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Original Research

Adult female acne: A cross-sectional study of diet, family history, body mass index, and premenstrual flare as risk factors and contributors to severity

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ABSTRACT

Background: The risk factors for adult female acne (AFA) and their influence on severity are unclear. The aim of this study was to document the role of diet, body mass index (BMI), premenstrual flare, and family history of acne as risk factors and cause of severity of AFA.

Methods: This was a prospective, cross-sectional, case-control study of 112 women age ≥25 years. The women were clinically evaluated. Sociodemographic data (age, family history of acne, premenstrual flare, weight, and height) and dietary habits were documented. Age, weight, height, and dietary habits of controls were also documented. Data were analyzed using SPSS, version 22.

Results: The mean age of the 56 patients with AFA was 33.4 ± 8.2 years (controls: 24.5 ± 4.4 years). Premenstrual flare of acne was noted in 58.9% of patients, a family history of acne was present in 51.8% of patients, and the mean BMI was 25.2 ± 4.9 (32.1%). A risk factor for AFA was a family history of acne ($p \leq 0.001$). Dietary habits (chicken, $p = 0.457$; beef, $p = 0.845$; cakes and sweets, $p = 0.956$; starchy food, $p = 0.361$; and type of milk, $p = 0.919$) and BMI ($p = 0.486$) were not risk factors for AFA. Premenstrual flare ($p = 0.178$), BMI ($p = 0.206$), family history of acne ($p = 0.592$), and diet did not contribute to the severity of AFA.

Conclusion: Diet and BMI are not risk factors for AFA, but a family history of acne is. Severity of AFA is independent of premenstrual flares, diet, BMI, and a family history of acne.

Background

Adult women who present to dermatology clinics with acne vulgaris is increasingly becoming a cause for concern, with almost 40% of women affected (Di Landro et al., 2016; Dréno, 2015). The risk factors responsible for adult female acne (AFA) are unclear. Suggested factors include diet, body mass index (BMI), use of cosmetics, premenstrual flare, hyperandrogenism, and a family history of acne (Dréno, 2015; Ekiz et al., 2015; Zeichner et al., 2017).

Studies of acne in young adults and adolescents reveal an influence of a high BMI on acne (Anaba et al., 2019; Okoro et al., 2016). Reports from these studies show a low BMI to be protective against acne vulgaris (Anaba et al., 2019; Okoro et al., 2016). In adult women, on the other hand, BMI appears to have a variable influence on acne (Di Landro et al., 2016; Ekiz et al., 2015; Lu and Hsu, 2015). Studies from Turkey and Italy show that the BMI of adult women who have acne is unassociated with the occurrence and severity of acne (Di Landro et al., 2016; Ekiz et al., 2015). These studies however, were not specifically about BMI and adult acne, which may be responsible for the study conclusion. Lu and Hsu (2015) in Taiwan had a contrary report and showed that BMI was positively related to the severity of acne.

In adult women, diet is a risk factor for acne causation (Di Landro et al., 2016; Zeichner, 2013). Low consumption of vegetables and fruits is associated with acne formation, but fish consumption is protective against acne occurrence (Di Landro et al., 2012, 2016). Dark chocolate consumption was found to result in an increased number of comedones and inflammatory lesions in a study on acne-prone individuals in Leeds (Vongraviopap and Asawanonda, 2016). A high glycemic load diet and dairy products (e.g., skimmed milk, chocolate) is reported to cause acne in adolescents (Di Landro et al., 2012; Okoro et al., 2016; Shen et al., 2012; Spencer et al., 2009).

These diets lead to proliferation of keratinocytes, increased lipogenesis, and increased sebum production, leading to worsening of acne (Romańska-Gocka et al., 2016). No association has been found between bread and cake consumption, and acne (Romańska-Gocka

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et al., 2016). Greasy and spicy foods have also not been found to be associated with acne (Shen et al., 2012).

A family history of acne, especially in first-degree relations, is associated with acne occurrence and its severity in adult women (Di Landro et al., 2016; Ekiz et al., 2015; Lu and Hsu, 2015; Uwajeni et al., 2018; Zeichner et al., 2017). Studies conducted in Turkey, India, Europe, and Tanzania show that 30% to 69% of adult women who have acne also have a family history of acne (Di Landro et al., 2016; Khunger and Kumar, 2012; Uwajeni et al., 2018). A family history of acne leads to more acne, earlier onset, more scars, and extension of acne lesions beyond the face to the trunk (Di Landro et al., 2016; Dréno et al., 2016; Lu and Hsu, 2015). In a similar study from Tanzania (same continent as this study), a family history of acne was found to be frequent in adult women and to contribute to the severity of acne (Uwajeni et al., 2018).

Premenstrual flares (i.e., increase in number of papules and pustules 1 week before menses) occur in 24% to78% of women (Ramos-e-Silva et al., 2015; Shen et al., 2012; Tanghetti et al., 2014; Uwajeni et al., 2018). However, Di Landro et al. (2012), in their study of young adults, did not find premenstrual flares to be associated with severity of acne. Most studies of adult women document the occurrence of premenstrual flares but do not correlate the flares with the severity of acne (Ramos-e-Silva et al., 2015; Shen et al., 2012; Tanghetti et al., 2014; Uwajeni et al., 2018).

AFA is not widely studied despite its occurrence. The risk factors for its occurrence remain unclear. There is a paucity of literature on the effect of a family history of acne, BMI, diet, and premenstrual flares on adult women who have acne. The aim of this study is to document the influence of diet, BMI, premenstrual flares, and family history on AFA and to correlate BMI, family history, premenstrual flares, and diet with the severity of AFA.

Methods

This prospective, cross-sectional, case-control, observational study was conducted at the outpatient skin clinic of the Lagos State University Teaching Hospital following ethical approval by the hospital's ethics committee. Fifty-six treatment-naïve women, age ≥25 years, who had acne and 56 matched controls, comparable in age and sex, were recruited for this study. Any woman who had acne but was <25 years of age was excluded from the study. The study was conducted over a 1-year period (February 2018 to January 2019).

Patient sociodemographic parameters (age, family history of acne in first-degree relatives), clinical history (severity of acne, history of premenstrual flares), personal habits (smoking, diet, and alcohol consumption), and anthropometric measurements (height, weight) were documented with a pro forma designed for the study. Patients were clinically examined for acne vulgaris, and lesion types and numbers were recorded by a board-certified dermatologist. Severity of acne was graded using the comprehensive acne grading scale and classified as mild, moderate, and severe (Tan et al., 2007). Each patient's BMI (kg/m^2) was calculated based on her weight and height. The World Health Organization reference range for BMI was used (underweight: <18.5; normal: 18.5–24.9; overweight: >25; obese: >30 kg/m^2; World Health Organization, 1995).

Frequency of intake per week of certain foods was recorded. Intake of <3 times per week was regarded as a low intake. The foods investigated included whole milk, skim or partially skimmed milk, fish, beef, starchy foods (pasta, bread, and rice), chocolate, cakes and sweets, and vegetables and fruits. Severity of acne was correlated with clinical and dietary factors.

The IBM Statistical Package for Social Sciences, version 22, was used for data analysis. The χ^2 test was used to compare categorical variables, and numerical variables were compared using the Student t test. For all statistical tests, the confidence interval was set at 95% and $p < 0.05$ was considered significant.

Results

The mean age of the 56 patients with AFA was 33.4 ± 8.2 years, and the mean age of the controls was 24.5 ± 4.4 years. Acne was recorded in 37.5% of those age <30 years, in 42.9% of those age 30 to 39 years, and in 19.6% of those age ≥40 years. Among the AFA group, a family history of acne was present in 51.8%. Mean BMI was 25.2 ± 4.9; 32.1% were overweight and 17.9% were obese. Premenstrual flares of acne were noted in 58.9%. A family history of acne was the only significant difference between the two groups (Table 1).

Milk was consumed by 60.7%, chocolate by 71.4%, vegetables by 62.5%, fish by 55.4%, and fruits by 51.8% >3 days per week. There was no significant difference in the dietary habits of patients with AFA and controls (chicken, $p = 0.457$; beef, $p = 0.845$; cakes and sweets, $p = 0.956$; starchy food, $p = 0.361$; type of milk, $p = 0.919$; Table 2).

Alcohol consumption and smoking was recorded in 35.7% and 0%, respectively, of patients. A family history of acne was recorded in 63.7%, 56%, and 40% of those who had mild, moderate, and severe acne, respectively. An overweight BMI was documented in 45.5%, 36%, and 20% of patients with mild, moderate, and severe acne, respectively. None of the assessed clinical parameters (BMI, premenstrual flare, family history of acne) was positively associated with the severity of acne (Table 3).

Milk was consumed <3 days per week by 70% of patients with severe acne compared with 81.8% of those with mild acne. Vegetables were consumed >3 days per week by 75% of patients with severe acne compared with 54.5% of those with mild acne. Fruits were consumed >3 days per week by 60% of patients with severe acne compared with 45.5% of those with mild acne. No dietary factor was significantly associated with the severity of acne (beef, $p = 0.863$; starchy foods, $p = 0.756$; chicken, $p = 0.095$). An analysis of chocolate, cakes, and sweets was not valid (Table 4).

Discussion

AFA is increasingly recognized to be different from adolescent acne (Holzmann and Shakery, 2014; Preneau and Dreno, 2012). The risk factors associated with AFA are not exactly clear. In this study, we demonstrated a family history of acne to be a risk factor for acne. Premenstrual flares, BMI, and diet were not found to be risk factors or causes of severe acne. Furthermore, a family history of acne was not found to contribute to acne severity.

The mean age of patients in this study is in keeping with what has been documented in other studies of AFA (Di Landro et al., 2016; Ekiz et al., 2015). AFA, although said to occur in women age ≥25 years, tends to occur mostly in women in their late 20 s to mid-30 s (Di Landro et al., 2016; Uwajeni et al., 2018).

Half of the patients in this study had a family history of acne, which is higher than reported by Ekiz et al. (2015) in Turkey but similar to that reported by Di Landro et al., (2016) and Uwajeni et al. (2018) in Tanzania. The present study, similar to the studies by Gupta et al. (2016), Uwajeni et al. (2018), and Di Landro et al. (2016), shows that family history is a risk factor for AFA. Acne, although not a heritable disease, is polygenic and tends to occur in families (Zeichner et al., 2017). A family history of acne has been recorded, not only as a risk factor for AFA but also as a cause of

Table 1
Sociodemographic characteristics of respondents.

Variable	Study n = 56 (%)	Control n = 56 (%)	Test	*p*-value
Age group, year				
<30	21 (37.5)	18 (32.1)		
30–39	24 (42.9)	24 (42.9)		
≥40	11 (19.6)	14 (25.0)		
Mean ± standard deviation	33.4 ± 8.2	34.5 ± 8.7	0.741*	0.460
Family history of acne				
Yes	29 (51.8)	13 (23.2)	14.515†	<0.001
No	15 (26.8)	36 (64.3)		
I don't know‡	12 (21.4)	7 (12.5)		
Body mass index				
Underweight	4 (7.1)	3 (5.4)		
Normal	24 (42.9)	30 (53.6)		
Overweight	18 (32.1)	14 (25.0)		
Obese	10 (17.9)	9 (16.1)		
Mean ± standard deviation	25.2 ± 4.9	24.5 ± 4.4	0.699‡	0.486

* Student *t* test
† χ^2 test
‡ Not part of the analysis

Table 2
Association of diet and acne.

Variable	Study n = 56 (%)	Control n = 56 (%)	×2	*p*-value
Milk				
<3 days/week	34 (60.7)	31 (55.4)	0.378	0.555
>3 days/week	20 (35.7)	23 (41.1)		
No response*	2 (3.6)	2 (3.6)		
Chocolate				
<3 days/week	40 (71.4)	33 (58.9)	0.019	0.890
>3 days/week	9 (16.1)	8 (14.)		
No response*	7 (12.5)	15 (26.8)		
Vegetables				
<3 days/week	18 (32.1)	24 (42.9)	0.910	0.340
>3 days/week	35 (62.5)	32 (57.1)		
No response*	3 (5.4)	0 (0.0)		
Fish				
<3 days/week	22 (39.3)	27 (48.2)	0.495	0.482
>3 days/week	31 (55.4)	29 (51.8)		
No response*	3 (5.4)	0 (0.0)		
Fruits				
<3 days/week	26 (46.4)	33 (58.9)	1.791	0.181
>3 days/week	29 (51.8)	22 (39.3)		
No response*	1 (1.8)	1 (1.8)		

* Not part of the analysis

Table 3
Associated factors with severity of acne.

Variable	Mild n = 11 (%)	Moderate n = 25 (%)	Severe n = 20 (%)	×2	*p*-value
Family history					
Yes	7 (63.7)	14 (56.0)	8 (40.0)	1.048	0.592
No	2 (18.2)	7 (28.0)	6 (30.0)		
I don't know*	2 (18.2)	4 (16.0)	6 (30.0)		
Body mass index					
Underweight	2 (18.2)	0 (0.0)	2 (10.0)	8.468	0.206
Normal	4 (36.4)	10 (40.0)	10 (50.0)		
Overweight	5 (45.5)	9 (36.0)	4 (20.0)		
Obese	0 (0.0)	6 (24.0)	4 (20.0)		
Premenstrual flare					
Yes	6 (54.5)	12 (48.0)	15 (75.0)	3.455	0.178
No	5 (45.5)	13 (52.0)	5 (25.0)		

* Not part of the analysis

Table 4
Association of diet with severity of acne.

Variable	Mild n = 11 (%)	Moderate n = 25 (%)	Severe n = 20 (%)	×2	*p*-value
Milk					
<3 days/week	9 (81.8)	11 (44.0)	14 (70.0)	5.633	0.060
>3 days/week	2 (18.2)	13 (52.0)	5 (25.0)		
No response*	0 (0.0)	1 (4.0)	1 (5.0)		
Milk type					
Skimmed	2 (18.2)	6 (24.0)	5 (25.0)	2.393	0.664
Partially skimmed	0 (0.0)	2 (8.0)	2 (10.0)		
Whole	9 (81.8)	16 (64.0)	9 (45.0)		
No response*	0 (0.0)	1 (4.0)	4 (20.0)		
Vegetables					
<3 days/week	5 (45.5)	9 (36.0)	4 (20.0)	2.334	0.311
>3 days/week	6 (54.5)	14 (56.0)	15 (75.0)		
No response*	0 (0.0)	2 (8.0)	1 (5.0)		
Fish					
<3 days/week	6 (54.5)	10 (40.0)	6 (30.0)	2.002	0.367
>3 days/week	5 (45.5)	12 (48.0)	14 (70.0)		
No response*	0 (0.0)	3 (12.0)	0 (0.0)		
Fruits					
<3 days/week	5 (45.5)	13 (52.0)	8 (40.0)	0.678	0.712
>3 days/week	5 (45.5)	12 (48.0)	12 (60.0)		
No response*	1 (9.1)	0 (0.0)	0 (0.0)		

* Not part of the analysis

early onset and extra facial lesions (Di Landro et al., 2016; Dréno et al., 2016; Gupta et al., 2016; Uwajeni et al., 2018).

When comparing the patients with AFA with controls, family history of acne was the only significant difference between the two groups. Although we did find a family history of acne to be a risk factor for AFA, it was not found to contribute to severity. This is contrary to the study by Lu and Hsu (2015) and Dréno et al. (2016), who found acne to be more severe in patients with a family history of acne. A family history of acne, especially in first-degree relations, is associated with severity and difficulty of acne treatment (Anaba et al., 2019; Di Landro et al., 2016; Gupta et al., 2016). In their study of acne in a similar population as this study, Uwajeni et al. (2018) did not find a family history of acne to correlate with severity, which is in consonance with our study. More studies are needed on adult women to ascertain the true relationship between severity of acne and a family history.

The mean BMI in the study population was within normal range and in consonance with the BMI in studies by Ekiz et al. (2015) in Turkey, Di Landro et al. (2016) in Italy, and Richter et al. (2017) in Germany. However, there was no difference in BMI between controls and patients with AFA. Thus, BMI is not a risk factor for AFA. In adolescents, BMI is a well-documented risk factor for acne (Anaba et al., 2019). Studies on the relationship between BMI and AFA are few, but the few studies done are in consonance with our study, showing that BMI is not a risk factor for AFA (Di Landro et al., 2016; Ekiz et al., 2015). Also, in this study, there was no relationship between acne severity and BMI. Ekiz et al. (2015) in Turkey, in their study of postadolescent acne similar to our study, were unable to demonstrate any association between BMI and acne severity. On the other hand, Lu and Hsu (2015) in Taiwan found BMI to be a predictor of severe acne. These studies were conducted in different countries with different weather. The contribution of the weather and season to the differing study results is not known.

Premenstrual flare was reported in more than half of patients, similar to what has been previously documented (Uwajeni et al., 2018; Tanghetti et al., 2014). Premenstrual flare has been linked to androgen hypersensitivity and increased severity of acne (Di Landro et al., 2012; Geller et al., 2014). In this study, premenstrual flare did not contribute to acne severity. A study from Italy specifically correlating premenstrual flare with acne severity, similar to our study, reported a negative association (Di Landro et al., 2012). Contrary to our study, Geller et al. (2014) demonstrated a worsening of acne with premenstrual flare. These studies show that the relationship between severity of acne and premenstrual flare is still unclear.

Diet has remained an unclear risk factor for AFA (Di Landro et al., 2016). In adolescents with acne, a high glycemic diet and the consumption of skimmed milk are risk factors for acne, but the consumption of fish is protective (Di Landro et al., 2012; Okoro et al., 2016). In this study, none of the assessed diets were risk factors for acne. However, Di Landro et al. (2016), in their study of diet and AFA, found that a low weekly intake of fruits or vegetables and a low consumption of fresh fish were risk factors for acne. The researchers also could not demonstrate the other assessed diets as risk factors for acne. In young adults with acne, cake, sweets, vegetables, and fruits were not found to be risk factors for acne (Di Landro et al., 2012).

Although not attaining significance, intake of whole milk appears to be a risk factor for severe acne. Di Landro et al. (2012) had a contrary report, although the study was of young adults and not of patients with AFA. Their study showed intake of milk to be protective against severe acne in young adults. The type of milk, vegetables and fruits, and intake of protein were not found to result in severe acne in this study. These foods have not been studied as risks for acne severity. Vongraviopap and Asawanonda (2016) found that dark chocolate increased the severity of acne in men, contrary to what we found in this study. The difference in study reports appears to be gender influenced, because Di Landro et al. (2016), in a study of AFA, could not demonstrate increased severity with chocolate intake.

There were some limitations to this study. The number of patients studied was limited by a combination of acne being typically a teenage problem and the study being conducted at a tertiary center with attendance by those with more severe acne. Another limitation was a recall bias with reference to diet, because this was a retrospective question. Further studies on the effect of specific diets on AFA need to be conducted to ascertain the true effect of diet on causality and severity of AFA.

Conclusion

AFA is prevalent. Diet and BMI are not risk factors for AFA although a family history of acne is. Severity of AFA is independent of premenstrual flares, diet, BMI, and a family history of acne.

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Study approval

The author(s) confirm that any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies.

Conflicts of interest

None.

References

Anaba EL, Ogunbiyi OA, George OA. Adolescent facial acne vulgaris and body mass index: any relationship? West Afr J Med 2019;36(2):129–32.

Di Landro A, Cazzaniga S, Parazzini F, Ingordo V, Cusano F, Atzori L, Cutrì FT, Musumeci ML, Zinetti C, Pezzarossa E, Bettoli V, Caproni M, Lo Scocco G, Bonci A, Bencini P, Naldi L. Family history, body mass index, selected dietary factors, menstrual history, and risk of moderate to severe acne in adolescents and young adults. J Am Acad Dermatol 2012;67(6):1129–35. https://doi.org/10.1016/j.jaad.2012.02.018.

Di Landro A, Cazzaniga S, Cusano F, Bonci A, Carla C, Musumeci ML, Patrizi A, Bettoli V, Pezzarossa E, Caproni M, Fortina AB, Campione E, Ingordo V, Naldi L. Adult female acne and associated risk factors: results of a multicenter case-control study in Italy. J Am Acad Dermatol 2016;75(6):1134–1141.e1. https://doi.org/10.1016/j.jaad.2016.06.060.

Dréno B. Treatment of adult female acne: a new challenge. J Eur Acad Dermatol Venereol 2015;29:14–9. https://doi.org/10.1111/jdv.13188.

Dréno B, Jean-Decoster C, Georgescu V. Profile of patients with mild-moderate acne in Europe: a survey. Eur J Dermatol 2016;26:177–84.

Ekiz O, Balta I, Unlu E, Bulbul Sen B, Rifaioğlu EN, Dogramaci AC. Assessment of thyroid function and lipid profile in patients with postadolescent acne in a Mediterranean population from Turkey. Int J Dermatol 2015;54(12):1376–81. https://doi.org/10.1111/ijd.12547.

Geller L, Rosen J, Frankel A, Goldenberg G. Perimenstrual flare of adult acne. J Clin Aesthet Dermatol 2014;7:30–4.

Gupta A, Sharma YK, Dash KN, Chaudhari ND, Jethani S. Quality of life in acne vulgaris: relationship to clinical severity and demographic data. Indian J Dermatol Venereol Leprol 2016;82(3):292. https://doi.org/10.4103/0378-6323.173593.

Holzmann R, Shakery K. Postadolescent acne in females. Skin Pharmacol Physiol 2014;27(s1):3–8. https://doi.org/10.1159/000354887.

Khunger N, Kumar C. A clinico-epidemiological study of adult acne: is it different from adolescent acne? Indian J Dermatol Venereol Leprol 2012;78(3):335. https://doi.org/10.4103/0378-6323.95450.

Lu PH, Hsu CH. Body mass index is negatively associated with acne lesion counts in Taiwanese women with post-adolescent acne. J Eur Acad Dermatol Venereol 2015;29(10):2046–50. https://doi.org/10.1111/jdv.12754.

Okoro EO, Ogunbiyi AO, George AO, Subulade MO. Association of diet with acne vulgaris among adolescents in Ibadan, southwest Nigeria. Int J Dermatol 2016;55(9):982–8. https://doi.org/10.1111/ijd.13166.

Preneau S, Dreno B. Female acne – a different subtype of teenager acne? J Eur Acad Dermatol Venerol 2012;26(3):277–82. https://doi.org/10.1111/j.1468-3083.2011.04214.x.

Richter C, Trojahn C, Hillmann K, Dobos G, Kanti V, Vogt A, Blume-Peytavi U, Kottner J. Sensitivity to change of the Dermatology Life Quality Index in adult females with facial acne vulgaris: a validation study. J Eur Acad Dermatol Venereol 2017;31(1):169–74. https://doi.org/10.1111/jdv.13757.

Romańska-Gocka K, Woźniak M, Kaczmarek-Skamira E, Zegarska B. The possible role of diet in the pathogenesis of adult female acne. Adv Dermatol Allergol 2016;6:416–20. https://doi.org/10.5114/ada.2016.63880.

Ramos-e-Silva M, Ramos-e-Silva S, Carneiro S. Acne in women. Brit J Dermatol 2015;172(s1):20–6.

Shen Y, Wang T, Zhou C, Wang X, Ding X, Tian S et al. Prevalence of acne vulgaris in Chinese adolescents and adults: A community-based study of 17,345 subjects in six cities. Acta Derm Venereol 2012;92:40–4.

Spencer EH, Ferdowsian HR, Barnard ND. Diet and acne: a review of the evidence. Int J Dermatol 2009;48(4):339–47. https://doi.org/10.1111/j.1365-4632.2009.04002.x.

Tan JKL, Tang J, Fung K, Gupta AK, Thomas DR, Sapra S, Lynde C, Poulin Y, Gulliver W, Sebaldt RJ. Development and Validation of a Comprehensive Acne Severity Scale. J Cutan Med Surg 2007;11(6):211–6. https://doi.org/10.2310/7750.2007.00037.

Tanghetti EA, Kawata AK, Daniels SR, Yeomans K, Burk CT, Callender VD. Understanding the burden of adult female acne. J Clin Aesthet Dermatol 2014:22–30.

Uwajeni AA, Mshana J, Kiprono S, Mavura D, Masenga EJ, Cazzaniga S, et al. J Eur Acad Dermatol Venereol 2018;32:e451–3.

Vongraviopap S, Asawanonda P. Dark chocolate exacerbates acne. Int J Dermatol 2016;55(5):587–91. https://doi.org/10.1111/ijd.13188.

World Health Organization. Physical status: The use and interpretation of anthropometry. Report of a WHO expert committee. World Health Organ Tech Rep Ser 1995;854:1–452.

Zeichner JA. Evaluating and treating the adult female patient with acne. J Drugs Dermatol 2013;12:1416–27.

Zeichner JA, Baldwin HE, Cook-Bolden FE, Eichenfield LF, Fallon-Friedlander S, Rodrigue DA. Emerging issues in adult female acne. J Clin Aesthet Dermatol 2017;10:37–46.