Predictors of Lesion Size Among People with Cutaneous Leishmaniasis (2016-2021): A Multilevel Analysis

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ABSTRACT

Introduction: Cutaneous leishmaniasis is one of Iran's most important endemic diseases and the second parasitic disease transmitted by arthropods after malaria in Iran. About 20,000 new cases of CL are reported from different parts of Iran annually. Since infectious disease risk factors operate simultaneously at multiple levels and ecological data are typically available at different geographic scales, multilevel modeling serves as a valuable tool for the epidemiological investigation of disease transmission. Given the prevalence of Leishmania disease in the population, this study was conducted to investigate the predictors of lesion size among individuals with cutaneous leishmaniasis.

Methods and Materials: This population-based cross-sectional study was conducted using data from 7,433 patients with CL who visited health centers, clinics, outpatient facilities, and hospitals in Khorasan Razavi province, Iran, from 2016 to 2021. Variables related to CL were assessed using mixed or multilevel effects models with two levels of analysis: individual and city. Geographic Information Systems (GIS) techniques were utilized to map the distribution of CL cases in Mashhad City. Poisson multiple regression was used to investigate the relationship between climatic variables and leishmaniasis incidence. Data management and analysis were performed using Stata 11.

Results: The mean age was significantly higher in the group with more extensive lesions (37.60 years) compared to the group with smaller lesions (32.10 years; $p = 0.001$). The incidence of CL varied across different cities during the study period. Binaloud City had the highest average annual incidence at 208.6 per 100,000 people, while Bakharz City had the lowest at 2.3 per 100,000. According to multilevel analysis, significant associations were found between lesion size and catching the disease from family members (AOR = 0.88; $p = 0.23$), female gender (AOR = 0.62; $p = 0.001$), and location of injury (AOR = 1.66; $p = 0.001$). Poisson regression found a statistically significant association between average humidity and the incidence rate ratio of CL.

Conclusion and Discussion: This study highlights the spatial heterogeneity in CL transmission across different cities in Northeast Iran. Larger lesion size was associated with intra-household transmission, female gender, and lesions on the lower limbs. Environmental factors, notably higher humidity levels, also significantly influenced the incidence rate of CL. Targeted interventions addressing household-level transmission, gender-specific risk factors, and climatic influences are crucial for effective disease control and prevention strategies.

Keywords: Cutaneous leishmaniasis, Geographic Information System, Multilevel analysis

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