

Smoking and Dietary Factors Associated with Moderate-to-Severe Acne in French Adolescents and Young Adults: Results of a Survey Using a Representative Sample

Pierre Wolkenstein^a Laurent Misery^b Jean-Michel Amici^c Rémi Maghia^d
Sébastien Branchoux^e Christine Cazeau^e Jean-Jacques Voisard^e
Charles Taïeb^e

^aDepartment of Dermatology, AP-HP, Henri Mondor Hospital, Université Paris-Est Créteil Val de Marne (UPEC), Créteil, ^bDepartment of Dermatology, Brest University Hospital, Brest, ^cPrivate Practice of Dermatology, Bordeaux, ^dPrivate Practice of Dermatology, Brive-la-Gaillarde, and ^eLaboratoires Pierre Fabre, Castres, France

Key Words

Acne · Epidemiology · Smoking · Diet

Abstract

Background: Dietary factors and smoking play a role in acne. **Methods:** CSA Santé conducted a survey in France in 2012. Each individual answered a questionnaire to report acne, with associated epidemiological variables. Data on subjects between 15 and 24 years of age were extracted. The characteristics of subjects reporting acne were compared to subjects reporting no acne, using univariate and multivariate analysis. **Results:** The daily consumption of chocolate and sweets was independently and highly associated with acne, with an odds ratio of 2.38 (95% CI: 1.31–4.31). Smoking more than 10 cigarettes a day was highly associated with no acne, with an odds ratio of 0.44 (95% CI: 0.30–0.66). The regular use of cannabis was associated with acne, with an odds ratio of 2.88 (95% CI: 1.55–5.37). **Conclusion:** Chocolate, sweets and cannabis smoking are associated with acne. We found tobacco to be protective. We failed to investigate the respective roles of sugar, lipids and milk.

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Introduction

Among genetic and environmental factors, dietary and smoking habits seem to play a pivotal role in the development of acne [1–13]. Studies across various countries have emphasized the link between acne and a Western lifestyle [2–4, 6, 14]. In France, the reported prevalence of acne was estimated at about 11% of the population in 2002 [15], but there is no knowledge of eating and smoking habits or their effect on acne. These habits are still rather distinct in France, leading to the famous French paradox [16–19].

As we experienced previously [15, 20, 21], surveys using the quota method enable swift data collection. In a board sponsored by Pierre Fabre Dermatologie and dedicated to severe acne, we planned to conduct a survey on a representative sample of the French population. This survey was designed with the following four goals in mind: (1) to evaluate the epidemiology of severe acne in France; (2) to evaluate eating and smoking habits associated with severe acne; (3) to evaluate the burden of acne in a specific French environment; and (4) to describe the management of severe acne at the population level.

In this paper, we will describe the findings related to the second goal, namely the evaluation of eating and smoking habits associated with severe acne.

Subjects and Methods

Questionnaire

A panel of experts in dermatology representing academic (P.W. and L.M.) and private practice (J.M.A. and R.M.) and comprising the Board of Severe Acne sponsored by Pierre Fabre Dermatologie developed a questionnaire with the help of the firm's Department of Public Health (C.T.). The questionnaire was designed to be understood by most people. In this paper, we will only describe the part of the questionnaire intended to diagnose acne and its level of severity in relation to eating and smoking habits. In addition to the sociodemographic characteristics of the sample population, we took into account their size and weight to calculate the body mass index. In short, the questions addressed the following matters:

- (1) Does the subject currently have acne, did they used to have acne or have they never had acne?
- (2) Which type of acne best describes the subject's condition?
 - Mild acne: some blackheads and some acne on any part of the face.
 - Moderate acne: many blackheads and bumps on a large part of the face.
 - Severe acne: many red bumps (including very large ones) across the entire face.
- Does the subject have acne on the back?
We planned to investigate tobacco and cannabis smoking:
- (1) Subjects were asked at what age they started smoking, how long they have been smoking and how many cigarettes they smoke on a daily basis.
- (2) Subjects were asked how frequently they smoke cannabis.
We planned to investigate drinking and eating habits:
- (1) Subjects were asked how often they drink alcohol and fizzy drinks.
- (2) Regarding dietary habits, subjects were asked about the frequency of milk, fast food, chocolate, and sweet intake.

Survey

A polling institute (CSA Santé, Paris, France) conducted the survey in France between April and May 2012. A 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 predefined sociodemographic 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. This survey design was chosen by the Board of Severe Acne based on the high level of home Internet access in France (81%) and given that acne is a well-known skin condition among the general public [15], leading to reliable reports of acne.

Table 1. Individuals between 15 and 24 years of age who reported to have acne (n = 1,375)

Gender	
Male	566 (41.2%)
Female	809 (58.8%)
Age, years (mean ± SD)	19.0 ± 2.6
Severity of acne	
Mild	896 (65.2%)
Moderate	429 (31.2%)
Severe	50 (3.6%)

Statistical Analysis

Data on subjects between 15 and 24 years of age were extracted from the database established after the survey. The characteristics of subjects reporting to have acne were compared to subjects reporting to have no acne.

Quantitative variables were expressed as means and standard deviations. 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 carried out with the χ^2 test. The level of significance was set at 5%. Data were analyzed using SAS[®] software version 9.3 (SAS Institute Inc., Cary, N.C., USA) on Windows hardware.

First, each variable was evaluated 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 were consequently generated. A second analysis, performed taking into account the severity of acne, was then developed using exactly the same methodology.

Results

Population Sample

A total of 10,084 subjects completed the survey. Among them, 2,266 were between 15 and 24 years of age. There were 884 males and 1,382 females. Overall, 1,375 claimed to have acne at the present time (acne group, 566 males and 809 females) and 891 claimed not to have acne at the present time (control group, 318 males and 573 females). Among those who claimed to have acne, 896 claimed to have mild acne, 429 to have moderate acne and 50 to have severe acne. Among the 50 patients with severe acne, 21 had acne on the face, 1 on the back and 28 on the face and on the back. Table 1 summarizes the characteristics of the population who claimed to have acne.

Table 2. Individuals reporting to have acne compared to those reporting not to have acne

Characteristic	Acne group (n = 1,375)	Control group (n = 891)	p value
Alcohol consumption			0.3911
Never	426 (31.0)	220 (24.7)	
Regular consumption	117 (8.5)	102 (11.5)	
Irregular consumption	762 (55.4)	510 (57.2)	
Used to drink	70 (5.1)	59 (6.6)	
Sugary fizzy drink consumption			0.7160
Never	234 (17.0)	168 (18.9)	
Less than 1 liter per day	942 (68.5)	582 (65.3)	
More than 1 liter per day	42 (3.1)	28 (3.1)	
Fizzy drink without sugar	157 (11.4)	113 (12.7)	
Fast food consumption			0.5088
Never	101 (7.3)	61 (6.8)	
Once to twice a week	195 (14.2)	128 (14.4)	
Every day	16 (1.2)	5 (0.6)	
Occasionally	1,063 (77.3)	697 (78.2)	
Dairy product consumption			0.1334
Never	53 (3.8)	46 (5.2)	
Once a day	584 (42.5)	405 (45.4)	
Twice a day	374 (27.2)	228 (25.6)	
Three times a day	272 (19.8)	140 (15.7)	
Four times a day	92 (6.7)	72 (8.1)	
Sweets and chocolate consumption			0.0004
Never	73 (5.3)	78 (8.8)	
Sweets and/or chocolate sometimes	965 (70.2)	662 (74.3)	
Sweets every day ± chocolate sometimes	76 (5.5)	35 (3.9)	
Chocolate every day ± sweets sometimes	195 (14.2)	92 (10.3)	
Sweets and chocolate every day	66 (4.8)	24 (2.7)	
Tobacco habits			0.0006
Never smoked	999 (72.7)	549 (61.8)	
Smoker, ≤10 cigarettes per day	182 (13.2)	164 (18.5)	
Smoker, >10 cigarettes per day	63 (4.6)	82 (9.2)	
Used to smoke	130 (9.5)	93 (10.5)	
Marijuana use			0.0506
Never	1,115 (81.1)	678 (76.1)	
Regular user	46 (3.4)	18 (2.0)	
Irregular user	95 (6.9)	76 (8.5)	
Previously used	119 (8.6)	119 (13.4)	

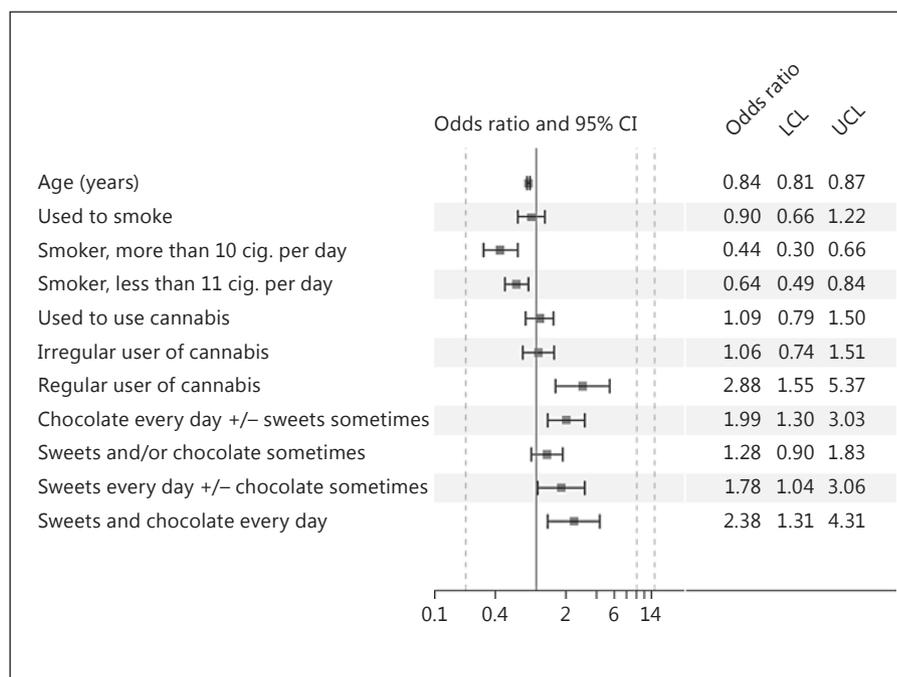
Values are numbers (with percentages in parentheses). Results of univariate analysis. p values adjusted for age as continuous variable. Tobacco habits: four individuals did not report their tobacco habits and were counted as missing data.

Variables Associated with Acne versus Control Group

First, we performed a univariate analysis. Table 2 summarizes the results of this first analysis comparing the acne group with the control group. The sex ratio of the two groups was equal when adjusted for age. Concerning the body mass index, the distribution was as follows: among the 1,367 patients with acne, 155 were overweight (11%) and 33 were obese (2%); among the 883 controls,

118 were overweight (13%) and 47 were obese (5%). Therefore, the number of obese was higher in the controls ($p < 0.05$). There were considerably more tobacco smokers in the control group ($p = 0.0003$). In terms of cannabis, more people who had never smoked cannabis were observed in the control group ($p < 0.10$). There was no difference between the two groups in terms of alcohol intake. There was also no difference between the two groups

Fig. 1. Multivariate analysis comparing patients reporting acne vs. no acne. LCL = Lower control limit; UCL = upper control limit. Odds ratios were calculated against the response 'never' for the variable under consideration.



in terms of fast food, fizzy drinks and milk consumption. However, sweet and chocolate intake of the acne group was considerably higher than that of the control group ($p = 0.0007$).

Second, we performed a multivariate analysis. Figure 1 summarizes the results of the logistic regression. No link was established between overweight/obese people and acne. The daily intake of chocolate and sweets was independently and highly associated with the acne group, with odds ratios of 1.99 (95% CI: 1.30–3.03) and 1.78 (95% CI: 1.04–3.06), respectively, and cumulatively of 2.38 (95% CI: 1.31–4.31). Smoking more than 10 cigarettes a day was highly associated with having no acne, with an odds ratio of 0.44 (95% CI: 0.30–0.66). The regular use of cannabis was associated with acne, with an odds ratio of 2.88 (95% CI: 1.55–5.37).

Discussion

Our study is the first to investigate the link between diet, smoking and acne in France. However, it is not the first study in the world to address this issue [2–7, 9, 11, 13, 14, 22, 23]. A number of studies have been published on this topic across different countries and settings.

We must acknowledge that all these studies have strikingly inconsistent results. We decided that pathophysiol-

ogy would not help explain these contradictory results and could lead to contradictory conclusions. However, these inconsistent results could be explained by the methodological differences of the studies and by the targeted population. The studies are different in terms of design, survey, case-control, recruitment, basis (school, community or hospital-based), case definitions, reports or examinations, the evaluation of risk factors, variables, variable quantification, etc. [1–7, 9, 14, 22, 23]. Considering the memory bias, we did not try to assess the exposure before the onset or first diagnosis of acne. Therefore, we cannot differentiate association with given exposure variables with a risk factor or a consequence.

In our study we focused on dietary habits and smoking in a population selected according to age (between 15 and 25 years) using a survey based on self-report. Our aim was to further investigate this issue, which has already been evaluated in the literature with inconsistent results.

Previous studies on acne, diet and smoking were mainly the products of Western-based research, but conducted in different countries of Europe and North America [1, 5, 11, 13, 22, 23] and exceptionally in Asia [2–4, 6, 7, 9]. As such, the targeted population had different smoking and eating habits (quantitatively and qualitatively), along with different genetic backgrounds. We will therefore discuss our results in line with previous studies, taking into account the methodology and target group.

In comparing the eating habits of individuals reporting to have acne with those reporting not to have acne, only the consumption of sweets and chocolate was associated with acne. Most chocolates available are heavily supplemented with dairy products and sugar. Sugary fizzy drink consumption, a very high source of sugar especially for those who drink 1 liter or more per day, was not different between patients and controls. Therefore, if the daily consumption of chocolate and sweets remained independently and highly associated with moderate-to-severe acne, further studies need to investigate the respective roles of sugar, lipids and dairy in these products with regard to acne.

We were unable to establish any link with milk consumption. Several studies have revealed a link between milk consumption (especially skimmed milk) and acne in Italy and the USA [1, 15, 16, 21]. This discrepancy between our study and other studies could be explained by the different profile of the consumption of milk and milk derivatives in this target population. For example, adults in France drink less milk and eat more cheese and butter than in the USA. Future studies should take these specificities into account [17–19].

In our study we did not find any link between being overweight/obese and acne. These results are contradictory to those previously published in the literature, according to which being overweight or obese is generally considered to be a risk factor for acne [1, 7]. Again, this contradiction should be discussed in line with the target group and methodology.

In comparing the smoking habits of individuals reporting to have acne with those reporting not to have acne, tobacco smoking was associated with no acne. Tobacco smoking seems to impact on acne by helping to prevent severe acne [24]. We failed to show any data on

acne and cannabis smoking in the literature. Nevertheless, cannabis smoking is common among teenagers in Western countries. Therefore, we investigated this issue in our survey. In comparing the cannabis-smoking habits of individuals reporting acne with those reporting not to have acne, cannabis smoking was associated with acne. These results could be considered as contradictory to those we obtained with tobacco. In France, cannabis is usually smoked in combination with tobacco, and the consumption of both tobacco and cannabis are strongly linked epidemiologically [25]. Nevertheless, although both types of smoke share the same components, only cannabis smoke contains tetrahydrocannabinol. Our findings suggest a specific role for each component of smoke (nicotine, tar and THC). In light of the literature, numerous hypotheses could be put forward, considering each of these components can prove certain facts and their opposites. We will refrain from discussing these hypotheses, which should be supported by specific studies.

In short, our study adds new findings regarding risk factors for acne. The consumption of sweets and chocolate and cannabis smoking were associated with acne. However, we found that tobacco acts as a protective factor.

We failed to investigate and demonstrate the respective roles of sugar, lipids and milk in acne. This role was analyzed with contradictory results. Future studies should take these contradictions into account. An international study with a common questionnaire is required to solve this important issue.

Disclosure Statement

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