

Prevalence of acne in Chinese college students and its associations with social determinants and quality of life: a population-based cross-sectional study

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To the Editor: Acne vulgaris is a common chronic inflammatory skin disease. It is the 8th most prevalent disease in the world. Among adolescents, more than 85% once suffered from acne.^[1] Moreover, according to the recent evidence,^[2] patients often experience great physical and mental stress especially among the college students, due to its recurrence and scars or post-inflammatory hyperpigmentation left after healing. In China, while there are many studies on acne among adolescents and young adults, most of them are hospital-based. Substantial selection bias may be introduced in these studies because patients with severer symptoms or signs of disease are more likely to seek medical care, and perceive more impaired quality of life. The epidemiologic data from population-based studies in China are still lacking. Our study aims to estimate the prevalence of moderate and severe acne in Chinese college students and assess its impact on the quality of life.

Our study was approved by the Ethics Committee of Huazhong University of Science and Technology (No. 2018S384) and Xiangya Hospital, Central South University (No. 201806877). Five universities located in Changsha, Wuhan, Xiamen, Urumchi, and Hohhot were selected using the cluster sampling framework. All first-year college students who consented to participate in received a health examination and an online questionnaire survey during September and October, 2018. The questionnaire that inquired demographic information, mental well-being, and quality of life was self-reported. Height and weight were measured by nurses using standardized methods. Body mass index (BMI) was calculated as weight (kg)/height² (m²).

The diagnosis of skin diseases and inquiries regarding disease history were performed by dermatologists during

the health examination. All the investigators were well trained about the process and inclusion/exclusion criteria. The severity of acne was determined by the Pillsbury Grading System^[3]: grade 1, mild acne; grades 2–3, moderate acne; and grade 4, severe acne. Moderate-to-severe acne was defined as the outcome of this study. We also investigated how acne affects mental well-being and quality of life. Anxiety and depression were measured by the Generalized Anxiety Disorder Scale-2 (GAD-2) and Patient Health Questionnaire-2 (PHQ-2), respectively. Health-related quality of life (HRQoL) was determined by the European Quality of Life-5 Dimensions (EQ-5D). Health utility estimates were mapped from the EQ-5D based on preference-based weights.

Continuous data with normal distribution were presented as the mean \pm standard deviation, and between-group differences were tested using Student's *t* test. Continuous data with skewed distribution were shown as median (Q₁, Q₃) and analyzed using Mann-Whitney *U* test. Categorical data were presented as numbers (%), and between-group differences were examined using the Chi-square test. The associations of acne with demographic characteristics were analyzed using the two-level multivariable logistic models (student as a level-1 unit and city as a level-2 unit), and the results were presented as adjusted odds ratio (aOR) with 95% confidence interval (CI). The associations of anxiety, depression, and HRQoL with acne were analyzed using the two-level linear models that were adjusted for demographic covariates, and the results were presented as regression coefficient (β) with standard error (SE). The statistical analyses were performed with SAS software (version 9.4, SAS Institute, Cary, NC, USA). All tests were two-sided, and a *P* value < 0.05 was considered statistically significant.

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Table 1: Comparison of social determinants and quality of life between college students with moderate/severe and clear/mild acne.

Characteristics	Total (n = 20,138)	Clear/mild acne (n = 18,051)	Moderate/severe acne (n = 2087)	Statistics	P
Geographic region, n (%)				39.645*	<0.001
North	3605 (17.9)	3143 (87.2)	462 (12.8)		
Northeast	631 (3.1)	552 (87.5)	79 (12.5)		
East	4470 (22.2)	4054 (90.7)	416 (9.3)		
Central	4246 (21.1)	3797 (89.4)	449 (10.6)		
South	1396 (6.9)	1254 (89.8)	142 (10.2)		
Southwest	1802 (8.9)	1626 (90.2)	176 (9.8)		
Northwest	3988 (19.8)	3625 (90.9)	363 (9.1)		
Age (years), mean ± SD	18.29 ± 0.77	18.30 ± 0.78	18.26 ± 0.74	1.960†	0.050
Body mass index (kg/m ²), mean ± SD	21.26 ± 3.55	21.23 ± 3.53	21.56 ± 3.67	-4.963‡	<0.001
Gender, n (%)				203.861*	<0.001
Male	10,289 (51.1)	8914 (86.6)	1375 (13.4)		
Female	9849 (48.9)	9137 (92.8)	712 (7.2)		
Ethnicity, n (%)				3.286*	0.070
Han	16,230 (80.6)	14,517 (89.5)	1713 (10.5)		
Other	3908 (19.4)	3534 (90.4)	374 (9.6)		
Annual household income (CNY), n (%)				6.083*	0.298
< 10,000	2169 (10.8)	1953 (90.0)	216 (10.0)		
10,000 to 29,999	4378 (21.7)	3941 (90.0)	437 (10.0)		
30,000 to 49,999	3470 (17.2)	3118 (89.9)	352 (10.1)		
50,000 to 99,999	4419 (21.9)	3942 (89.2)	477 (10.8)		
100,000 to 199,999	4065 (20.2)	3614 (88.9)	451 (11.1)		
≥ 200,000	1637 (8.1)	1483 (90.6)	154 (9.4)		
EQ-5D positive, n (%)					
Morbidity	125 (0.6)	118 (0.7)	7 (0.3)	3.081*	0.079
Self-care	109 (0.5)	96 (0.5)	13 (0.6)	0.285*	0.594
Activity	119 (0.6)	107 (0.6)	12 (0.6)	0.011*	0.918
Pain/discomfort	1263 (6.3)	1154 (6.4)	109 (5.2)	4.397*	0.036
Depression/anxiety	3986 (19.8)	3589 (19.9)	397 (19.0)	0.908*	0.341
EQ-5D-based health utility, mean ± SD	0.97 ± 0.07	0.97 ± 0.07	0.97 ± 0.06	-2.011†	0.044
GAD-2, median (Q ₁ , Q ₃)	1 (0, 2)	1 (0, 2)	0 (0, 2)	1.744‡	0.081
PHQ-2, median (Q ₁ , Q ₃)	0 (0, 2)	0 (0, 2)	0 (0, 1)	-1.347‡	0.178

CNY: Chinese yuan; EQ-5D: European Quality of Life 5-Dimensions; GAD-2: Generalized Anxiety Disorder-2; PHQ-2: Patient Health Questionnaire-2; SD: Standard deviation. *χ² values by Chi-square test. †t values by Student's t test. ‡Z values by Mann-Whitney U test.

A total of 27,114 students were enrolled in 2018 according to the registry information of the universities. A total of 20,138 subjects (74.3%) who consented to participate in and completed the investigation were included in the final analysis. The prevalence of moderate-to-severe acne was 10.4% (2087/20,138).

The prevalences of moderate-to-severe acne across different demographic groups were presented and compared in Table 1. There were significant differences in the prevalence of acne between different geographical regions (χ² = 39.645, P < 0.001), and participants from north China had the highest prevalence (462/3605, 12.8%). The prevalence of moderate-to-severe acne in males was significantly higher than that in females (13.4% vs. 7.2%, χ² = 203.861, P < 0.001). The BMI of moderate-to-severe acne group was significantly higher than that in clear-to-mild acne group (21.56 ± 3.67 kg/m² vs. 21.23 ± 3.53 kg/m², t = -4.963, P < 0.001). In contrast, no significant difference in the prevalence of acne was observed across different ethnicity and annual household income groups. In the two-level multivariable logistic

model, sex (female, aOR: 0.47; 95% CI: 0.42–0.52; P < 0.001) and region (aOR [95% CI]: east, 0.61 [0.53–0.69]; central, 0.65 [0.57–0.75]; south, 0.66 [0.54–0.80]; southwest, 0.62 [0.52–0.75]; northwest, 0.66 [0.57–0.77]; all P < 0.05 compared with north) were significantly associated with acne, but BMI was not significantly correlated with acne (aOR: 1.01, 95% CI: 0.99–1.02, P = 0.112).

With respect to mental well-being and quality of life, however, GAD-2, PHQ-2, and EQ-5D scores were in general not statistically different between those with moderate/severe acne and clear/mild acne [Table 1]. In the two-level linear model, acne was not significantly associated with GAD-2 (β = -0.015, SE = 0.028, P = 0.604), PHQ-2 (β = -0.012, SE = 0.029, P = 0.670), and health utility (β = 0.002, SE = 0.002, P = 0.141) after adjusting for demographic covariates.

In our study, the overall prevalence of moderate-to-severe acne among the first-year college students was 10.4%. The prevalence varied geographically, and subjects from

north China presented the highest prevalence compared with those from other regions. The regional difference might be attributable to variation in humidity, air pollution, and dietary habits characterized as high glycemic indices (such as noodles and wheaten foods).^[4] We also identified male sex and obesity as risk factors for moderate-to-severe acne. The sex difference might be attributable to hormone levels, lifestyles, and health care seeking behaviour.^[5] Higher BMI is associated with the increased expression of insulin-like growth factor-1, which has been confirmed to involve in the pathogenesis of acne. Although acne is a typical facial skin disorder that can cause disfigurement, mental well-being and quality of life in our study participants were not significantly affected. This is not consistent with previous hospital-based studies, probably because outpatients generally manifest severer conditions and have stronger demands for health care. Another explanation is that EQ-5D is not a sensitive measure of impaired quality of life for skin disorders and other mild conditions, and exhibits ceiling effects.

Our study is a large population-based cross-sectional survey, providing a representative and accurate estimate of the prevalence of acne among college students. However, the study has some limitations. First, the causal relationship between acne and demographic characteristics as well as quality of life can not be confirmed owing to the cross-sectional study design. Second, the conclusion of the study could not be generalized to non-student population.

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Conflicts of interest

None.

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