

ORIGINAL ARTICLE

Large-scale international study enhances understanding of an emerging acne population: adult females

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Abstract

Background Acne vulgaris is increasingly recognized in adult women; however, few studies have formally evaluated the clinical presentation and factors associated with acne in this population.

Methods This prospective, observational international study evaluated the clinical characteristics and lifestyle correlates of acne in adults (≥ 25 years) at a dermatology visit for acne. Investigators conducted a detailed clinical examination and administered a validated questionnaire that covered medical history, disease evolution, lifestyle habits, previous treatments, skin care and quality of life.

Results In this study ($n = 374$), acne was mild or clear/almost clear in 47.3% of subjects; however, the study visit was not required to be an initial consultation for acne and as such, many patients were already on treatment. Most women (89.8%) had acne involving multiple facial zones (cheeks, forehead, mandibular area, temples) with a spectrum of facial acne severity similar to adolescents. Mixed facial acne (both inflammatory and non-inflammatory lesions present) was the most common presentation; 6.4% of women had inflammatory acne only (no non-inflammatory lesions reported) and 17.1% had comedonal acne with no inflammatory lesions. Truncal acne was present in 48.4% of patients. A small subset (11.2%) had acne localized only to the mandibular area. Compared to the women without localized acne, those with mandibular acne were more likely to be employed (90.5% vs. 78.6%), reported greater daily stress levels (5.8 vs. 5.1), and were more likely to say their jobs were psychologically stressful (71.4% vs. 57.5%). Women with mandibular acne alone were significantly less likely to have a global acne severity rating of moderate or higher (7.1% vs. 50.1%), truncal acne (19.0% vs. 51.9%), post-inflammatory hyperpigmentation (23.8% vs. 51.9%) and erythema (19.0% vs. 48.4%). At the completion of the study visit, this group was also more likely to receive a prescription for an anti-androgen (16.7% vs. 7.7%).

Conclusions This study represents the first objective assessment of the facial distribution of acne lesions in adult women presenting to the dermatology office. The data surprisingly indicate that the acne distribution in almost 90% of cases is similar to that seen in adolescent acne. The stereotype of adult female acne being due to hormonal disturbances presenting as inflammatory acne localized only to the mandibular area was not found in the majority of this large group. The large majority (93.7%) of women had facial comedones. We recommend that the general treatment approach for adult acne should include agents that target each of the acne lesion subtypes. Subgroup analyses of recent large-scale controlled clinical trials have shown that many adult women respond well to standard first-line acne therapy.

Received: 29 April 2014; Accepted: 1 September 2014

Conflicts of interest

This study was sponsored by an unrestricted educational grant from Galderma International; no payments were made to any of the patients or investigators who participated in the study. Pr Dreno, Dr Thiboutot, Dr Layton, Dr Berson, Dr Perez and Dr Kang have served as consultants to Galderma who sponsored this study and markets drugs for acne.

Funding sources

None declared.

Introduction

Acne vulgaris is a chronic, inflammatory skin disease that affects between 20% and 40% of adults, with a higher reported frequency in women.^{1–4} Although there is no clear age cut off between adolescent and adult acne, adult acne can be defined as the presence of acne lesions after the age of 25 years. In adults, acne can be an extension or relapse of adolescent acne (persistent acne) or can be a new occurrence (late-onset acne).⁵ Late-onset acne is thought to be less common than persistent acne; Schmitt *et al.* reported that 80% of adult women in a cross-sectional study of female patients diagnosed with acne at a general dermatology clinic had acne that started before 20 years of age and had persisted.⁶

Adult acne, particularly in women, is increasingly a reason for dermatologic consultation.^{2,5} Goulden *et al.* reported an overall prevalence of acne in 54% of 749 randomly selected individuals, and further noted that the mean age of patients with acne in their clinical practice had increased from 20.5 to 26.5 years in the decade from 1989 to 1999.² A high prevalence of acne among adult women was also reported in 2008 (>50% in individuals in the 3rd decade of life) and acne was more common in women than men at all ages after age 20 ($P < 0.05$).⁴ Further, acne in adult women appears to result in greater appearance-related distress and greater impairments of quality of life vs. younger women.^{7,8}

Many questions concerning adult acne remain, including whether there are distinct presentations based on demographic variables such as age and gender. Should adult acne be considered a subtype of acne that is distinct from adolescent acne? The current study of individuals aged 25 years or older consulting a dermatologist for acne was conducted to increase the level of knowledge about this emerging population. With inclusion of 374 women, the results provide a strong database on adult female acne.

Methods

Design

This study was a non-interventional, observational multicentre trial to evaluate the characteristics of acne in adult subjects via both a consultation with dermatologist and an adult acne questionnaire. Participation of both investigators and subjects was voluntary and no compensation was provided. The study visit was not required to be the first consultation for acne and subjects could be treatment naïve or previously treated. The study started January 05, 2011 and the last subject was enrolled on September 15, 2012. The study was conducted according to good clinical practice, and Institutional Review Board (IRB)/Independent Ethics Committee approvals were obtained according to individual country practice. The study was explained to potential subjects and informed consent was obtained prior to any study procedures.

Patient selection

Subjects consulting a dermatologist for acne vulgaris who were aged 25 years or older were eligible to participate. The opportunity to participate was offered to all eligible subjects seen sequentially in participating dermatology practices. Subjects were excluded if they were unable to complete the study procedures or were unwilling to participate or provide informed consent.

Study assessments

Study investigators collected a detailed patient history including acne-related questions and administered two brief subject-completed questionnaires on quality of life [using the Cardiff Acne Disability Index (CADI) tool] and medication adherence for patients who had been previously treated (using the validated ECOB scale).^{9,10} Acne-related questions included acne characteristics and history, dietary and lifestyle factors that have been associated with acne in the literature, and use of acne treatments and makeup. A pilot study was conducted in 41 patients. After compiling the results of this pilot study, the questions provided to dermatologists were slightly modified to clarify some items and strengthen patient input; the final version (Adult Acne Questionnaire) was used with the remaining 333 subjects.

Acne was rated by investigators in three ways: global severity, localization on the face and type/counts of lesions per each area of face. First, investigators provided a global assessment using a 6-point global assessment scale (clear, almost clear, mild, moderate, severe, very severe). Specifically, investigators were asked to use the following definitions: Clear (0) = no lesions, residual pigmentation and erythema may be present; Almost clear (1) = a few scattered open or closed comedones and very few papules; Mild (2) = Easily recognizable, less than half of face is involved. A few open or closed comedones and a few papules and pustules; Moderate (3) = More than half of face is involved. Many papules and pustules, many open or closed comedones. One nodule may be present; Severe (4) = Entire face involved, covered with many papules and pustules, open or closed comedones and rare nodules; and Very severe (5) = Highly inflammatory acne covering face with presence of nodules. Second, investigators recorded the location of acne across five facial regions (forehead, temples, right cheek, left cheek, mandibular area) and on five bodily areas (neck, chest, back, shoulders, arms). For each facial region, the investigators indicated the type of lesions present (non-inflammatory, inflammatory, nodules, post-inflammatory hyperpigmentation, erythema and scarring). Finally, for non-inflammatory and inflammatory acne lesions, a semi-quantitative method was used to indicate number of acne lesions per facial region (investigators recorded 0, <10, 10–50, or >50 for each region). Investigators subjectively assessed the presence of hyperseborrhoea, erythema and post-inflammatory hyperpigmentation.

Statistical analysis

Descriptive statistics and summary tables were calculated for all of the parameters of interest. The means, standard deviations and standard errors, as well as the minimum and maximum values were calculated for continuous variables. For categorical variables, frequency and percentage distributions were calculated. Analyse-it 3.0 for Microsoft Excel software (Analyse-it Software, Ltd, Leeds, UK) was used for statistical tests. Correlations were tested using the Pearson correlation coefficient with a 95% confidence interval and Fisher's Z test.

Results

Demographics

A total of 374 women from 15 countries (Europe: Denmark, Italy, France, Germany, Morocco, Russia, Spain; Americas: Argentina, Chile, USA; Asia: Australia, Japan, Korea, Philippines, Singapore) participated in the study, with a mean age of 32.0 years (range 25–66 years). Demographic characteristics of the group are detailed in Table 1; notably, while a majority of women were Caucasian, other ethnic groups were also represented. Employment outside of the home – which may be used as an indirect indicator of stress – was the norm (reported by 80.2% of women) but 19.3% of women indicated they were either students or homemakers. Just under half of the group were single (48.0%) while 45.8% were married or living with a partner.

Acne history

Age of onset Subjects were asked to recall when acne first appeared, and investigators recorded responses as pre-pubertal (<12 years), adolescent (12–19 years), young adult (20–25 years) or after 25 years. A slight majority of the women (56%) recalled that acne began between 12 and 19 years of age; 5% reported pre-pubertal onset, 25% adult onset and data were missing or the subject could not remember for 13% of the group (Fig. 1). Notably, for the subgroup of women with mandibular acne, the majority (75%) reported onset of acne as an adolescent; the remainder reported onset in adulthood (age 20 or older). The self-reported mean age of acne onset was 15 years; the median age of onset was higher at 17.2 years.

Persistent vs. relapsing acne In describing the course of acne, 50.8% of women said that their acne had been present for all or most of the time since the disease onset (persistent acne); 24.8% reported substantial periods of time without acne (relapsing acne); and 24.4% did not respond to the question or could not remember. A total of 49% of the women with mandibular acne reported that acne was

Table 1 Demographic characteristics

	Females (N = 374)
Age (years)	
Mean	32.0
Median	30
Age Distribution (years)	
25–30	198 (53.2%)
31–35	85 (22.8%)
36–40	38 (10.2%)
40+	47 (12.6%)
Missing or <25 years	6 (1.2%)
Phototype	
I	5 (1.3%)
II	105 (28.1%)
III	176 (47.1%)
IV	66 (17.6%)
V	12 (3.2%)
VI	4 (1.1%)
Missing	6 (1.6%)
Ethnicity	
Amerindian	5 (1.3%)
Asian	62 (16.6%)
Caucasian	261 (69.7%)
Mestizo	13 (3.6%)
Negroid/Black	5 (1.3%)
Other	21 (5.6%)
Missing	7 (1.9%)
Employment status*	
Employed	300 (80.2%)
Student	37 (9.9%)
Homemaker	37 (9.9%)
Marital status	
Single	180 (48.0%)
Married	122 (32.5%)
Living with partner	50 (13.3%)
Divorced	21 (5.6%)
Widowed	1 (0.3%)
Missing	1 (0.3%)

*Multiple answers were allowed; Mestizo was defined as a mixture of European and Native American heritage in Latin American countries.

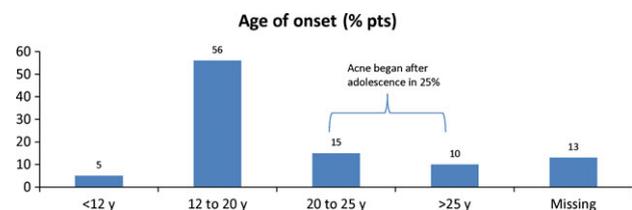


Figure 1 Recall of age of acne onset among women (% pts).

persistent or present 'all or most of the time.' However, just 25% of women who reported acne onset at age 20 or older also said that their acne was persistent.

Family history of acne and acne scarring More than half of the subjects (56.8%) reported first-degree family members with acne. Acne scarring in the family was reported by 28.8% of subjects. There were no significant differences in likelihood of family history of acne or acne scarring based on acne severity at consultation.

Prior acne treatment The majority of subjects (83.2%) had been treated previously for acne; 15.8% indicated no prior treatment, and data were missing for 1.1% of subjects. Prior treatments included a wide range of topical and systemic medications [including over-the-counter (OTC) options] as well as some procedural approaches. Subjects with moderate to severe acne were more likely to report prior acne treatment (48.5% vs. 35.6% no prior treatment). Those reporting acne onset at age 20 or older were also more likely to be treatment naïve compared to those with adolescent onset (38.9% vs. 25.5%). All subjects who reported prior treatment said they had used at least one topical treatment (prescription or OTC). Prior to the study visit, 50.8% of subjects had used systemic antibiotics, 20.6% had anti-androgenic agents prescribed, and 19.3% had received oral isotretinoin. Of interest, only 39.9% of the women treated with anti-androgen therapy reported an associated endocrine abnormality. Among those treated with isotretinoin, 18.9% had an associated endocrine abnormality. Treatment history was based on patient recall and was not captured as treatment regimens; as such, it was not analysed further.

Clinical presentation of acne in adult women

Investigator global severity Investigator global assessment rating of acne severity at the study visit is shown in Fig. 2. A total of 47.3% of women in this study had mild acne (rated as clear/almost clear or mild). Among the 59 subjects who reported no prior treatment, 57.8% had mild acne and 35.6% had moderate or more severe acne (data missing for 6.6%).

Distribution and localization of acne lesions Mixed acne (both inflammatory and non-inflammatory lesions present) was the most common presentation; 6.4% of women had inflammatory acne only (no non-inflammatory lesions reported) and 17.1% had comedonal acne with no facial inflammatory lesions.

Investigators were asked to indicate where acne lesions were present. As shown in Fig. 3, roughly the same percentage of subjects had comedonal and inflammatory acne lesions on the

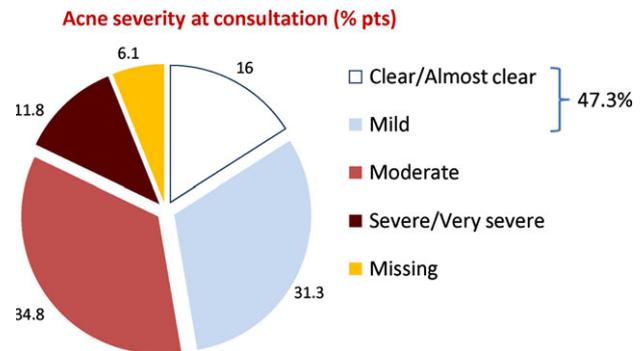


Figure 2 Investigator global assessment rating of acne severity on the face.

cheeks and mandibular area, fewer had lesions on the forehead and the least had acne on temples. Truncal involvement was present in just under half of the women (48.4%). Nodules were reported in 14.2% of the women and occurred with approximately similar frequencies on the cheeks and mandibular area but were less commonly reported on the forehead or temple. Among those with nodules, 8.6% had no other inflammatory lesions.

Lesion types and density per facial zone Although acne lesions were not counted individually, when lesions were present in a zone investigators were asked to estimate the number of acne lesions by type using three categories: <10, 10–50 and >50 lesions. As shown in Fig. 4, both comedones and inflammatory lesions occurred on all facial regions, most frequently in low numbers (<10). There were no reports of >50 inflammatory lesions within a specific facial zone in any individuals in the study, but a low percentage (1%–3% depending on facial area) of subjects had >50 comedonal lesions in one area.

Mandibular localization of acne lesions The traditional view of adult female acne centres on lesions localized to the mandibular area; therefore, we analysed the proportion of subjects with non-inflammatory and/or inflammatory acne lesions on the mandibular area but no other facial areas. In this study, 11.2% of women had acne lesions localized to the mandibular area. To determine if there are defining characteristics for the population of women with mandibular localization, we compared the frequency of various characteristics in the women with localized mandibular acne vs. those with acne not localized to the mandible. As highlighted in Table 2, some characteristics did differ between groups.

Truncal involvement Truncal involvement was reported in 48.4% of women. The majority of subjects with truncal involvement (78.9%) had multiple bodily areas involved, which most

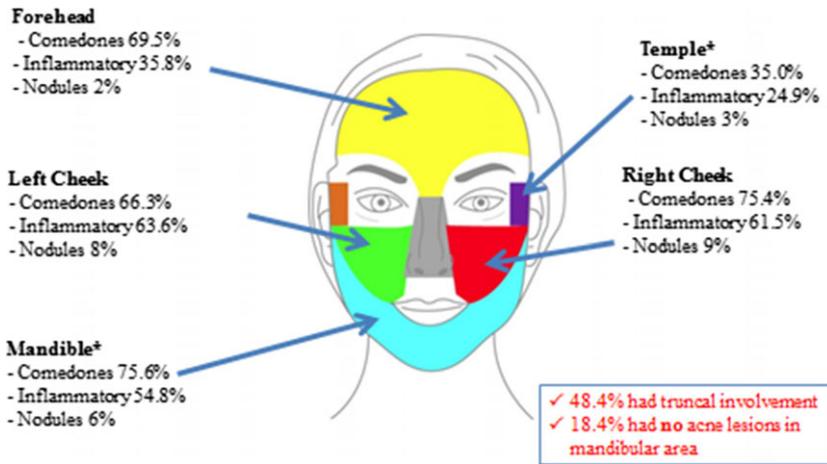


Figure 3 Distribution of acne lesions by facial zone for the group overall, reported as the percentage of patients with lesions in that zone.

commonly were neck/back/chest/shoulders and back/chest/shoulders.

Characteristics associated with acne severity Table 3 presents acne characteristics that occurred with differing frequency according to acne severity.

Additional clinical features

Post-inflammatory hyperpigmentation As shown in Fig. 5, PIH was present in 50.4% of women and was most commonly present on cheeks (38.2% right cheek, 39.4% left cheek) followed by mandibular area (26.1%), forehead (24.3%), and temples (13.2%). PIH was most likely to be present in subjects aged 25–30 years, with a trend towards decreasing frequency with increasing age. PIH was reported with the highest frequency in subjects with phototype IV (62.6%), followed by III (53.1%), VI (50.0%) I (40.0%), II (37.7%) and V (28.6%); however, it should be noted that there were very small numbers of patients with phototypes I (N = 5), VI (N = 4) and V (N = 14).

Erythema. Erythema was present in 41.4% of subjects (Fig. 5). Erythema was most frequently observed on cheeks followed by mandible then forehead and temples. It was most frequently seen in the age group of 25–30 years and occurred with decreasing frequency in older age groups in both males and females. It was present in women with skin phototypes II–V. Twenty-five per cent of subjects had both PIH and erythema present.

Scars Acne scars – primarily atrophic – were present in 58.8% of women and were less likely in women with inflammatory acne localized to the mandible (42.1%). Somewhat unexpectedly, the percentage of subjects with scars decreased with increasing age, with the highest proportion present at age 25–30 (66.0%), then

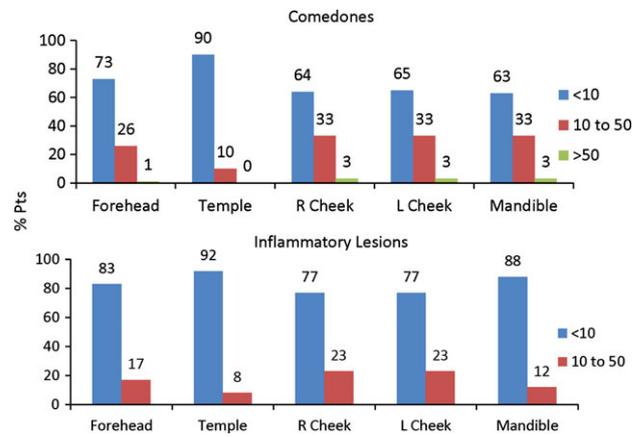


Figure 4 Investigator estimate of lesion count by facial zone (when lesions were present, % pts).

31–35 (61.1%), 36–40 years (55.6%) and over 41 years (45.2%). Analysis by facial region showed scars were present at highest frequencies on the cheeks (52.1% right cheek, 50.1% left cheek) followed by mandibular area (28.9%), forehead (25.7%) and temple (21.4%). Hypertrophic scars were reported in 2.7% of subjects; the distribution of hypertrophic scars was 8% each on the forehead and temples, 25% on the right cheek and 16.7% on the left cheek and 33.3% on the mandibular area.

Hyperseborrhoea According to investigator opinion, hyperseborrhoea was present in 72.2% of women (Fig. 6). Among those with hyperseborrhoea, the severity was weak in 44.7%, moderate in 27.5%, moderately severe in 19.6% and severe in 2.75 (severity data were missing for 5.5% of subjects reported to have hyperseborrhoea).

Presence of androgenic signs/symptoms Androgenic signs were reported to be present in 10.8% of subjects of the overall population and were in order of frequency alopecia, hirsutism

Table 2 Comparison of characteristics in the overall group and women with acne localized to the mandible (marked differences are highlighted in bold)

	Acne not localized (n = 332)	Localized mandibular acne (n = 42)
Demographic characteristics		
Mean age	32 y	34 y
Marital status: single	48.9%	38.1%
Employed	78.6%	90.5%
Acne history		
Onset after adolescence	27.3%	23.8%
Acne continuously present since onset	52.2%	47.6%
Family history of acne	56.6%	59.5%
Acne characteristics		
Global severity moderate or higher	50.1%	7.1%
Truncal acne	48.4%	19.0%
Nodules present	14.4%	11.9%
Scars present	61.3%	26.2%
Associated clinical features		
PIH present	51.9%	23.8%
Erythema present	43.1%	19.0%
Hyperseborrhoea present	72.1%	61.9%
Lifestyle factors		
Psychologically stressful job	57.5%	71.4%
Mean daily stress	5.1	5.8
Cigarette smoking	27.0%	14.3%
No or rare sun exposure	47.5%	33.3%
Regular exercise	59.8%	64.3%
Consumption of dairy products	86.5%	83.3%
Use of vitamins	38.4%	33.3%
Prior treatments		
No prior treatment	16.1%	23.8%
Systemic antibiotic	38.7%	40.5%
Contraceptive pill	33.4%	42.8%
Anti-androgens	20.6%	16.7%
Endocrine abnormalities present	19.9%	16.7%
Onset of menstruation <12 years	31.9%	28.6%
Irregular menstrual cycle	13.5%	11.9%
Oral isotretinoin	19.3%	26.2%
Chemical peel	29.4%	21.4%
Laser/IPL	10.4%	14.3%
Prescription of anti-androgen at end of study visit	7.7%	16.7%

and acanthosis. An endocrine evaluation had been done in 17.6% of the female subjects (results of the evaluations were not recorded as part of this survey).

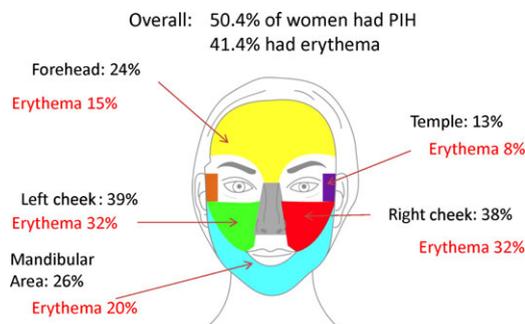
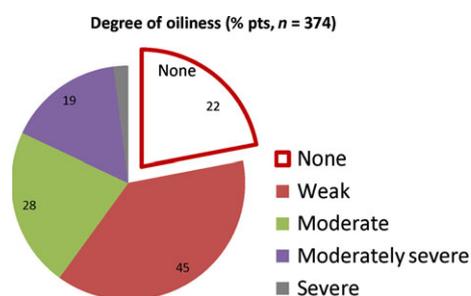
Menstrual cycle The majority of female subjects in this study (81.0%) reported having a regular menstrual cycle. Of interest, 89.5% of those with localized acne reported regular cycles. When asked to recall the age of onset of menstruation, the majority of women in the overall group reported between the ages of 12 and 15 years, regardless of cycle regularity (63.7% with regular cycle, 58.8% irregular cycle); a smaller percentage reported early onset

of menses (<12 years, 31.0% regular cycle and 33.3% irregular) and few reported onset after age 15 (4.6% regular and 5.9% irregular cycle). Of those who indicated that their menstrual cycle was not regular, 35/51 (68.3%) had a cycle 28 days or longer. Women felt that menstrual cycles were associated with worsening acne, reporting that acne flares occurred most commonly before onset of menses but also during and after for some women.

Women with irregular menstrual cycles were significantly more likely to have had an endocrine evaluation compared to women with regular cycles (51.0% vs. 14.9%, $P < 0.05$). Among

Table 3 Acne characteristics that differed by acne severity at study visit

	Clear-Mild (N = 177)	Moderate (N = 130)	Severe (N = 44)
Scars present	48.1%	68.1%	92.3%
Hyperseborrhoea present	64.5%	87.7%	65.4%
Psychologically stressful occupation	56.7%	62.8%	65.9%
CADI score ≥ 5	51.9%	77.5%	71.2%
Any previous acne treatment	79.8%	85.3%	93.2%
Previous systemic antibiotic treatment	33.9%	30.8%	54.5%
Previous isotretinoin treatment	20.8%	14.7%	34.1%

**Figure 5** Distribution of post-inflammatory hyperpigmentation and erythema.**Figure 6** Degree of hyperseborrhea in women with acne.

those with irregular menstrual cycles, endocrine abnormalities were identified in the following frequencies: hirsutism 31.4%, alopecia 17.6% and acanthosis nigricans 3.9%. Endocrine abnormalities were significantly less common among women with regular cycles; hirsutism was reported in 7.6% of subjects, alopecia in 2.3% and acanthosis in 0.3%.

Lifestyle factors that could potentially aggravate acne

Occupational chemical exposure Occupational chemical exposure was reported by 8.2% of subjects. Among these, 32.3% had moderate or more severe acne while 67.6% had mild, almost clear or clear acne.

Daily stress and job stress On 10-point scale, the mean daily stress rating for subjects in this study was 5.1 which is similar to the stress rating in general populations.¹¹ However, the vast majority of subjects (83.2%) reported at least moderate stress (rating of 4 or higher), and this group included 15.5% who reported high stress levels (8–10 rating). Subjects were asked whether they felt that their jobs were physically or psychologically stressful. A total of 23.0% reported that their jobs were physically stressful. However, 58.8% reported that their jobs were psychologically stressful. As noted above, job stress was associated with more severe acne in women. Women with localized acne were also more likely to report higher stress levels (6.0–6.4 vs. 5.1) and having a psychologically stressful job (68.6%–73.6% vs. 58.8%).

Cigarette smoking Smoking was reported by 24.8% of subjects, and there was a significantly higher proportion of subjects with severe acne among smokers compared with non-smokers (17.4% vs. 8.0%, $P < 0.05$). Women with acne localized to the mandible were less likely to smoke (8.6%–15.8%).

Dietary intake Consumption of dairy products was reported by 86.3% of subjects. Among those reporting dairy intake, 46.4% had an acne severity assessment of moderate or higher; in comparison, 41.5% of those who reported no dairy intake had moderate or more severe acne. More than half (60.7%) of the overall group reported drinking milk; severity of acne was similar regardless of milk intake, with moderate or more severe acne in 47.53% of those who reported not drinking milk compared to 45.36% in those who did drink milk.

Exercise The majority of subjects (61.2%) reported that at least some physical activity/exercise was part of their regular routine. Acne severity was similar among those who did and did not exercise.

Skin care and use of cosmetics

A total of 33.2% of subjects reported using a facial wash prescribed by a dermatologist or cosmetologist. Use of a prescribed facial wash was not correlated with acne severity. Slightly fewer (27.8%) reported use of a moisturizer, also with similar proportions across the spectrum of acne severity. The majority of subjects (70.7%) reported using cosmetics to cover acne and/or acne scarring. Use of cosmetics was significantly associated with increasing acne severity ($P < 0.05$). In our clinical experience,

skin care and cosmetic can be a factor in adult acne when retentional lesions (mainly closed comedones) are numerous and localized specifically on the cheeks and front head.

Comorbid conditions and concomitant medications

Other diseases were self-reported by half of the population (50.8%). The most commonly reported existing diseases were allergy (21.4%) followed by obesity (7.2%), depression (5.4%), cardiovascular disease (4.1%), diabetes (2.0%) and anxiety (0.4%). The category 'Other' was reported for 22.8% of subjects.

A total of 88.9% of the subjects reported no use of medications that might exacerbate acne. Psychopharmacologic drugs were used by 22 subjects (5.0%), topical steroids by seven subjects (1.6%), oral steroids by 6 subjects (1.3%) and steroids without topical/oral specification by seven subjects (1.6%).

Quality of life

The mean score on the CADI responses was 5.9, with the distribution of scores as shown in Fig. 7. The CADI score was >6, indicating a marked impact on quality of life in 48.3% of subjects.

The presence of scars was associated with an impact on quality of life that is suggestive of clinically significant impact in 53.2% of subjects (Fig. 8); however, it should be noted that the CADI score has not been validated as a measure of quality of life related to acne scarring.

Discussion

This study examines in detail the clinical manifestations and characteristics associated with acne in adult women. It has been postulated that acne in adult women differs from that in adolescents – adult acne has been described as having more inflammatory lesions but fewer lesions overall; as having deep-seated, long-lasting papules, nodules and 'cysts' (generally in few numbers) with inflammatory flares; and as being localized to the mandibular area (Fig. 9).⁵ In our study, these clinical presentations were present but represented subgroups of the

overall adult female acne population as shown in Table 2. According to investigator global assessments, 46.2% of females in this study had moderate or severe acne, which does not agree with the presentation of few lesions overall. Nodules and 'cysts' were present in 14.2% of the 374 women studied. In agreement with a recent article by Dreno *et al.*, we found that a subgroup of those with nodules had no other inflammatory lesions (8.6%).⁵ However, while we previously postulated that nodules were almost always found on the lower face in female adults,⁵ the results of this large-scale study show that nodules can be present on the upper face as well. A mandibular localization was not the most frequent clinical presentation; rather, it was reported in a minor subset of the population (10.2%). The likelihood of this type of presentation increased with age, and was found in 15.0% in subjects aged 41 or older.

A total of 47.3% of women in this study had very mild acne; however, it should be noted that adult patients were enrolled sequentially on presentation at the dermatologists' office and the study consultation was not required to be the first visit for acne. More than 80% of subjects reported using treatments for acne prior to the study visit, yet they remained bothered enough by their acne to continue consulting the dermatologist.

Involvement of non-facial skin was very common (Fig. 10), occurring in 48.4% of females. While acne on shoulders and back is mentioned in the literature about adult acne,⁷ this is the first study we know of to quantify how commonly this occurs.

Consistent with our clinical impressions and the limited available literature, we found that the majority of adult females had acne that started in adolescence (persistent acne);⁷ however, a surprisingly high percentage of subjects (25%) reported an onset of acne after the age of 20 years (late-onset acne). Taken together with the high frequency of non-facial acne in our population, these data tend to contradict our clinical impression that persistent and late-onset acne most commonly involve the face without other body areas.⁷ But this clinical impression does apply to the subgroup of women with the mandibular subtype of acne, who were less likely to have truncal involvement

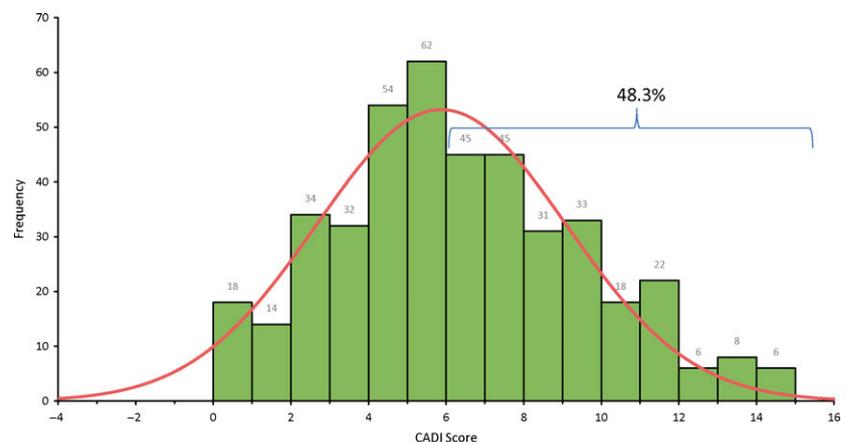


Figure 7 Distribution of CADI scores (n pts).

- 66% of subjects with scars were **young** (aged 25–30 years)
- 53% of those with scars had a CADI QoL score of 5 or higher, indicating clinically significant impact

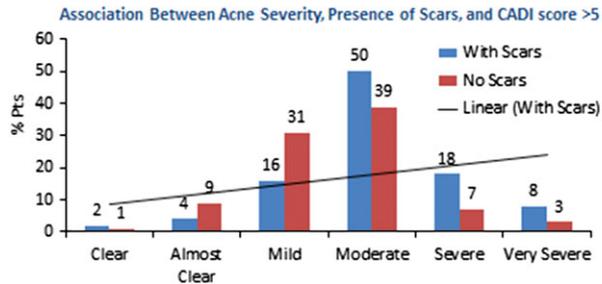


Figure 8 Association between acne severity, presence of scars, and CADI score >5.



Figure 9 Common presentation of acne in an adult woman. Photo courtesy of B. Dréno.



Figure 10 Truncal involvement in an adult female patient. Photo courtesy of B. Dréno.

(20.0%–25.7% vs. 48.4%) and to have a global severity assessment of moderate or more severe (0%–11.4% vs. 52.7%) and more likely to have endocrine abnormalities (17.1%–26.3% vs. 10.8%). In addition, results suggest that patients with no prior treatment were more likely to have mandibular localized lesions (23.8% vs. 16.1%).

Females with late-onset acne were more likely than those with persistent acne to be treatment naïve at the study visit. We have

speculated that the increasing population of adults in dermatology offices may be at least partly due to adults now being ‘less tolerant of their condition and [are] better informed about available therapies;’⁵ this may be the case, but it seems that there is a subset of adults that represents a new acne population. Slightly more than half (50.8%) of subjects reported that their acne had a persistent course – which was defined as ‘acne was present on most days without significant acne-free periods.’

The literature indicates that acne in adult women often involves scarring and/or pigmentation problems.⁷ Our findings were consistent with the literature, with scarring in 59.4% and PIH in half of the women in our study (50.4%). Both scarring and PIH were most common in women aged 25–30 years. One hypothesis to explain the frequency of scars in subjects between 25 and 30 years old could be that inflammatory acne is often more severe in individuals prior to the age of 20, and this increased inflammation may be more frequently associated with scarring which can take years to resolve. Erythema was also common, and was reported in 41.4% of women. Since most patients were using some sort of an acne treatment at the time of capturing this data, the rates of PIH and erythema could be higher; the recent survey of adult women with acne by Tanghetti *et al.*¹² reported pigmented lesions in >70% of 209 women.

Women with persistent acne have a higher sebum excretion rate vs. women without acne, suggesting that sebogenesis may have an increased role in acne among this age group.⁷ Hormonal abnormalities may contribute to this excess sebum, since the sebaceous gland is under androgenic control. However, a clear pattern of abnormality has not yet been determined to underlie adult acne.¹³ In this study, endocrine abnormalities were not common, with endocrine evaluations being reported for 17.6% of subjects and signs of androgenic abnormalities present in 10.8% of subjects.

Several factors, including genetic disposition, stress, fatigue and menstruation, are thought to trigger or worsen adult acne; however, none have been firmly substantiated.⁷ The majority of women in this group (56.8%) had a family history positive for acne and 29.1% had a family history of acne scarring. The likelihood of family history was higher in women with mixed acne localized to the mandible (73.7%)

The women in this study reported high daily stress, and there was an association between report of job stress and acne severity, which may bolster the association between stress and acne. Tobacco smoking was associated with more severe acne in our study, which agrees with the literature.¹⁴ We have previously noted that it remains unclear whether smoking has any causal relationship with acne.⁷ Contrary to recent literature, we found no association between exercise or dietary intake and acne severity according to subject recall of their exercise and diet habits.^{15–20} The fact that only 6.8% patients received oral anti-androgens as the prescription at the end of the study visit reinforces that this population did not have a high percentage of women with hormonal problems.

In this study, women consulting dermatologists for acne were mainly working women in their late 20s and early 30s leading active, stressful lives. Slightly more than half reported acne that had been continuously present since its onset – these may have had adolescent acne that did not resolve and that continued to manifest in a manner similar to adolescent acne. A small subgroup of women had mild acne localized to the mandible with a higher likelihood of hyperseborrhoea and endocrine abnormalities.

Limitations of the study include lack of a control group and reliance on patient self-report for history, prior treatment, and lifestyle factors. There was no requirement for patients to have been previously untreated or to be consulting a dermatologist for the first time for their acne; a study with these restrictions may yield somewhat different results. However, this is a real-life snapshot of the patients who are now coming to dermatologists' offices in increasing numbers and it does help to characterize the population of women with acne. Perhaps the most important finding is that the traditional view of adult women with mainly inflammatory/deep lesions on the mandible and difficult-to-treat acne associated with hormonal problems does not seem to reflect a significant majority of adult acne patients.

Conclusions

We believe that this large-scale study sheds new insight onto acne in adult women aged 25 or older, and significantly expands the patient profile. Adult acne should no longer be thought of as a disease that primarily affects women with hormonal problems. It seems clear that there is an emerging population of individuals seeking acne treatment who are aged 25 and older with acne that is generally similar to that of adolescent acne. These are often active patients, experiencing a relatively high level of daily stress; based on adult subgroup analyses of large-scale controlled clinical trials of various acne medications and other studies, it seems likely that these individuals will respond well to conventional acne therapy.^{21–23} The majority of adult women who have acne lesions report continuing or relapsing acne from adolescence, and they have often used many topical and/or systemic products. Some may have resistant strains *P. acnes*. Thus, in this context, the use of a topical antibiotic should be avoided and BPO in combination with topical retinoids proposed as first-line treatment including an oral agent if necessary. In addition, there are subsets of adult patients who will require oral anti-androgen/contraceptives. We recommend that the treatment of acne in adults should embrace a number of aspects including selection of therapy according to clinical aspects (presence of scars, PIH, age of the patient and presence of other pathologies like photo-ageing) as well as patients' lifestyle. Consideration should be given to procedures both as adjunctive treatment and in cases where medical therapies may not be helpful. Finally, we believe it is essential to help adult women with acne optimize their skin care regimens.

What this study adds

- 1 Results from 374 patients with adult acne show new paradigm for female acne
 - a Two distinct clinical presentations
 - i Similar to adolescent acne
 - ii Mild, inflammatory/nodular acne localized to mandibular region
 - b Most women do not have hormonal abnormalities
 - c Acne is typically found in active, working women in their 20s to 40s.

Acknowledgements

For their support and participation in this study, the authors would like to thank the membership of the Global Alliance to Improve Outcomes in Acne including all regional group members: Flordeliz Abad Casintahan, MD; Elena Araviiskaia MD, PhD; Vincenzo Bettoli, MD; Steven Chow, MD; Tam El Ouazzani, MD; Andrew Finlay, MD; Chee Leok Goh, MD; Harald Gollnick, MD; Maria Isabel Herane, MD; Juan Honeyman, MD; Ana Kaminsky, MD, PhD; Lajos Kemeny, MD; Raj Kubba, MD; Julien Lambert, MD; Andrzej Langner, MD; James J Leyden, MD; Jose Luis Lopez Esteban, MD; Cristina Oprica, MD; Jaime Piquero Martin, MD; Yoshiki Miyachi, MD; Nopadon Noppakun, MD; Marcia Ramos-e-Silva, MD, PhD; Kari Saarinen, MD; Jo Ann See, MD; Alan R Shalita, MD; Neil Shear, MD; Dae Hun Suh, MD, PhD; Vicente Torres Lozada, MD; Patricia Troielli, MD; Niels Venien, MD; John Wolf, MD and Cristos Zouboulis, MD. In addition, the authors would like to acknowledge and thank the following colleagues who contributed patients to the study: Ignacio Alonso Garcia, MD; Natalia Kasterina MD; Lesya Kirsanova MD; Alexey Kuznetsov MD, PhD; Natalia Lebedeva MD; Irina Mahinenko MD, PhD; Maria Nikolishvili MD; Beatriz Pinar, MD; Florence Poli, MD; Denis Shustov, MD; Eugene Sololovskiy MD, PhD; Grigoriy Sokolov MD, PhD; Miki Tanioka, MD, PhD; Teresa Vendramini, MD and Stefano Veraldi, MD.

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