Sleep Disturbances in Adults with Eczema Are Associated with Impaired Overall Health: A US Population-Based Study

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Sleep disturbances are associated with poor health outcomes in adults. However, little is known about the sleep disturbances that occur in adult eczema. We studied the association between adult eczema and sleep disturbance and their impact on overall health and health care utilization. We used the 2012 National Health Interview Survey, a cross-sectional questionnaire of 34,613 adults. Eczema was associated with higher odds of fatigue (odds ratio (95% confidence interval): 2.97 (2.65–3.34)), regular daytime sleepiness (2.66 (2.34–3.01)), and regular insomnia (2.36 (2.11–2.64)), even after controlling for sleep duration, history of allergic disease, sociodemographics, and body mass index. There were significant interactions between eczema and fatigue, sleepiness, and insomnia as predictors of poorer overall health status, number of sick days, and doctor visits, such that eczema and each of the sleep symptoms were associated with higher odds of poorer outcomes than either eczema or sleep symptoms alone. Latent class analysis was used and identified five classes of fatigue, sleep disturbances, and allergic disorders. Two classes had high probabilities of eczema: one with high probabilities of asthma, hay fever, food allergy, and multiple sleep symptoms and the other with intermediate probability of insomnia alone. Future studies are warranted to better characterize sleep loss in eczema and develop strategies for treatment and prevention.

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INTRODUCTION

Sleep disorders are associated with poor performance in school and work, impaired overall health and safety, and considerable economic burden (Skaer and Sclar, 2010). Eczema is a common inflammatory skin condition that causes significant morbidity secondary to severe itch, sleep impairment, social embarrassment, and psychological distress (Carroll *et al.*, 2005). Sleep disturbance is attributed to the intense pruritus; it results in functional impairment (daytime fatigue, irritability, disturbed cognition, and decreased motor performance) and profoundly worsens the quality of life (QOL) in eczema patients (Bender *et al.*, 2003; Beattie and Lewis-Jones, 2006; Ricci *et al.*, 2007; Beikert *et al.*, 2014). Having eczema and concurrent sleep disturbance also significantly increases the risk of psychological disorders (Romanos *et al.*, 2010; Schmitt *et al.*, 2011), motor vehicle accidents, and workplace injury (Young *et al.*, 1997; Akerstedt *et al.*, 2002; Gander *et al.*, 2005).

Previous studies have demonstrated significantly worsened sleep quality in childhood eczema with less sleep, more frequent and prolonged awakening, and overall lower sleep efficiency (Monti *et al.*, 1989; Dahl *et al.*, 1995; Stores *et al.*, 1998; Chamlin *et al.*, 2005; Hon *et al.*, 2008; Camfferman *et al.*, 2010; Anuntaseree *et al.*, 2012; Camfferman *et al.*, 2013; Chang *et al.*, 2013). However, few studies have addressed the quality of sleep in the adult eczema population. Further, little is known about how different patterns of sleep disturbance affect the overall health in affected adults. Better understanding of the impact of adult eczema on sleep patterns could lead to new treatment and improve QOL. We hypothesized that adult eczema in the United States is associated with fatigue and disturbance of sleep patterns, which worsen overall health, independent of allergic airway disease.

RESULTS

Prevalence of eczema and other atopic disorders

Data were collected on 34,613 adults, representing all age, gender, and racial/ethnic groups. The US prevalence (95%

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Abbreviations: AD, atopic dermatitis; aOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio

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confidence intervals (CIs)) of eczema in adults was 7.2% (6.9–7.6%). Eight percent (7.6–8.4%) currently had asthma, 7.5% (7.1–7.9%) had hay fever, 11.2% (10.8–11.7%) had respiratory allergies, and 3.9% (3.6–4.2%) had food or digestive allergies.

Prevalence of eczema was significantly associated with female sex (survey logistic regression; crude odds ratio (OR) (95% CIs): 1.52 (1.36–1.70)) and post-high school education (1.37 (1.13–1.66)) but inversely associated with African-American race (0.82 (0.70–0.96)), Hispanic origin (0.73 (0.62–0.85)), household income of $75,000–99,999 (0.76 (0.61–0.95)), families with children and either a single parent (0.79 (0.67–0.94)) or both parents living in the household (0.76 (0.65–0.89)) compared with those that had no children, and birthplace outside the United States (0.63 (0.54–0.73)). Prevalence was not associated with age (Table 1). Class II and III obesity, as defined by body mass index (BMI) of 35–39 and $\geqslant$40, respectively, was also associated with eczema (class II: 1.31 (1.04–1.64); class III: 1.49 (1.18–1.88)).

Prevalence of fatigue and sleep disturbances

The 1-year prevalence of self-reported fatigue or lack of energy for more than 3 days was 15.8% (15.0–16.0%). Frequent excessive daytime sleepiness was described in 12.8% (12.3–13.2%), and 19.3% (18.8–19.9%) reported regularly having insomnia or trouble sleeping. Among adults who reported having regular insomnia, 43.6% (42.1–45.1%) also reported fatigue, and 36.8% (35.3–38.2%) had daytime sleepiness.

Prevalence of having more than 3 days of fatigue, regular daytime sleepiness, and/or insomnia was associated with age 50–69 (1.42 (1.29–1.55)) and $\geqslant$70 years (1.59 (1.43–1.76)), female sex (1.67 (1.57–1.78)), and lower household income ($0–34,999: 2.15 (1.95–2.36); $35,000–74,999: 1.55 (1.40–1.71); $75,000–99,999: 1.19 (1.05–1.36)) and inversely associated with African–American (0.80 (0.74–0.87)) and Asian race (0.52 (0.45–0.60)), Hispanic origin (0.80 (0.74–0.87)), single (0.81 (0.74–0.89)) or multiple (0.67 (0.62–0.73)) children in the household, post-high school education (0.84 (0.76–0.92)), families that had children and either a single parent (0.83 (0.76–0.90)) or both parents in the household (0.60 (0.55–0.66)), and birthplace outside the United States (0.62 (0.57–0.67)). There was a U-shaped distribution of fatigue, daytime sleepiness, and/or insomnia associated with BMI, such that both, being underweight (1.57 (1.24–1.98)) and being obese (class I: 1.30 (1.19–1.42); class II: 1.90 (1.69–2.15); class III: 2.59 (2.25–2.99)), were associated with a higher prevalence of fatigue and sleep disturbance.

Association between eczema and sleep duration

History of eczema in the past year was associated with significantly higher odds of both short (1.35 (1.20–1.51)) and long (1.44 (1.19–1.74)) sleep duration (Table 2). These associations remained significant in multivariate models that controlled for the history of asthma, hay fever, respiratory allergy, food or digestive allergy, age, sex, race, Spanish origin, household income, level of education, US birthplace, number of children in the home, family structure, and BMI.

Association between eczema, fatigue, and sleep disturbance

Adults with eczema had a higher 1-year prevalence of fatigue (5,580,472 people or 32.8% (30.4–35.2%)), regular daytime sleepiness (4,430,186 people or 26.0% (23.8–28.3%)), and insomnia (5,847,404 people or 34.4% (32.0–36.8%)) compared with those without eczema (27.5% (26.9–28.1%); Table 2). In particular, eczema was associated with higher odds of fatigue (OR (95% CIs): 2.97 (2.65–3.34)), regular daytime sleepiness (OR (95% CIs): 2.66 (2.34–3.01)), and regular insomnia (OR (95% CIs): 2.36 (2.11–2.64)). These associations remained significant in multivariate models that included the above-mentioned atopic disorders, sociodemographics, and BMI, as well as sleep duration (Table 2).

Significant two-way interactions were found between symptoms of insomnia and fatigue/daytime sleepiness and between insomnia and sleep duration. Therefore, contrast statements were used to generate estimates for OR and 95% CIs at each level of combination. Odds of eczema were higher in subjects with either fatigue/daytime sleepiness (2.67 (2.28–3.13)) or insomnia (1.96 (1.65–2.34)) and highest with both fatigue/daytime sleepiness and insomnia (3.61 (3.15–4.12); Table 2). Adults with insomnia had higher odds of eczema for all sleep durations (3–6 hours: 2.38 (2.05–2.76); 7–8 hours: 2.40 (2.02–2.85); 9–14 hours: 3.72 (2.73–5.05)). These interactions remained significant in multivariate models. In contrast, adults without insomnia did not have significant interactions with sleep duration as predictors of eczema.

There were no significant differences of association between eczema, asthma and/or hay fever, and sleep disturbance in obese (class I–III) versus normal weight adults (data not shown).

Association between eczema, fatigue, sleep disturbance, and overall health status

In univariate models, eczema (OR (95% CIs): 1.98 (1.74–2.26)), fatigue (6.21 (5.70–6.76)), daytime sleepiness (4.71 (4.29–5.16)), and insomnia (3.99 (3.68–4.33)) were all significant predictors of having only fair/poor overall health. However, there were significant two-way interactions between eczema and fatigue and sleep disturbances. In models of interaction between eczema and fatigue, eczema alone was associated with fair/poor health (OR (95% CIs): 1.29 (1.07–1.56)), whereas fatigue without eczema was associated with higher odds of fair/poor health (OR (95% CIs): 5.93 (5.42–6.50)); those with both eczema and fatigue had even higher odds of fair/poor health (OR (95% CIs): 8.63 (7.15–10.43); Table 3).

Similarly, in models of interaction between eczema and regular daytime sleepiness or insomnia, eczema alone was consistently associated with fair/poor health; regular daytime sleepiness or insomnia without eczema had even higher odds of fair/poor health; and both regular daytime sleepiness or insomnia and eczema had the highest odds of fair/poor health.

Associations between eczema, sleep disturbances, and number of sick days and doctor visits

Significant two-way interactions were found between eczema and sleep disturbances as predictors of the number of missed