

Hansen's Disease and Complications among Marshallese Persons Residing in Northwest Arkansas, 2003–2017

Sarah M. Labuda,^{1,2*} Sandra H. Williams,¹ Leonard N. Mukasa,¹ and Linda McGhee³

¹Arkansas Department of Health, Little Rock, Arkansas; ²Epidemic Intelligences Service, Centers for Diseases Control and Prevention, Atlanta, Georgia; ³University of Arkansas for the Medical Sciences, Northwest Regional Campus, Fayetteville, Arkansas

Abstract. Persons from the Republic of the Marshall Islands have among the highest rates of Hansen's disease (HD) in the world; the largest Marshallese community in the continental United States is in northwest Arkansas. In 2017, the HD Ambulatory Care Clinic in Springdale, Arkansas, informed the Arkansas Department of Health (ADH) that Marshallese persons with HD had severe disease with frequent complications. To characterize their illness, we reviewed ADH surveillance reports of HD among Marshallese persons in Arkansas treated during 2003–2017 ($n = 42$). Hansen's Disease prevalence among Marshallese in Arkansas (11.7/10,000) was greater than that in the general U.S. population. Complications included arthritis (38%), erythema nodosum leprosum (21%), and prolonged treatment lasting > 2 years (40%). The majority (82%) of patients treated for > 2 years had documented intermittent therapy. Culturally appropriate support for therapy and adherence is needed in Arkansas.

Hansen's disease (HD) is a rare, chronic granulomatous infection predominantly of the skin and peripheral nerves caused by the noncultivable organism *Mycobacterium leprae*. Hansen's Disease causes rashes, anesthetic patches on the skin, muscle weakness or paralysis, and, less commonly, joint involvement, with an incubation period ranging from several months to over 30 years.^{1–3} Pacific Islanders from the Republic of the Marshall Islands (RMI), including those who have migrated to the United States, have among the highest HD rates in the world.⁴ In 2016, HD prevalence in the United States was 0.0083/10,000 persons, whereas prevalence in RMI was 12/10,000 persons.⁵ Marshallese communities with high rates of HD are present in California, Colorado, Florida, Hawaii, Iowa, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Utah, Washington, and Wisconsin.⁴ The largest Marshallese community in the continental United States is primarily located in Springdale, Arkansas,^{4,6} but the exact population size is not well documented. The American Community Survey estimated 5,625 Marshallese persons resided in Arkansas in 2013–2017, but rapid growth has occurred and the Arkansas Department of Health (ADH) uses ~12,000 as their current population estimate.^{6,7} Hansen's disease prevalence among the Arkansas Marshallese community has not been previously estimated.

In the United States, HD is diagnosed by skin biopsy. Hansen's Disease classification is based on the Ridley–Jopling scale, which measures the burden of *M. leprae* organisms and formation of tissue granulomas; granuloma formation indicates the immune system's ability to contain infection through cell-mediated responses.^{8,9} The least disseminated form of HD, occurring among persons with the strongest cell-mediated immune responses, is tuberculoid (TT). Tuberculoid usually has the fewest skin lesions and is least likely to have immune complications. Hansen's Disease classification follows a spectrum of higher bacillary burden and antibody- rather than cell-mediated responses,

including borderline tuberculoid (BT), borderline (BB), borderline lepromatous (BL), and the most diffuse and severe form, lepromatous leprosy (LL). In the United States, TT and BT are treated with 1 year of antileprosy multidrug therapy (MDT), and BB, BL, and LL are generally treated with 2 years of MDT.¹⁰ In Arkansas, HD is reportable within 24 hours of diagnosis to the ADH¹¹; cases are also reported to the National HD Program in Baton Rouge, Louisiana.¹² However, because HD is rarely diagnosed in the United States, a lack of knowledge exists among providers, and patients with HD have a mean of 1 year delay between symptom onset and diagnosis.¹³

Persons with more diffuse HD and higher bacillary load (i.e., BL or LL) are at risk for immune system reactions, including acute onset fever, arthritis, and soft tissue nodular swellings called erythema nodosum leprosum (ENL). These reactions can have rheumatologic-like manifestations and can be acute, chronic, or relapsing.^{3,14–17} Erythema nodosum leprosum can severely limit quality of life; it can occur before or after MDT initiation and be fatal in certain cases.¹⁸ Anti-inflammatory drugs are used to control ENL symptoms.¹⁷ Among patients with LL, ENL occurs among 5% to >50% of patients.^{3,14–16}

The HD Ambulatory Care Clinic staff in Springdale, Arkansas, evaluate and provide care to HD patients 1 day per month, and the clinic is the regional referral center for all HD patients in the mid-south region of the United States. The clinic reported that compared with U.S.-born patients with HD, Marshallese-born persons with HD were more likely to be designated LL at diagnosis, experience increased frequency of arthritis and ENL, and require > 2 years of MDT (L. McGhee, personal communication, August 25, 2017). To investigate the clinic's verbal report of disease severity among its patient population, we analyzed ADH's HD surveillance data to determine HD infection prevalence and describe disease complications among Marshallese persons who received an HD diagnosis in Arkansas.

We reviewed and analyzed ADH's surveillance database for HD during 2003–2017. Data, including demographics, symptoms described at each visit, complications for each patient, and treatment information, are entered in the ADH database by the clinic public health nurse and transmitted to the ADH monthly, adding any patient diagnosis or treatment data identified from outside facilities. We calculated descriptive statistics

* Address correspondence to Sarah M. Labuda, Division of Scientific Education and Professional Development, Epidemic Intelligence Service, Centers for Disease Control and Prevention, Arkansas Department of Health, 4815 West Markham St., Slot 32, Little Rock, AR 72205. E-mail: nqv0@cdc.gov

using R version 3.5.1 (R Foundation for Statistical Computing, Vienna, Austria). Because documentation in the free-text database forms lacked specificity to determine differences between patients who had a single prolonged ENL episode versus multiple episodes, we counted each patient as having an ENL episode if they had at least one visit for reaction or ENL. The University of Arkansas for Medical Sciences (UAMS) Institutional Review Board (IRB) (UAMS IRB number 217901) and CDC reviewed this study for human subjects protection and determined it to be nonresearch (CDC HSR number 2018-00131).

During 2003–2017, 54 cases of HD were reported to the ADH. We analyzed the 42 (78%) people in the dataset who were born in RMI and emigrated to the United States; no HD patients of Marshallese descent were born in the United States. Among the 42 patients, 28 (67%) were male; the median age at diagnosis was 30 years (Table 1). Using the 14 cases diagnosed or treated in 2017 as our numerator and the maximum published population estimate (12,000) of Marshallese persons in northwest Arkansas as the denominator,⁶ the lowest estimated prevalence of HD in this population was 11.7/10,000 in 2017. Five of the 42 patients with HD were diagnosed and partially treated in RMI before U.S. arrival. In total, 27 (64%) patients had an LL classification at diagnosis.

Sixteen (38%) Marshallese HD patients had joint pain or swelling, and 9 (21%) received an ENL diagnosis during therapy. Among 27 persons with LL disease, 7 (26%) were diagnosed with ENL, and 2 (33%) with BL disease had ENL. No patients with BB, BT, TT, or unknown HD type were diagnosed with ENL.

Among 35 Marshallese HD patients with available treatment dates, the median treatment length was 2.0 years (range: 0–9.7 years); 17 (49%) were treated longer than the standard 2 years (median: 3.8 years; range: 2.1–9.7 years). Fourteen of the 17 patients with prolonged treatments (82%) resulted from intermittent drug adherence. Twenty-six of 42 patients (62%) were lost to follow-up and did not have evidence of completing therapy, most (16/26 [62%]) because of a documented move to another town or return to RMI.

Hansen's disease prevalence among Marshallese persons residing in northwest Arkansas was comparable to the most recent published rate of HD in RMI, but much higher than among persons born in the United States. Because HD is rare among U.S.-born persons, providers might not consider the diagnosis in Marshallese persons residing in the United States. In addition, Marshallese persons can travel to and work in the United States freely but are not considered citizens and do not qualify for Medicaid, often leading to limited healthcare access and delayed healthcare-seeking behavior.⁶

Several reasons have been hypothesized for the high prevalence of cases among Marshallese persons. Crowded

housing, hygiene and sanitation challenges, and the afore-described delays seeking health care are among likely risk factors for increased exposure that encourages HD transmission in Marshallese communities in RMI and the United States.^{6,19,20} Transmission is exclusively person-to-person in RMI; however, in the southern United States where HD is endemic, transmission is attributed to exposure to armadillos and imported cases from areas with higher prevalence of disease outside the United States.²¹

The proportion of HD patients with ENL as a treatment complication was similar to that reported among populations in high-prevalence HD settings, including Nepal, India, and Brazil.^{3,14–16,18} The risk for ENL is reduced when patients receive more timely MDT treatment.¹⁴ Improved healthcare access and knowledge of HD by healthcare professionals providing care to Marshallese populations in Arkansas and increased support for treatment adherence and completion through the cadre of Marshallese-speaking community health workers in Arkansas might reduce this complication of HD.¹⁷

Approximately half (49%) of the study patients required therapy for longer than 2 years, most because of intermittent adherence to treatment. The use of home health visits and community health workers to administer medications and monitor for signs of complications might be helpful in improving adherence and reducing ENL among this patient population.⁶

This study has several limitations. First, ADH's HD surveillance database likely represents an underreporting of cases. Persons diagnosed with HD at facilities other than the HD Ambulatory Care Clinic in Springdale, Arkansas, might not be entered into the surveillance system. In addition, the Access[®] database (Microsoft Corp., Seattle, WA) used by the ADH for reporting included many free-form or nonstandard data entries, creating challenges with data management and analysis. Finally, the Marshallese community population in Arkansas has been estimated to have changed substantially since the 2010 census, so recent numbers are based on a less rigorous methodology.

In conclusion, most of the Marshallese persons with HD in Arkansas identified in this analysis had LL at the time of HD diagnosis. Many experience complications (e.g., ENL) and require prolonged MDT. The ADH can educate providers and the Marshallese community to increase HD awareness, facilitate improvements in surveillance through standardization of the reporting database, and educate laboratory staff and providers to ensure that cases of HD are reported if diagnosed outside the Springdale clinic, provide care linkages, and promote adherence to treatment to prevent HD complications among people from RMI in Arkansas.

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Authors' addresses: Sarah M. Labuda, Epidemic Intelligence Service, Centers for Disease Control and Prevention, Atlanta, GA and Arkansas Department of Health, Little Rock, AR, E-mail: nqv0@cdc.gov. Sandra H. Williams, and Leonard N. Mukasa, Arkansas Department of Health, Little Rock, AR, E-mails: nqv0@cdc.gov, sandy.hainline.williams@gmail.com and leonard.mukasa@arkansas.gov. Linda McGhee,

TABLE 1

Descriptive demographics and disease characteristics among Marshallese persons in Arkansas with Hansen's disease ($n = 42$), 2003–2017.

Characteristic	Median (range)	Number (%)
Male	–	28 (67)
Age (years)	30 (9–49)	–
Lepromatous leprosy	–	27 (64)
Borderline lepromatous	–	6 (14)
Borderline	–	0 (0)
Borderline tuberculous	–	1 (2)
Tuberculoid leprosy	–	1 (2)
Not documented, indeterminate, or other	–	7 (17)

University of Arkansas for the Medical Sciences, Little Rock, AR,
E-mail: lmcghee@uams.edu.

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