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Relationships of Self-Reported Dietary Factors and Perceived Acne Severity in a Cohort of New York Young Adults

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ABSTRACT

Background Recent observational and experimental evidence suggests that diet may contribute to acne prevalence.

Objectives To examine the differences in select dietary factors (glycemic index [GI], total sugar, added sugar, fruit/fruit juice, fruit/vegetables, vegetables, saturated fat, *trans* fat, and number of milk and fish servings perday) between groups of self-reported acne severity. Secondary objectives were to investigate the differences in food-aggravated acne beliefs and acne-specific quality-of-life between groups of self-reported acne severity.

Design This study utilized a cross-sectional design.

Participants/setting A total of 248 (115 male, 133 female) participants, age 18 to 25 years, completed questionnaires designed to measure self-reported acne severity, select dietary factors, food-aggravated acne beliefs, acne-specific quality-of-life, and anthropometric and demographic characteristics. The Block fat/sugar/fruit/vegetable food frequency questionnaire assessed usual dietary intake. Data were collected in New York City between January and May 2012.

Statistical analyses performed One-way between groups analysis of variance examined differences in dietary factors, anthropometric characteristics, and acne-specific quality-of-life between groups of self-reported acne. χ^2 tests compared food-aggravated acne beliefs and demographic characteristics between groups of self-reported acne.

Results Compared with participants with no or mild acne, participants with moderate to severe acne reported greater dietary GI ($P<0.001$), added sugar ($P<0.001$), total sugar ($P<0.001$), number of milk servings per day ($P<0.001$), saturated fat ($P<0.001$), and *trans*-fatty acids ($P<0.001$), and fewer servings of fish per day ($P=0.002$). Among all participants, 58.1% perceived diet to aggravate or influence acne.

Conclusions This study suggests that diet, particularly dietary GI, saturated fat, *trans* fat, milk, and fish may influence or aggravate acne development. Future research is necessary to elucidate the proposed mechanisms linking diet and acne and determine the impact of medical nutrition therapy on acne development.
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ACNE IS A WIDESPREAD AND COMPLEX SKIN disease among developed nations, affecting nearly all young adults between the ages of 15 to 17 years.[1,2] Although acne is commonly perceived as an adolescent disease, acne often persists well into adulthood.[3] Despite acne's high prevalence, comparatively little is known on the therapeutic role of diet in acne pathogenesis. Historically, medical nutrition therapy was a routine part of dermatological treatment for patients with acne. Dermatologists frequently discouraged patients with acne from eating excessive carbohydrate, chocolate, fat, sugar, and milk.[4] Diet, as a potential treatment for acne, fell out of favor after two influential studies during the 1960s and 1970s demonstrated that diet was not associated with acne induction or aggravation.[5,6] Consequently, most medical professionals dismissed the diet–acne relationship as myth. Unfortunately, these well-known studies were predominately based on research with considerable methodological limitations, making these diet–acne conclusions controversial.[4,7,8] Interestingly, 62% to 72% of patients with acne continue to believe diet contributes to acne development and severity.[9]

The diet–acne connection resurfaced in 2002 after Cordain and colleagues reported acne prevalence is nonexistent among non-Westernized populations.[10] These individuals predominately consume a traditional plant-based diet that is low in fat, added sugars, glycemic index (GI), glycemic load (GL), and dairy, and high in fish, n-3 fatty acids, fruits, and vegetables.[10,11] The absence of acne among these populations suggests environmental factors, including diet, may influence

or promote acne development. This observation helped ignite a new interest in the diet–acne relationship.

Acne typically results from excess sebum production, follicular hyperproliferation, bacterial colonization, and inflammation. Androgen hormones and various other hormonal mediators, including insulin-like growth factor-1 (IGF-1), are associated with acne development predominantly by influencing sebum or oil production in the sebaceous glands and increasing unregulated tissue growth. The role of diet in acne pathogenesis is due to the ability of some foods to stimulate these acne-promoting pathways. In recent years, researchers have examined the association between acne and a variety of dietary factors including dietary GI, GL, milk, and n-3 fatty acids. Compared with other dietary factors, the relationship is strongest among diets high in GI, GL, and milk.[4,7,12]

Foods with a high GI are rapidly digested and absorbed, causing hyperglycemia and reactive hyperinsulinemia.[13,14] Because the GL takes into account the quantity and characteristics of the carbohydrate consumed, the overall effect of a food on blood glucose and insulin concentrations can be estimated. A high-GL diet is implicated in the etiology of acne predominately by inducing hyperinsulinemia and increasing insulin and IGF-1 concentrations.[8,15] The acne-promoting or -aggravating mechanisms of milk and dairy are not well understood and seem to be multifactorial. Similar to high-GL foods, milk consumption increases insulin and IGF-1 concentrations.[16] The hormonal and protein content of milk may further augment acne development by activating other pathways.[16-18]

In recent years, researchers have examined the protective role of n-3 polyunsaturated fatty acids in acne development. Diets high in n-3 polyunsaturated fatty acids, including fatty fish, may suppress inflammatory cytokine production, decreasing acne.[8,19] Unfortunately, the literature investigating dietary fat or fish consumption and acne is limited and requires further study.

The primary aim of this study was to examine differences in select dietary factors (GI, total sugar, added sugar, fruit/fruit juice, fruit/vegetables, vegetables, saturated fat, *trans*-fatty acid, and number of milk and fish servings/day) and self-reported acne among young adults. Secondary objectives were to evaluate the differences in food-aggravated acne beliefs, acne-specific quality-of-life, and self-reported acne among young adults. The present study will add to the existing diet–acne literature by using validated tools to assess usual dietary patterns and self-reported acne among young adults.

METHODS

The study protocol followed a cross-sectional design. Participants were recruited between January and May 2012 in public locations in New York, NY. Participants were included if they could read and speak the English language and were between 18 to 25 years. Participation was voluntary, without incentives. The University Committee on Activities Involving Human Subjects at New York University approved this study and all participants provided informed consent prior to data collection.

Eligible participants completed two questionnaires at the time of recruitment. The Block Fat/Sugar/Fruit/Vegetable Screener, a validated food frequency questionnaire (FFQ), provided estimates of usual consumption of total sugar, added sugar, fruit/fruit juice, fruit/vegetable, vegetable, saturated fat, and *trans*-fatty acid intakes.[20] The reliability of this FFQ ranges from 0.56 for vegetables and 0.74 for *trans* fats. The validity ranges from 0.42 for *trans* fat to 0.92 for total sugar.[20] The Block FFQ analysis additionally provided an estimate of dietary GI and frequency of milk and fish consumption.

The second questionnaire collected information on acne severity, food-aggravated acne beliefs, acne-specific quality-of-life, and participant demographic and anthropometric characteristics. Each participant was provided with a clear description of acne, which was developed from a validated acne questionnaire.[21] A dermatologist reviewed the questionnaire and acne categories. Based on this explanation, participants self-reported acne severity by selecting the category that best described their current skin and acne condition. A dermatologist divided participants into three groups based on acne severity: no acne, mild acne, or moderate to severe acne. This questionnaire also collected information on participant food-aggravated acne beliefs. Food groups investigated included candy, chocolate, french fries, milk, soda and pizza, which have previously been hypothesized to influence acne development.[4,8,10] Each participant also completed a validated acne quality-of-life scale.[22] This scale is sensitive to self-reported changes in acne severity and the psychological impact associated with acne. The reported reliability and validity of this acne quality-of-life scale is 0.94 and 0.95, respectively.

In addition, participants answered demographic and anthropometric questions including age, relevant medical history, history of oral contraceptive use, and history of smoking. Anthropometric characteristics included self-reported weight and height. Body mass index (BMI) was calculated by dividing weight (kg) over the square of height (m). Participants were categorized into weight classifications using BMI.[23]

All statistical analyses were performed using SPSS version 20.0 (2011, SPSS, Inc). Descriptive analysis calculated percentages, means, and standard deviations (SDs). One-way between-groups analysis of variance examined the differences between dietary factors (GI, total sugar, added sugar, fruit/fruit juice, fruit/vegetables, vegetables, number of servings/day of milk and fish, saturated fat, and *trans* fat), anthropometric characteristics, and acne quality-of-life between self-reported acne groups (no acne, mild acne, and moderate to severe acne). χ^2 tests compared food-aggravated acne beliefs and self-reported acne. Participants were collapsed into two groups, (no and mild acne and moderate to severe acne) to analyze differences in food-aggravated acne beliefs and acne. P values <0.05 were considered significant.

RESULTS

A total of 281 young adults with and without acne were recruited and provided informed consent. Two participants were excluded from the analysis due to incomplete questionnaires. Thirty-one participants were excluded due to reported energy intakes <500 kcal or $>5,000$ kcal per day. A total of 248 adults (115 males, 133 females), age 18 to 25 years (mean age, 21±2 years), were included in the final analyses. Ninety-two participants (37.1%) reported no acne, 89 (35.9%)