms included blurry vision in both eyes with worse far vision in the right eye. She had participated in spring board diving competition the day prior to presentation, with associated repeated water impaction from three-meter height. The patient did spring board diving regularly as part of her athletic training and denied any significant trauma to her eyes or face outside of her normal regimen. No other neurological symptoms were present. There was no history of fever; illicit or prescribed drug contact, including scopolamine patch, or ingestion; or unintentional intoxication. She was not on any pertinent medications at the time of emer-

Family Name	Genus and Species	Common Name
Solanaceae	<i>Brusmansia x candida</i> or <i>Datura candida</i>	Angels’ trumpet
Proteaceae	<i>Protea cynarioides</i>	Protea
Euphorbiaceae	<i>Euphorbia pulcherrima</i>	Poinsettia
Rhizophoraceae	<i>Rhizophora mangle</i>	American Mangrove
Convolvaceae	<i>Convolvulus arvensis</i>	Morning glory



Figure 1. Photograph Taken in the Pediatric Emergency Department Hours After Onset of Symptoms Demonstrating Anisocoria with Right Pupil Mydriasis in a Brightly Lit Room. Consent to Use Picture Obtained from Patient's Mother and the Patient.

gency department presentation. Vital signs on presentation to the emergency room included a temperature of 36.7°C, blood pressure of 117/62 mmHg, heart rate of 61 beats per minute, respiratory rate of 20 breaths per minute, and peripheral capillary oxygenation of 100% on room air. On physical exam, she appeared in mild distress and the right pupil was dilated to approximately 5 mm, as seen in Figure 1, and was briefly and minimally reactive to direct and consensual light. The left pupil was approximately 3 mm in diameter and was reactive to direct light but not reactive to consensual light. No discharge, conjunctival injection, or discharge to bilateral eyes. Normal extraocular eye movements, tear film, and four quadrant visual acuity to confrontation. The remainder of the neurological exam was non-focal and within normal limits. Workup of the mydriasis in the emergency department included visual acuity, fluorescein exam, intraocular pressure measurement, pediatric neurology phone consult, and pediatric ophthalmology phone consult. The visual acuity was 20/20 in the right eye and 20/25 in the left eye. The intraocular pressure was measured with a tonometer and found to be 17 mmHg in the right eye, within normal limits. Pediatric neurology recommended brain magnetic resonance imaging and laboratory testing, including systemic lupus erythematosus panel, anti-myelin oligodendrocyte glycoprotein antibody, and anti-neuromyelitis optica antibody. Pediatric ophthalmology recommended brain magnetic resonance imaging and close follow up in clinic. The patient and her mother elected for 'watching and waiting', in the form of close follow up with their primary care physician and ophthalmology. Prior to discharge, patient's mother questioned the care team as to whether the patient's symptoms may have been due to the subject of her school video project, the Angel's trumpet plant. The presumptive diagnosis of mydriasis due to contact with the Angel's trumpet plant and contamination of both eyes, presumably right greater than left eye, was made. The patient followed up with pediatric ophthalmology the following day, by which time anisocoria was significantly improved. The patient's mother called the pediatric emergency department to inform care team that the patient's eyes were completely normal four days after presentation.

Discussion

Acute anisocoria and mydriasis is physically alarming to patients and diagnostically worrisome to clinicians on presentation. The etiology behind this presentation can most easily be broken down to anatomical, pharmacological, or a clustering of abnormal findings, as seen in Table 2.⁷ A general history of present illness related to such a presentation will generally elucidate a history of trauma, contact with prescribed or illicit substances, or related neurological symptoms that will quickly remove most of these etiologies from the differential. In this case presentation, as well as the majority of other published case presentations related to Angel's trumpet plant exposure, very few patients shared with clinicians that they had been in contact with a plant immediately prior to their onset of mydriasis. Without this critical exposure history, clinicians are left with a broad, and potentially life altering etiology list that oftentimes result in neuroimaging, laboratory testing, and in some case reports, admission to the hospital for monitoring.

The Angel's trumpet plant contains three active components which can result in mydriasis: hycosamine, atropine, and scopolamine.¹ Various amounts of these three components occur in different parts of the plant, including on the small glandular hairs which nearly cover the entire plant, as confirmed by the

Category	Common Etiologies
Anatomical	<ul style="list-style-type: none"> • Unilateral pupillary sphincter muscle pathology • Unilateral ciliary ganglion pathology • Unilateral short ciliary nerve pathology
Pharmacological	<ul style="list-style-type: none"> • Unilateral para-sympholytic substance exposure • Unilateral sympathomimetic substance exposure • Unilateral anticholinergic substance exposure
Clustering of Symptoms	<ul style="list-style-type: none"> • Cranial nerve III palsy <ul style="list-style-type: none"> ○ Unilateral paralysis of eye adduction, depression, and elevation ○ Unilateral mydriasis ○ Unilateral ptosis

Dragendorff positive reaction observed in a study by Andreola, et alius.⁸ Dragendorff reagent is a bismuth nitrate compound that creates a brown precipitate when it comes in contact with alkaloids in plant samples.⁹ Since even the small hairs covering the Angel's trumpet plant contain alkaloids, this likely explains why even brief, non-significant contact with the plant can result in contamination of the eyes and resulting mydriasis, as seen in our patient. Since our patient had mydriasis with minimal reaction to direct and consensual light in the right eye as well as a non-reactive left pupil to consensual light, it is likely she contaminated both eyes after contacting the Angel's trumpet plant. The patient likely contaminated the right more than the left eye with the plant alkaloids. Absorption of the alkaloids via the conjunctivae, nasolacrimal canal, and nasal mucosa also bypasses first pass metabolism in the liver, which is likely why systemic symptoms, in the form of palpitations, occurred in those patients who had Angel's trumpet plant sap directly contaminate the eye.¹⁰ Of note, the most likely cause of these systemic symptoms are atropine and hycosamine, as scopolamine via contact with the eye has been shown to not effect heart rate.¹¹ The relationship between extent of alkaloid eye contact and longevity of mydriasis also does not seem to be correlated, based on the multiple published case reports, as even those patients who only touched the plant also had symptoms up to one week following contact. In all reported cases of mydriasis reviewed for this case report, the mydriasis completely resolved within one week.^{8,10,12-14}

Conclusion

The Angel's trumpet plant, as well as other tropane alkaloid containing plants, is common in Hawai'i as well as other warm or tropical weather climates and can cause adverse medical reactions even with non-significant contact with any portion of the plant, as seen in Figure 2. It is critical when obtaining a history from a patient with such a presentation to explicitly ask about any contact with plants prior to onset of symptoms. It is also critical to thoroughly document in the medical record when the patient and family decline the recommended imaging and bloodwork studies in the event of further decompensation or lack of symptom improvement. Although eye contamination with scopolamine, atropine, and hycosamine is self-limited and resolves within a week, the appearance of a persistently mydriatic eye can be alarming to patients and clinicians, which too often results in unnecessary neuroimaging, laboratory testing, and hospital admission.

Conflict of Interest

We certify that we have no financial affiliation/interest (eg, stock holdings, consultantships, honoraria) in the subject matter, materials, or products mentioned in this manuscript. None of the authors of this article have any conflict of interest to report, nor any interests represented with any products discussed or implied.



Figure 2. The Angel's Trumpet Flower Touched by the Patient. Photo Taken by the Patient's Mother and Used with Permission.

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A Comparison of Skeletal Injuries Arising from Moped and Motorcycle Collisions

John P. Dupaix MD; Maria I. Opanova MBBS; Marlee J. Elston BA; and Lorrin S.K. Lee MD

Abstract

Motorcycle and moped injuries remain a significant cause of motor-vehicle related morbidity and mortality. There is a paucity of literature describing the skeletal injuries of moped riders and how these compare to those of motorcyclists, however. This study seeks to examine the skeletal injuries sustained in such incidents and determine if there are significant differences. Hospitalized riders injured on powered two-wheeled vehicles (PTW) between 2004 and 2007 were entered into a registry along with their presentation and clinical course. This registry was sorted by PTW type. Riders with injuries of the appendicular skeleton, bony pelvis, and spine were extracted. Injuries were categorized by bone location. Demographic data, helmet use, head injury, facial fracture, Injury Severity Score (ISS), and mortality were extracted. Overall, 406/578 motorcyclists, 197/357 moped riders, and 62/92 dirt-bike riders sustained fractures of the appendicular skeleton, pelvis and/or spine. Motorcyclists had a significantly higher ISS upon presentation and had increased first-hospital-day mortality in addition to more skeletal injuries, more fractures of the upper extremity, and more fractures of the spine, pelvis, and foot. Moped riders had a significantly lower rate of helmet use and higher rate of head injuries and facial fractures. In summary, while both moped and motorcycle riders share a risk for injuries of the lower extremity, their overall pattern of injury differs. Motorcyclists appear to be at increased risk for more severe injuries and injuries of the upper extremity, spine, and pelvis, while moped riders are at increased risk for significant head and facial injury.

Keywords

powered two-wheeled vehicle, skeletal trauma, moped, motorcycle

Introduction

Powered two-wheeled (PTW) vehicle accidents account for a large percentage of admissions in orthopedic surgery as well as hospital admissions generally. Two of the highest risk groups for traffic injuries and fatality accidents are motorcycle and moped riders. Injuries sustained in PTW accidents are often more severe than those sustained in automobile crashes.¹ In the United States (US) as a whole, motorcycle accidents contribute to roughly 12% of motor vehicle related deaths.² This is an even greater concern for Hawai'i, where motorcycle and moped accidents caused an average of 27% (20%-34%) of traffic fatalities over the ten years from 2008-2018.³ Some studies have documented that the risk of injury for moped riders per distance traveled is up to 100 times than that of automobile drivers.⁴

A motorcycle is defined as a two- or three- wheeled powered vehicle with an engine larger than 50cc. This study separates motorcycles into general motorcycles designed primarily for on-road use and dirt bikes, which are motorcycles designed primarily for off-road use.⁵ A moped is defined as a two- or

three-wheeled powered vehicle that can only carry one person with a maximum of two horse power, an engine size of 50cc or less and a top speed on a level surface of 30 miles per hour.⁶ Mopeds are typically equipped with a device designed to prevent them from exceeding 30 mph, however many vehicles have been suspected to have had these devices removed or modified.⁷ In the state of Hawai'i, mopeds hold special appeal to some users because they do not require a special motorcycle license and do not require insurance if they are privately owned, making them comparably inexpensive, they have less stringent licensing requirements, they are more compact, allowing for easier parking in urban areas, and they are typically less expensive to purchase than motorcycles, dirt bikes, or automobiles.⁶

Previous studies have evaluated the factors that influence the occurrence of PTW accidents and PTW fatalities. These include age,^{1,8} length of time the individual has held a motorcycle license,⁹ gender,¹⁰ personality traits,¹¹ alcohol intoxication,^{9,12,13} helmet use,^{14,15} presence or absence of up to date motorcycle license,^{9,16} presence or absence of a passenger, speeding,⁷ time of day, road design and road conditions.¹⁷

The federal government does not make a distinction between moped and motorcycles in their reports and there is a gap in understanding the risks and injury type differences. Significant resources are invested in the prevention and treatment of PTW injuries, making it critical to better understand these injuries. Examination of the differences in injuries sustained in motorcycle accidents compared to moped accidents is important given that these vehicles generate different types of traffic interactions than cars and trucks and are often not factored into traffic design.¹⁸ Although previous studies have examined moped related injuries, much of the literature is dated or specifically looks at injuries in children and teenagers, particularly because some European countries allow moped use at age 14.^{19,20} The state of Hawai'i has only a partial helmet law, similar to 27 other states in the US. This partial helmet law is lenient, only requiring helmets for PTW riders and passengers under 18. Those 18 and older are currently not required to wear a helmet in the state of Hawai'i.²¹

The purpose of this study is to describe injuries sustained in moped and motorcycle accidents and examine the differences based on powered two-wheeled vehicle type, gender, age, and helmet use on injury type, fracture location, head injury, facial fracture, injury severity score (ISS), and mortality.

Methods

The data were collected prospectively in the IRB-approved trauma registry from all patients who presented with trauma activation and arrived alive at The Queen's Medical Center, in Honolulu, Hawai'i, USA with an injury involving a powered two-wheeled vehicle between 2004 and 2007. This registry included such data as: age, gender, use of helmet, type of vehicle, mortality, and hospital stay in addition to a free text description of their presenting injuries. First, the trauma registry was sorted by vehicle type. Demographic information was collected on each group including gender, age at time of injury, use of helmet, and mortality. Next, we coded the free text description of all orthopaedic injuries into injury type, boney location of the fracture, and the presence or absence of open fractures.

The severity of injuries sustained in traumatic incidents are often described using scoring systems. One such system is the Injury Severity Score (ISS).^{22,23} This score is the sum of squares of the highest three scores obtained from the Abbreviated Injury Scale (AIS) which describes the severity of injuries of six anatomical regions (head and neck/cervical spine, face, chest & thoracic spine, abdomen and lumbar spine, extremities, external) from one (minor) to six (not survivable). The score goes from 1-75. Any injury resulting in an AIS of 6 (unsurvivable) for that region is automatically scored as 75. This score is widely used and has been found to correlate with measures of severity such as mortality, morbidity, and hospital stay.²³ ISS was noted for each group and ISS of those with fractures of the appendicular skeleton, spine or pelvis were extracted for each group.

Statistical analyses using ANOVA with post-hoc Tukey's HSD were performed to evaluate ISS on presentation, both overall and in patients with fractures of the appendicular skeleton, pelvis, or spine. Fisher's exact test was used to evaluate proportions of motorcycle and moped riders sustaining injuries. Chi square testing was used to compare proportions of riders from all three vehicle types. All statistical analyses were performed using Microsoft Excel (Microsoft, Redmond, WA).

Results

We examined the records of 578 trauma-presenting motorcyclists, 357 trauma-presenting moped riders, and 92 trauma-presenting dirt bike riders. Overall, 406 of the 578 motorcyclists, 197 of the 357 moped riders, and 62 of the 92 dirt-bike riders sustained fractures of the appendicular skeleton, pelvis, and/or spine. The majority of patients were male in all groups (88.9% motorcycle, 81.5% moped, 97.8% dirt bike) (data not shown). The mean age of motorcycle riders was 35.8 ± 13.3 years, 35.1 ± 13.4 years for moped riders, and 25.8 ± 11.9 years for dirt bike riders (data not shown). There was no significant difference in the proportion of open fractures between moped and motorcycle riders who had sustained fractures. In comparison to moped and dirt bike riders, motorcyclists had a significantly

higher ISS score upon presentation and were more likely to die within the first hospital day as shown in Table 1 and Table 2. Dirt bike riders showed the lowest ISS, with an average ISS of 12.9 compared to an average ISS of 14.5 for moped riders and an average ISS of 16.6 for motorcycle riders.

This study also found that motorcyclists sustained significantly more skeletal injuries than moped riders ($P < .0001$), as well as more fractures of the upper extremity (hand, radius, ulna, scapula) and significantly more fractures of the spine, pelvis, and foot as seen in Tables 3, 4, 5, and 6. In contrast, moped riders were more likely to sustain significant head injuries and facial fractures (Table 2). There was also a significantly lower rate of helmet use among moped users (9.5% compared to 48.8% among motorcycle riders).

	ISS	Standard Deviation	ISS of Those with Skeletal Injury	Standard Deviation
Motorcycle Riders	16.6	± 13.04	18.77	± 12.89
Moped Riders	14.5	± 10.78	17.15	± 11.72
Dirt Bike Riders	12.9	± 8.42	14.10	± 8.47
P-Value (ANOVA)	.0030		.0125	

Values with $P < .05$ by Tukey's HSD are in bold.

	Motorcycle Riders n (%)	Moped Riders n (%)	P-Value
Mortality at Hospital	29 (5.0%)	16 (4.5%)	.7555
Death Upon Presentation/HOD #1	24 (4.2%)	4 (1.1%)	.0091
Lung/Hollow Viscus/Solid Organ Injury (Including PTX, Pulm Contusion)	181 (31.3%)	81 (22.6%)	.0044
Head Injury	259 (44.8%)	230 (64.4%)	.0001
Facial Fracture	96 (16.6%)	89 (24.9%)	.0023
Helmet Use	282 (48.8%)	34 (9.5%)	<.0001

Values with $P < .05$ are in bold.

Table 3. Location of Upper Extremity Fractures Segregated by Vehicle Type.			
	Motorcycle Riders n (%)	Moped Riders n (%)	P-Value
Scapula	50 (12.3%)	13 (6.6%)	.0113
Clavicle	76 (18.7%)	30 (15.2%)	.0917
Humerus	34 (8.4%)	11 (5.6%)	.1426
Radius	67 (16.5%)	17 (8.6%)	.0013
Ulna	53 (13.1%)	17 (8.6%)	.0445
Hand	66 (16.3%)	20 (10.2%)	.0101

Values with $P < .05$ are in Bold.

Table 4. Differences in Spinal Fractures and Fracture Location in Motorcycle Versus Moped Riders.			
	Motorcycle Riders n (%)	Moped Riders n (%)	P-Value
Overall spine	112 (27.6%)	35 (17.8%)	.0006
Cervical spine fractures	37 (9.1%)	16 (8.1%)	.4525
Thoracic spine fractures	47 (11.6%)	16 (8.1%)	.0929
Lumbar spine fractures	49 (12.1%)	11 (5.6%)	.0039

Values with $P < .05$ are in Bold.

Table 5. Percentage and Location of Fractures to the Sacrum and Pelvis Segregated by Vehicle Type.			
	Motorcycle Riders n (%)	Moped Riders n (%)	P-Value
Fractures of the Sacrum	32 (7.95)	4 (2.0%)	.0010
Fractures of the pelvis excluding the acetabulum	64 (15.8%)	18 (9.1%)	.0058
Acetabular fractures	32 (7.9%)	11 (5.6%)	.1858

Values with $P < .05$ are in Bold.

Table 6. Location of Lower Extremity Fractures Segregated by Vehicle Type.			
	Motorcycle Riders n (%)	Moped Riders n (%)	P-Value
Fractures of the femur	72 (17.7)	39 (19.8)	.3330
Fractures of the patella	15 (3.7)	12 (6.1)	.3112
Fractures of the tibia	122 (30.0)	59 (29.9)	.3455
Fractures of the fibula	102 (25.1)	48 (24.4)	.7604
Fractures of the foot	48 (11.8)	15 (7.6)	.0496

Values with $P < .05$ are in Bold.

Discussion

This is one of the first reports to examine the differences in injury severity and fracture location differentiated by PTW type. This is critical to understanding injuries sustained in PTW accidents and the crucial differences between those sustained by motorcycle riders versus moped riders versus dirt bike riders.

Our findings mirror and expand on the results of prior literature in the field. As seen in some previous studies of other populations,^{9,24} the ISS was highest in hospitalized motorcycle riders, with an average score of 16.6 compared to an average ISS of 14.5 in moped riders and an average ISS of 12.9 in dirt bike riders. This contrasts with observations of very similar levels of injury severity between moped riders and motorcyclists.²⁵ We found a significantly higher rate of head and facial injury in moped riders, as compared to motorcycle riders. As is reflected in Table 2, this study also found a statistically significant difference in the use of helmets between those who came in following a moped crash (9.5% had worn a helmet) and those who presented following a motorcycle accident (48.8% had been wearing a helmet), which may explain the increased levels of head injuries and facial fractures among moped riders in this study. Lower extremity injury was common and not significantly different between injured moped and motorcycle riders. Upper extremity injuries distal to the elbow were significantly more common in motorcyclists, as were spinal injury and thoracic injury. We also found pelvic fracture to be more common in motorcyclists.

One of the first reports on moped injuries was a relatively small (N=42) prospective study of moped riders presenting at their trauma center published in 1984.²⁶ Like our study, they noted a high proportion of head injuries and orthopedic injuries—nearly 1/3 of patients had each. Similar findings were noted in a 2002 study of primary diagnoses in a retrospective analysis of Swedish health service data.²⁷ Unfortunately, in contrast to the >90% helmet use in the Swedish study, only 9.5% of Hawaii'i moped riders admitted wearing a helmet at the time of the accident. This may explain Hawaii's nearly double rate of head injury in moped riders compared to the other two groups.

In previous studies, we noted that about a third of Hawaii's population had lower extremity fractures, with the tibia being the most common location of fracture.¹⁰ Among patients in an 8-month duration prospective study of moped riders admitted to a South Carolina ED and trauma center, 100% presented with soft tissue injuries, 33% with head injury, and 24% with fractures.²⁶ This study also saw a low rate of helmet use (5%). By contrast, a retrospective review of 4716 moped riders using records from a Swedish Hospital Discharge Registry (1987-1999) found 28% with a head injury despite 90%-95% reported helmet use. In that study less than one third of moped riders had fractures of the lower extremity (most common tibia/fibula).¹⁰

Another study in 2002 reported that over one third of moped riders had fractures of the lower extremity as the primary diagnosis.²⁷ In addition, 28% had some sort of head injury. Unlike our study, however, patients reported high helmet use (90%-95%). Also, this group only evaluated percentages of diagnoses and used combined body regions, so the true percentage of riders with injuries and the specific fractured bone is unclear.²⁷

Limitations of this study are that it only includes patients who arrived at the institution alive, and therefore excludes those who expired prior to arrival. This study also only includes injuries noted in the patients' initial hospitalization and does not include long term follow up outcomes. This study also excluded patients who did not seek medical care or received care at other institutions. The authors also had to rely on trauma activation to identify potential patients for inclusion in the retrospective database analysis. We know from past studies that many accidents are not reported in official statistics.⁸ Future studies would test the robustness of these findings in different populations and under different variable conditions. To further elucidate the differences in moped and motorcycle injuries, a statewide trauma registry would provide a more robust data set for future studies. Additionally, collecting injury data starting at the time of police report would capture a greater percentage of all powered two-wheeled vehicle collisions. Advantages of this study include one of the largest moped cohorts to compare to motorcycle riders, with one of the largest series of moped injuries published so far. These data were collected at the time of hospitalization and is the only moped rider injury study to date to examine fracture location by specific bone. Additionally, this facility is the primary tertiary referral center in Hawai'i with the highest-level trauma designation in the state with a catchment area including the entire state, allowing this study to present a representative sample of riders of powered two-wheeled vehicles in Hawai'i with injuries.

Based our findings, some recommendations can be put forth for further consideration and testing. This includes requiring helmets for all moped and motorcycle riders to reduce the number of facial and cranial injuries. Many previous studies have demonstrated a reduction in head injuries, facial fractures, and fatality accidents after the adoption of mandatory helmet laws.²⁸ In addition to helmets, white or reflective clothing has been found to reduce accidents in previous studies.²⁹ Requiring basic moped training may also be considered, although previous research on this has been inconclusive.³⁰⁻³²

Conclusion

Motorcycle and moped riders are amongst the highest risk groups in traffic. This study found several novel patterns in injuries when comparing moped and motorcycle accident trauma data. One is that moped and motorcycle riders had a similar risk of injury to their lower extremities. Moped riders were found to have an increased risk of head injury and facial fractures, likely due to lower levels of helmet use. Motorcyclists were found to have an increased risk of injury to the upper extremities, spine, pelvis and injury to the thoracoabdominal region. Both motorcycle and moped riders had similar injury scores and mortality even though their injury pattern differs. Our data demonstrate a vital need for safety improvements to reduce the incidence and severity of PTW accidents. The most effective safety improvement based on this study and previous studies would be the implementation of a mandatory helmet law for all PTW operators and passengers.

Conflicts of Interest

None of the authors identify a conflict of interest.

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Duodenal Adenocarcinoma at the Ligament of Treitz: Management and Outcome

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Abstract

Primary small bowel neoplasms at the ligament of Treitz are extremely rare and require advanced surgical technique for extirpation. The insidious onset of disease allows for a delayed presentation, often accompanied by moderate-size growth of the neoplasm, causing intestinal bleeding and bowel obstruction. The partial retroperitoneal location of these tumors pose a unique challenge for surgical resection. We present an unusual case of a primary small bowel adenocarcinoma at the Ligament of Treitz, requiring segmental resection of the fourth portion of the duodenum plus the proximal jejunum.

Keywords

adenocarcinoma, angle or ligament of Treitz, neoplasm

Abbreviations

CT = computerized tomography
EGD = esophagogastroduodenoscopy
FAP = Familial Adenomatous Polyposis
HNPCC = Hereditary non-polyposis colorectal cancer
IHC = immunohistochemistry
MSI = microsatellite instability
PET = positron emission tomography
SUV = standardized uptake value
5-FU = Fluorouracil

Introduction

Although the small bowel constitutes over 75% of the length and 90% of the mucosal surface of the alimentary tract, it is the site of only 1% of gastrointestinal cancers,¹ 1/50th as common as adenocarcinomas of the large intestine,² making neoplasms in this location particularly interesting. The mean age at presentation of these tumors is 67 years with higher prevalence in blacks than whites and men than women.³ The epidemiology of these tumors favors men to women at a rate ratio of 1.5:1.³ The incidence of carcinomas and carcinoid tumors has been cited as nearly two fold in blacks at 10.6 per million people, compared to 5.6 per million people in whites.³ Lifestyle factors that are associated with increased risk of small bowel adenocarcinomas include alcohol consumption, ingestion of smoked foods, salt-cured foods, red meats, and refined sugars.⁴ Given that most small bowel adenocarcinomas arise from adenomas in the intestinal mucosa, the adenoma–carcinoma sequence well described in the large bowel appears to be recapitulated to some extent in the small bowel, however the exact sequence of genetic changes in the small bowel mucosa has not been well

elucidated. Small bowel primary tumors are more frequent in hereditary nonpolyposis colorectal cancer (HNPCC) and familial adenomatous polyposis (FAP) family members, implying similar cancer pathogenesis between these two neoplastic genetic syndromes.⁵ Small bowel adenocarcinomas occur with greatest frequency in the duodenum, then decrease in incidence with distal movement throughout the midgut, first jejunum then ileum.⁶ This case in particular highlights the rarity of the tumor location at the Ligament of Treitz, thus posing a unique challenge both for identification of the tumor location and for surgical planning: small bowel resection with reestablishment of gastrointestinal continuity.

Case Presentation

A 58-year-old man experiencing slowly progressive lightheadedness, an approximate one-year history of gastrointestinal bleed, iron deficiency anemia, and low-grade upper abdominal vague pain associated with progressive dyspepsia. After a series of negative upper and lower endoscopy studies the patient subsequently underwent a pill endoscopy that showed a proximal small bowel mass lesion. This was followed by a computerized tomography (CT) scan of the abdomen and pelvis which showed a polypoid mass involving the anterior wall of the small intestine, arising from the retroperitoneum at the duodenal-jejunal junction. Internal fluid attenuation of the mass measured 2.6 x 1.8 x 1.7 cm, with additional findings of fat stranding and increased attenuation of the surrounding mesentery. There was no gross regional lymphadenopathy. The patient underwent an endoscopic biopsy of this lesion by esophagogastroduodenoscopy (EGD), which returned with a diagnosis of moderately differentiated adenocarcinoma.

A whole body pre-operative positive emission tomography (PET)—CT was performed, which demonstrated that the neoplasm displayed marked hypermetabolism, showing a standardized uptake value (SUV) max of 19.1, as well as an associated hypermetabolic 1.5 cm lymph node or tumor extension immediately adjacent and anterior to this small bowel segment. The cut off between benign and malignant lesion/nodule is in the SUV range of 2.0-2.5.⁷

The patient was taken for surgery and the small bowel tumor was resected (duodeno-jejunal segmental resection) en bloc with the corresponding jejunal mesentery for wide margins and

nodal clearance (15 nodes harvested). The tumor involved the fourth portion of the duodenum and extended into the proximal jejunum. The duodenal/jejunal mass seemed to be adherent to the mesentery of the transverse colon initially, and by following oncologic principle, no attempt was made initially to separate these two structures (thus avoiding cutting through the tumor extension which could also potentially compromise the mesenteric blood supply to the transverse colon). With division of the transverse colon, our angle of visualization of this small bowel mass in the retroperitoneum vastly improved. The surrounding peritumoral desmoplastic reactions/adhesions were carefully lysed, allowing the mass to be gently dissected (released) off the transverse mesocolon anteriorly and the retroperitoneum posteriorly. Because it was not necessary to resect any transverse colonic mesentery as part of the tumor, we did not compromise the blood supply to the divided colon, thus allowing for easy re-approximation of the transverse colon.

After resection with a 3 cm gross proximal margin at the third portion of the retroperitoneal duodenum and generous resection of the proximal jejunum (8 cm) distally, a hand-sewn side-to-side two layer anastomosis was performed (running 3-0 vicryl full thickness approximation of the small bowel wall with interrupted 4-0 silk Lembert sutures at the serosal layer, and the proximal third portion of duodenum was anastomosed to the free limb of the proximal jejunum (duodenojejunosomy)

(Figure 1). The transverse colon was then re-anastomosed in a side-to-side fashion using a 45 mm gastrointestinal anastomosis endoscopic linear cutting stapler, followed by closure of the common enterotomy with two layers in like fashion as the small bowel anastomosis previously described. The mesocolon was then closed with a running 3-0 vicryl suture and then this site was fixed to the relocated proximal jejunum using a 3-0 silk stitch. The neoplasm (Figure 2) was near-circumferential, and centrally eroded into the mucosa, measuring 6.6 x 8.9 x 2.3 cm (axially x circumferentially x radially). It extended 1.1 cm from the anterior muscular wall into free serosal jejunal fat, which was focally retracted near the lesion. No other masses or adenopathy were grossly identified. The pathology report showed that sectioning through the adjacent jejunal fatty mesentery revealed multiple negative lymph nodes (15 total).

Final pathology confirmed that this lesion represented a moderately differentiated adenocarcinoma. Final tumor staging pT3N0M0G2R0, Stage IIA, with 1.7 cm of proximal free margin, 1.8 cm radial/mesenteric margin and 6.6 cm distal margin. The patient was referred for consideration of adjuvant chemotherapy. He was initially considered for Fluorouracil (5-FU) adjuvant chemotherapy, but it was not offered when his microsatellite instability (MSI) testing of the small bowel tumor revealed that he was MSI-H positive and immunohistochemistry (IHC) negative for mismatch repair gene deficiency.

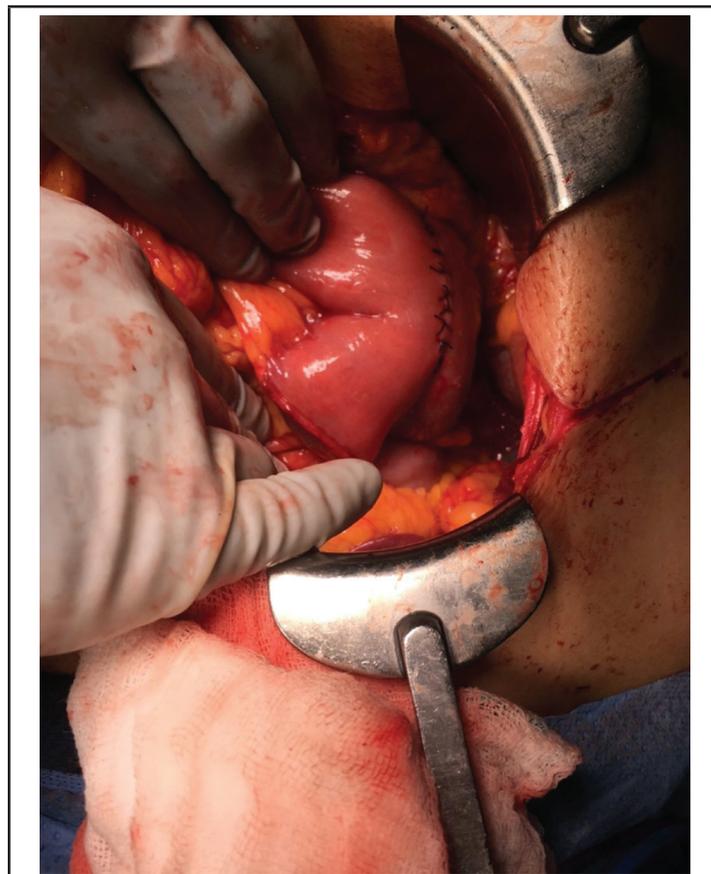


Figure 1. Duodeno-jejunal Anastomosis Following Segmental Resection.



Figure 2. Excised Segment of Small Bowel Containing Neoplasm. Specimen is 16.0 cm in Length and 2.8 cm in Diameter.

The patient has recovered well following his surgery, and does not report any abdominal pain, bloating, or any intestinal bleeding at initial post-op visits to the surgery clinic and on his last visit to the medical oncology clinic he remains asymptomatic with a negative PET/CT 24 months after his surgical procedure. At the most recent follow up, 31 months post surgery, he continues to be asymptomatic without gastrointestinal symptoms: He reports that he is eating well, working regularly and playing golf on weekends.

Discussion

Small bowel malignancies are uncommon, comprising only 1%-2% of gastrointestinal malignancies,⁸ and 0.3% of all malignancies.⁹ A retrospective study of 1260 patients showed that the most common location of small bowel tumors is the ileum (29.7%), followed by the duodenum (25.3%), and then the jejunum (15.3%) for the entire small intestine. The most prevalent subtype was carcinoid (33%), followed by adenocarcinoma (27%), and lymphoma (16.3%).⁹ The prevalence of neoplasms at each location is theorized to be due to the relative concentration gradients of ingested and partially digested carcinogens along the small bowel.⁷ The relatively low incidence of neoplasms in the jejunum in particular is thought to be due to increased protection from carcinogen damage and subsequent metaplasia by continuous and rapid turnover of epithelial cells.⁹

Segmental excision of the fourth portion of the duodenum is challenging, as it is a partially retroperitoneal structure, located in a posterior confined space. Of note is the anatomic

proximity to the aorta posteriorly, and the stomach superiorly. The reconstructive anastomosis is often unique, and surgical fixation is crucial in order to replicate the functionality of the Ligament of Treitz in suspending the duodenum and preventing gastrointestinal malrotation.

Conclusion

Adenocarcinoma at the Ligament of Treitz is extremely rare. The insidious onset and vague abdominal symptoms, coupled with the difficulty in viewing this location and performing a biopsy on endoscopy, make diagnosing neoplasms at the Ligament of Treitz particularly difficult. Surgical resection for these junctional small bowel adenocarcinomas is also challenging because of the short mesentery and close proximity to the retroperitoneum. We were able to achieve wide surgical margins and yet establish continuity of the upper gastrointestinal tract. Our patient remains asymptomatic and free of disease 31 months after surgery, despite no adjuvant chemotherapy. Studies of follow-up data on a cohort of patients who have undergone excision of similar rare small bowel adenocarcinomas with adjuvant therapy are needed to assess its inherent prognosis and to better evaluate treatment outcomes.

The views expressed in this manuscript are those of the authors and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the US Government.

Conflict of Interest

None of the authors identify any conflict of interest.

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The State of Childhood Lead Poisoning Prevention in Hawai'i

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Keywords

Lead poisoning, public health surveillance, pediatric environmental health

Abbreviations

BLL = blood lead level

CDC = Centers for Disease Control and Prevention

DOH = Hawai'i Department of Health

EPA = Environmental Protection Agency

HI-CLPPP = Hawai'i Childhood Lead Poisoning Prevention Program

HIEDSS = Hawai'i Electronic Disease Surveillance System

PCP = primary care provider

Introduction

Childhood lead poisoning has long been recognized as an important public health concern. Lead has no biological role in the human body; therefore, any detected lead in the blood is considered abnormal and indicates an exposure to environmental lead contamination. In children, low to moderate elevated blood lead levels (BLLs) are associated with difficulty paying attention, decreased IQ and poor academic performance,¹⁻³ and can have a profound effect on the life of a child, their family and their community. Most children with elevated blood lead levels are asymptomatic, with neuropsychiatric deficits appearing as children age. Children with very high BLLs (>45 µg/dL) may have acute symptoms such as abdominal pain, vomiting, constipation, anemia, lethargy, irritability, and loss of appetite.⁴ In 2012, the US Centers for Disease Control and Prevention (CDC) lowered the blood lead reference value from 10 µg/dL to 5 µg/dL and reinforced the need for primary prevention of lead poisoning by eliminating environmental exposure to lead.^{5,6} This reference value is based on lead levels in US population studies and is used to identify children exposed to lead in whom intervention is indicated.

In the United States, the majority of lead poisoning cases are from exposure to deteriorating, lead-based paint on interior surfaces despite the banning of lead-based paint for residential usage in 1978.¹ Young children are particularly at risk given their hand-to-mouth exploratory behaviors and the resulting

unintentional ingestion of lead-contaminated dust and paint chips.⁷ Soil may be contaminated with lead from deteriorating outdoor lead-based paint and the historic use of leaded gasoline, as well as from outdoor activities such as welding and certain types of vehicle repair. The home smelting of lead fishing weights, a common practice in Hawai'i, can also introduce lead into the soil.⁸ Home water catchments systems can leach lead from roofing and plumbing materials into the water in acidic conditions, which occur with volcanic emissions.^{9,10} The recent recognition of elevated levels of lead in certain religious and cultural products as well as in some imported spices, ayurvedic medicines, and dietary supplements are also cause for concern as Hawai'i is the home of cultural groups from all over the world and imports a large quantity of foreign goods.^{11,12}

Treatment for children with lead poisoning includes identification and removal of the source of lead, maximizing nutrition, and referral to early intervention services that can help mitigate the impact of lead on intellectual development.^{1,13,14} In cases of high lead levels and/or symptoms, chelation therapy and occasionally hospitalization may be indicated.⁴ Population studies show that lead levels have been steadily decreasing since the 1970s due to public health efforts in conjunction with the ban of lead-based paint in residential settings and the phase-out of leaded gasoline. However, recent biomonitoring data from National Health and Nutrition Examination Survey (NHANES) shows a slight rise in the 95th percentile BLLs for children ages 1-5 years in 2015-2016 as compared to 2013-2014 data.¹⁵ An analysis of Quest Diagnostics Laboratory BLL data over a period of 6 years (2009-2015) in a significantly larger sample of 3.8 million children ages 1-5 years also demonstrated a small increase in the incidence of high blood lead levels in the final year of the study.¹⁶ The implications of this unexpected rise after years of continuous decline are unclear and further evaluation of childhood BLLs is required to understand the progression of lead exposure in the United States. Continued public health efforts are needed to promptly identify children with elevated BLLs and exposure to lead hazards and to provide resources to eliminate the exposure to and decrease the harmful effects of lead.

Hawai'i Childhood Lead Poisoning Prevention Program (HI-CLPPP)

The CDC was charged with funding state-based programs for childhood lead poisoning prevention (CLPP) by the Lead Contamination Control Act of 1988.¹⁷ The goal of CLPP programs was to increase identification of children with lead poisoning and coordinate surveillance, clinical treatment, and environmental services. An earlier version of Hawai'i's Childhood Lead Poisoning Prevention Program (HI-CLPPP) was lost in 2003 due to CDC funding cuts. However, in October 2017, CDC granted HI-CLPPP funds for 3 years and the program is now housed in the Department of Health (DOH) Children with Special Health Needs Branch (CSHNB). With the return of CDC funding and through collaborations with the DOH Hazard Evaluation and Emergency Response Office (HEER) and Public Health Nursing Branch, HI-CLPPP has once again become an active participant in the effort to protect children's health in Hawai'i.

Currently, HI-CLPPP consists of a mix of full-time and part-time program staff with additional support from physicians and other DOH offices. HI-CLPPP's strategies and activities aim to strengthen BLL testing and surveillance, identify lead-exposed children and link them with needed services, and improve population-based interventions. In March 2018, HI-CLPPP implemented the Hawai'i Electronic Disease Surveillance System (HIEDSS) for BLL surveillance, using the Maven Disease Surveillance and Outbreak Management System[®] (CONDUENT, Florham Park, NJ). Now, all blood lead test results from laboratories in Hawai'i are electronically reported and received in HIEDSS in real-time for immediate review. HI-CLPPP recommends that children in Hawai'i are tested for lead at ages 1 and 2 years. When a child with a BLL ≥ 5 $\mu\text{g}/\text{dL}$ is identified, HI-CLPPP contacts the primary care provider to advise on follow-up testing and care coordination. A packet of resources is sent to the family, which includes information on minimizing lead hazards, recommended nutrition and hygiene, and improving development and cognition. Children with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ receive follow-up care from the program's nurse or a state public health nurse. If needed, the nurses make referrals to developmental programs or other state and community services. HI-CLPPP also offers environmental investigations through a collaboration with the Region 9 US Environmental Protection Agency (EPA) On-Scene Coordinators. All child

and family case management information, including identified environmental hazards, is stored in HIEDSS.

In August 2018, HI-CLPPP published new childhood lead poisoning prevention guidelines for health care providers.¹⁸ These screening and testing recommendations were distributed via a mass mailing campaign to more than 800 health care providers in an effort to increase blood lead testing statewide. HI-CLPPP is also working to increase awareness of lead poisoning prevention in Hawai'i's communities through various outreach events, advertisements, and presentations. Collaborations with local organizations and other state programs have been instrumental in reaching targeted audiences.

Childhood Lead Data Trends

Elevated BLLs among Hawai'i's children continue to be a concern. In 2018, of the 16,539 children under 6 years of age tested for lead, 160 children (1.0%) had a BLLs ≥ 5 $\mu\text{g}/\text{dL}$, a slight decline from the 2017 rate of 1.2%. The majority of elevated BLL cases occurred in urban Honolulu, O'ahu's Leeward areas, and the east side of Hawai'i Island. In Honolulu County, Maui County, and Kaua'i County, the prevalence of elevated BLLs among tested children under 6 years of age was between 0.7% to 1.0%, while the prevalence among tested children under 6 years of age in Hawai'i County was 1.8%, indicating possible disparities in lead exposure (Table 1).

Unfortunately, lead testing rates in all of Hawai'i's counties remain very low. From 2017 to 2018, less than 16 percent of children under 6 years of age were tested for lead statewide. For children with Medicaid insurance, lead testing is required at ages 9-12 months and 2 years, and between 3-6 years if there is no record of a previous blood lead test or if risk changes.¹⁶ However, in 2017, Medicaid reported that 16,620 children ages 1-2 years should have received at least 1 initial or periodic blood lead test in Hawai'i, yet only 6,390 of these tests were done. Assuming that each child was tested once, this means that only an estimated 38.4% of these children age 1-2 years were appropriately tested for lead.¹⁹ Children who miss lead screening may have an unrecognized elevated BLL, and families may miss the opportunity for early identification and interventions to reduce or eliminate lead exposure for that child as well as other children in the home.

County	Population of Children <6 Years (2017 estimate) ²⁰	Number of Children <6 Years Tested for Lead (2018)*	Number (%) of Children <6 Years with Elevated BLL (2018)
Honolulu	76,357	11,851	102 (0.9)
Hawai'i	14,666	1,931	35 (1.8)
Maui	12,144	1,971	19 (1.0)
Kaua'i	5,519	755	5 (0.7)

*31 children with blood lead test results were missing county address information and were excluded from the analysis.

Data Source: HIEDSS, Hawai'i Department of Health, 2019.

Local Case Study

A 13-month-old boy was found to have a venous BLL of 18.2 $\mu\text{g}/\text{dL}$ at a well-child exam. The child was asymptomatic and showed no developmental delays. The family resided in an apartment building built after 1978 and his parents did not work in any occupations involving lead. Originally from South Asia, the family commonly used a variety of cultural products and foods imported from Asia. The patient's primary care provider (PCP) suspected that the ceremonial makeup used on his face daily may be the lead source and this practice was discontinued. However, follow-up lead testing showed an increase to a venous BLL of 22.1 $\mu\text{g}/\text{dL}$. A thorough environmental history by his PCP with assistance from HI-CLPPP did not identify an obvious source of lead, however, concern developed about the family's heavy use of imported turmeric which previous studies have found to be frequently contaminated with lead.^{11,12} The turmeric was tested by DOH and did not have significantly high levels of lead. Due to persistently elevated BLLs, the EPA was contacted to collaborate on an environmental investigation. An extensive evaluation of the home revealed a metal chest used for storing bed linens which the child would use to pull himself into a standing position and then proceed to suck on the metal. When tested with an X-ray fluorescence spectrometer (XRF), the decorative metal on the chest was noted to be >10% lead by weight, or over 100,000 ppm. A lead wipe sample was collected from the chest and the result was 520,000 $\mu\text{g}/\text{ft}^2$. Removal of the chest from the child's environment resulted in a rapid decrease of the child's BLL to 6 $\mu\text{g}/\text{dL}$. This case illustrates that there may be many unusual potential sources of lead in a child's environment and that it may be difficult to identify the source of exposure. Traditional questionnaires aimed at identifying high-risk children would not have identified this patient. Without the diligence of his primary care provider, this child's lead poisoning may have gone undetected for years. Identifying the lead source resulted in stopping the exposure and provided the family with resources to help mitigate the detrimental effects of lead poisoning.

Successes and Challenges

Although HI-CLPPP has only been reinstated for 2 years, there have been some exciting successes. With the start of real-time surveillance in HIEDSS, outreach to families and providers of children with elevated BLLs has improved substantially. Approximately 400 letters have been mailed to parents and health care professionals, providing resources on lead poisoning and reminders about confirmatory and overdue blood lead testing. More than 300 PCPs were individually contacted to collaborate on providing optimal care for patients with elevated BLLs. Thirty-one children received follow-up care from a registered nurse, and the EPA provided environmental investigations in 4 cases of lead poisoning. Since HI-CLPPP has been reinstated, 100% of the children identified in HIEDSS with an elevated BLL have received the recommended initial follow-up services within 2 weeks of a confirmed elevated blood lead test result.

Awareness of lead exposure as a problem in Hawai'i is rising within the healthcare system and the community. Approximately 10,000 lead poisoning prevention brochures were distributed directly to health care providers and additional educational resources are available by request. A new interactive HI-CLPPP website (<https://lead.hawaii.gov>) was developed to communicate the individual and social costs of lead in Hawai'i as well as provide resources for families, health care professionals, and contractors. HI-CLPPP has provided outreach at numerous events, including the Early Childhood Leadership Symposium, Pediatric Island Style Conference, and Keiki Health Learning Fair. Presentations were provided for public health nurses, early childhood program staff, and child care providers. The first public advertisement for HI-CLPPP was created for the inside front cover of Kaua'i Family Magazine Summer Edition for distribution in May, June, and July 2019.

Although these successes are encouraging, there remain many challenges in the continued effort to reduce lead exposure in Hawai'i. Of primary importance is the need for testing of more children. Without increased testing, it is impossible to understand the burden of childhood lead poisoning in Hawai'i. Another challenge involves resources and authority for environmental investigations. Currently, HI-CLPPP has no in-house capabilities to provide assessments to identify sources of lead exposure. EPA has collaborated with HI-CLPPP to provide investigations for difficult cases where the source could not be identified, but in most situations, there are few resources or funds to support these investigations, and the burden of paying for them and any subsequent remediation falls on the homeowner or landlord. Because tenants may be unwilling to risk their housing status or may have tenuous relationships with their landlords, families will often refuse HI-CLPPP and EPA access to their homes. This may result in persistent lead exposure to the child or future residents. In 2018, HI-CLPPP offered an investigation and/or home visit to 25 families of children with an elevated BLL and 44 % turned down the free resources.

Going Forward

Much work remains for HI-CLPPP and its partners in the effort to eliminate childhood lead poisoning in Hawai'i. HIEDSS surveillance data will continue to be monitored for unusual clusters or geographic patterns of lead exposure. Efforts to follow-up with families and providers of children with EBLLs in HIEDSS will remain a key part of the program. HI-CLPPP will continue to strengthen partnerships with health care professionals and local communities to increase awareness of the dangers of lead exposure statewide.

HI-CLPPP is working to better understand and remove the barriers that keep children from being tested for lead in Hawai'i. In some states, universal testing was adopted for a short period (i.e. 3 years) to obtain a baseline prevalence of lead poisoning. The resulting data was used to determine if universal testing should be continued or if targeted screening was adequate to

protect public health.²¹ This may be a viable future option for Hawai‘i. Hawai‘i’s children would also benefit from:

- Stable HI-CLPPP funding to ensure continuing program progress.
- Meaningful laws protecting renters from lead hazards.
- Increased resources and clear legal authority to provide environmental investigations and require remediation.

In conclusion, childhood lead poisoning remains an ongoing problem in Hawai‘i, affecting children and families statewide. HI-CLPPP, the Department of Health, and community partners are working hard to eliminate childhood lead poisoning in Hawai‘i, but more support, resources, and awareness are needed to reach this goal.

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SOCIAL WORK IN ACTION

Hā Kūpuna: Telling Stories of Challenge and Resilience Through Data

Shelley Muneoka MSW and Colette Browne DrPH

Social Work in Action is a solicited column from the social work community in Hawai'i. It is edited by HJMPH Contributing Editor Sophia Kim PhD, of the Myron B. Thompson School of Social Work at the University of Hawai'i at Manoa.

On a rainy morning in Hilo in 2008, a group of *kūpuna* (elders) gathered to discuss their wants and needs, their strengths and struggles with a team of researchers from the University of Hawai'i at Mānoa. The researchers posed a simple question, "What makes someone a *kupuna*?" Over the last 13 years, *Hā Kūpuna*, the National Resource Center for Native Hawaiian Elders, has convened elders, families, and those who provide direct support to them to ask questions about their lived experiences, and to explore what they need to have a healthy and good "later life."

Hā Kūpuna, founded in 2006 under the direction of Drs. Noreen Mokuau, Colette Browne, and Kathryn Braun, has focused its work on developing a baseline of information about Native Hawaiian elders, their health and overall well-being. The field of gerontology is devoted to examining different aspects of later life, and while there is a rich body of scholarship on Hawaiian history and culture, data regarding Native Hawaiian elders are limited. Most information centered around the poor health profile of *kānaka maoli* (Native Hawaiians). High rates of certain health problems - including cancer, heart disease and diabetes - were documented, but lacking were reliable data on other health and social disparities and their possible causes. Resilience and strength of *kūpuna* were legendary, but it was not a story being represented by data. *Hā Kūpuna* researchers knew that without a more complete picture of Native Hawaiian elders, policies and practices were limited in addressing the needs of this population and their families. Through a variety of different methods, the *Hā Kūpuna* team compiled a body of information about this special group.

The name *Hā Kūpuna* refers to the practice of an elder transmitting their knowledge and very life force by exhaling one's final *hā* (breath) into a chosen person, so that one's legacy will live on beyond physical death. It describes the passing of intergenerational knowledge. This tradition is depicted in the *Hā Kūpuna* logo which shows a revered Hawaiian elder and physician, Dr. Kekuni Blaisdell, sharing his *hā* with a young girl. An advisory board member from the very beginning, the late Dr. Blaisdell was key in forming and guiding the center.

The center began with two advisory boards, one composed of leaders in the *kānaka maoli* community and the other of service providers from the professional gerontology field. The value of the interface of these two groups was quickly realized. In 2008 the two boards were combined to form the Joint Advisory Committee that now helps to set direction and focus to the Center's work. The Joint Advisory Committee meets annually to discuss the activities at their respective agencies and to provide feedback on the recent developments at the Center. Housed in the Myron B. Thompson School of Social Work and funded by the Administration on Community Living and the Department of Health and Human Services, the goal of *Hā Kūpuna* is to improve access to and delivery of services to Native Hawaiian elders and their caregivers through the development and dissemination of knowledge around health and long-term care patterns and preferences.

In 2019, *Hā Kūpuna* published their most recent study in the *Journal of Aging and Health*. The article highlighted the benefits of using a mixed methods approach of both qualitative and quantitative research to best uncover and understand aging issues faced by Native Hawaiian elders. This study captures the nature of the center's work. It allows researchers to honor the rich stories and wisdom of *kūpuna* as well as uses their skills as trained researchers to interpret data to ensure that the needs of *kūpuna* are being met. The quantitative data confirmed numerous health disparities experienced by Native Hawaiians, whereas the qualitative data revealed Native Hawaiians' own limited knowledge of the poor health profile and documented their historical and contemporary experiences with discrimination in education, employment, and health care. Hawaiian culture was identified as a continued source of resilience in support of elders and family caregiving. The authors of the article suggested policies, practices, and research directions to respond to and improve *kūpuna* health.

The center has remained responsive and flexible to community needs as they arise. In 2017, Dr. Lana Ka'opua, a center researcher, led a research training program with middle school students at a Hawaiian Charter School to explore the nature of

intergenerational living situations that are more common for Native Hawaiian families than families of other ethnicities. A discovery was made that Hawaiian youth were not just living with their elders, but they were also helping to care for them, especially those with some form of dementia. The cultural value of *mālama kūpuna* (care and respect for elders) was apparent, but it was less clear that youth could discern between “normal aging” and “dementia-related aging,” and more importantly, had knowledge of the best way to provide assistance. An idea was born to create a teaching tool to help youth in Hawai‘i better understand the symptoms of dementia and learn how to help support their family and *kūpuna* with this challenge. A product of this effort was a storybook, which was released in July 2019. The booklet is about a young girl named Pomai, and her Papa (grandfather), who is starting to display the early signs of Alzheimer’s disease (See Figure 1). Within 24 hours of the press release, requests for hard copies flooded in, suggesting the need for this type of resource in the community.

In response to the question, “How do you define a *kupuna*?” the themes that have emerged over the years viewed elderhood positively in contrast to a western view of aging as negative. Participants often speak of the wisdom that comes with experience and the role of elders as transmitters and teachers of cultural knowledge and values. Another common theme is the relational nature of being a *kupuna* – described both as having biological grandchildren as well as being respected in the broader community. It is in this spirit that *Hā Kūpuna* continues to pursue its research objectives, to create and disseminate data to direct service providers who work to improve the health profile of Hawaiian elders.

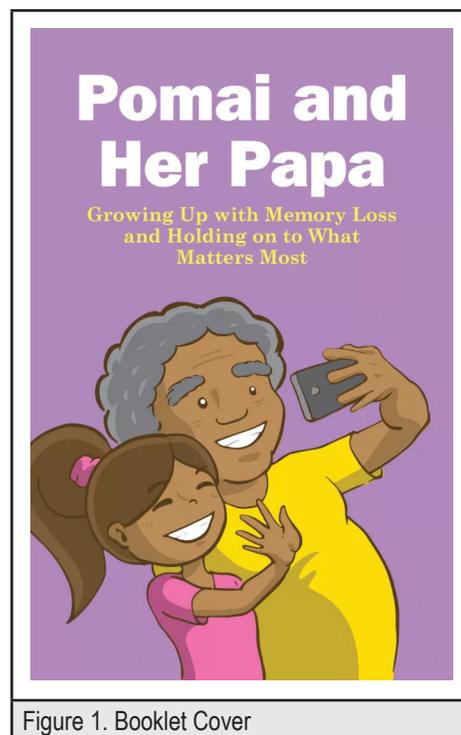


Figure 1. Booklet Cover

For more information about the work of *Hā Kūpuna*, check out their website at manoa.hawaii.edu/hakupuna.

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Revised September 27, 2019

General Recommendations on Data Presentation and Statistical Reporting (Biostatistical Guideline for HJH&SW) [Adapted from Annals of Internal Medicine & American Journal of Public Health]

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Percentages: Report percentages to one decimal place (eg, 26.7%) when sample size is ≥ 200 . For smaller samples (< 200), do not use decimal places (eg, 27%, not 26.7%), to avoid the appearance of a level of precision that is not present.

Standard deviations (SD)/standard errors (SE): Please specify the measures used: using “mean (SD)” for data summary and description; to show sampling variability, consider reporting confidence intervals, rather than standard errors, when possible to avoid confusion.

Population parameters versus sample statistics: Using Greek letters to represent population parameters and Roman letters to represent estimates of those parameters in tables and text. For example, when reporting regression analysis results, Greek symbol (β), or Beta (b) should only be used in the text when describing the equations or parameters being estimated, never in reference to the results based on sample data. Instead, one can use “b” or β for unstandardized regression parameter estimates, and “B” or β for standardized regression parameter estimates.

P values: Using *P* values to present statistical significance, the actual observed *P* value should be presented. For *P* values between .001 and .20, please report the value to the nearest thousandth (eg, $P = .123$). For *P* values greater than .20, please report the value to the nearest hundredth (eg, $P = .34$). If the observed *P* value is greater than .999, it should be expressed as “ $P > .99$ ”. For a *P* value less than .001, report as “ $P < .001$ ”. Under no circumstance should the symbol “NS” or “ns” (for not significant) be used in place of actual *P* values.

“Trend”: Use the word trend when describing a test for trend or dose-response. Avoid using it to refer to *P* values near but not below .05. In such instances, simply report a difference and the confidence interval of the difference (if appropriate), with or without the *P* value.

One-sided tests: There are very rare circumstances where a “one-sided” significance test is appropriate, eg, non-inferiority trials. Therefore, “two-sided” significance tests are the rule, not the exception. Do not report one-sided significance test unless it can be justified and presented in the experimental design section.

Statistical software: Specify in the statistical analysis section the statistical software used for analysis (version, manufacturer, and manufacturer’s location), eg, SAS software, version 9.2 (SAS Institute Inc., Cary, NC).

Comparisons of interventions: Focus on between-group differences, with 95% confidence intervals of the differences, and not on within-group differences.

Post-hoc pairwise comparisons: It is important to first test the overall hypothesis. One should conduct *post-hoc* analysis if and only if the overall hypothesis is rejected.

Clinically meaningful estimates: Report results using meaningful metrics rather than reporting raw results. For example, instead of the log odds ratio from a logistic regression, authors should transform coefficients into the appropriate measure of effect size, eg, odds ratio. Avoid using an estimate, such as an odds ratio or relative risk, for a one unit change in the factor of interest when a 1-unit change lacks clinical meaning (age, mm Hg of blood pressure, or any other continuous or interval measurement with small units). Instead, reporting effort for a clinically meaningful change (eg, for every 10 years of increase of age, for an increase of one standard deviation (or interquartile range) of blood pressure), along with 95% confidence intervals.

Risk ratios: Describe the risk ratio accurately. For instance, an odds ratio of 3.94 indicates that the outcome is almost 4 times as likely to occur, compared with the reference group, and indicates a nearly 3-fold increase in risk, not a nearly 4-fold increase in risk.

Longitudinal data: Consider appropriate longitudinal data analyses if the outcome variables were measured at multiple time points, such as mixed-effects models or generalized estimating equation approaches, which can address the within-subject variability.

Sample size, response rate, attrition rate: Please clearly indicate in the methods section: the total number of participants, the time period of the study, response rate (if any), and attrition rate (if any).

Tables (general): Avoid the presentation of raw parameter estimates, if such parameters have no clear interpretation. For instance, the results from Cox proportional hazard models should be presented as the exponentiated parameter estimates, (ie, the hazard ratios) and their corresponding 95% confidence intervals, rather than the raw estimates. The inclusion of *P*-values in tables is unnecessary in the presence of 95% confidence intervals.

Descriptive tables: In tables that simply describe characteristics of 2 or more groups (eg, Table 1 of a clinical trial), report averages with standard deviations, not standard errors, when data are normally distributed. Report median (minimum, maximum) or median (25th, 75th percentile [interquartile range, or IQR]) when data are not normally distributed.

Figures (general): Avoid using pie charts; avoid using simple bar plots or histograms without measures of variability; provide raw data (numerators and denominators) in the margins of meta-analysis forest plots; provide numbers of subjects at risk at different times in survival plots.

Missing values: Always report the frequency of missing variables and how missing data was handled in the analysis. Consider adding a column to tables or a footnote that makes clear the amount of missing data.

Removal of data points: Unless fully justifiable, all subjects included in the study should be analyzed. Any exclusion of values or subjects should be reported and justified. When influential observations exist, it is suggested that the data is analyzed both with and without such influential observations, and the difference in results discussed.

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