Ahmad Dahlan Medical Journal
VOL 6, No. 1, 01 - 10
http:// http://journal2.uad.ac.id/index.php/admj

Article

The relationship between the frequency of cleaning facial skin and the incidence of acne vulgaris

[1]Nabila Sulaksono*, [1]Leonny Dwi Rizkita, [1]Betty Ekawati Suryaningsih
Email (Corresponding Author) : *nabila2000034010@webmail.uad.ac.id
[1] Faculty of Medicine, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

ARTICLE INFO

Article history
Received 14 Jan 25
Revised 10 May 25
Accepted 13 May 25

Keywords:
Acne Vulgaris;
Frequency of Facial Cleansing;
Student

ABSTRACT

Acne Vulgaris is a skin infection experienced by almost the entire population in the world. In his research on the Global Burden of Disease (GBD), acne vulgaris occurs in around 85% of young to adult individuals aged 12 to 25. This research aims to determine the relationship between the frequency of facial cleaning and acne vulgaris in Ahmad Dahlan University Medical Students Class of 2022. This research used an analytical observational approach with a cross-sectional study approach. The samples used were medical students from Ahmad Dahlan. Specialist doctors in dermatology examined samples of 94 students to identify acne vulgaris, after tabulation of samples that could be processed, as many as 80 student samples. Frequency of facial cleaning was related to facial cleaning behavior as measured using a questionnaire. Demographic data, acne vulgaris characteristics, and facial cleansing frequency were reported. Data processing uses univariate analysis and bivariate chi-square analysis. Hypothesis testing using the chi-square test with a confidence level of 95% obtained a p-value of 0.000 which is smaller than the significance of 0.05. The frequency of cleaning your face will reduce the occurrence of acne vulgaris or be a treatment to prevent acne vulgaris from occurring. The recommended frequency is 2-3x a day, it doesn't need to be more than 5x a day, because this can cause facial irritation and ultimately acne vulgaris.

INTRODUCTION

Acne vulgaris is a common skin infection that affects nearly the entire global population. The Global Burden of Disease (GBD) study reports that acne vulgaris affects approximately 85% of young adults aged 12 to 25 years. Additionally, GBD indicates that acne vulgaris is one of the eight most frequent skin disorders, with an estimated global prevalence of about 9.38% across all age groups[1]. In European countries, acne vulgaris has the highest prevalence among individuals aged 15 to 17 years, after which it declines with age[2]. The prevalence of acne vulgaris in Indonesia in

2023 was estimated to reach between 85% and 100%. This figure is notably high, particularly among adolescents, with the peak incidence occurring between the ages of 15 and 18[3].

Acne vulgaris is a skin condition resulting from long-term inflammation in the pilosebaceous follicles, commonly occurring during adolescence. Its characteristic features include pigmentation, scarring, cysts, nodules, pustules, papules, and comedones in its typical locations. Acne is known to be a multifactorial disease, with clinical manifestations influenced by various factors such as stress, physical environment, trauma, diet, cosmetics, genetics, and hormones. Acne vulgaris typically occurs between the ages of 12 and 15, with the most severe forms occurring between ages 17 and 21. Over 80% of individuals with acne vulgaris are affected during early adulthood and childhood, with males being more commonly affected than females. The prevalence of acne during adolescence is high, ranging from 47% to 90%, with severe forms characterized by multiple pustular-cystic and nodular lesions[5].

The use of cosmetic products, especially by adolescent and young adult females, can be a trigger for the development of acne vulgaris. This is due to the presence of ingredients such as lanolin, petrolatum, butyl stearate, lauryl alcohol, and oleic acid in these products, which have comedogenic properties[6]. Cosmetic products often contain oils that can make the skin softer, but excess oil can clog pores, leading to the development of acne vulgaris. Additionally, the use of colorants in cosmetics may block pores, exacerbating acne vulgaris[7]. Prior research explains that there is a correlation between the use of facial cosmetic products and the tendency to frequently change cosmetic products, which is associated with a higher incidence of acne vulgaris[8]. This finding is supported by Perera et al.'s study, which demonstrates that regular use of cosmetics is a contributing factor to acne vulgaris[6].

The repeated use of cosmetic tools over extended periods without maintaining proper hygiene can result in the accumulation of moisture, sebum, dead skin cells, and dirt, creating an environment conducive to microorganism growth. If cosmetic products are contaminated with microorganisms that exceed safe contamination levels and have pathogenic characteristics, they can pose a health threat. Certain microorganisms, such as Staphylococcus aureus, Escherichia coli, Salmonella spp., Candida albicans, and Pseudomonas aeruginosa, are not allowed in cosmetic products[9].

A study conducted by Nusa Research Indonesia in 2020 involving 2,830 individuals who used cosmetic tools found that 46.8% of the participants were in the 18-24 age group, followed by 27.0% in the 25-35 age group. The majority of respondents were students (29.4%), followed by staff or employees (24.7%). The primary reasons for using cosmetic tools were to enhance appearance (75.1%) and to increase self-confidence (66.7%).

The blockage of facial pores is often caused by oil, dirt, dust, and sweat, which can easily lead to the development and exacerbation of acne vulgaris[10]. A preventive measure to reduce acne vulgaris

is facial cleansing. Cleansing the face is not only for skin hygiene but also for maintaining skin health, requiring the use of cleansers and toners to support it[11]. Maintaining facial skin hygiene is considered important as it can improve self-confidence and enhance an individual's quality of life [12,13]. The goal of facial cleansing is to achieve healthy, fresh, and smooth skin. To maintain clean and healthy skin, it is recommended to cleanse the face twice daily. Another goal of facial cleansing is to prevent pathological conditions, such as acne vulgaris, from developing[14].

Several studies suggest that cleansing the face twice daily with water and a suitable facial cleanser is an effective method for maintaining facial hygiene[15]. This claim is supported by prior research, which also indicates that cleansing the face 2 to 3 times a day using facial cleansers is associated with a reduction in acne vulgaris among adolescent males in Manado[16]. When cleansing the face, it is important to avoid excessive scrubbing and drying, as this can cause irritation, stimulate excessive oil production, and prolong acne development[17].

The Medical Education Program at the Faculty of Medicine applies fully in-person learning, with activities such as lectures, Clinical Skill Labs, tutorials, and practical sessions taking place on campus for approximately eight hours each day[18]. All activities conducted on campus must adhere to health protocols, including wearing masks. After engaging in various educational activities on campus or in laboratories, students return home but must continue studying for exams and completing assignments, which can create stress for individuals and contribute to psychological factors, including stress[19].

Prior research showed a significant relationship between facial cleansing habits and the incidence of acne. This study involved 60 students, divided into three groups: Group 1 washed their faces once a day, Group 2 washed their faces twice a day, and Group 3 washed their faces three times a day[20].

Psychological stress can trigger and exacerbate acne vulgaris. Stress experienced by individuals with acne vulgaris can lead to increased sebum production. Stress activates the hypothalamus to produce Corticotropin-Releasing Factor (CRF), which, in turn, increases androgen hormone levels. Androgens are associated with high sebum production. Sebum production is regulated by dehydroepiandrosterone sulfate (DHEA-S), a weak androgen that is converted into stronger androgens by sebocytes. Increased sebocyte sensitivity to androgens can lead to excessive sebum production, triggering the development of acne vulgaris[21]. So, this research aims to determine the relationship between the frequency of facial cleaning and acne vulgaris in Ahmad Dahlan University Medical Students Class of 2022. This study contributes to the understanding of how facial cleansing frequency affects the incidence of acne vulgaris, particularly among medical students. By identifying a statistically significant relationship between facial hygiene behavior and acne prevalence, the findings provide evidence-based recommendations for daily skincare routines.

The research also supports public health education efforts aimed at preventing acne through simple, non-pharmacological interventions, thereby promoting healthier skin practices among adolescents and young adults.

METHODS

This study was quantitative research using a descriptive observational approach. The type of research is cross-sectional. Cross-sectional research is an observational study design that involves collecting data at a single point in time to assess the prevalence of outcomes or to examine the relationships between variables within a defined population[22]. This study was conducted by simultaneously collecting data from the dependent and independent variables. The research was designed with the distribution of questionnaires and direct examination of the subjects, who were students of the Faculty of Medicine at UAD. Before being distributed, during the preparation of research instruments. The questionnaire to measure the frequency of facial cleansing has been confirmed to be valid and reliable. This study used primary data collected through questionnaire completion and was administered to the students of the Faculty of Medicine, Ahmad Dahlan University, Class of 2022. The selection of research subjects was based on predetermined criteria, and the sample was selected using a total sampling technique, consisting of 94 respondents. The criteria are Active medical students from the Faculty of Medicine at UAD in 2022, willing to complete the questionnaire and participate in the entire research process, have experienced or are currently experiencing acne vulgaris, or at least have a history of facial skincare treatment. The data were analyzed using Statistical Product and Service Solutions (SPSS) version 27.

Univariate analysis in this study was used to describe the characteristics of the respondents and the distribution of the main research variables. Bivariate analysis was conducted to test the relationship between the frequency of face washing and the degree of acne vulgaris among the respondents using the Chi-square test, as the variables used are categorical and non-paired. This test was used to assess the relationship between the frequency of face washing and the incidence of acne vulgaris. If $p < 0.05$, it indicates a significant relationship between the variables. Conversely, if $p > 0.05$, it suggests that there is no significant relationship between the variables[22].

RESULTS

This study was conducted on students of the Faculty of Medicine at Universitas Ahmad Dahlan, Class of 2022, using a questionnaire-based data collection technique. The purpose of this study was to determine the characteristics of acne vulgaris occurrences among the students and to examine the relationship between the frequency of face washing and the types of nodules, papules, and pustules in acne vulgaris. The study was carried out between October and December 2023. The respondents of this study were all active students who enrolled in the Faculty of Medicine at

Universitas Ahmad Dahlan in the 2022 academic year. The sample used in this study was based on total sampling, consisting of 94 students. Out of the 94 respondents, data that met the inclusion criteria was collected from 80 respondents. The remaining 14 respondents were excluded due to criteria such as having a history of hormonal diseases or using facial makeup, and their data were excluded from the analysis and not used.

Table 1. Frequency Distribution of Respondents

No	***Variables***	***n***	***%***
1	Acne Vulgaris	80	100
	Absent	42	52.5
	Present	38	47.5
2	Behavior toward Frequency of Face Washing	80	100
	Negative	40	50
	Positive	40	50
3	Gender	40	100
	Female	58	72.5
	Male	22	27.5

Based on Table 1, the results of the frequency distribution of respondents according to the study variables are presented. It was found that 42 students, or 52.5% of the respondents, did not exhibit any clinical manifestations of acne vulgaris on the facial area, while the remaining 38 respondents, or 47.5%, displayed at least one clinical manifestation of acne vulgaris on the face. Regarding the behavior toward the frequency of face washing, 40 respondents exhibited negative behavior, and 40 respondents exhibited positive behavior, indicating that each group represents 50% of the total sample. Lastly, the univariate analysis results show that the majority of respondents were female, with 58 students (72.5%) being female, while 22 students (27.5%) were male.

Table 2. The Relationship Between the Frequency of Face Washing and the Occurrence of Acne Vulgaris

Frequency of Face Washing	***The Occurrence of Acne Vulgaris***				***Total***		***P-Value***
	Absent		***Present***				
	n	***%***	***n***	***%***	***n***	***%***	
Negative	10	25	30	75	40	100	0,000
Positive	32	80	8	20	40	100	
Total	32		38		70		

The results indicate that among students with negative behavior regarding the frequency of face washing, 10 students (25%) did not exhibit any clinical manifestations of acne vulgaris on their face, while 30 students (75%) displayed at least one clinical manifestation of acne vulgaris. On the other hand, among students with positive behavior regarding the frequency of face washing, 32 students (80%) did not show any clinical manifestations of acne vulgaris, while 8 students (20%) showed at least one manifestation of acne vulgaris.

To assess the relationship between the frequency of face washing and the severity of acne vulgaris, the p-value for the Continuity Correction was considered, as this study utilized a 2x2 cross-

tabulation table and no expected values were less than 5. The result obtained was 0.000, meaning the p-value is less than 0.05. Therefore, the hypothesis is accepted, and it can be concluded that there is a significant relationship between the frequency of face washing and the occurrence of acne vulgaris among the students.

DISCUSSION

Characteristics of the Occurrence of Acne Vulgaris

Based on the findings in Table 1, it was observed that 42 students, or 52.5% of the respondents, did not exhibit any clinical manifestations of acne vulgaris on their facial area, while the remaining 38 respondents, or 47.5%, showed at least one clinical manifestation of acne vulgaris on their face. These results differ from a study by prior research, which was conducted among adolescent males in Manado[16]. The discrepancy can be attributed to differences in the study population, as the majority of respondents in the present study were female, accounting for 58 students (72.5%) of the total sample. Females are generally more self-conscious about their appearance, particularly when dealing with skin conditions such as acne vulgaris[16].

Further analysis of Table 1 reveals that 38 respondents (47.5%) exhibited at least one clinical manifestation of acne vulgaris, with 32 female respondents showing such manifestations, while the remaining 6 male respondents also demonstrated clinical signs of acne vulgaris. This finding aligns with the study by prior research, which also reported that the prevalence of acne vulgaris was higher in females[23]. The dominance of acne vulgaris in females is likely due to hormonal factors, as hormonal fluctuations in women, particularly during ovulation, lead to an increase in sebaceous gland activity, which can exacerbate acne vulgaris[23]. Lastly, regarding the behavior of face washing, 50% of the respondents exhibited both negative and positive behaviors. Among those with negative behavior, 33 respondents were female, and 7 respondents were male. This indicates that negative face-washing behavior was more common among female respondents, which may reflect differing skincare habits between genders.

The Relationship Between the Frequency of Face Washing and Acne Vulgaris

The results of the Chi-square test in this study indicate a significant relationship between the frequency of face washing and the severity of acne vulgaris among medical students at the University of Ahmad Dahlan (UAD) class of 2022 (p-value=0.000). These findings align with prior research, which also found a significant relationship between facial hygiene behaviors and the occurrence of acne vulgaris among male medical students at Al-Azhar University[15]. Acne vulgaris is a complex skin condition that commonly affects the face, and maintaining facial hygiene is essential for preventing its onset. Facial hygiene includes actions aimed at keeping the skin clean and

healthy[24]. These behaviors involve regular face washing, the frequency of washing, the use of moisturizers, and the application of facial cleansers[25]. Literature reviews have examined various hygiene practices, including face washing habits, washing frequency, the use of facial cleansers, and moisturizers, as part of an overall skin care regimen. Studies have indicated that regular face washing and the use of cleansers to reduce facial oil are associated with the occurrence of acne vulgaris. These findings are supported by previous research[16,17,26].

Facial cleansing and skin care for individuals with acne vulgaris can be more effective when proper hygiene is maintained[27]. Washing the face is an important hygiene behavior for reducing the occurrence of acne vulgaris. The recommended frequency of face washing is 2-3 times a day. However, excessive washing, scrubbing, or drying should be avoided to prevent the cycle of persistent acne. Over-washing can strip the skin of its natural oils, leading to irritation and stimulating excess oil production. Improved facial hygiene can reduce excess sebum production[17,28]. Moreover, maintaining skin cleanliness prevents bacteria from entering the pilosebaceous follicles, which helps prevent inflammation and the onset of acne. The importance of face washing as an indicator of improved acne vulgaris is also supported by previous studies that highlight a significant relationship between facial cleanliness and the occurrence of acne vulgaris[29].

Face-washing behavior reflects self-awareness regarding hygiene and health, particularly skin health. The occurrence of acne vulgaris is not solely determined by washing frequency; factors such as age, gender, genetics, hormonal fluctuations, psychological stress, cosmetic use, medications, diet, and climate also play significant roles[30]. Nonetheless, face washing remains one of the most crucial preventive measures for acne vulgaris. This is because the skin serves as a gateway for various microorganisms that can trigger acne vulgaris. This argument is consistent with findings from prior research, who reported a relationship between facial cleanliness and the occurrence of acne vulgaris. Regular, proper face washing reduces the potential for acne vulgaris to develop[31]. Prior research also reviewed 21 studies and found that 74% indicated a relationship between face washing and acne vulgaris[32]. This study supports those findings, affirming that frequent face washing can prevent acne vulgaris. The recommended frequency is 2-3 times per day, as washing more than five times a day could irritate the skin and potentially worsen acne[32].

Consistent with the results of this study, the average responses from participants regarding face washing frequency indicated that most respondents wash their faces 2-3 times daily, with an average score of 3.4 (on a 1-4 scale) on questionnaire item 5. This suggests that the study's findings align with previous research, which also supports the recommendation of washing the face 2-3 times a day as an effective method for managing and preventing acne vulgaris.

Washing the face 2-3 times a day is considered the ideal practice for preventing acne vulgaris because it helps reduce excess oil and removes dirt and bacteria from the skin's surface.

However, washing the face too frequently or excessively can have the opposite effect and worsen skin conditions. Over-washing can strip the skin of its natural oils, which serve as a protective barrier, leading to dryness and irritation. Dry skin can trigger the pilosebaceous units to produce more sebum as a compensatory mechanism, which can increase the risk of clogged pores and the formation of acne. A study published in Dermatology Research and Practice indicated that over-cleansing can damage the skin barrier and disrupt the skin's natural microbiome, making it more susceptible to infection and inflammation[33,34].

Lipids in the epidermal layer, produced by keratinocytes, are crucial in maintaining the skin barrier's function against microbial invasion and the movement of water and electrolytes[35]. The lipid layer, composed of ceramides, cholesterol, and free fatty acids, is mainly located in the outermost layer of the epidermis, the stratum corneum. Disruption of this barrier can lead to increased synthesis of cholesterol and fatty acids, which are essential for barrier recovery, followed by slower ceramide synthesis. If this process is delayed, skin barrier function will remain compromised, potentially exacerbating skin conditions. Therefore, excessive face washing with soap can hinder the recovery of the skin barrier[36].

CONCLUSION

This study conducted on medical students at Ahmad Dahlan University (UAD), class of 2022, found that there a significant relationship between the frequency of facial washing and the occurrence of acne vulgaris. These findings underscore the importance of maintaining proper facial hygiene as a preventive measure for acne vulgaris, offering valuable insights into the role of skin care practices in managing this widespread skin issue. This research contributes to the understanding of facial hygiene practices as a modifiable risk factor in the prevention and management of acne vulgaris. Future studies should explore further behavioral factors and the potential long-term effects of regular facial cleansing on acne prevalence.

REFERENCES

1. Vos T, Flaxman AD, Naghavi M, et al. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The lancet*. 2012;380(9859):2163-2196.
2. Wolkenstein P, Machovcová A, Szepietowski JC, Tennstedt D, Veraldi S, Delarue A. Acne prevalence and associations with lifestyle: a cross-sectional online survey of adolescents/young adults in 7 European countries. *Journal of the European Academy of Dermatology and Venereology*. 2018;32(2):298-306.
3. Nurwanti R. Gambaran Pengetahuan Sikap dan Tindakan Swamedikasi Jerawat Pada Mahasiswa Farmasi Politeknik Baubau. *Jurnal Promotif Preventif*. 2023;6(3):438-444.
4. Ollyvia ZZ, Febriyana N, Damayanti D, Ardani I. The association between Acne vulgaris and stress among adolescents in Kenjeran, Surabaya. *Jurnal Psikiatri Surabaya*. 2021;10(1):33.
5. Tuchayi SM, Makrantonaki E, Ganceviciene R, Dessinioti C, Feldman SR, Zouboulis CC. Acne vulgaris. *Nature reviews Disease primers*. 2015;1(1):1-20.

6. Perera MPN, Peiris WMDM, Pathmanathan D, Mallawaarachchi S, Karunathilake IM. Relationship between acne vulgaris and cosmetic usage in Sri Lankan urban adolescent females. *Journal of cosmetic dermatology*. 2018;17(3):431-436.
7. Conforti C, Giuffrida R, Fadda S, et al. Topical dermocosmetics and acne vulgaris. *Dermatologic therapy*. 2021;34(1):e14436.
8. Andriana R, Effendi A, Berawi K. Hubungan antara penggunaan kosmetik wajah terhadap kejadian akne vulgaris pada mahasiswi Fakultas Kedokteran Universitas Lampung. *Jurnal Majority*. 2014;3(1)
9. Maryanto EP. Hubungan Penggunaan Produk Kosmetik Terhadap Kejadian Akne Vulgaris. *Jurnal medika hutama*. 2020;2(01 Oktober):304-307.
10. Khairunnisa K, Rialita A, Mardhia M. Pengetahuan dan Perilaku Kebersihan Wajah Terhadap Timbulnya Akne Vulgaris pada Pelajar SMP di Mempawah Hilir. *Jurnal Kedokteran dan Kesehatan: Publikasi Ilmiah Fakultas Kedokteran Universitas Sriwijaya*. 2021;8(1):25-32.
11. Wasono HA, Sani N, Panongsih RN, Shauma M. Hubungan Kebersihan Wajah terhadap Kejadian Akne Vulgaris pada siswa kelas x smk negeri tanjungsari lampung selatan tahun 2020. *J Med Malahayati*. 2020;4(2):82-6.
12. Waldman A, Maisel A, Weil A, et al. Patients believe that cosmetic procedures affect their quality of life: an interview study of patient-reported motivations. *Journal of the American Academy of Dermatology*. 2019;80(6):1671-1681.
13. Amraei M. Self-confidence through skincare: The effect of skincare on self-confidence: A theoretical study. 2024;
14. Levin AT, Hanage WP, Owusu-Boaitey N, Cochran KB, Walsh SP, Meyerowitz-Katz G. Assessing the age specificity of infection fatality rates for COVID-19: systematic review, meta-analysis, and public policy implications. *European journal of epidemiology*. 2020;35(12):1123-1138.
15. Artasih PCN, Mulianingsih W, Nirmala S, Mariam L. Hubungan Perilaku Membersihkan Wajah Dengan Kejadian Acne Vulgaris Pada Mahasiswa Laki-Laki. *Journals of Ners Community*. 2023;13(2):267-275.
16. Sole FR, Suling PL, Kairupan TS. Hubungan antara Mencuci Wajah dengan Kejadian Akne Vulgaris pada Remaja Laki-laki di Manado. *e-CliniC*. 2020;8(1)
17. Sari AR, Ramadhanty PK, Anggraeni N, Destra E, Firmansyah Y. Exploring the Connection Between Facial Skin Cleansing Habits and Acne Vulgaris: A Comprehensive Review. *Medicor: Journal of Health Informatics and Health Policy*. 2023;1(1):25-30.
18. Elendu C, Amaechi DC, Okatta AU, et al. The impact of simulation-based training in medical education: A review. *Medicine*. 2024;103(27):e38813.
19. Walke HT, Honein MA, Redfield RR. Preventing and responding to COVID-19 on college campuses. *Jama*. 2020;324(17):1727-1728.
20. Hastuti R, Mustifah EF, Ulya I, Risman M, Mawardi P. The effect of face washing frequency on acne vulgaris patients. *Journal of General-Procedural Dermatology & Venereology Indonesia*. 2019;3(2):7.
21. Prasad SB. Acne vulgaris: A review on pathophysiology and treatment. *Asian Journal of Pharmaceutical and Clinical Research*. 2016;9(4):54-59.
22. Notoatmodjo S. Metodologi penelitian kesehatan cetakan ke-3. *Pt Rineka Cipta*. 2018;
23. Hertanto DCF, Flora Ramona S, KK S, Pramuningtyas R, KK S. *Hubungan antara kebersihan wajah dengan kejadian akne vulgaris pada siswa sma negeri 3 klaten*. Universitas Muhammadiyah Surakarta; 2014.
24. Ogé LK, Broussard A, Marshall MD. Acne vulgaris: diagnosis and treatment. *American family physician*. 2019;100(8):475-484.
25. Rhee Y, Palmer LJ, Okamoto K, et al. Differential effects of chlorhexidine skin cleansing methods on residual chlorhexidine skin concentrations and bacterial recovery. *infection control & hospital epidemiology*. 2018;39(4):405-411.
26. Altun E, Topaloglu Demir F. Occupational facial dermatoses related to mask use in healthcare professionals. *Journal of Cosmetic Dermatology*. 2022;21(6):2535-2541.
27. Toama MAEQ, Samir MA, Omar HH. Modalities in acne vulgaris treatment. *The Egyptian Journal of Hospital Medicine*. 2021;85(2):4167-4172.
28. George RM, Sridharan R. Factors aggravating or precipitating acne in Indian adults: a hospital-based study of 110 cases. *Indian journal of dermatology*. 2018;63(4):328-331.
29. Juhl CR, Bergholdt HK, Miller IM, Jemec GB, Kanters JK, Ellervik C. Dairy intake and acne vulgaris: a systematic review and meta-analysis of 78,529 children, adolescents, and young adults. *nutrients*. 2018;10(8):1049.
30. Sitohang I, Wasitaatmadja S. Akne vulgaris. *Ilmu Penyakit Kulit dan Kelamin Edisi*. 2015;7

31. Zaenglein AL, Pathy AL, Schlosser BJ, et al. Guidelines of care for the management of acne vulgaris. *Journal of the American academy of dermatology*. 2016;74(5):945-973. e33.
32. Sitohang MN, Teresa A. Literature Review: Hubungan Perilaku Higiene Kulit Wajah dengan Akne Vulgaris Pada Wajah. *Jurnal Kedokteran Universitas Palangka Raya*. 2022;10(1):13-17.
33. Barbieri J, Wanat K, Seykora J. Skin: basic structure and function. 2014;
34. Kogut I, Bilousova G. Environmental influences on the development of epidermal progenitors. 2019;
35. de Szalay S, Wertz PW. Protective barriers provided by the epidermis. *International Journal of Molecular Sciences*. 2023;24(4):3145.
36. Draelos ZD. The science behind skin care: Cleansers. *Journal of cosmetic dermatology*. 2018;17(1):8-14.