Certain Dairy Products Can Negatively Affect Acne Severity in Young Adult Korean and Malaysian Populations

Velika Lotwala

Pacific University
 Certain Dairy Products Can Negatively Affect Acne Severity in Young Adult Korean and Malaysian Populations

Abstract

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**Results:** Forty-one articles were found and reviewed for relevancy. Two studies fit the inclusion criteria and were included in this systematic review. Both studies were case-control studies. In both studies, dietary data was collected by self-completed questionnaires and a dermatologist evaluated acne severity. Both studies found a positive association with certain dairy products and acne vulgaris. This supports the idea that diet has a role in the severity of acne in young adults of certain Asian descent.

**Conclusion:** The results of this literature review support the correlation between acne vulgaris and certain dairy products amongst Korean and Malaysian young adults. Further research including clinical trials is needed to evaluate the links between dairy and acne. Longer study periods and follow-up is needed to evaluate long-term effects of diet modifications and acne severity. Additional research is also needed to determine if medical nutrition therapy is effective against acne formation. Given these studies, nutritionists and dermatologists should recognize a possible correlation between diet and acne when treating patients with acne vulgaris. This connection should be considered in addition to conventional methods for the treatment of acne.

**Keywords:** Acne vulgaris and dairy products.

**Degree Type**
Capstone Project

**Degree Name**
Master of Science in Physician Assistant Studies

**First Advisor**
Saje Davis-Risen, PA-C, MS

**Second Advisor**
Annjanette Sommers, PA-C, MS

**Keywords**
acne vulgaris, acne, dairy products, dairy, Korea, Malaysia
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Velika Lotwala

A Clinical Graduate Project Submitted to the Faculty of the
School of Physician Assistant Studies
Pacific University
Hillsboro, OR
For the Masters of Science Degree, August 13, 2016

Faculty Advisor: Saje Davis-Risen, PA-C, MS
Clinical Graduate Project Coordinator: Annjanette Sommers, PA-C, MS
Biography

Velika Lotwala is a native of Phoenix, Arizona. She received her Bachelor of Arts degree in Broadcast Journalism and Spanish from Arizona State University. After graduating, she worked as an undercover investigative reporter specializing in medical and science journalism. Prior to the start of PA school, she worked as a physical therapy technician and marketing specialist while tutoring future health care providers in anatomy, microbiology and chemistry. Upon graduation, she is interested in pursuing a career in dermatology.
Abstract

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Acknowledgements

To my Mom, Thank you for your endless support, encouragement and love. You taught me the definition of achieving your goals through hard work and perseverance and for this, I am forever grateful.

To Sossan Al-Darraji: Thank you for your willingness and dedication in helping me to succeed in this program. Without you, I would not be where I am today. You inspire me to be better everyday.
Table of Contents

Biography 2
Abstract 3
Acknowledgements 4
Table of Contents 5
List of Tables 6
List of Figures 6
List of Abbreviations 6
Background 7
Methods 8
Results 9
Discussion 13
Conclusion 15
References 16
Table I. Quality Assessment of Reviewed Articles 17
Table II. Summary of Findings, Malaysia Study 18
Table III. Summary of Findings, Korea Study 19
Figure I. Summary of Findings, Korea Study 20
List of Tables

Table I  Quality Assessment of Reviewed Articles
Table II  Summary of Findings, Malaysia Study
Table III  Summary of Findings, Korea Study

List of Figures

Figure I  Summary of Findings, Korea Study

List of Abbreviations

AF  Aggravated by food
CASS  Comprehensive acne severity scale
DHEAS  Dehydroepiandrosterone sulfate
DHT  Dihydrotestosterone
GI  Glycemic index
GRADE  Grading of Recommendations, Assessment, Development and Evaluation
IGF-1  Insulin-like growth factor-1
IGFBP-3  Insulin-like growth factor binding protein-3
NAF  Not aggravated by food
OR  Odds Ratio
PP2  Post prandial 2 hours blood glucose
SLE  Systemic Lupus Erythematosus
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BACKGROUND

Acne vulgaris is a widespread and complex skin condition affecting mainly young adults in developed nations. Acne is a multifactorial disease and the correlation between diet and acne has long been debated. Other factors include genetics, hormones, stress, and certain hygiene techniques.¹

Acne begins with the retention of desquamated keratinocytes within the pilosebaceous unit leading to follicular plugging (microcomedo), and as the keratinocytes and sebum continues to accumulate, the microcomedo wall eventually ruptures which leads to inflammation. *Propionibacterium acnes*, an anaerobic/microaerophilic, gram-positive rod, resides within the sebaceous follicle and also incites an inflammatory response by acting on toll-like receptor-w, which may stimulate the secretion of cytokines, such as interleukin (IL)-6 and IL-8 by follicular keratinocytes and IL-8 and -12 in macrophages. Hormonal influences from estrogen and androgens, such as dehydroepiandrosterone sulfate (DHEAS), have been shown to increase sebum production young adults.²

Another hormone mediator, insulin-like growth factor-1 (IGF-1), has been associated with acne development by influencing sebum production in the sebaceous glands and increasing unregulated tissue growth. Milk consumption increases IGF-1 concentrations in the body and thus causes an increase in acne development and formation. Milk contains hormones, carbohydrates, and protein. The hormones contained in milk include reproductive, nonreproductive, and growth hormones, which may contribute to the development of acne.
Specific hormones include the precursors of dihydrotestosterone (DHT) and IGF-1. DHT precursors may be converted to DHT, which is the main acne-stimulating androgen through enzymes contained within the human pilosebaceous unit. Milk contains IGF-1 and consumption of milk increases serum IGF-1 concentrations more so than meat products.²

Foods with a certain glycemic indices (GI) also have the ability to activate certain acne-promoting pathways. High GI foods are rapidly digested and absorbed in the body causing hyperglycemia and hyperinsulinemia. Hyperinsulinemia causes increased androgen bioavailability as well as an increase in IGF-1 serum concentrations in the body. Therefore, low glycemic index diets have been recommended in decreasing acne production. Although several studies have been done on GI and acne, this was not the focus of this literature review.

The incidence of acne has increased over the past several decades in Korea.³ Diet changes could be the reason for the increase in acne amongst Korean young adults. Consumption amongst Koreans that used to be rare, now includes carbohydrates, carbonated drinks and certain dairy products. The prevalence of facial acne amongst teenagers in Malaysia was also reported at 67.5%.⁴ The adoption of a Western diet in countries such as Korea and Malaysia could be associated with an increase in acne. Investigating the entirety of changes in these cultures’ diets would provide the most comprehensive answer for the increase in acne cases; however, dairy seems to have the most causal relationship with acne. Therefore, the primary aim of this literature review was to address the relationship between certain dairy products and acne severity in young adults of Korea and Malaysia.

METHODS
An exhaustive literature search of available medical literature was performed using MEDLINE-Ovid, MEDLINE-PubMed, Cochrane, EMBASE, Web of Science, CINAHL, and EBM Review Multifile. Keywords used included: acne, acne vulgaris, dairy, and dairy products. The search was narrowed to include only English language articles written within the past 10 years. Not included in this literature review was the discussion of whey protein supplementation, lactoferrin, fermented milk, breast milk, or chocolate. The bibliographies of the articles were further searched for relevant sources. Relevant articles were assessed for quality using the Grading of Recommendation, Assessment, Development, and Evaluation (GRADE).5

RESULTS

The initial result of the search yielded 41 articles for review. After screening relevant articles, a total of two articles3,4 met inclusion and exclusion criteria. Both articles were case-control studies. See Table I.

Malaysia Study

In this case-control study, 44 patients with acne vulgaris and 44 controls aged 18 to 30 years from October 2010 to January 2011 were included. All participants were recruited through a convenience sampling method and matched by age, gender, and ethnicity. Comprehensive acne severity (CASS) was used to determine acne severity. A dermatologist further evaluated and assessed acne severity on all participants. The controls in this study were healthy individuals who scored 0 (clear) or 1 (almost clear) on CASS. Measurements of body weight, height, and body fast percentage were also conducted. Participants with chronic diseases such as Systematic Lupus Erythematosus (SLE), diabetes and or heart disease were excluded.
Participants were asked to complete a questionnaire of dietary habits, which recorded the presence of a family history of acne vulgaris, in particular. Food intake was recorded on two weekdays and one weekend day in a three-day food diary. The questionnaire also included perceptions and beliefs on food that affect acne vulgaris occurrences. The questionnaire was validated with Cronbach-\(\alpha\) value of 0.684. Further validation occurred in face-to-face interviews using an adapted structured, validated questionnaire on the frequency of milk and dairy product intake. Questionnaires were returned via mail to researchers who then followed up and validated data through emails and phone calls.\(^4\)

A total of 94 patients agreed to participate in this study, however 6 subjects did not return their three-day diet records. Of the 88 participants, 29 were female and 15 were male. Of the participants that had acne vulgaris, 81\% reported a family history of the disease citing either a parent or sibling compared to the control group. The majority of the control group reported no family history of acne vulgaris.

Higher frequency of milk and ice cream intake were positively associated with acne vulgaris occurrence (see Table II). Consumption of milk greater than once a week increased the risk of acne vulgaris occurrence by 4 times. Consumption of ice cream greater than once a week also increased the risk of having acne by 4 times compared to the control group. There were 86.4\% of patients with acne vulgaris who drank milk more frequently, greater than once a week, compared to 61.4\% of the control group. In addition, 56.8\% of acne vulgaris patients, consumed a higher frequency of ice cream, greater than once a week, compared to 22.7\% of the control group.
There were significant limitations to this study, which need to be addressed. The study was limited in its design by only being able to associate acne vulgaris with certain dairy products, but not necessarily the cause and effect of consuming these products. Furthermore, acne severity should be assessed through acne lesion counts on patients’ skin in order to further correlate specific types of foods and frequency of consumption. Repeated 3 day food records would have been beneficial in determining acne, however this was not done due to the limited study duration. Measuring the amount of dairy protein consumed would be important in this study as well, considering the proteins in milk activate the acne promoting pathways in the body. A retrospective food frequency questionnaire would be helpful in determining the association between specific dairy products and acne development. Acne is a multifactorial disease, therefore factors such as stress, inadequate sleep, smoking, alcohol consumption, and facial hygiene should also be taken into account. Despite these limitations, a positive correlation was found further supporting the relationship between diet and acne.

**Korea Study**

In this case-control study, 3,783 patients with acne vulgaris and 502 controls were included. Participants were asked to complete a questionnaire about their diet habits including types of food consumed, amount of food eaten during a one-week time period, snacks, and midnight meals. The questionnaire also included questions regarding foods and events that did and did not aggravate acne. Acne patients were further categorized into “aggravated by food” group (AF) and a “not aggravated by food” group (NAF). Also included were questions regarding precipitating events to acne such as stress, food intake, menstruation, fatigue, and lack of sleep. Lastly, the questionnaire addressed regularity of meals by assessing inter-meal intervals.
and skipping a meal. Skipping each meal more than three times a week was considered irregular meal habits. The questionnaire used was adapted from an existing questionnaire used in the diabetic clinic at Seoul National University Hospital, where the study took place. Specialists in nutrition and statistics verified the questionnaire for accuracy, reproducibility, and validity. All questions were multiple-choice. After evaluating the results of the questionnaire, participants were asked to confirm their answers. For participants with acne, blood tests for insulin, IGF-1, insulin-like growth factor binding protein-3 (IGFBP-3), postprandial 2 hours blood glucose (PP2), and DHEAS were performed. The controls in this study were age-matched healthy individuals who did not suffer from acne and did not receive any treatment for acne. Age, gender, weight, height, BMI, and severity of acne were recorded for all participants at the initial visit. Two independent dermatologists, using the Dr. Cunliffe’s grading system, further assessed patients’ severity of acne. Data collected was analyzed by multiplying the frequency of consumption of each unit of food, and the differences between the three groups, control, AF and NAF, were compared.

The intake of processed cheeses was significantly higher in the acne patients compared to the controls (see Table III). Also worth noting was the intake of certain foods such as hamburgers, doughnuts, croissants, and carbonated drinks were significantly higher in the acne patients compared to the controls. Overall, 54% of acne patients stated their acne was further aggravated by food. The consumption of these foods further supports a correlation between recent dietary changes and acne prevalence amongst Korean young adults.

The study placed major emphasis on changes in dietary patterns of Koreans. Preference has shifted from carbohydrates to fats, meats, carbonated drinks, snacks, and junk food.
Furthermore, the number of diabetic, obese, and overweight Koreans is increasing annually. This could attribute to the increase in acne vulgaris amongst Korean young adults.

The study found the regularity of meal habits was significantly higher in the control group than in acne patients. (See Figure I) These findings are relevant in that external factors such as stress and lack of sleep can cause irregular meal habits and skipping meals. Stress is a well-known cause of acne further exacerbating the condition.

There were several limitations in this study. Acne was assessed based on a one-week diet questionnaire. Further studies need to be done in order to prove a correlation between specific food types along with the frequency of consumption and acne lesion counts. Furthermore, aggravated foods verses non-aggravated foods were assessed solely based on patients’ answers to the questionnaire. Although the questionnaire was verified and confirmed, further intervention would be useful in determining a link between certain aggravating foods. The questionnaire used was adapted from an existing questionnaire. Although validated food frequency questionnaires are available, an adapted questionnaire was necessary in this study in order to fully assess the diverse cuisine of Korea. Therefore a limitation or bias could present in the results of this study based on the modified questionnaire.

**DISCUSSION**

This review aimed to investigate the correlation between certain dairy products and acne severity in Korean and Malaysian young adults. Of the articles reviewed, there is insufficient, high quality evidence to support or refute diet as a role in acne. However, despite the methods used to obtain information for these studies, short study duration, and limited follow up,
evidence does suggest a higher frequency of certain dairy products including milk, ice cream, and processed cheese, were positively associated with acne vulgaris.

Neither study\textsuperscript{3,4} mentioned the fact that all dairy comes from pregnant cows therefore, the consumption of dairy includes the hormones from both the female and male cows as a result of the reproductive process. Further studies can be done to evaluate organic, raw, and bovine growth hormone free milk in the event patients suffering from acne vulgaris do not wish to eliminate dairy completely from their diet.\textsuperscript{6}

Furthermore, neither study\textsuperscript{3,4} mentioned the use of supplemental vitamins to aid in the treatment of acne. Eliminating dairy from the diet can lead to deficiencies, which can easily be corrected by adding omega-3 anti-inflammatory fats, zinc, evening primrose, vitamin A, and vitamin E. Although more studies are needed to determine if replacing dairy products with nutritional elements alone, it is an effective treatment option for those patients with acne vulgaris.

Both studies\textsuperscript{3,4} linked hormonal changes as a result of consuming certain dairy products trigger the formation of acne. However, neither study offer alternative recommendations or effective treatment options in lieu of traditional acne vulgaris treatments such as topical creams or oral antibiotics. Consuming more fruits and vegetables that contain anti-inflammatory and anti-oxidant properties, taking a probiotic to reduce inflammation in the digestive tract, and exercise are simple yet inexpensive and safe management options to aid in the care of acne.\textsuperscript{6}

In both studies,\textsuperscript{3,4} a retrospective food diary completed by participants would be an appropriate tool to measure dietary intake and acne development. However, retrospective studies
could present with bias such as recall bias, which could heavily influence results of the study. Heredity factors were not taken into account in the Korea study nor were environmental factors. These factors can vastly impact study results. Furthermore complicating the treatment of acne is the prevalence in young adults. Their dietary behaviors could be challenging to modify given the studies found milk, ice cream, and processed cheese may be correlated with acne. Ultimately, acne vulgaris is a multifactorial disease and many different aspects need to be taken into account when treating patients.

CONCLUSION

The results of this literature review though very low in quality support the correlation between acne vulgaris and certain dairy products amongst Korean and Malaysian young adults. Health care providers can advise young adult patients of Korean and Malaysian descent to modify their diet to exclude certain dairy products such as milk, ice cream, and processed cheeses. Diet modifications are safe and inexpensive treatment plans to implement prior to more extreme treatments for acne vulgaris. Further research including clinical trials is needed to evaluate the links between dairy and acne. Specific foods and acne severity should be evaluated in order to make a definitive distinction in the role of diet and acne.
References


<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Limitations</th>
<th>Indirectness</th>
<th>Inconsistency</th>
<th>Imprecision</th>
<th>Publication bias</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaysia⁴</td>
<td>Case Control</td>
<td>Very Serious&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Not Serious</td>
<td>Not Serious</td>
<td>Not Serious</td>
<td>Unlikely</td>
<td>Very Low</td>
</tr>
<tr>
<td>Korea&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Case Control</td>
<td>Not Serious</td>
<td>Not Serious</td>
<td>Not Serious</td>
<td>Not Serious</td>
<td>Unlikely</td>
<td>Low</td>
</tr>
</tbody>
</table>

<sup>a</sup>Use of a questionnaire, which was limited in duration and details, which prevented addressing possible confounders.
### Table II. Summary of Findings, Malaysia Study

Comparison of milk and dairy products intake frequencies between cases and controls

<table>
<thead>
<tr>
<th>Milk and dairy products</th>
<th>Frequencies</th>
<th>Cases (n=44)</th>
<th>Controls (n=44)</th>
<th>p Value</th>
<th>Odds Ratio (OR)</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td>≥ Once a week</td>
<td>38 (86.4)</td>
<td>27 (61.4)</td>
<td>0.008</td>
<td>3.988</td>
<td>(1.391-11.434)</td>
</tr>
<tr>
<td></td>
<td>0 - &lt; Once a week</td>
<td>6 (13.6)</td>
<td>17 (38.6%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ice Cream</td>
<td>≥ Once a week</td>
<td>25 (56.8)</td>
<td>10 (22.7)</td>
<td>0.001</td>
<td>4.474</td>
<td>(1.777-11.266)</td>
</tr>
<tr>
<td></td>
<td>0-&lt; Once a week</td>
<td>19 (43.2)</td>
<td>34 (77.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table III. Summary of Findings, Korea Study

Food preferences of the acne aggravated by food, acne not aggravated by food and control groups

<table>
<thead>
<tr>
<th>Food Preferences</th>
<th>Control (%)</th>
<th>AF (%)</th>
<th>NAF (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processed cheese</td>
<td>4.5</td>
<td>6.3</td>
<td>5.8</td>
</tr>
</tbody>
</table>
Figure I. Summary of Findings, Korea Study

Regularity of dietary habits by each meal among AF, NAF and control groups.³