



Research Article

Relationship of genetic factors to the degree of Acne vulgaris as one of the predisposing factors in student Faculty of Medicine University of Muhammadiyah Malang

Dwi Nurwulan Pravitasari¹, Ratna Wulandari¹, Sri Adila Nurianiwati¹, M. Yuliansyah Aldi Kurniawan², Raihan Fatihka Devi²

1) Departement Dermato Venerology, Faculty of Medicine, University of Muhammadiyah Malang

2) Faculty of Medicine, University of Muhammadiyah Malang

ARTICLE INFO

Submitted : 10th January 2023

Accepted : 30th May 2023

Published : 27th July 2023

Keywords:

Acne vulgaris, age, gender, genetic factors

*Correspondence:

vitha_sabrinaviancha@umm.ac.id

This is an Open acces article under the CC-BY license



ABSTRACT

Acne vulgaris is a skin disease, a chronic inflammation that affects the poly sebaceous glands, especially on the face and neck. One of the endogenous causes that influence the occurrence of acne vulgaris is a genetic and hormonal predisposition. Family history of acne is one of the risk factors in family genetics associated with the onset of the disease, the difficulty of therapy, and the risk for relapse. This research aimed to explain the relationship between genetic factors to the degree of acne vulgaris as one of the predisposing factors. This research was observational analytic, using purposive sampling as the sampling method and collecting data using a cross-sectional questionnaire. Statistical analysis between variables shows that age was not related ($p = 0,790$), while gender was not related ($p = 0,066$), the father's genetic history was related ($p = 0,001$), and mother's genetic history was not related ($p = 0,390$). In conclusion, among the factors that were analyzed, the father's genetic history was the only one which has a relationship in aggravating the degree of acne vulgaris.



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



INTRODUCTION

Acne vulgaris is a chronic inflammatory skin condition that mostly affects the poly sebaceous glands of the face and neck. Based on the Global Burden of Disease Study in 2010, acne vulgaris ranks eighth globally, with 9.83% of cases. The prevalence of acne vulgaris in 2006-2016 increased by 5.1% (Yang et al., 2020). The Dr. Cipto Mangunkusumo Hospital, Indonesia, shows a majority of adult female patients, with a rate of 4,3% in 2014, 4,72% in 2015, and 4,67% in 2016 (Teresa, 2020).

Acne vulgaris and its severity are influenced by various factors, including epidemiological factors, dietary habits, demography, genetics, hormonal, and lifestyle (Heng et al., 2021). External factors that influence the incidence of acne vulgaris such as exposure to comedogenic substances, cosmetics, stress, drugs, and smoking. Endogenous risk factors affecting acne vulgaris are hormonal and genetic (Bansal et al., 2020). Based on research by Common et al., family history factors influence acne vulgaris, but research on genetic influences is still lacking. Polymorphisms of various genes and chromosomal abnormalities of human leucocyte antigen (HLA) influence the incidence of acne. A history of acne in the family is associated with the onset of the disease, increased retention lesions, difficulties in therapy, and a higher risk of relapse Common et al. (2019).

Genes that affect the incidence of acne vulgaris include melanocortin receptor genes (MCRs), peroxisome proliferator-activated receptors (PPARs), matrix metalloproteinases (MMPs), and pro-inflammatory cytokines such as tumor necrosis factor- α (TNF α) and interleukin-1 α (IL-1 α). It is said that such

genes can increase the severity of the disease, response to therapy, modification of the clinical course, and inflammation and affect the level of sebum secretion (Melnik, 2016).

From the introduction above, this research was made to explain the relationship of these factors with the degree of acne vulgaris.

METHODS

This research was cross-sectional observational analytics research. The data were collected using a questionnaire. The population of this research was students from the Faculty of the Medicine University of Muhammadiyah Malang (FM-UMM). Inclusion criteria in this study were FM-UMM students who agreed to participate in the research, had a history of acne vulgaris, and experiencing acne vulgaris. The exclusion criteria were students of FM-UMM who often change cosmetics, not maintaining facial hygiene, wash their face too often, frequently squeeze acne vulgaris, have poor sleep quality, use oral steroid drugs for a long time, use birth control drugs, and conditions of pregnancy and lactation. Purposive sampling was used as the sampling method. The relationship of every variable was analyzed using the Chi-square test. This research was approved by the Health Research Ethics Committee of the University of Muhammadiyah Malang through ethical approval No.E.5.a/200.a/KEPK-FKUMM/XI/2020.

RESULTS

This research involves 156 students as the sample. The profile of the samples that contain average age, gender, degree of acne vulgaris, father genetic history, and mother genetic history is shown in **Table 1**.



QANUN MEDIKA
JURNAL KEDOKTERAN FKUM SURABAYA
<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



Table 1. Characteristic respondents of the sample

Characteristics	n	%
Age		
≤20 years	86	55,12%
>20 years	70	44,88%
Gender		
Male	47	30,31%
Female	109	69,87%
Degree of acne vulgaris		
Mild	91	58,33%
Moderate	50	32,05%
Severe	15	9,62%
Father genetic history		
Acne	21	13,5%
No acne	135	86,5%
Mother genetic history		
Acne	26	16,7%
No acne	130	83,3%

Table 2. Results of statistical analysis between variables

Variable 1	Variable 2	P value
Degree of acne vulgaris	Age	0,790
	Gender	0,066
	Father genetic history	0,001
	Mother genetic history	0,390

Table 3. Results of multivariate analysis

Variable 1	Variable 2	P value	OR	Nagelkerke R square
Severe degree of acne vulgaris	Gender (male)	0,002	3,947	10,3%
	Father's genetic history (with acne)	0,027	0,435	



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



The results of the statistical analysis between variables are shown in **Table 2**. Statistical analysis of the father's genetic history results in a p-value of 0,001, which means that the father's genetic history was significantly related ($p < 0,05$) to the degree of acne vulgaris. While analysis between ages results with a p-value of 0,790, age was not related ($p > 0,05$) to the degree of acne vulgaris. Analysis between gender with a p-value of 0,066 means gender was not related ($p > 0,05$) with the degree of acne vulgaris. Furthermore, the analysis mother's genetic history resulted with a p-value of 0,390; this means that the mother's genetic history was not related ($p > 0,05$) to the degree of acne vulgaris.

The result of the multivariate analysis for this research is shown in **Table 3**. The variables that followed the multivariate analysis test were variables of gender and the father's genetic history because the $p < 0.25$. The variables included as a comparison are the father's genetic history with acne and the male gender associated with the variables of the degree of severe acne vulgaris. The male gender significantly influences severe acne grade with p-value = 0.027. The OR obtained was 0.435, which means that respondents of the male gender inhibit ($OR < 1$) the possibility of a heavier degree of acne. Father's genetic history with acne significantly influences severe acne grade with a p-value of 0.003. The OR obtained was 3,947, meaning that respondents with the acne father gene will increase ($OR > 1$) the probability of a severe degree of acne. The result of the coefficient of determination (Nagelkerke R Square) obtained by 10.3% showed that the influence of the father's genetic history and the male gender contributed 10.3% in predicting the occurrence of severe degrees of acne.

DISCUSSION

Table 1 showed respondents mostly aged 20 years, and based on Table 2, the result of statistical analysis means age was not related to the degree of acne vulgaris. Studies conducted by Anyachukwu et al. explain that there is a relationship between age and the density of facial acne lesions among subjects. It is proven from the results of studies that the severity of acne on the face decreases with age. This research can add to the knowledge that age is an essential factor in the prevalence of acne. Usually, acne begins at puberty, when sebum production increases substantially. It can last for an average of 8-12 years in most patients. More often, acne improves around the age of 20 but may last longer (Anyachukwu et al., 2018).

Acne vulgaris is one of the signs of puberty in girls and appears earlier than in boys. In 17-year-olds, acne vulgaris occurs in 40% of girls and 25% of boys aged 18. The incidence of acne will decrease after the age of 17 in girls. While in boys, the incidence of acne decreases and disappears at the age of 25 years (Edalatkhah et al., 2017). Research by Wang et al. showed that acne vulgaris mainly occurs at 16-20 years old and occurs when entering the age of puberty with mild grading of acne vulgaris (Wang et al., 2018).

The respondents in this research are dominant females (Table 1). However, based on Table 2, the result of statistical analysis showed that gender was not related to the degree of acne vulgaris. The same result is in line with the research conducted by Noer Hidayati at RSUP Dr. Sardjito Yogyakarta, where acne vulgaris sufferers are dominated by women, which is as much as 77%. This is because women have more significant risk factors than men, namely hormonal and cosmetic factors. The selection of cosmetics or skincare containing comedogenic ingredients will cause retensional



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



hyperkeratosis. Continuous use of cosmetics over a long time can also form closed blackheads with some papulopustular lesions on the facial area (Sitohang et al., 2019).

Journal of Clinical and Aesthetic Dermatology states that hormones play a role in causing acne. Acne can occur if the oil is produced excessively, which causes clogged pores. Fluctuations of estrogen and progesterone before the menstrual cycle can be predisposing factors that cause acne. Furthermore, stress and cosmetics can be the etiological factors. Research conducted by Karnik et al. (2014) said there is an association between women are more susceptible to chronic stress that can lead to acne. Research by Skroza et al. (2018) said acne vulgaris mainly occurs in women compared to men.

The respondents in this study dominantly have no father's genetic history of acne (Table 1), and the result of statistical analysis means the father's genetic history was significantly related to the degree of acne vulgaris (Table 2). A study by Dilandro states that the severity of acne vulgaris is influenced by family history. This suggests that a family history of acne affects the incidence of more severe acne. The data found that most patients had acne localized on the face and body (47.7%), and among them had a positive family history. If the father has a history of acne vulgaris, their children's risk doubles. According to the researchers, this increases the likelihood that genetic characteristics associated with the X chromosome play a role (each person inherits the X chromosome from his mother, while the father donates the X chromosome only to girls).

More than 80% of respondents have no mother's genetic history of acne (Table 1), and the result of statistical analysis means the mother's genetic history was not related to the degree of acne vulgaris (Table 2). The incidence and persistence of acne influence the

incidence and severity of acne in adult women. Studies conducted in Turkey, India, Europe, and Tanzania show that 30-69% of adult women who experience acne have a family history of acne. Families with a history of acne cause someone prone to acne the onset of acne earlier, leaving more scars and the spread of acne to other areas of the body. Tanzanian research states that families with a history of acne often affect the occurrence of acne in adult women and the severity of acne degrees (Anaba & Oaku, 2021).

Ghods et al. (2009) state that teenagers in Iran with a history of acne in mothers can make their children experience acne. This research aligns with the results of the study by Edalatkhah et al. (2017) that the history of acne in the mother influences the onset of acne in children. However, the reason has not yet been determined the number of suspected excessive activity of enzymes in the pathogenesis of acne, genetic and immune system. Research conducted by Zouboulis (2014) said that a child with a mother who has experienced acne with severe or moderate grading has a strong possibility of experiencing acne compared with a child who has not a mother with an acne history. This research is the same as Monib et al. (2020), where mothers' genetics lead to acne in their children.

The father's genetic history of acne has a significant effect on acne vulgaris with a severe degree (Table 3). The history of acne in the family may be related to the wider localization of the acne due to genetic predisposition (Šijak et al., 2019). A deficiency of pantothenic acid (CoA) can result in low fatty acid oxidation and decreased metabolism resulting in oily skin and causing acne (Amin et al., 2020). Research by Heng & Chew (2020) states that the CYP17 gene significantly influences the severity of acne in men, while in women, it is



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



said not to affect acne severity. Research by Ebrahimi et al. (2019) said that genotype drom CYP19 increased the incidence and severity of acne vulgaris. Research by (Bazid et al., 2022) said that enzymes cytochrome related to acne are CPY11B1, CYP11A1, CYP17, and CYP21A2.

CONCLUSION

Father's genetic history was the only variable that correlated with the degree of acne vulgaris, while age, gender, and mother's genetic history was not related to the degree of acne vulgaris. Father genetic history and male more affect to predictions severe acne vulgaris. The following research could investigate other factors that could affect acne vulgaris severity, such as food, hormonal, and frequent cosmetic changes with an increased degree of acne vulgaris.

REFERENCES

- Amin, A., El-Rifaie, A.-E., Rashed, L., & Osman, S. (2020). Vanin-1 Gene Expression in Acne Vulgaris and its Correlation with Disease Severity. *Egyptian Journal of Medical Research*, 1(2). <https://doi.org/10.21608/ejmr.2020.89104>
- Anaba, E. L., & Oaku, I. R. (2021). Adult female acne: A cross-sectional study of diet, family history, body mass index, and premenstrual flare as risk factors and contributors to severity. *International Journal of Women's Dermatology*, 7(3). <https://doi.org/10.1016/j.ijwd.2020.11.008>
- Anyachukwu, C., Onyeso, O., & Ezema, C. (2018). Age, Body Mass and Physical Activity Determinants of Facial Acne Severity among Southern Nigerian Adolescents and Young Adults. *West Indian Medical Journal*. <https://doi.org/10.7727/wimj.2017.162>
- Bansal, P., Sardana, K., Vats, G., Sharma, L., Garga, U., & Khurana, A. (2020). A prospective study examining trigger factors and hormonal abnormalities in adult female acne. *Indian Dermatology Online Journal*, 11(4). https://doi.org/10.4103/idoj.idoj_500_19
- Bazid, H., Marae, A., Tayel, N., Sleem, R., Mahrous, E., Mostafa, M. I., & el Gayed, E. M. A. (2022). Interleukin19 gene polymorphism and its serum level in acne vulgaris patients. *Journal of Immunoassay and Immunochemistry*, 43(1). <https://doi.org/10.1080/15321819.2021.1952425>
- Common, J. E. A., Barker, J. N., & van Steensel, M. A. M. (2019). What does acne genetics teach us about disease pathogenesis? In *British Journal of Dermatology* (Vol. 181, Issue 4). <https://doi.org/10.1111/bjd.17721>
- Ebrahimi, A., Rahimi, Z., Ghadami, Z., Shakiba, E., Rahimi, Z., Akbari, M., Shafiei, M., Bahrehmand, F., Vaisi-Raygani, A., & Naseri, R. (2019). Association between CYP19A<G rs700518 polymorphism with acne vulgaris and its severity: Influence on sex hormones level. *International Journal of Molecular and Cellular Medicine*, 8(2). <https://doi.org/10.22088/IJMCMBUMS.8.2.162>
- Edalatkhah, H., Matin, E., & Ahari, S. S. (2017). Familial risk of acne vulgaris in 8-13 year-old females: A case-control study. *Iranian Journal of Dermatology*, 20(2).
- Ghodsi, S. Z., Orawa, H., & Zouboulis, C. C. (2009). Prevalence, severity, and severity risk factors of acne in high school pupils: A community-based study. *Journal of Investigative Dermatology*, 129(9).



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



- <https://doi.org/10.1038/jid.2009.47>
- Heng, A. H. S., & Chew, F. T. (2020). Systematic review of the epidemiology of acne vulgaris. *Scientific Reports*, *10*(1). <https://doi.org/10.1038/s41598-020-62715-3>
- Heng, A. H. S., Say, Y. H., Sio, Y. Y., Ng, Y. T., & Chew, F. T. (2021). Gene variants associated with acne vulgaris presentation and severity: a systematic review and meta-analysis. *BMC Medical Genomics*, *14*(1). <https://doi.org/10.1186/s12920-021-00953-8>
- Karnik, J & S.R., S. (2014). A double-blind, randomized, multicenter, controlled trial of suspended polymethylmethacrylate microspheres for the correction of atrophic facial acne scars. In *Journal of the American Academy of Dermatology* (Vol. 71, Issue 1).
- Melnik, B. C. (2016). Western diet-induced imbalances of FoxO1 and mTORC1 signalling promote the sebofollicular inflammasomopathy acne vulgaris. *Experimental Dermatology*, *25*(2). <https://doi.org/10.1111/exd.12898>
- Monib, K. M., Salem, R. M., Alfallah, A. A., & EL-Sayed, S. E. (2020). Risk Factors for Acne Vulgaris Development. *Benha Journal of Applied Sciences*, *5*(5). <https://doi.org/10.21608/bjas.2020.136704>
- Šijak, D., Horvat, I., Sonicki, Z., Murat-Sušić, S., Husar, K., Skerlev, M., Marinović, B., & Mokos, Z. B. (2019). Correlation between family history and the age of onset of childhood acne in relation to sex and type of acne. *Acta Dermatovenerologica Croatica*, *27*(2).
- Sitohang, I. B. S., Fathan, H., Effendi, E., & Wahid, M. (2019). The susceptibility of pathogens associated with acne vulgaris to antibiotics. *Medical Journal of Indonesia*, *28*(1). <https://doi.org/10.13181/mji.v28i1.2735>
- Skroza, N., Tolino, E., Mambrin, A., Zuber, S., Balduzzi, V., Marchesiello, A., Bernardini, N. T., Proietti, I., & Potenza, C. (2018). Adult acne versus adolescent acne: A retrospective study of 1,167 Patients. *Journal of Clinical and Aesthetic Dermatology*, *11*(1).
- Teresa, A. (2020). Acne Vulgaris Dewasa : Etiologi, Patogenesis Dan Tatalaksana Terkini. *Jurnal Kedokteran Universitas Palangka Raya*, *8*(1).
- Wang, Y., Hata, T. R., Tong, Y. L., Kao, M. S., Zouboulis, C. C., Gallo, R. L., & Huang, C. M. (2018). The Anti-Inflammatory Activities of Propionibacterium acnes CAMP Factor-Targeted Acne Vaccines. *Journal of Investigative Dermatology*, *138*(11). <https://doi.org/10.1016/j.jid.2018.05.032>
- Yang, J., Yang, H., Xu, A., & He, L. (2020). A Review of Advancement on Influencing Factors of Acne: An Emphasis on Environment Characteristics. In *Frontiers in Public Health* (Vol. 8). <https://doi.org/10.3389/fpubh.2020.00450>
- Zouboulis, C. C. (2014). Acne as a chronic systemic disease. In *Clinics in Dermatology* (Vol. 32, Issue 3). <https://doi.org/10.1016/j.clindermatol.2013.11.005>