TO THE EDITOR

Patients with atopic dermatitis (AD) have multiple potential risk factors for decreased physical activity. First, heat, sweat, and exercise were found to be the most commonly reported exacerbants of AD in children (Tay et al., 2002; Williams et al., 2004). Second, patients with eczematous lesions affecting the hands and feet may have limitations of physical activities. Third, comorbid fatigue, sleep disturbances, and depression might all be indirectly associated with decreased physical activity in AD. We previously found that adult AD is associated with lower odds of self-reported daily vigorous physical activity and lower frequency of vigorous activity (Silverberg and Greenland, 2015). Moreover, adult AD was associated with significantly higher cardiovascular risk (Silverberg, 2015; Silverberg and Greenland, 2015). However, no studies examined physical activity in adult AD patients using objective measures. Self-report of physical activity is limited because respondents’ perceptions of activity intensity vary and periods of physical activity may be difficult to recall and quantify. We sought to confirm whether adults with AD have decreased vigorous physical activity using objective measures.

We used the 2005–2006 National Health and Nutrition Examination Survey. Written informed consent was obtained from all participants or proxies. Household surveys were administered in-person in English and Spanish, followed by health examinations in mobile examination centers (Centers for Disease Control and Prevention, 2014). Then, all participants 6 years or older, who reported no walking impairments during the health examination, were invited to wear the uniaxial ActiGraph AM-7164 (ActiGraph, Ft. Walton Beach, FL) strapped around the waist to assess ambulatory physical activity (Troiano et al., 2008). The accelerometer output is an activity count, which is the weighted sum of the number of accelerations over a minute, where weights are proportional to the magnitude of acceleration. A sedentary minute and a moderate-vigorous minute are analytically identified by activity counts/minute of <100 and ≥2,020, respectively (Troiano et al., 2008). Nonwear time was defined as intervals of at least 60 consecutive minutes of 0 counts with allowance for up to 2 consecutive minutes of counts between 0 and 100. A valid day of monitoring was defined as 10 or more wear hours (Troiano et al., 2008). To provide reliable physical activity estimates, we restricted analyses to participants with at least 4 valid days of accelerometer monitoring (Troiano et al., 2008). Children were excluded from the analysis because of different definitions of

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**Atopic Dermatitis Is Associated with Less Physical Activity in US Adults**


Table 1. Association of atopic dermatitis with physical activity as measured by daytime actigraphy in adults

<table>
<thead>
<tr>
<th>Variable</th>
<th>No (n = 3,061)</th>
<th>Yes (n = 189)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (95% CI)</td>
<td>Crude beta (95% CI)</td>
</tr>
<tr>
<td>Average daily activity (count)¹</td>
<td>261275 (254825.6–267225.3)</td>
<td>-19562 (-35498 to -3627.32)</td>
</tr>
<tr>
<td>Average sedentary time (min)</td>
<td>489.7 (485.0–494.4)</td>
<td>15.03 (-1.83 to 33.50)</td>
</tr>
<tr>
<td>Average light activity (min)</td>
<td>344.4 (338.5–350.3)</td>
<td>-14.19 (-31.41 to 3.04)</td>
</tr>
<tr>
<td>Average moderate-vigorous activity (min)</td>
<td>21.2 (20.0–22.4)</td>
<td>-2.68 (-5.42 to -0.06)</td>
</tr>
</tbody>
</table>

Survey linear regression models were constructed with minutes of average daily activity, sedentary time, light activity, and moderate-vigorous activity as measured by actigraphy being the dependent (outcome) continuous variables and history of atopic dermatitis (binary) as the independent (explanatory) variable. Multivariate models included age (continuous), gender (binary), race/ethnicity (white vs. other), birthplace in the United States (binary), highest level of education in the household (less than high school vs. high school or greater), type of home (house vs. other), body mass index (<18, 18–24, 25–29, ≥30), and daily wear time of the actigraph (continuous) as covariates. Domain analysis was performed to yield appropriate estimates of variance. Crude and adjusted beta and 95% confidence intervals (95% CI) were determined. Boldface indicates significant value.

¹Average daily activity is the average total daily accelerometer count.

physical activity levels, as well as potential differences between pediatric and adult AD.

Bivariate and multivariate survey weighted linear regression was performed in SAS version 9.4 (SAS Institute, Cary, NC). The dependent variables were average daily activity, sedentary time, light, and moderate-vigorous physical activity time (all in minutes). The independent variable was history of AD. Multivariate models included age, sex, race, education level, US birthplace, type of home, body mass index, and actigraph wear time. Additional models controlled for asthma, sleep disturbance (difficulty falling asleep, difficulty staying asleep, waking up early, not having restful sleep) or comorbid depression (SIGECAPS criteria). Domain analysis was performed to yield appropriate estimates of variance for nonmissing values. Two-way interaction terms between AD and covariates were tested and included in final models if P < 0.01 and modification of estimates >20%. A two-sided P < 0.05 was taken to indicate statistical significance. Results were weighted to represent the population of US adults using data from the US Census Bureau. Approval by the Northwestern University institutional review board was waived.

A total of 3,252 adults aged 18–85 (58.5% of the cohort) were included in this analysis; 344 (6.2%) had AD, of whom 57.7% were women, 68.2% white, 84.9% completed high school or higher education, 89.9% were born in the United States, 25.9% overweight, 37.6% obese, and 29.3% had a history of asthma or hay fever.

In multivariate models, adult AD was associated with significantly lower average total counts of daily activity (adjusted beta [95% CI]: -15994 [-30536.00 to -1452.74], P = 0.03) and moderate-vigorous physical activity (-2.12 [-3.92 to -0.33], P = 0.02), but no association with sedentary time (12.74 [-4.30 to 29.79], P = 0.13) or light physical activity (-7.91 [-27.39 to 6.35], P = 0.20) (Table 1). The association between AD and total daily activity and moderate-vigorous physical activity also remained significant in models that controlled for sleep disturbance, comorbid asthma, and depression. Moreover, there were no significant two-way interactions between AD and any of the covariates as predictors of physical activity levels (P ≥ 0.36 for all).

Analysis of the pattern of missing values for actigraphy data in National Health and Nutrition Examination Survey revealed that missing values were more likely in women, blacks, those who did not complete high school education, had a body mass index ≥35 and <18 (P < 0.05), but were not associated with age, birthplace in the United States, history of AD or asthma. Therefore, sensitivity analyses were performed that excluded these subgroups in adults. The associations for average daily activity remained significant in models that excluded women (P = 0.04), blacks (P = 0.049), those who did not complete high school education (P = 0.007) and had body mass index ≥35 and <18 (P = 0.02).

The results of this study confirm and expand on previous studies that found less self-reported vigorous physical activity among adults with AD from two different cohorts (Silverberg et al., 2015). In that study, however, physical activity was assessed by self-report, which may not be a reliable predictor of activity levels. Moreover, a recent systematic review found no significant association between history of AD and physical activity (Kim and Silverberg, 2016). However, there were very few studies, with considerable heterogeneity, different regions, and inconsistent measures of self-reported physical activity. The present study further suggests that adult AD is associated with less physical activity, particularly moderate-vigorous activity, in a different cohort. Moreover, this study used objective measures of physical activity, that is, actigraphy. Physical activity levels were neither related to comorbid asthma, sleep disturbances, or depression. It is well established that regular physical activity decreases acquired cardiovascular risk factors, including obesity, diabetes, hypertension, and hyperlipidemia (Thompson et al., 2003). Thus, decreased physical activity in adults with AD may contribute toward increased cardiovascular risk.

This study has several strengths, including being US population-based, with complex survey weighting, a very large diverse sample, and objective measurement of physical activity and...
TO THE EDITOR

Crohn’s disease (CD) and ulcerative colitis (UC), both subtypes of inflammatory bowel disease (IBD), were observed to be risk factors for hidradenitis suppurativa (HS), yet the risk for IBD in HS patients has been poorly defined. The purpose of our study, therefore, was to evaluate the association between HS and IBD, both CD and UC, based on the comprehensive population-based database of Clalit Health Services (CHS). CHS is the largest health maintenance organization in Israel, serving a population of more than 4,300,000 enrollees. CHS’s database is a comprehensive computerized database with continuous real-time input from pharmaceutical, medical, and administrative operating systems.

Our study was designed as a cross-sectional study with an age- and sex-matched control subjects. The group of HS patients consisted of patients with at least one documented HS diagnosis in their medical records between the years 1998 and 2013, registered by a CHS dermatologist in a primary care center. The control group consisted of

Hidradenitis Suppurativa and Inflammatory Bowel Disease: A Cross-Sectional Study of 3,207 Patients


Abbreviations: CD, Crohn’s disease; CHS, Clalit Health Services; HS, hidradenitis suppurativa; IBD, inflammatory bowel disease; UC, ulcerative colitis

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