

CLINICAL REPORT

Consequences of Acne on Stress, Fatigue, Sleep Disorders and Sexual Activity: A Population-based Study

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Acne is a common disease among young people, which could have a serious impact on quality of life. Based on a survey using the quotas method on a large sample of the French population, we studied the impact of acne on feelings of stress, fatigue upon waking, sleep disorders and sexual activity. We did not establish any relationship to sleep disorders, but clearly ascertained that people with acne ($n=1,375$) feel more stressed and have less sexual intercourse. Hence, 18% of people from acne group declared to be stressed every day (13.9% in control group) and 37.5% had no sexual intercourse (20.4% in control group; $n=891$). To our knowledge, this is the first study to show that fatigue upon waking is strongly associated with the presence of acne (65.4% versus 58.4%). This study emphasises the fact that acne could have a deep resounding impact on the lives of people suffering from the disease. *Key words:* acne; stress; fatigue; sleep; sexual intercourse.

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The relationship between stress and acne (1) is a well-known but complex one. On the one hand, stress induces the release of neuropeptides and hormones that are able to activate cells involved in acne pathogenesis (2). These mechanisms involve the neuro-immuno-cutaneous system (3) and the hypothalamic-pituitary axis (HPA) (4). In response to physical or psychological stressors, the hypothalamus and pituitary gland release neuropeptides inducing the release of catecholamines and cortisol through the adrenal gland, whereas the skin is able to produce neuropeptides, such as corticotropin-releasing hormone, substance P or calcitonin gene-related peptide, in response to stress. It is very interesting to note that an equivalent of the HPA axis has also been described in the skin (5, 6).

On the other hand, acne has major psychological consequences for people suffering from the disease (7). Some studies have revealed that the burden of

acne diminishes adolescents' quality of life (QoL) and affects their overall self-esteem (8, 9). Girls and boys with acne are less self-assured, have more feelings of uselessness, fewer feelings of pride, lower self-worth, and lower body satisfaction than those without acne (10). As a result, acne-related psychological suffering could be linked to the occurrence of psychiatric disorders such as anxiety, depression and suicidal ideation. Many studies have shown these disorders to be present in patients with acne, but the impact of these studies was often diminished by small sample size and absent or doubtful controls (11, 12). A few large studies have demonstrated depressive symptoms to be present in patients with acne (13). Recently, Halvorsen et al. (14) compared adolescents with acne and controls and showed that those with substantial acne often reported suicidal ideation and were significantly more likely to report mental health problems than those with less acne. Social impairment was more common with increasing acne: low attachment to friends, not thriving at school, never having had a romantic relationship, and never having had sexual intercourse were all aspects associated with substantial acne in a multivariate model.

Such surveys, based on the quota method, facilitate swift data collection and relevant results analysis. We planned to use a survey conducted on a representative sample of the French population to study acne and especially severe acne. This survey was designed with 4 goals in mind: *i*) to evaluate the epidemiology of severe acne in France; *ii*) to evaluate eating and smoking habits associated with severe acne; *iii*) to evaluate the burden of acne in a specific French environment; *vi*) to describe the management of severe acne at the population level. In this paper, we will describe the findings related to the third goal.

SUBJECTS AND METHODS

Questionnaire

A panel of experts in dermatology representing academic (PW, LM) and private practice (JMA, RM) developed a questionnaire with the help of an expert in public health (CT). The questionnaire was designed to be understood by most people in the general population. Socio-demographic characteristics were collected, in addition to data regarding acne, stress, fati-

gue and QoL. The following questions were asked to assess the presence and severity of acne: 1) Do you currently suffer from acne, have you suffered from acne in the past, or have you never suffered from acne? 2) Which type of acne best describes your condition? a) Mild acne: some blackheads and some acne on any part of the face. b) Moderate acne: many blackheads and bumps on a large part of the face. c) Severe acne: many red bumps (including very large ones) across the entire face.

The people interviewed were asked to answer questions related to stress ("Do you feel stressed? Never? Sometimes? Every day?"), sexuality ("How frequently do you have sexual intercourse? Never had? Not currently? Sometimes? Once a week or more?"), fatigue ("Do you feel tired in the morning?") and sleep ("Do you fall asleep easily at night? How many hours do you sleep?").

The impact of acne on the patient's life was assessed by the help of the Cardiff Acne Disability Index (CADI) (15), which has been approved for use in French (16). There are 5 questions with respect to the preceding month that cover feelings, symptoms, social life and perceived severity. Each question has 4 possible answers with a maximum of 3 points and a total maximum score of 15. Higher scores indicate more severely affected QoL.

Survey

A poll institute (CSA Santé, Paris, France) conducted the survey in France between April and May 2012. A representative sample of the general population aged 15–69 years was recruited using the stratified random sampling method. Based on a database with the e-mail addresses of 900,000 Internet users who agreed to participate in surveys, fixed quotas of subjects fulfilling pre-defined socio-demographic criteria were recruited. Drawing on national population data, these quotas were based on the following aspects: sex, age (6 categories), socio-professional status (3 categories) and regional distribution (9 regions), thereby ensuring the accurate representation of the French sample population. The target size for the entire sample was 10,000 people.

Statistical analysis

In this descriptive study, subjects between 15 and 24 years of age (usual age of acne) were extracted from the database established after the survey and the characteristics of subjects reporting to suffer from acne were compared to subjects reporting not to suffer from acne. In order to compare people with mild or moderate acne to those with severe acne, the study was performed on subjects between 15 and 34 years of age to get a higher number of patients with severe acne.

Quantitative variables were expressed as mean and standard deviation. Qualitative variables were expressed as frequencies and percentages. Comparisons between groups were performed using the Wilcoxon test in the case of quantitative variables; for categorical variables, intergroup comparisons were done with

Table I. Comparisons between Acne group and Control group in 15–24-year-olds: Acne was more frequent in 18–20-year-olds

	Acne n (%)	Control n (%)	p
Total	1,375 (100)	891 (100)	–
15–17 years	403 (29.3)	124 (13.9)	<0.0001
18–20 years	580 (42.2)	328 (36.8)	<0.0001
21–24 years	392 (28.5)	439 (49.3)	<0.0001
Males	566 (41.2)	318 (35.7)	NS
Females	809 (58.8)	573 (64.3)	NS

NS: not significant.

the χ^2 test. The level of significance was set at 5%. Data were analysed using SAS® software version 9.3 (SAS Institute Inc., Cary, USA) on Windows hardware.

First, each variable was evaluated independently in a univariate analysis adjusted for age to identify factors associated with acne. Second, all variables associated with acne at a probability threshold of 0.1 were entered into a multiple logistic regression analysis. In this model, variables were retained in a stepwise manner in order to determine those variables that were independently associated with acne at a probability threshold of 0.05. Odds ratios (ORs) were consequently generated.

RESULTS

Population sample

Among the group of 10,084 people, who completed the survey, 2,266 (884 males and 1,382 females) were between 15 and 24 years of age. 1,375 (566 males and 809 females) claimed to have acne at the present time (Acne group) and 891 (318 males and 573 females) claimed not to have acne at the present time (Control group). The sex ratio of the 2 groups was equal when adjusted for age. Among those who claimed to have acne, 896 had mild acne, 429 had moderate acne and 50 had severe acne; 802 people had acne on the face, 69 on the back and 504 on both. Table I summarises some characteristics of the Acne Group and Control Group, respectively.

Variables associated with Acne vs. Controls group

First, we performed a univariate analysis. Table II summarises the results of this first analysis, comparing the Acne group with the Control group. There were differences ($p < 0.0001$) in sexual activity and feelings of stress, as well as fatigue in the morning ($p < 0.001$). There were no significant differences between the number of hours of sleep, the quality of sleep, or the presence of a treatment (pharmacological or not) for depression.

Second, we performed a multivariate analysis. The absence of acne was independently and highly associa-

Table II. Relationship of the presence of acne with feelings of stress, fatigue upon waking, sleep disorders, treatment for depression and frequency of sexual intercourse in 15–24-year-old people

	Acne %	Control %	p
Never stressed	17.9	26.8	<0.0001
Sometimes stressed	64.1	59.3	<0.0001
Stressed every day	18	13.9	<0.0001
Tired upon waking	65.4	58.4	<0.001
Sleep disorders	53.6	54.3	NS
No sexual intercourse (never)	37.5	20.4	<0.0001
No sexual intercourse (not currently)	16.9	14.9	<0.0001
Occasional sexual intercourse	19.7	23.5	<0.0001
Weekly sexual intercourse (or more)	25.9	41.2	<0.0001
Treatment for depression	4.4	3.7	NS

NS: not significant.

ted with frequent sexual intercourse (once a week or more) (OR 0.622; CI95% 0.467 and 0.827). The same applies to occasional sexual intercourse (OR 0.553; CI95% 0.422 and 0.725). Having acne multiplies the risk by 2.4 of daily feelings of stress compared with no feelings of stress (OR 2.388; CI95% 1.727 and 3.303) and increases the risk to have sometimes feelings of stress (OR 1.754; CI95% 1.391 and 2.210). Having acne was associated with a higher risk of difficulty falling asleep and feeling tired upon waking up (OR 1.587; CI95% 1.147 and 2.195).

Variables associated with acne according to its severity

Third, we analysed variables associated with acne according to its severity. We compared subjects who claimed to have mild or moderate acne ($n=2,038$) with those who claimed to have severe acne ($n=71$) in a univariate analysis in the 15–34 year-old population ($n=2,109$). There were no significant differences in terms of the frequency of sexual intercourse, feelings of stress, quality of sleep, age, or the age of acne onset. Severe acne was more common among men (52.1%; $p<0.05$).

Stress

Among the 15–24-year-old population, younger people were more likely to have feelings of stress ($p=0.0005$). More women claimed to be stressed than men ($p<0.0001$). The number of people with fatigue upon waking was higher among stressed people than among those who did not report to be stressed (66.6% vs 48.2%; $p<0.0001$). The same applies to people with sleep disorders (57.6% vs 40.6%; $p<0.0001$). There was no significant difference between the sexual activity of stressed and non-stressed people. After adjustment for sex and age, the presence of acne remained highly associated with stress (OR 1.975 [CI95% 1.588–2.457], $p<0.0001$), fatigue upon waking and sleep disorders (OR 1.914 [CI95% 1.532–2.392], $p<0.0001$).

Fatigue upon waking

Among the 15–24-year-old population, fatigue upon waking varied according to age, and older people more frequently felt tired upon waking ($p<0.05$). More women reported fatigue upon waking than men ($p<0.005$). Among those who were tired upon waking, the number of people who felt stressed every day was higher ($p<0.0001$), but there were not a considerably higher number of people with sleep disorders. After adjustment for sex and age, the presence of acne remained highly associated with fatigue upon waking (OR 1,428 [CI95% 1,192; 1,710], $p<0.0001$).

Sexual activity

Among the 15–24-year-old population, the proportion of people having occasional or regular sexual intercourse increased with age ($p<0.0001$) with higher frequency in women than men ($p<0.0001$). After adjustment for sex and age, the presence of acne remained highly associated with less sexual activity (OR 0.614 [CI95% 0.508; 0.742], $p<0.0001$).

DISCUSSION

In this population-based study on acne in a representative sample of the French population, we focused on people who were between 15 and 24 years of age. Acne was reported for approximately 30% of 15–19-year-olds and 17% of 20–24-year-olds.

There are not too many studies about the prevalence of acne. This work is in keeping with previous papers about the prevalence of self-reported acne in France, which was estimated at 25% (17) or 41% in women (18). Nonetheless, the data should be analysed cautiously, since the acne was not diagnosed by doctors, but by patients. Although the quota sampling method ensures that the sample is representative of the population for specified criteria or strata, it may not be representative for other important criteria. The sample is not randomly selected, which can lead to bias. As with all other non-probability sampling methods, it is necessary to assume that all persons selected are similar to those not selected, but one must take this reservation into account (17).

As in previous studies, CADI scores were correlated with the severity of acne (19). As such, the impact of acne appears to be higher in patients with severe acne, and psychological consequences are also more severe, with the eventual onset of depression, anxiety or suicidal ideations (14). This underlines the necessity of treating these patients effectively and providing psychological follow-up, especially in the case of adolescents (20), because psychological change does not necessarily correlate with disease severity (21). Nonetheless, we have to bear in mind that, although the impact on QoL related to the severity of acne is observed mainly before treatment and at the beginning of treatment, there is also a weaker but persistent impact on QoL at a later stage, which is more associated with social and emotional factors (22).

Our study confirms that patients with acne feel more stressed than other people. As either a cause or consequence, subjects with acne feel more stressed and spontaneously reported these feelings, although they could be measured more accurately with dedicated scales (23). Our results did not show any differences according to the severity of acne, but women whose QoL has been more deeply affected by acne (22) felt more stressed. After adjustment for sex and age, the presence of acne

remained highly associated with stress. Stressed people were tired and suffered from sleep disorders more often, but there was no difference in terms of sexual activity.

To our knowledge, our study is the first to explore the relationship between acne and fatigue, and one of the first to study the occurrence of sleep disorders in patients with acne. Although fatigue was associated with sex and age, the presence of acne remained highly associated with fatigue upon waking, after adjustment of these factors. Morning fatigue could be related to sleep disorders or depression. Depression is known to be frequent in patients with acne (24) and morning fatigue could be a symptom of depression. Our study did not reveal any association between morning fatigue and depression, but we only asked whether the patient was being treated or not for depression (by drugs or psychotherapy). Fatigue could be a consequence of sleep disorders, but we did not find any relation.

Our results evidenced that acne is associated with lower sexual activity, as previously suggested (14, 25). In France and probably other countries, an old belief is that beginning sexual activity will heal acne. This belief is clearly unfounded. Moreover, it is interesting to note that we did not find any difference between the age of first sexual intercourse in patients with acne and in subjects without any acne, and that the age of the occurrence of acne preceded the age of first sexual intercourse (data not shown). Acne has adverse effects on self-perceived sexual attractiveness and self-confidence (25), especially in women and in people between 20 and 24 years of age (by comparison with those between 15 and 19 years of age) (26) and these could inhibit this patient's sexual relations.

In summary, based on a large population sample, our study revealed that acne is associated with feelings of stress, less sexual intercourse and fatigue upon waking.

The authors declare no conflicts of interest.

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