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SHORT COMMUNICATION

Psychological Stress and Skin Symptoms in College Students: Results of a Cross-sectional Web-based Questionnaire Study

Christina Schut[1,2], Nicholas K. Mollanazar[1], Mansha Sethi[1], Leigh A. Nattkemper[1], Rodrigo Valdes-Rodriguez[1], MacKenzie M. Lovell[3], Gina L. Calzaferri[3] and Gil Yosipovitch[1]*

*[1]Department of Dermatology and Itch Center, Temple University School of Medicine, 3322 North Broad Street, Medical Office Building, Suite 212, Philadelphia, PA, 19140 USA, [2]Institute of Medical Psychology, Justus-Liebig-University, Giessen, Germany, and [3]Office of Institutional Research & Assessment at Temple University, Philadelphia, USA. *E-mail: gil.yosipovitch@tuhs.temple.edu*

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College can be a cause of increased psychological stress, especially given the complex social, academic, and financial pressures faced by today's students (1, 2). The association between psychological stress and the manifestation or exacerbation of different skin diseases is well established (3–8). Previous studies that demonstrated an association between stress and skin symptoms focused their analyses on a single skin disease. Therefore, this questionnaire-based cross-sectional study aimed to assess the relationship between perceived psychological stress and the prevalence of various skin symptoms in a large, randomly selected sample of undergraduate students.

MATERIALS AND METHODS

The investigation was conducted at Temple University in Philadelphia, Pennsylvania, during the fall semester of 2014 by the Department of Dermatology and the Temple Itch Center. Five thousand undergraduate students aged 18–30 years were randomly selected and e-mailed an invitation to participate in a web-based survey. Electronic informed consent was obtained from all participants. The study was approved by the Institutional Review Board at Temple University School of Medicine.

We utilized Research Electronic Data Capture (REDCap) to construct, host, implement, and collect the survey and subsequent data.

To assess stress levels, we used the validated Perceived Stress Questionnaire (PSQ; 9) a 30-item questionnaire that measures self-reported psychological stress (9). The raw scores were combined to produce a PSQ index that varied from 0 to 1, representing lowest and highest levels of perceived stress, respectively. To assess skin complaints, we utilized a modified version of the Self-Reported Skin Questionnaire (SRSQ; 10).

Statistics

The statistical analyses were done using SPSS 22. The group was divided into low stress (LS), moderate stress (MS) and high stress (HS) students by determination of the 25th and 75th percentile of the PSQ index. Students scoring $\leq$25th percentile (PSQ index $\leq$0.389) were regarded as lowly stressed, students scoring $\geq$75th percentile (PSQ index $\geq$0.622) were regarded as highly stressed. All other students fell in the category of moderately stressed. Moreover, the answers concerning the (skin-) symptoms were dichotomized in such a way that the answer "no complaints" was compared with the other 3 answers ("a little", "quite a lot" and "very much"). Thus, we only distinguished whether the symptom occurred in the student or not. This dichotomization was done to allow the computation of odds ratios (OR). To compare the low and high stressed students regarding socio-demographic variables, χ^2-tests as well as *t*-tests for independent groups were computed. Subsequently, OR and 95% confidence intervals were calculated to conclude as to whether the low stress group had a lower probability of having (skin-) complaints than the high stress group. Due to the fact that sex was not equally distributed in the groups, sex and stress severity were used as a covariate in the binary logistic regressions which were subsequently conducted using the skin symptoms as dependent variables. This made it possible to report OR and 95% confidence intervals (CI) adjusted for sex.

RESULTS

From the 482 students who participated, 60 had to be excluded due to incomplete data, unspecified sex and/or failure to meet inclusion criteria resulting in a final sample size of 422. The group was divided into LS, MS and HS students. Of the 422 subjects, 109 were designated LS, 201 MS, and 112 HS subjects. The mean±SD age was 20.76±2.09, with no difference in age among the 3 groups (all $p>0.05$). There were no significant differences in the distribution of academic standing between the three groups (all $p>0.05$). The total sample included 113 men and 309 women. There was a statistically significant difference in terms of sex distribution between the groups, with more women in the MS and HS cohorts ($p=0.005$) in comparison to the LS group.

When compared to LS subjects, HS subjects suffered from significantly more pruritus ($p\leq0.001$, adjusted OR 2.79 (95% CI 1.58–4.94)), alopecia ($p\leq0.001$, 2.87 (1.53–5.41)), oily, waxy, flaky patches on scalp ($p\leq0.001$, 2.61 (1.47–4.65)), hyperhidrosis ($p=0.001$, 2.56 (1.46–4.47)), scaly skin ($p=0.002$, 2.42 (1.30–4.51)), onychophagia ($p=0.011$, 1.92 (1.11–3.32)), itchy rash on hands ($p=0.021$, 2.54 (1.01–6.40)), and trichotillomania ($p=0.038$, 2.42, (1.16–5.04)). Pimples, dry/sore rash, warts and other rash on the face all demonstrated no association with perceived psychological stress levels (all $p>0.05$; Table I).

The frequencies of pruritus in HS, MS, and LS were 72% ($n=81$), 56% (113), and 46% (50), respectively. The frequency of hair loss (alopecia) was 39% ($n=44$) in the HS group, 30% (60) in the MS group, and 17% (19) in the LS group. The self-reported frequencies of oily, waxy, or flaky patches on the scalp in the HS, MS, and LS groups were 50% ($n=56$), 41% (82), and 26% (28). The frequencies of troublesome sweating (hyperhidrosis)

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Table I. *Skin symptoms in high and low stress groups of undergraduate students*

	p-value	Crude OR	Adjusted OR
Pruritus	≤0.001	3.08 (1.76–5.34)	2.79 (1.58–4.94)
Hair loss (alopecia)	≤0.001	3.06 (1.64–5.71)	2.87 (1.53–5.41)
Oily, waxy or flaky patches on the scalp	≤0.001	2.89 (1.64–5.10)	2.61 (1.47–4.65)
Troublesome sweating (hyperhidrosis)	0.001	2.62 (1.515– 4.53)	2.56 (1.46–4.47)
Scaly skin	0.002	2.61 (1.42–4.80)	2.42 (1.30–4.51)
Nail-biting (onychophagia)	0.011	2.03 (1.19–3.48)	1.92 (1.11–3.32)
Itchy rash on hands	0.021	2.97 (1.19–7.40)	2.54 (1.01–6.40)
Hair pulling (trichotillomania)	0.038	2.15 (1.06–4.37)	2.42 (1.16–5.04)
Other rash on face	0.065	2.08 (0.98–4.44)	2.10 (0.97–4.55)
Dry/sore rash	0.265	1.41 (0.81–2.44)	1.28 (0.73–2.25)
Pimples	0.408	1.46 (0.64–3.35)	1.22 (0.52–2.87)
Warts	0.830	1.17 (0.5–2.73)	1.21 (0.50–2.89)

OR: odds ratios; AOR; adjusted OR; CI: confidence interval.

in HS, MS, and LS groups were 55% ($n=62$), 48% (97), and 32% (35). The frequency of scaly skin was 38% ($n=43$) in the HS group, 26% (52) in the MS group, and 19% (21) in the LS group. The frequency of nail biting (onychophagia) in the HS, MS, and LS groups was 61% ($n=68$), 47% (95), and 43% ($n=47$), respectively. The frequency of itchy rash on hands in the HS, MS, and LS groups were 17% ($n=19$), 10% ($n=20$), and 6% ($n=7$). The HS, MS, and LS groups had reported frequencies of hair pulling (trichotillomania) in 24% ($n=27$), 14% ($n=29$), and 13% ($n=14$), respectively.

DISCUSSION

The purpose of this study was to investigate the relationship between skin symptoms and stress levels in a large randomly selected sample of undergraduate students. While a causal relationship between stress and the manifestation of skin disease remains to be proven, this study clearly demonstrates that heightened stress levels are associated with pruritus, alopecia, oily/waxy/flaky patches on the scalp, hyperhidrosis, scaly skin, onychophagia, trichotillomania, and itchy rash on hands. The associations we report are in agreement with previously reported findings associating heightened levels of psychological stress with the aforementioned skin complaints (4, 5, 11–14).

There are several limitations to this study, chief amongst which is the low response rate of <10%, which might have produced an overrepresentation of persons with high stress or skin complaints. A second limitation lies in the fact that subjects were not physically assessed. In the absence of a physical assessment, we cannot confidently ascertain the exact clinical diagnoses for some of the more generalized skin complaints reported by the subjects. For this reason, we relied on a skin questionnaire that was previously validated (SRSQ; 10) and found to have relatively high positive predictive values for the self-reported responses (10).

Despite these limitations, the associations reported herein bear importance for dermatologists treating undergraduate students experiencing either new skin symptoms or an exacerbation of skin disease, and highlight the salience of questioning students about their levels of psychological stress. Importantly, disease flare or exacerbation while on treatment in the setting of increased stress may not necessarily reflect treatment failure. These findings suggest that non-pharmacologic therapeutic interventions should be considered for patients presenting with both skin conditions and heightened levels of psychological stress.

The authors declare no conflict of interest.

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