Seasonal and environmental variation of lower extremity cellulitis incidence among emergency department patients in three geographic locations

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Abstract

Background: Several previous studies have suggested a higher incidence of lower extremity cellulitis (LEC) during the summer, but it is not clear if this phenomenon is limited only to certain climates or locations. We sought to investigate this phenomenon and further elucidate the relationship with environmental climate factors.

Methods: This was a retrospective study of all patients with at least 1 ICD-9 code recorded during an emergency department (ED) visit at Mayo Clinic in Scottsdale, AZ; Jacksonville, FL; and Rochester, MN; between 1/1/2009 – 12/31/2014. Demographics were defined using ICD-9 data. Temperature data was obtained from the National Oceanic and Atmospheric Administration website. The climates of each location were classified according to the Köppen Climate Classification System as hot desert (AZ), humid subtropical (FL) or humid continental (MN) climate types. The primary outcome was LEC (ICD-9 code 682.7) expressed as a proportion of 1000 ED visits (LEC visits/1000 EDV), to account for seasonal variation in ED usage. Univariate and multivariate regression was performed for analysis.

Results: There were 627,292 ED visits among 288,349 patients during the study period. The incidence of LEC visits/1000 EDV was significantly different across sites (9.36 in FL, 7.95 in AZ, and 7.39 in MN, p <0.0001 for any difference). In the humid climate types (FL and MN), the peak incidences of LEC occurred in the warmest month; July in FL (11.77 LEC visits/1000 EDV) and August in MN (9.69 LEC visits/1000 EDV). In AZ, the peak incidence occurred in November, the 4th coolest month (9.44 LEC visits/1000 EDV) (Figure 1). There was a significant positive correlation between the high daily temperature and the incidence of LEC cellulitis in all 3 sites (Figure 2). After controlling for total daily ED visits, gender, and age, the high temperature for the day was significantly associated with occurrence of LE cellulitis at each site (p <0.0001).

Conclusions: The incidence of LEC presenting to the ED is associated with environmental temperature across different geographic locations and climate types, but slight variations in seasonality of infection was observed. Further studies should assess the impact of measured humidity on incidence of cellulitis as a contributing factor.

Background

- Lower extremity cellulitis (LEC) is a common cause for emergency department visits and resource utilization
- Previous studies have demonstrated a higher frequency of hospitalizations for LEC in summer months[1,2]
- Whether this observation extends across geographically and climatically diverse sites is unknown

Methods

- All adults with at least 1 visit at 3 academic emergency departments from 1/1/2009-12/31/2014 were included
- Climate data was obtained from the National Oceanic and Atmospheric Administration website for Minneapolis-St. Paul, Jacksonville, and Phoenix International Airports
- LEC was defined by an ICD-9 code 682.7 on the same calendar day of the ED visit and expressed as LEC visit density (LEC visits/1000 ED visits)
- Chi square, t-test, univariate and multivariate logistic regression were performed for analysis as appropriate

Figure 1. Average LEC visit density by month and site

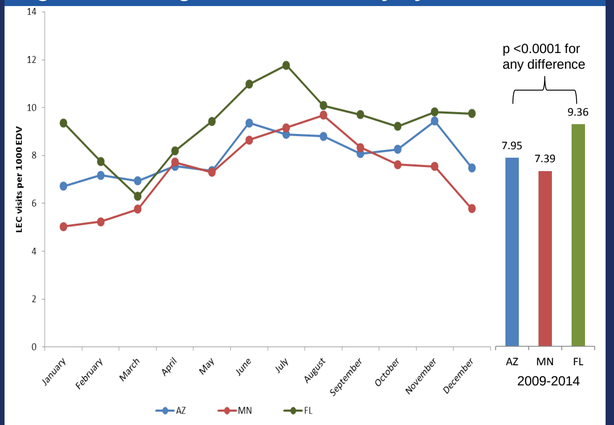

Figure 2. LEC visit density as a function of maximum daily temperature

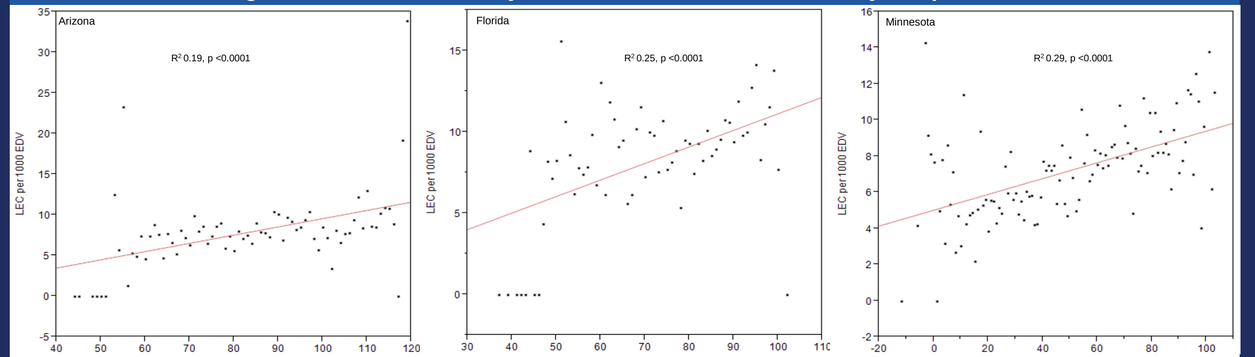

Table 1. Demographics

	Cellulitis (n = 5005)	No cellulitis (n = 622287)	p value
Male gender, n (%)	2702 (54%)	287417 (46.2%)	<0.0001
Age in years, mean (SD)	60.1 (20.3)	55.5 (21.0)	<0.0001
Site, n (%) [a]			<0.0001
Arizona	1186 (0.79%)	147998 (99.21%)	
Florida	1357 (0.94%)	143573 (99.06%)	
Minnesota	2462 (0.74%)	330716 (99.26%)	
Maximum daily temperature, mean (SD)	72.9 (22.2)	69.2 (24.2)	<0.0001

[a] % expressed as % of total ED visits at site. P value is from Chi Square for any difference across sites.

Figure 3. LEC visit density, all 3 sites 2009-2014

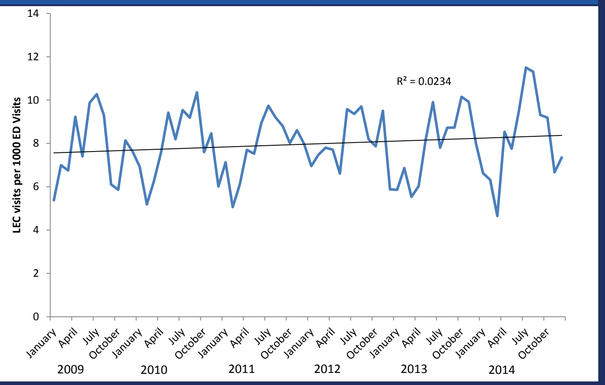

Table 2. Logistic regression model results [b]

Covariate	Odds ratio (95% CI)	P value
Male gender	1.348 (1.275-1.425)	<0.0001
Age (per 1 year increase)	1.010 (1.009-1.012)	<0.0001
ED visits per day (per 1 visit increase)	1.001 (0.999-1.001)	0.059
Maximum daily temperature (per 1 degree Fahrenheit increase)	1.007 (1.005-1.008)	<0.0001

[b] The outcome variable is ED visit for lower extremity cellulitis

Conclusions

- LEC visit frequency is independently associated with the maximum daily temperature across 3 different locations and climate types, after controlling for total daily ED visits, gender and age
- Peak LEC visit frequency occurred during the warmest months in humid climates (FL, MN), but not in the desert climate (AZ)
- The impact of measured humidity on LEC frequency should be investigated

References

1. Peterson et al. Open Forum Infect Dis. 2017 Feb 8;4(1):ofx008.
2. Marcelin et al. Mayo Clin Proc. 2017 Aug;92(8):1227-1233.