

The Relationship Between Body Mass Index and the Severity of Acne Vulgaris in Outpatients at the URJ Dermatology and Venereology Clinic, Dr. Soetomo General Hospital, Surabaya, January 2023-July 2024

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ABSTRACT

Background: Acne vulgaris, as one of the most common skin problems in Indonesia, is thought to be caused by body mass index (BMI). Several studies have shown a positive correlation between high BMI and more severe acne severity, although some others do not state this. **Objective:** This study aims to analyze the relationship between body mass index and the severity of acne vulgaris in outpatients at the Dermatology and Venereology Department of Dr. Soetomo Hospital, Kota Surabaya, for the period January 2023-July 2024. **Methods:** This study is statistical-descriptive, where data are investigated on the relationship between body mass index and the severity of acne vulgaris. **Results:** The results of this study on 125 acne vulgaris patients showed that although the main triggering factors were stress (60%), use of skincare/cosmetics (59.2%), and diet (54.4%), there was no significant relationship between Body Mass Index (BMI) and the severity of acne vulgaris in children ($p=0.183$) or adults ($p=0.829$).

Keywords: acne vulgaris; body mass index; Dr. Soetomo Hospital; severity

INTRODUCTION

Acne vulgaris, commonly known as acne, is an inflammation of the pilosebaceous unit and is one of the most common skin problems in Indonesia and globally [1]. According to data from the Indonesian Ministry of Health, there has been an increase in the number of acne cases each year in Indonesia. In 2021, it is estimated that more than 20 million people in Indonesia suffer from acne, with the highest prevalence in adolescents and young adults with varying severity [2].

Globally, acne is estimated to affect around 9.4% of the world's population, or the equivalent of 635 million people in 2020 [3]. Although not life-threatening, acne can have a significant negative impact on a person's quality of life, such as low self-confidence, psychological disorders, and the risk of complications such as permanent scarring [4]. In

Southeast Asia, the prevalence of acne vulgaris is around 40-80%, with inflammatory lesions being more common than comedonal lesions, namely 20% inflammatory and 10% comedonal lesions. In Indonesia, according to records from Indonesian Cosmetic Dermatology, there has been a significant increase in the prevalence of acne vulgaris from year to year. This increase is thought to be related to lifestyle changes, stress, and other factors [5].

This condition is caused by various risk factors, such as increased oil production (sebum), accumulation of dead skin cells, growth of Cutibacterium acnes bacteria, inflammation, hormonal factors, genetics, stress, and lifestyle [6]. Pathophysiologically, acne vulgaris occurs through a process of increased sebum production, hyperproliferation of keratinocytes that clog hair follicles, bacterial colonization, and inflammatory response [7].

One factor that is thought to play a role in the development of acne is body mass index (BMI). BMI is an indicator used to assess a person's nutritional status by comparing weight and height [8]. A high BMI (overweight or obese) is associated with increased levels of androgen hormones, such as testosterone and insulin-like growth factor-1 (IGF-1). Androgen hormones can stimulate excess sebum production and hair follicle hyperproliferation, which are factors that trigger the formation of acne. However, a low BMI (underweight) is also associated with the severity of acne vulgaris. This condition is related to certain nutritional deficiencies that can affect skin health and the wound healing process [9].

Several studies have been conducted on the relationship between BMI and the severity of acne vulgaris, but the results are inconsistent. Alowairdhi's (2022) study of 596 acne patients in Saudi Arabia found no significant relationship between age group, gender, BMI, and acne (severity of acne) [10]. However, a systematic review and meta-analysis conducted by Pambudi (2023) found a statistically significant correlation between body mass index and acne severity, although the clinical significance of this correlation is not yet known [11]. This is supported by Silvia's (2021) study, which found a significant relationship between BMI and the incidence of seborrheic dermatitis, a condition associated with excessive sebum production [12]. This shows that some studies have found a positive correlation between high BMI and more severe acne, while others have found no significant relationship. The researchers chose Dr. Soetomo General Hospital in Surabaya as the research location because this hospital is one of the national referral hospitals in Indonesia that plays an important role in providing comprehensive and high-quality health services to the community. This hospital has a number of patients suffering from acne vulgaris. Although acne vulgaris is commonly found among the general population, no previous studies have been conducted at Dr. Soetomo General Hospital that focus on this condition.

Based on the above description, questions arise regarding the relationship between body mass index and the severity of acne vulgaris. Therefore, the author is interested in conducting a study titled "The Relationship Between Body Mass Index and the Severity of Acne Vulgaris in Outpatients at the Dermatology and Venereology Department of Dr. Soetomo General Hospital, Surabaya, from January 2023 to July 2024."

METHODS

This study is an observational analytical study with a cross-sectional design using medical record data from outpatients with acne vulgaris at the Dermatology and Venereology Unit of Dr. Soetomo General Hospital to examine the relationship between body mass index and the severity of acne vulgaris. The population involved in this study was all new patients with acne vulgaris complaints who underwent treatment at the Dermatology and Venereology Outpatient Unit of Dr. Soetomo General

Hospital in Surabaya from January 2023 to July 2024. This study used total sampling, where the sample used met the criteria, namely all medical records of patients who met the inclusion and exclusion criteria for the period January 2023 to July 2024. The sample in this study consisted of patients suffering from acne vulgaris at the Dermatology and Venereology Outpatient Unit (URJ) of Dr. Soetomo General Hospital in Surabaya between January 2023 and July 2024.

This study used two variables, namely the dependent variable (Severity of acne vulgaris) and the independent variable (body mass index (BMI) of acne vulgaris patients). The instrument used in this study was the Medical Records of Acne Vulgaris Outpatients at the Dermatology and Venereology Outpatient Unit (URJ) of Dr. Soetomo General Hospital in Surabaya during the period from January 2023 to July 2024. The study was conducted at the Dermatology and Venereology Outpatient Unit (URJ) of Dr. Soetomo General Hospital in Surabaya from February to December 2024. The data to be processed in this study is secondary data obtained from the medical records of patients at the Dermatology and Venereology Outpatient Unit (URJ) of Dr. Soetomo General Hospital in Surabaya for the period January 2023 to July 2024. The data collected for processing includes age, gender, BMI, and the severity of acne vulgaris.

The data obtained will be converted into tables and processed using statistical software. The stages of data processing are as follows: editing, coding, entry, cleaning, serving, and data analysis. The data obtained and collected will then be analyzed using a computer with the Statistical Product and Service Solution (SPSS) program. The data in this study will then be further analyzed using Pearson's correlation and chi-square tests to find out whether there is a relationship between the two variables. The ethics of this study are: Approval from the Dr. Soetomo General Hospital Health Research Ethics Committee and confidentiality.

RESULT AND DISCUSSION

TABLE 1: Demography of Patients.

Demography	Frekuensi (n)	Presentation (%)
Age		
Children (1-11 years old)	2	1,6
Early Adolescents (12-16 years old)	22	17,6
Late Adolescents (17-25 years old)	57	45,6
Adults (26-45 years old)	43	34,4
Early Elderly (46-59 years old)	1	0,8
Total	125	100

Demography	Frekuensi (n)	Persentase (%)
Gender		
Male	45	36
Female	80	64
Total	125	100
Body Mass Index		
Nutritional status of patients based on adult BMI		
Underweight	16	16,7
Normal	45	46,9
Overweight	17	17,7
Obesity I	17	17,7
Obesity II	1	1
Total	96	100
Nutritional status of patients based on the BMI of children aged 5-18 years		
Malnutrition	0	0
Undernourishment	3	10,3
Good nutrition	18	62,1
Overweight	5	17,2
Obesity	3	10,3
Total	29	100
Severity of Acne Vulgaris		
Mild	78	62,4
Moderate	42	33,6
Severe	5	4
Total	125	100

Based on the data in Table 1, the age range of patients in the outpatient unit of the Dermatology and Venereology Clinic at Dr. Soetomo General Hospital from January 2023 to July 2024 varied between 8 and 45 years, with the majority of patients in the 17–25 age group, totaling 57 patients (45.6%), which is classified as late adolescence and early adulthood, followed by adults with 43 patients (34.4%), adolescents aged 12–16 years with 22 patients (17.6%), and children aged 1–11 years with 2 patients (1.6%). Based on gender, female patients dominated with 80 patients (64%), while male patients numbered 45 (36%). In the Body Mass Index (BMI) category, 45 patients (46.9%) had a normal BMI, 17 patients (17.7%) were overweight, 16 patients (16.7%) were underweight, 17 patients (17.7%) were obese I, and 1 patient (1%) was obese II. The nutritional status of patients showed that most had good nutrition, 18 patients (62.1%), followed by 5 patients (17.2%) with excessive nutrition, 3 patients (10.3%) with malnutrition and obesity, respectively, and no patients with poor nutrition. Based on severity, most patients had mild acne vulgaris (78 patients, 62.4%), followed by moderate acne (42 patients, 33.6%), and severe acne (5 patients, 4%). Thus, it can be concluded that the majority of patients had mild to moderate acne vulgaris.

TABLE 2: Patient Distribution Based on Acne Vulgaris Trigger Factors.

Triggering Factors	Frekuensi (n)	Persentase (%)
Genetics	54	43,2
Diet	68	54,4
Stress	75	60
Use of Skincare/Cosmetics	74	59,2
Use of Medications	12	9,6

Based on Table 2, the main triggering factors for the onset of acne vulgaris in patients at the dermatology and venereology outpatient unit of Dr. Soetomo General Hospital from January 2023 to July 2024, according to the research findings, were stress, with a frequency of 75 (60%) patients. Other factors with high percentages include the use of skincare/cosmetics in 74 (59.2%) patients and dietary patterns affecting 68 (54.4%) patients. Additionally, genetic factors were found in 54 (43.2%) patients, while medication use had the lowest influence, affecting only 12 (9.6%) patients.

TABLE 3: Kolmogorov-Smirnov Sample Test Results.

One-Sample Kolmogorov-Smirnov Test				
	Statistic	N	Sig.	Ket.
Severity of Acne Vulgaris	0.351	125	.000	The data is not normally distributed
BMI	0.326	125	.000	The data is not normally distributed

Based on Table 3 above, the results of the normality test using Kolmogorov-Smirnov obtained an Asymp. Sig. value of 0.000 < 0.05, indicating that the sample data from the tested population was not normally distributed.

TABLE 4: Results of Linearity Test between Severity of Acne Vulgaris and Body Mass Index.

ANOVA TABLE			
		F	Sig.
Severity* BMI	Sources of Variation (Within Groups)	0.955	0.435
	Linearity	0.326	0.569
	Deviation from Linearity	1.165	0.326

Based on Table 4 above, the results of the linearity test analysis show that there is no significant difference in the severity between groups as a whole with F=0.955 and Sig.= 0.435 because the significance value (Sig.) is greater than 0.05.

Furthermore, no strong linear relationship was found between Body Mass Index (BMI) and the severity of acne vulgaris, with an F value of 0.326 and a Sig. value of 0.569, as well as a linearity

deviation value of $F=1.165$ and $Sig.=0.326$. This indicates that all significance values are greater than 0.05, meaning there are no statistically significant differences or relationships.

TABLE 5: Results of Nonparametric Spearman's rho Test on the Relationship between Children's Body Mass Index and the Severity of Acne Vulgaris.

			BMI of Children	Severity of Acne
Spearman's rho	BMI of children	Correlation Coefficient	1.000	0.234
		Significant	.	0.223
		N	29	29
	Severity of acne vulgaris in children	Correlation Coefficient	0.234	1.000
		Significant	0.223	.
		N	29	29

Based on Table 5, the results of Spearman's rho correlation test show that the Spearman correlation coefficient obtained is 0.234 with a significance value of sig. (2-tailed) of 0.223 > greater than 0.05 or 0.01, meaning that there is no

statistically significant relationship between BMI and the severity of acne vulgaris. This indicates that changes in BMI do not have a significant effect on the severity of acne vulgaris. Therefore, the hypothesis proposed by the researcher is rejected.

TABLE 6: Results of Spearman's rho Nonparametric Test of the Relationship between Adult Body Mass Index and the Severity of Acne Vulgaris.

			BMI of Adult	Severity of Acne Vulgaris
Spearman's rho	BMI of an adult	Correlation Coefficient	1.000	0.051
		Significant	.	0.625
		N	96	96
	Severity of acne vulgaris in adult	Correlation Coefficient	0.051	1.000
		Significant	0.625	.
		N	96	96

Based on Table 6, the results of Spearman's rho correlation test show that there is no statistically significant relationship between BMI and the severity of acne vulgaris.

The Spearman correlation coefficient obtained is 0.051 with a significance value or sig. (2-tailed) of 0.625 > greater than 0.05 or 0.01.

TABLE 7: Chi-square Test Results for the Relationship between Children's Body Mass Index and the Severity of Acne Vulgaris.

BMI of Children	Severity of Acne Vulgaris				p
	Mild	Moderate	Severe	Total	
	Frequency (n)	Frequency (n)	Frequency (n)	N	
Malnutrition	3	0	0	3	0,183
Undernourishment	9	9	0	18	
Good nutrition	3	1	1	5	
Overweight	1	2	0	3	

Based on Table 7, the results show that there were 3 patients in the underweight BMI category with mild acne vulgaris. In the normal BMI category, there were 9 patients with mild acne vulgaris and 9 patients with moderate acne vulgaris. In the overweight BMI category, there were 3 patients with mild acne vulgaris, 1 patient with moderate acne vulgaris, and 1 patient with severe acne

vulgaris. In the obesity BMI category with mild acne vulgaris, there was 1 patient. Bivariate analysis using the chi-square test for the relationship between body mass index and the severity of acne vulgaris showed no significant relationship, as the p -value = 0.183 was greater than the significance value of 0.05.

TABLE 8: Chi-square Test Results for the Relationship between Adult Body Mass Index and the Severity of Acne Vulgaris.

BMI of Adult	Severity of Acne Vulgaris				p
	Mild	Moderate	Severe	Total	
	Frequency (n)	Frequency (n)	Frequency (n)	N	
Underweight	13	4	0	17	0,657
Normal	26	17	2	45	
Overweight	13	3	1	16	
Obesity I	10	6	1	16	

Based on Table 8, the results show that in the underweight BMI category, there were 15 patients (68.2%) with mild acne vulgaris, 7 patients (31.8%) with moderate acne vulgaris, and no patients with severe acne vulgaris. In the normal BMI category with mild acne vulgaris, there were 32 patients (56.1%), moderate acne vulgaris in 21 patients (36.8%), and severe acne vulgaris in 4 patients (7%). In the overweight BMI category group with mild acne vulgaris, there were 14 patients (63.6%), moderate acne vulgaris in 7 patients (31.8%), and severe acne vulgaris in 1 patient (4.5%). In the obesity I BMI category group with mild acne vulgaris, there were 15 patients (71.4%), moderate acne vulgaris in 6 patients (28.6%), and no patients with severe acne vulgaris. In the obesity category II BMI group with mild acne vulgaris, there were 2 patients (66.7%), 1 patient (33.3%) with moderate acne vulgaris, and no patients with severe acne vulgaris. Bivariate analysis using the chi-square test for the relationship between body mass index and the severity of acne vulgaris showed no significant relationship, as the p-value = 0.829 was greater than the significance value of 0.05.

DISCUSSION

Discussion of Research Results Based on General Patient Distribution

The results of the study show that the age group with the highest number of acne vulgaris cases was in the 17–25 age range, with 57 patients (45.6%) falling into the late adolescence category. During this period, individuals experience significant physical, psychological, and social changes, most of which are influenced by hormonal activity, especially androgen hormones. These hormones play an important role in stimulating the sebaceous glands to produce excess sebum. Increased sebum production can cause clogged skin pores and the formation of blackheads, which then develop into acne. This condition is also in line with increased hormone levels during puberty, which generally occurs between the ages of 12 and 25. Research conducted by [13] states that high sebum production due to hormonal changes is one of the main triggers of acne in adolescents. In addition, the results of the Global Burden of Disease (GBD) study show that the prevalence of acne vulgaris reaches 85% and occurs most frequently in the 12–25 age group, with the 15–24 age group classified as late adolescence [14]. These results are also supported by the findings of Sinaga (2020), who

reported that the majority of respondents were aged 17–25 years (82.8%), while the older age group only accounted for 17.2%. Overall, these results confirm that late adolescence and early adulthood are the most vulnerable phases for the onset of acne vulgaris due to hormonal fluctuations that affect skin balance.

In terms of gender, this study found that the majority of acne vulgaris patients were female, numbering 80 (64%), while males numbered 45 (36%). This difference can be explained by hormonal and physiological factors, whereby women experience more complex hormonal changes than men, particularly during puberty, menstrual cycles, pregnancy, and menopause. Changes in estrogen, progesterone, and androgen levels can increase sebaceous gland activity, leading to excess sebum production, pore blockage, and skin inflammation. Research [15] explains that these hormonal fluctuations are the main trigger for the onset of acne vulgaris in women. These results are also consistent with Glenn Javier's (2023) research at SMAN 1 Makassar, which found that female respondents (64.7%) experienced acne vulgaris more than males (35.3%), as well as research by Latifah, U., Maulida, I., & Henda, K. A. (2024), which reported that the majority of acne vulgaris patients were female (251 people, 87.2%) compared to male (37 people, 12.8%). Based on these results, it can be concluded that women have a higher risk of developing acne vulgaris due to complex hormonal influences. In addition, excessive use of cosmetics and skin care products can also worsen skin conditions if they are not suitable for the skin type.

Based on Body Mass Index (BMI) categories, the results of this study show that the majority of patients have good nutritional status (62.1%), while a small number of others are classified as overweight or obese. Being overweight can affect hormonal balance and increase the body's inflammatory response, which has the potential to worsen acne vulgaris. However, no patients with malnutrition were found, indicating that most respondents had a relatively stable nutritional status. Study [16] also supports these results by showing that the majority of adolescents have a normal nutritional status. However, in the adult group, 46.9% of patients had a normal BMI, and 17.7% were classified as overweight. This indicates that even if BMI is within normal limits, it does not

guarantee that a person will be free from acne vulgaris. Other factors such as hormonal balance, stress, diet, sleep quality, and skin care habits also affect skin health. Research [17] states that obesity is associated with an increased risk of various skin problems, including acne, while research [18] concludes that BMI is not a major risk factor for acne vulgaris, as genetic, socioeconomic, and geographical factors have a greater influence on the severity of acne. Thus, nutritional status and BMI can be additional indicators in understanding skin conditions, but they are not the sole determinants of acne vulgaris.

Discussion of Research Results on the Relationship Between Body Mass Index and the Severity of Acne Vulgaris

This study aims to analyze the relationship between Body Mass Index (BMI) and the severity of acne vulgaris in patients undergoing treatment at the Dermatology and Venereology Outpatient Unit of Dr. Soetomo General Hospital during the period from January 2023 to July 2024. Based on the results of statistical tests using Spearman's rho, a significance value of 0.696 was obtained, which is greater than 0.05 and 0.01 (Table 4), indicating that there is no significant relationship between BMI and the severity of acne vulgaris. The Chi-square test conducted to confirm these results also showed a p-value of 0.829, which was again greater than 0.05 (Table 5). Thus, the research hypothesis stating that there is a significant relationship between BMI and the severity of acne cannot be accepted. These findings indicate that body weight or nutritional status, as represented by BMI, does not directly affect the severity of acne vulgaris. This is consistent with the understanding that acne vulgaris is a multifactorial skin disorder that cannot be explained by a single variable. Pathophysiologically, acne vulgaris occurs due to the complex interaction of various internal and external factors. The process of acne formation begins with increased sebum production from the sebaceous glands, which is controlled by androgen hormones. Individuals who are overweight or obese usually have higher levels of androgen hormones, because body fat tissue also plays a role in the production of these hormones. Increased androgen hormones can stimulate sebaceous gland activity, resulting in excess sebum production that clogs skin pores and forms comedones. However, in addition to hormonal factors, there are also external influences such as a high glycemic index diet, stress, inappropriate use of cosmetics, and consumption of certain medications that can worsen skin conditions. Previous research by Prida Ayudianti and Indramaya (2016) at Dr. Soetomo General Hospital showed that the most common triggers in male patients were food (23.2%) and stress (23.9%), while in female patients, it was more due to hormonal factors (89%) and cosmetic use (89.1%). The findings of this study are in line with study [19], which also found no significant relationship between BMI and the severity of acne ($p > 0.05$). However, study [20] reported a weak but significant correlation, and Ayu, A. Z. et al.

(2023) found that a high glycemic index was positively correlated with the severity of acne. The differences in results between studies may be due to variations in the activity of enzymes that convert testosterone to 5 α -dihydrotestosterone in skin cells, which affects androgen sensitivity and suggests that BMI is not always a reliable indicator of the severity of acne vulgaris [21].

CONCLUSION

Based on the results of research conducted at the Dermatology and Venereology Outpatient Unit of Dr. Soetomo General Hospital in Surabaya from January 2023 to July 2024, it can be concluded that most patients with acne vulgaris have good nutritional status. In the pediatric group, the majority of patients had good nutritional status, totaling 18 patients (62.1%), while in the adult group, most patients had a normal Body Mass Index (BMI), totaling 45 patients (46.9%). These results indicate that most patients with acne vulgaris do not experience extreme weight disorders, either in the form of malnutrition or overnutrition. In terms of disease severity, the majority of patients experienced mild acne vulgaris, totaling 78 patients (62.4%), followed by moderate cases, with only a small proportion experiencing severe cases. This indicates that most patients sought treatment when the acne was still in its early stages or had not yet caused severe complications.

In addition, the results of the analysis of the relationship between Body Mass Index and the severity of acne vulgaris showed no significant correlation. This means that the nutritional status or weight of patients does not directly affect the severity of acne. Thus, factors other than BMI play a greater role in triggering or worsening acne vulgaris. Based on the results of the identification of triggering factors, it was found that stress was the factor most commonly reported by patients, namely 75 people (60%). Unstable psychological conditions can increase androgen hormone activity, which in turn stimulates excess sebum production and worsens acne. These results indicate that the treatment of acne vulgaris should not only focus on physical factors but also consider the patient's psychological aspects and lifestyle comprehensively.

Based on the results of the study, it is recommended that future studies consider other factors that may have a greater impact on the severity of acne vulgaris, such as diet, hormonal factors, and personal hygiene, as these aspects are closely related to skin condition. In addition, future studies are also expected to use more specific additional parameters in assessing body condition, such as body fat percentage or fat distribution, to obtain a more accurate picture of the relationship between nutritional status and the severity of acne vulgaris. Health institutions are advised to periodically evaluate patient medical record data entry procedures and adjust their recording systems to improve the completeness and accuracy of medical information, so that the data obtained

can be optimally used in research and clinical decision-making.

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