

PREVALENCE AND ASSOCIATED FACTORS OF ACNE VULGARIS AMONG HIGH SCHOOL STUDENTS IN RURAL AND URBAN AREAS OF THAILAND: A CROSS-SECTIONAL STUDY

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Abstract

Background: Acne is the most common skin disorder affecting teenagers. Current knowledge of acne is continuously evolving with particular food especially skim milk, which has been recently recognized as a causative factor while environmental factors have not been clearly investigated.

Objectives: A cross-sectional study was conducted concerning the prevalence of acne among secondary school students living in rural and urban areas of Thailand. Associated risk factors were also evaluated as basic knowledge about acne.

Methods: We developed a questionnaire comprising baseline data, body mass index (BMI) and dietary, sleeping and exercise habits. Acne severity was assessed based on the Investigator's Global Assessment (IGA).

Results: A total of 526 students completed the questionnaires. Of these, 287 (54.6%) lived in rural areas. In all, 172 (32.7%) students had moderate to severe acne. No statistical significance was found between the proportion of moderate to severe acne and none to mild acne cases among students living in rural areas 94/287 (32.7%) and those living in urban area 78/239 (32.6%) ($p = 0.977$). Being male and high BMI were associated with moderate to severe acne using the adjusted odds ratio (OR) = 2.05 (95% CI, 1.38-3.05) and adjusted OR = 1.06 (95% CI, 1.01-1.11). Milk consumption did not affect acne severity.

Conclusion: Students residing in urban and rural areas had about equal prevalence of moderate to severe acne. Dietary habits especially milk consumption and living environment had no influence on acne severity.

Keywords : Acne, Milk consumption, Teenagers

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Introduction

Acne is a chronic inflammatory skin disorder found in all age groups with the highest prevalence among adolescents and young adults. Clinical manifestation usually presents with mild to moderate acne with open or closed comedones and a smaller proportion with more severe acne including inflammatory papules, pustules, cysts or nodules. Acne pathogenesis is multifactorial affecting the pilosebaceous units of the skin.

The current understanding of acne has been continuously evolving, especially the aspect of causative or aggravating factors. No harmful morbidity is associated with acne, but has quite significant physical and psychological consequences, such as permanent scarring, low self-esteem, anxiety disorders, depression, and emotional distress.⁽¹⁻³⁾ A related large epidemiological study of the prevalence of acne among Chinese adolescents reported that 3,163 students aged 10 to 18 years from 7 schools had an overall prevalence of 53.5%, with 51.3% among males and 58.6% among females.⁽⁴⁾

Many predisposing factors of acne have been studied. An interesting study by Goulden et al. suggested that family or genetic factors were important to susceptibility to adult persistent acne.⁽⁵⁾ Furthermore, Ghodsi et al. also stressed the correlation of genetic background and acne severity especially with mother's acne history.⁽⁶⁾ Other risk factors that are known to aggravate acne include insufficient sleep, smoking, the use of oral contraceptives, skin care products or cosmetics use, particular food consumption such as sweet and oily foods and occupation.⁽⁴⁻⁸⁾ Consumption of a high glycemic index diet such as cow's milk, chocolate and fatty foods may also increase the risk of acne.^(8,9)

The hypothesis that dairy products or milk consumption can cause acne has been explored during the past decade. LaRosa et al. recently reported that consumption of lowfat/skim milk, but not full fat milk among teenagers, was significantly associated with acne eruptions.⁽⁹⁾ Other studies have also supported this association.⁽¹⁰⁻¹²⁾ Hormonal constituents or other biological substances in skim milk may affect endogenous hormones and cause acne.⁽¹³⁾

We report a cross-sectional descriptive study regarding the prevalence and risk factors of acne vulgaris among secondary school students aged 14 to 19 years residing in two

different areas, urban and rural of Thailand. In addition, basic knowledge about acne and skin care practices during acne eruptions in these populations were explored.

Methods

Study Population

This study was approved by the Institutional Review Board of the Royal Thai Army Medical Department and the Ethics Committee. The Thai Clinical trial registration number was TCTR20180102001. Secondary school students, aged 14 to 19 years living in rural and urban areas of Thailand, participated in this study. A high school, located in Chachoengsao Province, 190 km from Bangkok, was chosen as the rural area school, whereas a school in Samut Prakan Province, approximately 30 km from Bangkok, was selected as the urban area school. The appropriate sample size calculated totaled 400 students. After obtaining permission from the directors of both schools, the investigators approached students in their assigned classrooms to inform them about the study objectives. Students who declined to answer the questionnaire or were unable to answer the questionnaire by themselves were excluded from the study.

Data Collection

We developed the questionnaire comprising two sets of questions. The first part comprised general baseline data, students' self-evaluation of acne severity (none to mild acne or moderate to severe acne), intake of particular foods (high glycemic index diet, i.e., chocolate, amount and type of cow's milk consumption) and activities or personal habits including smoking, exercise, sleeping and cosmetics use. A second set of ten true-false questions was developed covering basic knowledge of acne and proper skin care practices during acne eruptions. The questionnaire was pilot-tested by volunteers to develop a final version before launching to the study population. The investigator was trained by a pediatric dermatologist to grade the severity of acne based on the Investigator's Global Assessment (IGA) scale for acne severity. The investigator had to evaluate each individual student one by one and classify as either none to mild acne (IGA scales 0, 1, 2) or moderate to severe acne (IGA scales 3, 4) before providing the questionnaire. The students were informed they could decide by themselves

if they did not want to be included, and could leave the questionnaire without completing it. This survey was voluntary, and no information could be traced back to the subjects.

Statistical analysis

Prevalence was analyzed using descriptive statistics. Associated factors were analyzed between groups by univariate and multiple logistic regression, presented in odds ratio (OR) and 95% CI. Knowledge about acne was analyzed

using descriptive statistics presenting the average scores. All data was analyzed using the STATA Program, Version 12.

Results

The assigned questionnaires were 100% completed by 526 students, including 287 (54.5%) students from the rural area in Chachoengsao Province and 239 (45.4%) students from the urban area in Samut Prakan Province. Baseline demographic data of the two groups were compared as shown in **Table 1**.

Table 1. Baseline demographic characteristics of subjects according to acne severity groups

Characteristics	Acne Severity	
	None – Mild Acne (n = 354) n (%)	Moderate – Severe Acne (n = 172) n (%)
Location		
Rural	193 (67.25)	94 (32.75)
Urban	161 (67.36)	78 (32.64)
Sex		
Male	127 (58.26)	91 (41.74)
Female	227 (73.70)	81 (26.30)
Class		
Ninth grade	97 (72.39)	37 (27.61)
Tenth grade	122 (65.59)	64 (34.41)
Eleventh grade	46 (69.70)	20 (30.30)
Twelfth grade	89 (63.57)	51 (36.43)
Age, years old		
14	72 (73.47)	26 (26.53)
15	93 (64.58)	51 (35.42)
16	95 (68.35)	44 (31.65)
17	63 (63.00)	37 (37.00)
18	30 (69.77)	13 (30.23)
Average (SD)	15.68 (1.23)	15.75 (1.20)
BMI, kg/m²		
Underweight (< 18.5)	153 (79.69)	39 (20.31)
Normal (18.5-22.9)	144 (61.54)	90 (38.46)
Overweight (23-25)	18 (52.94)	16 (47.06)
Obese (> 25)	36 (60.00)	24 (40.00)
Average BMI (SD)	19.92 (3.92)	21.18 (4.47)

The mean age of all students was 15.7 years (14-18). Overall, 172 (32.7%) students were evaluated to have moderate to severe acne (IGA scales 3, 4). The proportion of moderate to severe acne (IGA scales 3, 4) and none to mild acne (IGA scales 0, 1, 2) comparing rural living students, 94/287 (32.7%) and urban living students, 78/239 (32.6%) did not significantly differ ($p=0.977$). Male students (91/218, 41.7%) were more significantly affected by moderate to severe acne than female students (81/308, 26.3%; $p < 0.001$).

Regarding body mass index (BMI) and acne severity, the overweight (16/34, 47.0%) and obese groups (24/60, 40.0%) were noted to have a higher proportion of more severe acne than that of the underweight (39/192, 20.3%) and normal BMI student groups (90/234, 38.4%; $p < 0.001$). Furthermore, the group of more severe acne had higher average BMI, 21.18 compared with 19.92 kg/m².

The univariate analysis of acne severity is shown in **Table 2**.

Table 2. Univariable logistic regression analysis of associated factors correlated with acne severity

	None – Mild (n = 354) n (%)	Moderate – Severe (n = 172) n (%)	Crude OR (95% CI)	p-value
Living area				
urban	161 (67.36)	78 (32.64)	0.99 (0.69, 1.43)	0.977
Sex				
male	127 (58.26)	91 (41.74)	2.01 (1.39, 2.91)	0.000
Age, years old				
mean (SD)	15.68 (1.23)	15.75 (1.20)	1.06 (0.91, 1.23)	0.476
BMI, kg/m²				
mean (SD)	19.92 (3.92)	21.18 (4.47)	1.07 (1.03, 1.12)	0.002
Self – evaluation to have				
none / mild acne	194 (84.72)	35 (15.28)	1	
moderate / severe acne	160 (53.87)	137 (46.13)	4.75 (3.10, 7.27)	0.000
Family history of acne				
father with acne	63 (67.74)	30 (32.26)	0.98 (0.60, 1.58)	0.920
mother with acne	77 (63.11)	45 (36.89)	1.27 (0.83, 1.95)	0.261
brother or sister with acne	138 (67.98)	65 (32.02)	0.95 (0.65, 1.38)	0.792
Smoking	51 (68)	24 (32)	0.96 (0.57, 1.63)	0.889
Dietary habits				
Sweets (snack)/soft drinks (> 2 days/week)	304 (67.26)	148 (32.74)	1.01 (0.60, 1.71)	0.958
Chocolate (> 2 days/week)	214 (69.71)	93 (30.29)	0.77 (0.53, 1.11)	0.164
Milk (> 250 ml/day)	184 (67.65)	88 (32.35)	0.97 (0.67, 1.39)	0.861
Type of milk				
low-fat milk or skim milk	46 (58.23)	33 (41.77)	0.63 (0.39, 1.03)	0.064
full-fat milk	308 (68.9)	139 (31.1)	1	
Exercise				
(> 2 days/week)	186 (66.43)	94 (33.57)	1.09 (0.76, 1.57)	0.649
Hours of sleep				
(< 6 hours/night)	125 (64.77)	68 (35.23)	1.20 (0.82, 1.74)	0.346

The parameters that displayed a significant associated risks with moderate to severe acne included being male (crude OR =2.01, 95% CI, 1.39-2.91; $p = 0.000$) and high BMI (crude OR= 1.07, 95% CI, 1.03-1.12; $p=0.002$).

In addition, we found that the moderate to severe acne group had a tendency to self-evaluate their acne severity more correctly than the less severe group with crude OR= 4.75 (95%CI, 3.10-7.27; $p = 0.000$). Regarding dietary habits, we found no significant association of moderate to severe acne with the particular foods mentioned in the questionnaire including high sugar diets,

any type of cow's milk or chocolate consumption. Daily activities such as sleeping hours, exercise habits and smoking were also found to exhibit no significant association with acne severity. Using multiple logistic regression analysis, associated risk factors were identified and summarized in **Table 3**. Being male, high BMI and self-evaluation of having more severe acne tended to indicate risk association with moderate to severe acne after adjusting for relevant factors with OR = 2.05 (95% CI = 1.38-3.05), OR = 1.06 (95% CI =1.01-1.11) and OR = 4.65 (95% CI = 2.99-7.20) ($p < 0.05$), respectively.

Table 3. Multiple logistic regression analysis of risk factors associated with acne severity

	None-Mild n (%)	Moderate-Severe n (%)	Adjusted OR* (95% CI)	p-value
Sex: male	127 (58.26)	91 (41.74)	2.05 (1.38, 3.05)	< 0.001
BMI (kg/m ²): mean (SD)	19.92 (3.92)	21.18 (4.47)	1.06 (1.01, 1.11)	0.021
Self-evaluation to have moderate / severe acne	160 (53.87)	137 (46.13)	4.65 (2.99, 7.20)	< 0.001
Chocolate (> 2 days/week)	214 (69.71)	93 (30.29)	0.85 (0.57, 1.27)	0.432
Low-fat and skim milk	46 (58.23)	33 (41.77)	1.66 (0.97, 2.85)	0.064

* Adjusted odd ratio for male, BMI, self-evaluation, chocolate consumption, and milk consumption

A set of true or false questions regarding acne basic knowledge and proper skin care during acne eruptions was answered by all students. Overall average scores totaled 46%. No significant difference was found by comparing the average scores between the none to mild acne group and the moderate to severe acne group with scores 45.5% and 46.7%, respectively (mean difference = 0.12, 95% CI = 0.11-0.37, $p = 0.299$). The most correct answers were found for the question, “*pressing or squeezing acne can cause acne scars and pits, true or false*” (502/526, 95.4%). The most incorrect answers were when students answered “true” to the question, “*cleansing your face with facial*

cleansing scrub can prevent acne, true or false” (230/526, 43.7%)

Discussion

In this study, 526 Thai adolescents aged between 14 and 19 years from two different areas of Thailand had an overall prevalence of moderate to severe acne (IGA scales 3, 4) of 32.7%, with similar proportions among students residing in rural and urban areas. This was the first study comparing acne epidemiological data among teenagers in rural and urban areas in Thailand. However, this study failed to provide any evidence supporting the hypothesis

that differences in environment or dietary culture in different residential areas could affect acne prevalence. However, teenagers living in urban areas were more likely to be in contact with more environmental pollution or consume higher fat foods, higher glycemic diets and seemed to drink more milk than those living in rural areas. However, rapid changes and growth in many rural areas of Thailand could have changed environment, life styles and eating habits of people residing in rural areas.

A large epidemiological study on the prevalence of acne among Chinese teenagers showed that among 3,163 students aged 10 to 18 years from 7 schools had an overall prevalence of 53.5%, with 51.3% among males and 58.6% among females.⁽⁴⁾ Dreno et al. reviewed several acne epidemiological studies and reported that the prevalence of acne vulgaris was 27.9 to 68.5% among male teenagers and 20.8 to 59.6% among female teenagers.⁽⁷⁾ Similar to this study, male students (41.7%) were observed to have more severe acne than female students (26.3%). Concerning secondary outcomes, using multiple logistic regression analysis, risk factors including being male, high BMI and self-evaluation of having severe acne were significantly associated with moderate to severe acne. Contrarily, family history of severe acne, smoking, high sugar diet, chocolate consumption, any kind of milk consumption, physical exercise and hours of sleep did not affect the severity of acne in this study. In 2009, a similar cross-sectional, community-based study conducted in Tehran, Iran, reported numbers of family members with acne especially mothers with acne, seborrhea, mental stress, consumption of sweet and oily foods constituted the risk factors for moderate to severe acne.⁽⁶⁾ They also discussed the variations in community-based populations, with different genetic backgrounds, environmental factors and consumption cultures.

Recently, many studies have proposed a positive association between intake of skim milk and acne severity.^(9-11,13) A large meta-analysis of 78,529 participants aged less than 30 years showed considerable heterogeneity and bias across studies. Thus, interpretations or conclusions regarding the association between dairy product consumption and acne severity should be made with caution.⁽¹⁴⁾ From our community-based data, the amount of milk consumed was only 250 ml daily on average. Thus, with this cultural

dietary variation, the study of the effect of milk on acne severity could not be easily conducted with strong validity in different parts of the world. We suggest that a larger community-based surveillance with appropriate study design to determine associated factors of acne vulgaris among teenagers should be further investigated.

Regarding the basic knowledge testing questions about acne, we found that both students residing in urban and rural areas could achieve less than 50% scores. These results implied the need to implement more knowledge of adolescent medicine including correct skin care practices during acne eruptions among teenagers in school health programs.

Conclusion

The prevalence of moderate to severe acne based on the IGA scale among students aged 14 to 19 years was 32.7%. Students residing in urban and rural areas had about equal risk of moderate to severe acne. In this study, dietary habits including milk consumption and daily activities had no influence on the severity of acne.

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