

Prevalence, social determinants, comorbidities, and patient-reported outcomes of dermatographism in Chinese adolescents: a population-based study

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To the editor,

Dermatographism is a secondary temporal linear cutaneous wheal after scratching, stroking, or rubbing the skin. The prevalence of dermatographism was estimated as 4%-5% in general population¹, with a higher prevalence of 24% in the pediatric population². From previous reports, dermatographism was associated with drug-induced urticaria³, hypereosinophilic syndrome⁴, and endocrinopathies. However, the above data were mainly derived from case reports or case-control studies of western countries. Moreover, Bologna *et al* proposed that dermatographism was not related to the atopy, food allergy, autoimmunity diseases⁵.

We conducted a population-based cross-sectional study in China. The first-year college students in three universities of China who consented to participate underwent health examination and an online questionnaire survey. Diagnosis of skin diseases and inquiry of disease history were performed by dermatologists during the health examination. Dermatographism was induced by a scratching test and evaluated by a dermatologist. Annual household income and parents' educational level were determined by a self-reported questionnaire that included six given categories. Itch and pain of the skin were measured by the numeric rating scales. Sleep quality was measured by the Pittsburgh Sleep Quality Index. Symptoms of depression and anxiety were measured by the 2-item Patient Health Questionnaire and Generalized Anxiety Disorder Scale-2, respectively. Mixed logistic models were used to estimate the associations in terms of odds ratios (OR), including crude and adjusted ORs and 95% uncertainty intervals. The effect sizes were adjusted for the individual-level covariates (sex and socioeconomic indicator) and the random effects of sampling units (university). Statistical analyses were performed with SAS 9.4 (SAS Inc., Cary, USA). $P < 0.05$ was considered statistically significant.

A total of 16,167 college students were newly enrolled in three universities located in Changsha, Xiamen, and Hohhot, respectively, in 2018. Among them, 12,127 (response rate 75%) completed the questionnaire survey and health examination and were finally analyzed. The mean age of the participants was 18.3 ± 0.8 years, and 52.7% were women. The point prevalence of dermatographism was 15.6%, with no sex difference. The prevalence of grade 2-3 dermatographism was 1.43%. As shown in Table 1, the prevalence of dermatographism was positively associated with socioeconomic status indicators (trend $P < 0.001$). Dermatographism was significantly associated with a series of skin comorbidities (Table 2), including atopic dermatitis (adjusted OR=1.39, P

=0.008), chronic urticaria (OR=2.56, $P < 0.001$), acne vulgaris (OR=1.29, $P < 0.001$), and warts (OR=2.07, $P = 0.012$). In contrast, dermatographism was not significantly associated with a self-reported history of asthma or allergic rhinitis or other diagnosed skin disorders. Regarding other patient-reported outcomes (Table 2), dermatographism was only significantly associated with itch (OR=1.20, $P = 0.005$).

The high prevalence suggests that dermatologists should not neglect to test relevant patients for dermatographism in order to avoid misdiagnosis, especially in patients of younger age and with comorbid conditions such as atopic dermatitis and symptoms of itch. The significant correlation between dermatographism and socioeconomic status indicators may be attributable to urbanization, air pollution, and changes in dietary habits. In conclusion, dermatographism affects a substantial proportion of Chinese young adults, and is associated with higher socioeconomic status, comorbidities, and symptoms of itch.

References

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Table legends

Table 1. Prevalence of dermatographism by sociodemographic characteristics

Table 2. Association of dermatographism with comorbidities and patient-reported outcomes

Table 1. Prevalence of dermatographism by sociodemographic characteristics

| Characteristics | Total, n (%) | Prevalence, n (%) | Grade, % 1 | Grade, % 2–3 |
|------------------------------------|--------------|-------------------|---------------|-----------------|
| Sex | | | | |
| Men | 5736 (47.3) | 888 (15.5) | 14.2 | 1.3 |
| Women | 6391 (52.7) | 1008 (15.8) | 14.2 | 1.6 |
| Annual household income (CNY) | | | | |
| < 10,000 | 1374 (11.3) | 133 (9.9) | 9.0 | 0.9 |
| 10,000 to 29,999 | 2551 (21.0) | 352 (13.8) | 12.7 | 1.1 |
| 30,000 to 49,999 | 2086 (17.2) | 339 (16.3) | 14.4 | 1.9 |
| 50,000 to 99,999 | 2618 (21.6) | 418 (15.9) | 14.6 | 1.3 |
| 100,000 to 199,999 | 2466 (20.3) | 463 (18.7) | 16.9 | 1.8?;? |
| 200,000 | 1032 (8.5) | 191 (18.3) | 16.8 | 1.5 |
| Parental highest educational level | | | | |
| Primary school and below | 846 (7.0) | 92 (11.1) | 10.4 | 0.7 |
| Middle school | 3128 (25.8) | 429 (13.8) | 12.4 | 1.4 |
| High school | 2980 (24.6) | 482 (16.1) | 14.4 | 1.7 |
| College and above | 5173 (42.6) | 893 (17.2) | 15.7 | 1.4 |

Table 2. Association of dermatographism with comorbidities and patient-reported outcomes

| | Dermatographism | Dermatographism | OR (95% UI) | OR (95% |
|--|-----------------|-----------------|-------------|---------|
|--|-----------------|-----------------|-------------|---------|

| Comorbidities or outcomes | Total, n (%) | No, % | Yes, % | Crude estimates | Adjusted |
|---|--------------|-------|-------------------|-------------------------------|-------------------------------|
| Comorbidities | | | | | |
| Obesity (body mass index[?]28 kg/m ²) | 572 (4.8) | 4.8 | 4.5 | 0.93 (0.74–1.18) | 0.91 (0.73–1.14) |
| Asthma | 175 (1.5) | 1.4 | 1.7 | 1.20 (0.81–1.76) | 1.06 (0.72–1.56) |
| Allergic rhinitis | 1324 (10.9) | 10.8 | 11.6 | 1.08 (0.92–1.26) | 1.00 (0.86–1.16) |
| Atopic dermatitis | 422 (3.5) | 3.3 | 4.7 ⁺ | 1.45 (1.14–1.85) ⁺ | 1.39 (1.09–1.75) ⁺ |
| Chronic urticaria | 247 (2.0) | 1.6 | 4.2 ⁺ | 2.64 (2.02–3.47) ⁺ | 2.56 (1.93–3.41) ⁺ |
| Chronic spontaneous urticaria | 131 (1.1) | 0.8 | 2.6 | 3.22 (2.25–4.61) ⁺ | 3.09 (2.10–4.54) ⁺ |
| Chronic inducible urticaria | 116 (1.0) | 0.8 | 1.7 | 2.02 (1.34–3.05) ⁺ | 1.97 (1.30–2.83) ⁺ |
| Acne vulgaris | 1294 (10.7) | 10.2 | 13.0 ⁺ | 1.31 (1.13–1.51) ⁺ | 1.29 (1.11–1.49) ⁺ |
| Vitiligo | 30 (0.2) | 0.2 | 0.3 | 1.35 (0.56–3.31) | 1.51 (0.63–3.64) |
| Tinea | 437 (3.6) | 3.5 | 3.9 | 1.11 (0.86–1.43) | 1.13 (0.87–1.47) |
| Warts | 62 (0.5) | 0.4 | 0.9 ⁺ | 1.96 (1.11–3.46) ⁺ | 2.07 (1.17–3.68) ⁺ |
| Patient-reported outcomes | | | | | |
| Itch (NRS[?]3) | 1853 (15.3) | 14.9 | 17.4 ⁺ | 1.20 (1.06–1.37) ⁺ | 1.20 (1.06–1.37) ⁺ |
| Pain (NRS[?]3) | 340 (2.8) | 2.8 | 3.0 | 1.07 (0.80–1.43) | 1.12 (0.83–1.52) |
| Sleep disturbance (PSQI [?]6) | 3644 (30.1) | 29.9 | 30.9 | 1.05 (0.94–1.17) | 1.04 (0.94–1.15) |
| Anxiety (GAD-2 [?]3) | 1003 (8.3) | 8.3 | 7.9 | 0.95 (0.79–1.13) | 0.96 (0.80–1.14) |
| Depression (PHQ-2 [?]3) | 871 (7.2) | 7.1 | 7.7 | 1.10 (0.91–1.32) | 1.09 (0.91–1.30) |
| Suicidal ideation | 482 (4.0) | 4.0 | 3.9 | 0.96 (0.75–1.24) | 0.96 (0.74–1.24) |

GAD-2, Generalized Anxiety Disorder-2; NRS: numeric rating scale; PHQ-2, 2-item Patient Health Questionnaire; PSQI, Pittsburgh Sleep Quality Index; OR, odds ratio. UI, uncertainty interval.

* Adjusted for sex, household income, and parental educational level. ⁺ $P < 0.05$