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# The relationship between the use of cosmetics and the occurrence of acne vulgaris in female medical students at the faculty of medicine UKI in the year 2016

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## Abstract

Acne vulgaris is a chronic inflammation of the pilosebaceous follicles caused by various factors, typically characterized by distinctive clinical features and usually occurring in adolescents and young adults. The use of cosmetics can lead to the development of acne in women, as the ingredients used may be comedogenic or acnegenic. The current use of cosmetics is undeniably an essential need for women. The aim of this study is to determine the relationship between the use of different types of cosmetics and the occurrence of AV. The variables examined in this research include compact powder, loose powder, sunblock, foundation, and blush. This study is an observational research with a cross-sectional design involving a sample of 100 female medical students from the Faculty of Medicine at the Christian University of Indonesia, divided into two respondent groups: one with acne and one without acne. The chi-square test is used for the analysis. From the research results, it can be concluded that, of the five variables studied, only the use of compact powder showed a significant correlation.

**Keywords:** Acne vulgaris; Compact powder; Sunblock; Foundation; Blush

## 1. Introduction

The current use of cosmetics is an essential need for women; however, cosmetics can lead to skin diseases such as Acne Vulgaris (AV). AV is commonly found in adolescents and young adults[1-3]. The occurrence of AV is also influenced by other factors such as the content of cosmetics, skin type (sensitive skin), or the frequency of use[4]. There are four pathogeneses of acne, namely increased sebum production, hyperproliferation of pilosebaceous follicles, colonization of Propionibacterium acnes (PA), and the inflammatory process[1-5]. Clinical symptoms of acne include comedones, papules, pustules, nodules, and cysts[6]. Given the widespread use of cosmetics and the prevalence of AV, the purpose of this study is to prove the relationship between the use of different types of cosmetics (loose powder, compact powder, sunblock, foundation, blush) and the occurrence of AV.

## 2. Material and methods

The research design used is observational with a cross-sectional design. Inclusion criteria are female students willing to participate as research respondents, aged between 18-23 years, and have used cosmetics for at least 2 weeks. Exclusion criteria are female students undergoing acne treatment by a general practitioner, dermatologist, or purchasing acne medication from a store/pharmacy in the last 2 weeks. The minimum sample size used is 50 samples. Data is collected through questionnaire completion, followed by a physical examination according to the clinical presentation of acne vulgaris. Acne vulgaris is categorized as moderate (acne <20) and severe (acne >20), and types of

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cosmetics include compact powder, loose powder, sunblock, foundation, and blush. Data processing is done using SPSS software for univariate and bivariate analysis using chi-square. Research ethics involve obtaining informed consent, prioritizing the interests of respondents, and not imposing any charges.

## 3. Result

Univariate analysis describes the characteristics of 100 respondents, including age, class, acne issues, and the use of loose powder, compact powder, sunblock, foundation, and blush among the 100 respondents.

**Tabel 1** Distribution of Respondent Characteristics

| | | Frequency | Percentage |
|---|---|---|---|
| Age | 18 years | 18 | 18.00 |
| | 19 years | 11 | 11.00 |
| | 20 years | 13 | 13.00 |
| | 21 years | 49 | 49.00 |
| | 22 years | 9 | 9.00 |
| | 23 years | 0 | 0.00 |
| Class | 2013 | 69 | 69.00 |
| | 2014 | 2 | 2.00 |
| | 2015 | 3 | 3.00 |
| | 2016 | 26 | 26.00 |
| Experiencing Acne Issues | Not experiencing | 50 | 50.00 |
| | Moderate acne (< 20 acne) | 48 | 48.00 |
| | Severe acne(> 20 acne) | 2 | 2.00 |
| Use of loose powder | Never | 36 | 36.00 |
| | Once a day | 48 | 48.00 |
| | Twice a day | 11 | 11.00 |
| | Three times a day | 5 | 5.00 |
| Use of Sunblock | Never | 48 | 48.00 |
| | Once a day | 46 | 46.00 |
| | > More than Once a day | 6 | 6.00 |
| Use of foundation | Never | 66 | 66.00 |
| | Once a day | 28 | 28.00 |
| | Twice a day | 6 | 6.00 |
| | > More than twice a day | 0 | 0.00 |
| *Use of Blush on* | Never | 73 | 73.00 |
| | Once a day | 25 | 25.00 |
| | > More than Once a day | 2 | 2.00 |
| Total | | 100 | 100 |

Bivariate analysis was conducted to examine the relationship between the use of cosmetics, including compact powder, loose powder, sunblock, foundation, and blush on, with acne vulgaris using cross-tabulation and the chi-square ($x^2$) method.

**Table 2** Cross-tabulation between the Use of Compact Powder and the Occurrence of Acne Vulgaris

| **Acne Vulgaris** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **No Acne** | | **Moderate acne** | | **Severe acne** | | **Total** |
| | | **n** | **%** | **n** | **%** | **n** | **%** | |
| Compact Powder | Never | 25 | 25 | 21 | 21 | 0 | 0 | 46 |
| | 1x a day | 14 | 14 | 16 | 16 | 0 | 0 | 30 |
| | 2x a day | 7 | 7 | 5 | 5 | 1 | 1 | 13 |
| | 3x a day | 4 | 4 | 6 | 6 | 0 | 0 | 10 |
| | 4x a day | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Total | | 50 | 50 | 48 | 48 | 2 | 2 | 100 |

**Table 3** Chi-Square Tests

| **Value** | | **Asymp. Sig. (2-sided)** |
|---|---|---|
| N | 100 | 0.000 |
| df | 8 | |
| Pearson Chi-Square | 54.082 | |
| Critical Value | 15.507 | |
| Conclusion | Significant | |

The result of the analysis of compact powder yielded a $x^2$ value of 54.082, which is greater than the $x^2$ table value. Additionally, the p-value is less than 0.05, leading to the conclusion that there is a significant relationship between the use of compact powder and the occurrence of acne vulgaris.

**Table 4** Cross-tabulation between the Use of Loose Powder and the Occurrence of Acne Vulgaris

| **Acne Vulgaris** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **No acne** | | **Moderate acne** | | **Severe acne** | | **Total** |
| | | **n** | **%** | **n** | **%** | **n** | **%** | |
| Loose Powder | Never | 22 | 22 | 14 | 14 | 0 | 0 | 36 |
| | 1x a day | 19 | 19 | 27 | 27 | 2 | 2 | 48 |
| | 2x a day | 6 | 6 | 5 | 5 | 0 | 0 | 11 |
| | 3x a day | 3 | 3 | 2 | 2 | 0 | 0 | 5 |
| Total | | 50 | 50 | 48 | 48 | 2 | 2 | 100 |

**Table 5** Chi-Square Tests

| Value | | Asymp. Sig. (2-sided) |
|---|---|---|
| N | 100 | 0.466 |
| df | 6 | |
| Pearson Chi-Square | 5.627 | |
| Critical Value | 12.592 | |
| Conclusion | Not Significant | |

After the analysis, the calculated $x^2$ value is (5.627), which is less than the $x^2$ table value, and the p-value is 0.466, where the p-value is greater than 0.05. Therefore, it can be concluded that there is no significant relationship between the use of loose powder and the occurrence of acne vulgaris.

**Table 6** Cross-tabulation between the Use of Sunblock and the Occurrence of Acne Vulgaris

| Acne Vulgaris | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | No Acne | | Moderate acne | | Severe acne | | Total |
| | | n | % | n | % | n | % | |
| Sun block | Never | 27 | 27 | 21 | 21 | 0 | 0 | 48 |
| | 1x a day | 20 | 20 | 24 | 24 | 2 | 2 | 46 |
| | >1x a day | 3 | 3 | 3 | 3 | 0 | 0 | 6 |
| Total | | 50 | 50 | 48 | 48 | 2 | 2 | 100 |

**Table 7** Chi-Square Tests

| Value | | Asymp. Sig. (2-sided) |
|---|---|---|
| N | 100 | 0.483 |
| df | 4 | |
| Pearson Chi-Square | 3.467 | |
| Critical Value | 9.488 | |
| Conclusion | Not Significant | |

The analysis resulted in a calculated $x^2$ value of 3.467, as $x^2$ hitung < $x^2$ tabel, and the obtained p-value is 0.483. When the p-value is greater than 0.05, it can be concluded that there is no significant relationship between the use of foundation and the occurrence of acne vulgaris.

**Table 8** Cross-tabulation between the Use of Foundation and the Occurrence of Acne Vulgaris

| Acne Vulgaris | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | No Acne | | Moderate acne | | Severe acne | | Total |
| | | n | % | n | % | n | % | |
| *Foundation* | Never | 34 | 34 | 32 | 32 | 0 | 0 | 66 |
| | 1x a day | 12 | 12 | 14 | 14 | 2 | 2 | 28 |
| | 2x a day | 4 | 4 | 2 | 2 | 0 | 0 | 6 |
| Total | | 50 | 50 | 48 | 48 | 2 | 2 | 100 |

**Table 9** Chi-Square Tests

| Value | | Asymp. Sig. (2-sided) |
|---|---|---|
| N | 100 | 0.193 |
| df | 4 | |
| Pearson Chi-Square | 6.088 | |
| Critical Value | 9.488 | |
| Conclusion | Not Significant | |

The analysis of the use of foundation resulted in a $x^2$ table value of 9.488. With a calculated $x^2$ value of 6.088, where $x^2$ hitung < $x^2$ tabel, and a p-value of 0.193, it can be concluded that there is no significant relationship between the use of foundation and the occurrence of acne vulgaris, as the p-value is greater than 0.05.

**Table 10** Cross-tabulation between the Use of Blush On and the Occurrence of Acne Vulgaris

| Akne Vulgaris | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | No Acne | | Moderate acne | | Severe acne | | Total |
| | | n | % | n | % | n | % | |
| *Blush On* | Never | 40 | 40 | 33 | 33 | 0 | 0 | 73 |
| | 1x a day | 10 | 10 | 13 | 13 | 2 | 2 | 25 |
| | >1x a day | 0 | 0 | 2 | 2 | 0 | 0 | 2 |
| Total | | 50 | 50 | 48 | 48 | 2 | 2 | 100 |

**Table 11** Chi-Square Tests

| Value | | Asymp. Sig. (2-sided) |
|---|---|---|
| N | 100 | 0.057 |
| df | 4 | |
| Pearson Chi-Square | 9.164 | |
| Critical Value | 9.488 | |
| Conclusion | Not Significant | |

The analysis of the use of compact powder yielded a $x^2$ value of 6.088, with a calculated $x^2$ value lower than the $x^2$ table value (9.488), and a p-value of 0.193. With a p-value greater than 0.05, it can be concluded that there is no significant relationship between the use of foundation and the occurrence of acne vulgaris.

## 4. Discussion

In the pathogenesis of acne vulgaris, increased sebum production and enlarged sebaceous follicle size occur. Sebum production is regulated by androgen hormones, which also play a role in changes to sebocyte and keratinocyte cells, leading to the development of microcomedones and comedones that progress into inflammatory lesions. Individuals with acne also experience hyperplasia of pilosebaceous follicles, possibly due to decreased linoleic acid in acne patients[7-9]. This leads to thickening of the granulosum layer, increased keratohyalin, increased lipid content, resulting in gradual thickening and blockage[7]. These blockages are also influenced by the use of compact powder because the particle size of compact powder is extremely small, allowing it to enter the pores. Additionally, the occurrence of blockages is also influenced by the presence of lanolin as a binding agent that is acne-prone[10]. Furthermore, the tropical climate in

Indonesia, situated in a tropical region, causes the skin to tend to sweat and become oily. This can lead to clogged pores, especially when combined with the use of compact powder[11,12].

Loose powder rarely causes acne because the particle size of loose powder is larger compared to compact powder. The particle size of loose powder is around 200 mesh, which is larger than that of compact powder (250 mesh), preventing it from entering and clogging the facial pores[13]. The composition of loose powder, including ingredients like lanolin, petrolatum, etc, is generally less than what is found in compact powder[14,15].

The use of sunscreen does not have an impact on the occurrence of acne. This can happen because the majority of users apply it infrequently, typically once a day. Infrequent use of cosmetics results in lower absorption, minimizing the likelihood of acne development. The content of ingredients in sunscreen also plays a role, such as anhydrous preparations, emulsions, and oil-free preparations. Oil-free or non-greasy sunscreens minimize pore blockage, reducing the chances of acne formation[16,17].

Foundations come in different types. Some types of foundation contain a significant amount of acne-causing or comedogenic ingredients, and using them on sensitive skin can lead to acne development. Using a foundation with fewer acne-causing or comedogenic ingredients is less likely to cause acne, as it does not clog facial pores[18-20].

The frequency of use and skin type, whether normal or dry, rarely lead to acne. Additionally, cleanliness factors also play a role. Individuals who diligently clean their face after activities or after using cosmetics can minimize the occurrence of acne on the face[18,19].

Blush comes in various types, including Loose or Compact Powder Rouges, Anhydrous cream rouge, Emulsion cream, and liquid rouges. If loose powder blush is used, it tends to be less likely to cause acne because the particle size is larger compared to compact powder types[19-21]. This is because the particle size of loose powder blush is larger, preventing it from clogging pores. Liquid rouge blush types also rarely cause acne. This is because the solvent is water or hydroalcoholic, making it safe for the skin. Another factor is the frequency of blush application, with the majority not using it every day. The less frequent the use of cosmetics, the less likely acne will occur, as the absorption into facial pores is reduced[22,23].

## 5. Conclusion

From the results of a study on the influence of cosmetic use on the occurrence of acne vulgaris in female medical students at UKI FK in 2016, it can be concluded that there is a significant relationship only between the use of compact powder and the occurrence of acne vulgaris (AV). The use of loose powder, sunblock, foundation, and blush on was not found to be associated with the occurrence of AV.

## Compliance with ethical standards

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*Disclosure of conflict of interest*

No conflict of interest to be disclosed.

*Statement of informed consent*

Informed consent was obtained from all individual participants included in the study. Ethical Clearance was obtained from Faculty of Medicine, Universitas Kristen Indonesia.

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