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Systemic inflammation and associated factors in truncal versus facial acne in young adults: an analytical cross-sectional study

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Abstract

Background: Acne is a common skin condition in young adults. It affects appearance, psychological well-being, and overall health. Recently, a paradigm shift has suggested that acne is not merely a localized follicular disorder but may be significantly driven by systemic inflammation. Evidence is growing that truncal acne is linked to systemic inflammation and lipid metabolism disorders; however, the specific link between systemic inflammatory markers, metabolic features, and the distribution of acne lesions (truncal versus facial) remains underexplored.

Methods: An analytical cross-sectional descriptive study was conducted on 75 patients diagnosed with acne who received treatment at Ho Chi Minh City Dermatology Hospital in June 2025. Patients were divided into two groups: a facial acne group (n = 40) and a truncal acne group (n = 35). Anthropometry, lifestyle, and skin care habits were collected via a questionnaire. Blood test results were obtained through laboratory software.

Results: A study of 75 patients (mean age 18.2 ± 3.5, with 81.3% being students) found that 100% of cases of truncal acne were accompanied by lesions on the face, with the back being the most common site on the trunk. The group of patients with truncal acne had a significantly higher BMI (22.6 ± 3.9), was more common in males (OR = 4.64, 95% CI: 1.74 – 12.37, p = 0.002), had an earlier age of onset (mean = 14; OR = 0.76, 95% CI: 0.61 – 0.93, p = 0.009), and had a longer duration of illness compared to the group with facial acne only. In terms of laboratory findings, truncal acne was associated with elevated NLR and PLR; each unit increase in NLR was associated with a 5.45 higher odds of truncal acne (95% CI: 1.80 – 18.7, p = 0.003), alongside increased total cholesterol levels and reduced HDL-C (OR = 0.13, 95% CI: 0.02 – 0.91, p = 0.04).

Conclusions: Truncal acne accounts for 46.7% of acne patients, characterized by a broader distribution pattern (present in 100% of cases) and primarily affects the back. Clinically, the condition is most commonly seen in males with a high BMI, has an early onset (average age of 14), and a prolonged course. Biologically, the condition is characterized by systemic inflammation (elevated NLR) and dyslipidemia (elevated total cholesterol, reduced HDL cholesterol).

Keywords: Acne vulgaris, truncal acne, facial acne, NLR

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1. INTRODUCTION

Acne is a disease of the hair follicle and sebaceous gland unit, with a high prevalence among adolescents and young adults [1]. The disease not only causes physical damage such as pitted scars and dark spots, but also profoundly affects the quality of life and self-confidence of patients [2]. The pathogenesis of acne is complex, involving increased sebum production, follicular hyperkeratinization, the presence of *Cutibacterium acnes* bacteria, and inflammatory responses [3].

In clinical practice, the severity of acne is often assessed based on the number and nature of lesions. In addition, the evidence has highlighted the crucial role of systemic inflammation in the pathogenesis and severity of the disease. Elevated hematological markers, particularly the neutrophil to lymphocyte Ratio (NLR), platelet to lymphocyte ratio (PLR), have emerged as accessible and reliable indicators of this systemic inflammatory burden [4,5]. These indices are thought to reflect the degree of systemic inflammation and may predict the severity of acne [6]. In particular, the difference in the pathogenesis between facial acne and truncal acne (back, chest) remains a research gap that needs to be clarified, as patients with widespread lesions often respond less well to treatment and suffer greater psychological burden [2,7].

Although the role of lifestyle and systemic inflammation has been addressed in global medical literature through the concept of the "exposome" [8], there remains a need for additional empirical data on specific patients at treatment facilities. To provide additional scientific evidence for optimizing treatment protocols and comprehensive counseling, we conducted this study with the following objectives: (1) To describe anthropometric characteristics, lifestyle, skin care habits, and clinical test results; (2) To analyze the association between these factors and lesion distribution (facial versus truncal acne).

2. MATERIALS AND METHODS

2.1. Study design and participants

This cross-sectional study included 75 patients diagnosed with acne who visited and received treatment at Ho Chi Minh City Dermatology Hospital in June 2025. A consecutive sampling method was used for all patients with acne who attended Ho Chi Minh City Dermatology Hospital and met the inclusion criteria and had no exclusion criteria during the study period.

- Inclusion criteria: Patients diagnosed with acne who were indicated for routine blood tests (including complete blood count and lipid profile) and voluntarily agreed to participate in the study.
- Exclusion criteria: Patients with other dermatological conditions, pregnant women.

Determination criteria:

- Facial acne: the patients with acne only on the face.
- Truncal acne: the patient has acne on other parts of the trunk (back, chest, etc.) besides the face.
- High intake of sugary and fatty foods: the patients who regularly consume sweet foods or fried foods and fast food at least 3 times/week
- Late-night sleeping: the patient has been going to bed after 11 pm at least 3 times/week over the past month
- Use of skincare cosmetics: the patients who use any type of topical cosmetic product on the acne-affected skin (make-up, sun cream, moisturiser) on a daily basis.

- No prior treatment: the patient has not used any intensive acne treatments (including systemic oral medication or prescription topical medication/ corticosteroids) within the last month.

A consecutive sampling method was employed. All eligible patients diagnosed with acne who visited the hospital during the study period (June 2025) and met the inclusion criteria were continuously enrolled, resulting in a total sample size of 75 patients.

2.2. Data collection methods

Data was collected using questionnaires, including: anthropometric characteristics, lifestyle, skin care habits, and acne location.

Test results were collected using Labconn software after patients agreed to participate in the study.

2.3. Statistical analysis

Data were entered using MS Excel 365 and analyzed using R 4.5.1 statistical software.

Prior to the analysis, the normality of continuous variables was evaluated using the Kolmogorov-Smirnov test. Statistical analyses performed included independent Student's t-tests (for normally distributed. data) or Mann-Whitney U tests (for non-normally distributed data) to compare continuous variables. For categorical variables, differences between groups were analyzed using the Chi-square test or Fisher's exact test, as appropriate.

Independent variables showing a potential association with the dependent variable in the correlation analysis ($p < 0.05$) were selected for analysis in a univariate logistic regression model, as the dependent variable was binary (facial acne versus truncal acne). Categorical variables were appropriately coded as dummy variables. All results were considered statistically significant when a two-tailed p-value was < 0.05.

2.4. Ethics

The study was approved by the Ethics Committee of Pham Ngoc Thach University of Medicine, No. 1345/TĐHYKPNT-HĐĐĐ, dated March 24, 2025, and the Ethics Committee of Ho Chi Minh City Dermatology Hospital, No. 992/CN-BVDL, dated June 3, 2025. All patients were fully informed about the objectives and content of the study and gave their consent to participate.

3. RESULTS

3.1. General characteristics and lifestyle habits

Table 1. Distribution of acne lesions

Groups		Frequency (n)	Percentage (%)
Facial acne		40	53.33
Truncal acne	**Face**	35	47.67
	Chest	4	5.33
	Back	15	20.00
	Others	7	9.33
	≥ 3 site (face, chest, back, others)	9	12.00

Among 75 patients enrolled in the study, 40 had facial acne, and 35 had truncal acne. Among those with truncal acne, 100% also have facial acne; the next most common site is the back (20%), and the least common is the chest (5.33%).

The average age of the study subjects was 18.2±3.5 years old, with a male-to-female ratio of 52.0% and 48.0%, respectively, a difference that was not statistically significant (p = 0.817). Most patients were students (81.3%). The results of comparing anthropometric characteristics and lifestyle habits between the two groups are presented in Table 2.

Table 2. Comparison of anthropometric characteristics between the two groups

Characteristics	Total (n = 75)	Facial acne (n = 40)	Truncal acne (n = 35)	p value
Age (year), $\bar{X} \pm$ SD	18.2 ± 3.5	18.1 ± 3.3	18.4 ± 3.8	0.15*
BMI (kg/m²), $\bar{X} \pm$ SD	21.3 ± 3.5	20.2 ± 2.8	22.6 ± 3.9	**0.004***
Sex n (%)				
Female	36 (48.0%)	26 (65.0%)	10 (28.6%)	**0.004 ****
Male	39 (52.0%)	14 (35.0%)	25 (71.4%)	

** Independent Student's t-test, ** Chi-square test*

The body mass index (BMI) in the truncal acne group (22.6 ± 3.9) was statistically significantly higher than in the facial acne group (20.2 ± 2.8) with p = 0.004. Acne on the trunk is more common in males; conversely, in females, acne is usually confined to the face, a difference that is statistically significant (p = 0.004). Furthermore, there is no statistically significant difference in age between the two groups.

Table 3. Comparison of medical history and lifestyle characteristics between the two groups

Characteristics	Total (n = 75)	Facial acne (n = 40)	Truncal acne (n = 35)	p value
Age at acne onset (years), Median (IQR)	14.00 (12.00 - 15.00)	15.00 (13.00 - 17.00)	14.00 (12.00 - 15.00)	**0.008 ***
Duration of acne, n (%)				
< 6 months	13 (17.3%)	11 (27.5%)	2 (5.7%)	**0.020 ****
6 - 12 months	9 (12.0%)	6 (15.0%)	3 (8.6%)	
> 12 months	53 (70.7%)	23 (57.5%)	30 (85.7%)	
Family history, n (%)	54 (72.0%)	28 (70.0%)	26 (74.3%)	0.877 ***
High intake of sugary and fatty foods, n (%)	34 (45.3%)	16 (40.0%)	18 (51.4%)	0.448 ***
Late-night sleeping, n (%)	43 (57.3%)	21 (52.5%)	22 (62.9%)	1.000 ***
Use of skincare cosmetics, n (%)	55 (73.3%)	30 (75.0%)	25 (71.4%)	0.930 ***
No prior treatment, n (%)	14 (18.7%)	10 (25.0%)	4 (11.4%)	0.227 ***

** Mann-Whitney U test, ** Fisher's exact test, *** Chi-square test*

Patients in the truncal acne group had an earlier age of onset compared with the group with facial acne (14 versus 15 years). Furthermore, the group with truncal acne had a longer duration of the acne (>12 months) than the other group. These differences were statistically significant (with p-values of 0.008 and 0.02, respectively). No statistically significant differences were found in the remaining lifestyle factors between the two groups.

3.2. Lipid profiles and systemic inflammatory markers

Table 4. Comparison of hematological and biochemical parameters between the two groups

Test results	Total (n = 75)	Facial acne (n = 40)	Truncal acne (n = 35)	p value
WBC, Median (IQR) (10^9/L)	8.65 (7.33 - 10.29)	8.68 (7.67 -10.01)	8.03 (6.79 -10.36)	0.807*
NLR, $\bar{X} \pm$ SD	1.91 ± 0.82	1.78 ± 0.45	2.64 ± 0.81	**< 0.001****
PLR, $\bar{X} \pm$ SD	108.52 ± 30.5	105.2 ± 30.1	138.4 ± 45.6	**0.005****
MHR, Median (IQR)	0.47 (0.36 - 0.63)	0.44 (0.36 - 0.52)	0.48 (0.40 - 0.71)	0.075*
Total Cholesterol, $\bar{X} \pm$ SD (mmol/L)	4.19 ± 0.81	4.34 ± 0.80	4.02 ± 0.79	0.083**
Triglyceride, Median (IQR) (mmol/L)	0.98 (0.71 - 1.29)	1.00 (0.78 - 1.34)	0.82 (0.65 - 1.25)	0.186*
HDL-C, Median (IQR) (mmol/L)	1.31 (1.14 -1.44)	1.38 (1.27 - 1.48)	1.17 (1.06 - 1.40)	**0.011***
LDL-C, $\bar{X} \pm$ SD (mmol/L)	2.40 ± 0.69	2.35 ± 0.72	2.62 ± 0.85	0.200**

** Mann-Whitney U test, **Independent Student's t-test*

The NLR and PLR in the truncal acne group were significantly higher than in the facial acne group ($p < 0.05$). In particular, the NLR showed a very large difference ($p < 0.001$) while WBC and MHR showed no statistically significant differences between the two groups. Regarding lipid metabolism, HDL-C levels in the group with facial acne tended to be higher than in the other group (1.38 vs. 1.17, $p = 0.011$), while differences in triglycerides, total cholesterol and LDL-C were not statistically significant.

3.3. The relationship between factors and the location of acne lesions

Table 5. Univariate logistic regression analysis for factors associated with truncal acne and facial acne

Variables	OR (Odds Ratio)	95% CI	p value
Sex			
Female	1.00 (Reference)	-	-
Male	4.64	1.74 - 12.37	**0.002**
BMI	1.23	0.95 - 1.57	0.121
Age at acne onset (per 1 year increase)	0.76	0.61 – 0.93	**0.009**
Duration of acne			
6–12 months*	1.00 (Reference)	-	-
< 6 months	0.36	0.05 - 2.82	0.333
> 12 months	2.61	0.59 - 11.56	0.207
HDL-C (per 1 mmol/L increase)	0.13	0.02 - 0.91	**0.040**
NLR (per 1 unit increases)	5.45	1.80 - 18.75	**0.003**
PLR (per 1 unit increases)	1.19	0.89 - 1.48	0.141

Males had a 4.64 times higher prevalence of truncal acne than female patients (OR = 4.64, 95% CI: 1.74 - 12.37, p = 0.002). Furthermore, for every year of delayed onset of acne, the prevalence of truncal decreases by 24% (OR = 0.76, 95% CI: 0.61 - 0.93, p = 0.009). HDL-C demonstrates a protective effect; an increase of 1 mmol/L in HDL-C is associated with an 87% reduction in the odds of having truncal acne (OR = 0.13, 95% CI: 0.02 - 0.91, p = 0.040). Furthermore, each unit increase in NLR was associated with a 5.45 higher odds of truncal acne (95% CI: 1.80 - 18.75, p = 0.003). Other factors, such as BMI, duration of acne, and PLR, did not show statistically significant differences in the prevalence odds ratio in the univariate logistic regression analysis.

4. DISCUSSION

4.1. Demographic characteristics and lifestyle

The average age of the study sample was 18.2 ± 3.5 years, falling entirely within the age range for 'young acne' (10 to 24 years) as defined by the World Health Organisation [9]. These findings are consistent with reports indicating that acne typically flares up during puberty and adolescence due to increased androgen production [10]. The fact that the majority of patients were students (81.3%) accurately reflects the epidemiological reality, as this group faces significant academic pressure – an exposome that may exacerbate acne [8,11]. Pressure from exams often leads to stress, which activates the hypothalamic-pituitary-adrenal axis, increasing the release of corticotropin-

releasing hormone and stimulating sebum production, thereby causing acne [11]. The study found that 52.0% of participants were male and 48.0% were female, with no statistically significant difference (p = 0.817). This is consistent with the literature, which indicates that during adolescence, the prevalence of acne is comparable between the sexes or slightly higher among males [9]. The study findings indicate that 100% of patients with truncal acne also have facial acne. This is entirely consistent with international studies confirming that the face is the most common site (accounting for up to 99%) and that truncal acne is often an extension of facial acne [2,10]. Of all the body areas, the back is the most common site (20%), while the chest is the least common (5.33%), consistent with data from other studies, in which the upper back is typically the most affected area (approximately 52%) due to the high density of sebaceous glands and hair follicles [12].

The research findings indicate that gender is the factor most closely associated with whether acne is confined to the face or spreads down to the body. Males are 4.64 times more likely to have acne on the trunk than females (OR = 4.64; p = 0.002). This is fully consistent with epidemiological data, which reports that the prevalence of truncal acne in males (approximately 54%) is higher than in females (approximately 43%) [12,14]. This difference may be due to the influence of higher androgen levels in males, which strongly stimulate the sebaceous follicles in the back and chest, where they are densely concentrated [12,15]. Conversely, in women, acne tends to be localised in the 'U-shaped' area (chin, jawline, and front of the neck) and rarely affects the trunk (accounting for only approximately 2.1% according to some reports) [9]. In addition, the truncal acne group had an earlier age of onset (14 years) compared to the group with facial acne (15 years), and for every year the age of onset of acne increases, the prevalence of truncal acne decreases by 24% (OR = 0.76; p = 0.009). These findings align with the report by Jerry Tan et al. (2022) that early-onset acne is often associated with widespread lesions on the trunk rather than being limited to the face [10]. Early onset during puberty reflects the high sensitivity of the hair follicle-sebaceous unit to hormonal changes, facilitating the spread of the condition beyond the facial area from the very outset [12]. The final associated factor was BMI. The truncal acne group had a significantly higher BMI (22.6 ± 3.9) than the group with facial acne only (20.2 ± 2.8), with p = 0.004. These results support scientific evidence suggesting that a high BMI is associated with the spread of acne [9,13]. Previous studies have indicated that being overweight or obese is often accompanied by peripheral androgen excess, which increases sebum production and leads to widespread acne [13].

The study found no statistically significant difference in age or lifestyle factors between the two patient groups. These findings are consistent with the STRIDE quantitative survey, which showed no significant difference in mean age between the group with facial acne alone and the group with combined facial and truncal acne [10,12]. Regarding the impact of lifestyle, it can be explained that, for this study population, the spread of acne to the trunk is primarily due to intrinsic pathological characteristics and genetic factors, rather than differences in external factors.

4.2. Higher lipid profiles

This study found that HDL-C levels in the facial acne group were higher than in the truncal acne group (1.38 vs 1.17, p = 0.011),

and each 1 mmol/L increase in HDL-C was associated with 87% lower odds of truncal acne (OR = 0.13, p = 0.040). These results are fully consistent with meta-analyses showing that patients with acne typically have higher LDL-C levels and lower HDL-C levels compared to healthy individuals [15]. The association between blood lipid levels and acne can be explained by the role of androgens. Studies have shown that androgens increase LDL-C levels but decrease HDL-C levels [15]. Androgens stimulate sebaceous gland cell proliferation and sebum production, creating conditions for *C. acnes* colonization and inflammation [12,15]. Notably, truncal acne is more closely associated with signs of androgen excess and a longer duration of the condition in women [12]. The fact that the group with truncal acne has lower HDL-C suggests that this patient group is associated with systemic metabolic disorders [10].

4.3. The role of systemic inflammatory markers

The significant finding of the study was that the group with truncal acne exhibited more pronounced systemic inflammation compared to the group with facial acne, as evidenced by significantly higher NLR and PLR indices ($p < 0.05$), particularly the NLR, which showed a very large difference. Each one-unit increase in the NLR was associated with a 5.45 higher odds of truncal acne ($p = 0.003$). Acne is an inflammatory condition of the pilosebaceous unit, in which the presence of *C. acnes* plays a role in activating the innate immune response and causing inflammation [3,8]. The elevated NLR and PLR indices in the truncal acne group suggest that when acne spreads beyond the facial region, it is not merely a localized issue but reflects a more pronounced systemic inflammatory response [3,10]. Therefore, the NLR can be regarded as an indicator of the extent of acne spread in clinical settings [4]. The fact that there was no difference in the WBC count between the two groups suggests that markers such as the NLR are more sensitive in reflecting the chronic inflammatory state of acne than the total white blood cell count, which typically fluctuates in acute infectious conditions [4].

4.4. Limitations

Due to limited data collection time, this study was designed as an exploratory cross-sectional study using a consecutive sampling method. All patients who met the inclusion criteria during the study period were included in the sample, resulting in a sample size of n=75. To establish a causal relationship between systemic inflammatory markers (such as NLR) and the progression of acne, large-scale, multicenter longitudinal studies are required, utilizing standardized clinical classification systems to correlate these biomarkers with specific severity scores. Another limitation of our study is the lack of strict exclusion criteria regarding concomitant systemic inflammatory conditions. Consequently, we cannot completely rule out the possibility that the elevated inflammatory markers observed in our cohort might be partially confounded by unmeasured systemic conditions. Future studies must rigorously control for these confounding variables to isolate the true systemic inflammatory burden of acne.

5. CONCLUSION

The prevalence of truncal acne was 46.7%. Truncal acne represents a more severe and persistent form of acne, typically presenting as an extension of facial acne (accounting for 100% of cases in the study), with the back being the most commonly affected area. This patient group is characterized by typical demographic features: male, high BMI, early onset (mean age 14 years), and prolonged

duration of the condition. Biologically, truncal acne demonstrates a marked systemic inflammatory response through an elevated NLR and higher lipid profiles with elevated total cholesterol and reduced HDL-C levels.

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