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CORRELATION BETWEEN ANTHROPOMETRIC PARAMETERS AND SEVERITY OF ACNE VULGARIS IN MEDICAL STUDENTS

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Abstract

Acne vulgaris (AV) is a prevalent dermatological condition that impacts individuals across all age groups. It is a dermatological disorder characterized by the inflammation of the sebaceous glands and hair follicles. Several research have attempted to investigate the relationship between nutritional status and AV. This study examines the relationship between body mass index, fat mass, mid-upper arm circumference, waist circumference, and the severity of acne vulgaris in medical students. This study utilized a cross-sectional technique. Anthropometric measurements encompass body mass index (BMI), fat mass, mid-upper arm circumference (MUAC), and waist circumference. The severity of AV was assessed using the Lehman Acne grading standards. The association between variables was assessed by bivariate analysis using the Somers' d test. The subject for this study consisted of 115 preclinical medical students. The average age was 20.5±0.89 years. The results indicated that there was no significant correlation seen between BMI, fat mass, waist circumference, MUAC, or severity of AV in either subject. This study has demonstrated that anthropometric parameters were not reliable indicators of the severity of AV. Further inquiry is necessary to explore additional factors that could potentially contribute to the severity of acne.

Keywords: Anthropometric Parameters, Acne Vulgaris, Medical Students, Body Mass index (BMI), Fat Mass, Mid-Upper Arm Circumference (MUAC), Waist Circumference.

INTRODUCTION

Acne vulgaris (AV) is a common skin problem that affects people of all ages but is more prevalent among teens. According to the 2019 Global Burden of Condition (GBD) database, which comprises 105 data sources on AV patients worldwide, the number of persons affected by this condition. AV is more prevalent in nations with high sociodemographic indices, particularly in Asia Pacific (1). Indonesian medical students have a high incidence of AV. In Lampung, up to 71.3% of medical students reported experiencing AV (2). Meanwhile, students at the Faculty of Medicine in Kupang, Nusa Tenggara Timur had mild AV 87.1% and moderate AV 12.9% (3). Furthermore, 58% of students from the Faculty of Medicine, UIN Syarif Hidayatullah Jakarta encountered AV (4).

AV is a skin condition marked by inflammation of the sebaceous glands and hair follicles. AV can have an impact on quality of life, particularly psychological and social well-being (1,5). Bacterial infection, inflammation, hormonal changes, and hereditary factors are among the causes of AV. Excessive sebum production, *Propionibacterium acnes* germs, and plugged pores are all causes that can cause inflammation. Lifestyle factors such as food and physical activity also influence the development and severity of AV (6,7).

One intriguing component is the link between nutrition and AV. Unbalanced diets can impair overall bodily function, including skin health. According to several research, eating foods heavy in sugar and fat can exacerbate AV. In contrast, eating foods high

in protein, veggies, and fruits can help minimize AV instances. Micronutrients like vitamins A, E, zinc, and selenium are linked to skin health and may help minimize AV. (8–10).

Multiple studies have endeavored to examine the correlation between nutritional status and AV. The body mass index (BMI) is a useful tool for evaluating an individual's nutritional health. Individuals with a high body mass index (BMI) or obesity are at an increased risk of developing skin diseases, such as AV. Research has shown that individuals with an imbalanced body composition, especially those with a significant amount of body fat, are more susceptible to AV. Consequently, obesity has emerged as one of the most widespread health concerns on a global scale. Further investigation is required to establish the correlation between AV and obesity, as the results of these investigations are not consistently aligned, and the mechanisms behind the connection between nutritional status, body composition, and AV remain partially understood. Conversely, having a low amount of muscle mass has been associated with inadequate nutritional status, which can negatively impact overall skin health (7,11,12). In addition to anthropometric measurements that can be utilized to assess nutritional status. Several scholars believe that variations in study design, researched population, and measuring techniques could potentially impact the results. Therefore, further investigation with improved methodologies is necessary to elucidate this correlation. This study investigates the correlation between , fat mass, mid-upper arm circumference, waist circumference and the severity of acne vulgaris in medical students. Medical students were selected as subjects due to their frequent exposure to academic stress, which can impact their food patterns, body composition, and the development of AV.

METHODS

This study was a cross-sectional methodology to examine the relationship between nutritional status, body composition, and the occurrence of AV events among medical students. Stratified random sampling was employed to ensure a precise representation of various levels of schooling in the preclinical stage. The subjects must meet the specified inclusion criteria. Preclinical medical students currently enrolled at the Faculty of Medicine, UIN Syarif Hidayatullah Jakarta. Voluntarily willing to take part in the trial and provide informed consent, currently not receiving any AV treatment that could potentially impact the results of the study (e.g., isotretinoin). The exclusion criteria encompass individuals with medical conditions that could potentially affect their nutritional status and body composition, such as metabolic diseases. Additionally, those with skin issues other than severe acne vulgaris, as well as individuals adhering to specific diets or rigorous exercise routines that may influence body composition, are also excluded.

Age and gender were among the demographic information gathered through a questionnaire. Weight and height are the two main variables necessary for calculating BMI. In order to get correct BMI findings, it is imperative to accurately measure both of these characteristics. A digital scale, which has a precision of 0.1 kg, is used to measure body weight. The body's weight should be measured while wearing lightweight clothing and barefoot. Keep a vertical stance, looking straight ahead, without moving. The tool used to measure A stadiometer, also known as a measuring device, was mounted on the wall to ascertain an individual's height. The stadiometer was contacted by the soles, back, and head of the person, and their height was

determined without wearing shoes. It is necessary to maintain a vertical position with the head orientated straight ahead, without any motion. Body composition, namely the amount of body fat and fat-free mass, can be accurately assessed by employing a bioelectrical impedance analysis (BIA) apparatus. The choice of BIA was made due to its non-invasive, fast, and accurate capacity to measure body composition in large groups of people(13). The Body Mass Index (BMI) is a measure that calculates the ratio of an individual's body weight to the square of their height, expressed in kilograms per square meter (kg/m^2) . Fat mass percentage is a metric that quantifies the ratio of fat to total body weight (13). The Mid-Upper Arm Circumference (MUAC) was assessed using a pliable measuring tape that does not stretch, and was marked in centimetres. The subject flexes their left arm at a 90-degree angle, with the elbow bent and the palm pointing upwards. Determine the exact midpoint between the acromion, which is the prominent bone on the shoulder, and the olecranon, which is the tip of the elbow. While the arm was in a downward position, gently use a marker to make a faint mark at the centre point on the back of the arm. This is the location where the MUAC measurement was conducted. The individual should allow their arm to hang down naturally by their side. Encircle the MUAC tape around the arm precisely at the designated halfway (14). Subjects were measured for waist circumference while standing erect with feet together, weight uniformly distributed, wearing light clothing, and with direct measurement on the skin. Identify the highest point of the iliac crest, which is the uppermost border of the hip bone, and the lowermost part of the rib cage. The measurement should be taken precisely at the halfway between these two anatomical landmarks (15). The mean value was utilised for analysis, and each subject received measurements on two occasions to ensure precision.

An experienced dermatologist performed a physical examination to assess the AV condition. During this evaluation, the examiner was utilise tools such as magnifying lenses and flashlights to detect blackheads on the face that may not be visible to the naked eye. The evaluation was utilize the Lehman Acne grading criteria (16).

Continuous data were denoted by the mean, median, and standard deviation, whilst the frequency and percentage represent categorical variables. The presentation of the data were in these forms. The link between variables was evaluated by bivariate analysis utilizing the Somers' d test, which was specifically designed for categorical variables.

This study adheres to the standards of research ethics and ensures informed permission from all research subjects. Strict measures was taken to ensure the confidentiality and privacy of subject data. The collected data were securely saved and anonymized.

RESULTS

Characteristics of the subjects

This study included a total of 115 medical students who were currently enrolled in the Faculty of Medicine at UIN Syarif Hidayatullah Jakarta. All of them were preclinical students in their third and fourth years of study. The mean age was 20.5 years with a standard deviation of 0.89 years. Table 1 presents data on the gender of the subject. The majority of the subjects were female.

Table 1: Characteristics of the Subject's

Category	Frequency (n=115)	Percentage (%)
Gender		
- Male	27	23.5
- Female	88	76.5
BMI		
- Underweight	14	12.2
- Normal	38	33
- Over normal	63	54.8
Fat mass		
- Low	10	8.7
- Normal	32	27.8
- High	31	27
- Very High	42	36.5
Waist circumference		
- Normal	60	52.2
- Central Obesity	55	47.8
MUAC		
- Underweight	47	40.9
- Normal	44	38.3
- Overweight	10	8.7
- Obesity	14	12.2
Severity of Acne Vulgaris		
- Mild	71	61,3
- Mild	44	38,3
- Advanced	0	0

Body mass index (BMI)

The mean body weight was 60.04 ± 97 kg. The average height was 158.77 cm, with a variation between 146 and 179 cm. The nutritional status of respondents was assessed using the BMI category described in Table 1. The findings revealed that most subjects exhibited a BMI that exceeded the standard range.

Fat mass

Table 1 displays the findings of the measurements made in the fat mass category. Among the entire subjects, 36.5% were classified as having a markedly high-fat mass, while 63.5% had a fat mass that fell outside the normal range.

Mid Upper Arm Circumference (MUAC)

The MUAC data indicated that there was a virtually similar distribution across subjects in both the normal and underweight categories (Table 1). The number of categories over the normal level was lowered.

Waist circumference

The results revealed that the distribution of waist circumference was almost evenly distributed between individuals with a normal waist circumference and those identified as having central obesity (Table 1). The nearly equal distribution highlights the substantial prevalence of central obesity among the subjects examined.

Severity of Acne Vulgaris

Table 1 displays the distribution of acne severity among the subjects. 61.3% of the overall sample in this study were categorized as having mild acne vulgaris, making

them the largest group of subjects. There were no subjects classified under the advance AV degree category.

Bivariate analysis

Table 2 presents a Bivariate study of the relationship between BMI, Fat mass, Waist circumference, MUAC, and the Severity of Acne Vulgaris. There was no notable link observed between BMI, fat mass, waist circumference, MUAC, or severity of AV in either subject. Despite the fact that they seem to be positively correlated with one another.

Table 2: Bivariate analysis between BMI, Fat mass, Waist circumference, MUAC, and Severity of AV.

	Severity of Acne Vulgaris.		Total	r*	p*
	Mild	Mild			
BMI				0.002	0.979
- Underweight	9	5	14		
- Normal	23	15	38		
- Over normal	39	24	63		
Fat mass				0.085	0.309
- Low	5	5	10		
- Normal	20	12	32		
- High	17	14	31		
- Very high	29	13	42		
Waist circumference				0.073	0.431
- Normal	35	25	60		
- Central Obesity	36	19	55		
MUAC				0.003	0.968
- Underweight	30	17	47		
- Normal	24	20	44		
- Overweight	9	1	10		
- Obesity	8	6	14		

*: Somers'd test

BMI: body mass index; MUAC: mid-upper arm circumference; AV: acne vulgaris

DISCUSSION

The gender distribution of the individuals was predominantly female. This finding is consistent with other research that have also documented the same phenomenon (4,17–19). This demonstrates the societal acceptance of women in the medical profession since the 19th century. Moreover, males have a greater inclination towards engineering, while females demonstrate a stronger preference for health-related fields.

Most subjects exhibited a BMI that was above the usual range. The majority of subjects fell into the group of having a significantly high-fat mass. In addition, waist circumference data was collected from the subject to evaluate the prevalence of abdominal obesity. The nearly equal distribution highlights the substantial occurrence of central obesity among the population examined. This pattern contradicts the nutritional status statistics based on MUAC, which indicates a prevalence of normal and underweight nutritional status.

Excessive or elevated body weight can lead to a variety of illnesses. An overweight body can pose risks to both physical and emotional health. Individuals who are obese

have a significantly higher risk of developing diabetes compared to those who have an optimum body weight. The likelihood of developing diabetes is ten times greater for obese individuals. Obesity can lead to insulin resistance, resulting in elevated blood sugar levels and the development of type 2 diabetes. Moreover, the likelihood of having additional health complications, such as cardiovascular disease, renal illness, vision impairment, and stroke, will be significantly heightened. Obesity can lead to hypertension, hyperlipidemia, and atherosclerosis. The significance of these three hazards associated with obesity should not be underestimated, since they can heighten the likelihood of acquiring cardiovascular disease. Indeed, if obesity leads to constriction and obstruction of the arteries, it becomes more prone to experiencing heart attacks and strokes. Students fall under the young adult age group and should prioritize their health from a young age to mitigate the likelihood of getting degenerative illnesses in the future (20).

This pattern contradicts the nutritional status statistics based on MUAC, which indicates a prevalence of normal and underweight nutritional status. Differences in the measurements highlight the significance of employing a comprehensive method to evaluate nutritional status and health hazards. MUAC is a measurement that assesses the general nutritional state of an individual, specifically by evaluating the amount of muscle mass and fat storage in the upper arm. BMI provides a broad assessment of body fat but does not reflect the distribution of fat or the amount of muscle mass. Waist circumference refers to the measurement around the waist.

This test specifically assesses central obesity, which is strongly associated with metabolic and cardiovascular risks. Every measure offers distinct perspectives, and their collective utilization can provide a more precise and comprehensive comprehension of an individual's well-being. Identifying and resolving these inconsistencies might result in more focused health interventions and enhanced results.

These findings align with the research undertaken by Lajevardi et al (11), Goodarzi et al (21), and Raditra et al (22), which similarly shown no significant correlation between BMI and AV. Contrary to the findings of Hasrat and Al-Yassen (23), this study demonstrates a clear link between higher BMI it establishes a positive correlation between BMI and acne severity ratings on a global scale. Gündüz and Ataş (24) also emphasized a notable correlation between the severity of acne and various measures of body mass index (BMI). Furthermore, Qasim et al (12) discovered that the AV was substantially larger in those with obesity in comparison to those without obesity.

This study discovered that a large proportion of body fat mass and visceral fat, as determined by waist circumference, did not show a correlation with an elevated risk of AV. Several studies have indicated a positive association between high amounts of visceral fat and insulin resistance, which is known to stimulate sebaceous glands and promote sebum production. IGF-1 has the ability to enhance the growth of keratinocytes, which leads to the obstruction of hair follicles and the production of acne vulgaris (25,26). Additional research has demonstrated that those who are obese are at a higher risk of experiencing severe acne vulgaris in comparison to individuals who have a normal weight. Other factors, such as physical activity levels and dietary choices, may alter the association between obesity and AV (9,10,27). This implies that genetic and environmental variables are also significant contributors.

In order to comprehend these results indicating a lack of correlation, it is crucial to take into account fundamental theories and up-to-date research. Considering the absence of a notable correlation, This could be attributed to additional factors that exert a more significant impact on the severity of AV. Possible factors contributing to this condition may encompass hormone imbalances, genetic predisposition, food habits heredity, environment, stress, sleep patterns, usage of cosmetic products, and lifestyle choices (7). Genetics have a substantial influence on an individual's predisposition to AV. If an individual has a familial predisposition to AV, they are more prone to get the same ailment (28).

Exposure to pollution, inadequate skin care, and the use of comedogenic cosmetic items can exacerbate acne vulgaris. Research has demonstrated that psychological stress exacerbates AV. Stress can enhance the secretion of hormones that activate the sebaceous glands, leading to an increased production of sebum (7). Medical students frequently encounter academic stress, which can elevate cortisol levels, leading to heightened sebum production and exacerbation of AV. Smoking, insufficient sleep, and unhealthy food can exacerbate the severity of AV (12,13,29). Nevertheless, these factors may not have a direct correlation with BMI.

Thus, concentrating exclusively on anthropometric characteristics for the purpose of predicting or treating the severity of acne may out to be ineffective. The findings emphasize the significance of implementing a comprehensive approach in comprehending and managing acne vulgaris. When evaluating patients, dermatologists and healthcare practitioners should take into account several elements such as clinical, hormonal, genetic, and lifestyle factors, instead of just relying on anthropometric measurements.

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It is important to acknowledge the various constraints of this study. The cross-sectional design lacks the ability to establish causality. Furthermore, the study was constrained to solely encompass medical students from a single university, hence the findings may not be applicable to a broader demographic.

CONCLUSION

This study has found that anthropometric measurements are not good indicators of the severity of acne. Additional investigation is required to examine alternative factors that may contribute to the severity of acne. Conducting longitudinal research and examining the impact of certain food components, stress levels, and alterations in the microbiome could offer a more comprehensive knowledge of how acne develops. Subsequent investigations should prioritize a wider array of variables in order to formulate more efficient approaches for the management and treatment of acne.

References

1) Layton AM, Thiboutot D, Tan J. Reviewing the global burden of acne: how could we improve care to reduce the burden?*. Br J Dermatol. 2021;184(2):219–25.

2) Aulia R, Resati N, Arti F, Silvia E. Hubungan antara kualitas tidur dengan. Hub Antara Kualitas Tidur dengan Acne Vulgaris pada Mhs Fak Kedokt Umum Univ Malahayati Angkatan 2019. 2020;4(1):33–8.

3) Maria Jozilyn Bria Seran, Kartini Lidia, Arley S. Telussa. Hubungan Kualitas Tidur dengan Tingkat Keparahan Acne Vulgaris Pada Mahasiswa Preklinik Fakultas Kedokteran Undana. Cendana Med J. 2020;8(2):58–65.

4) Indah Juliantika. Hubungan Kualitas Tidur Dan Waktu Mulai Tidur Malam. 2022. 10–30 p.

5) Smith H, Layton AM, Thiboutot D, Smith A, Whitehouse H, Ghumra W, et al. Identifying the Impacts of Acne and the Use of Questionnaires to Detect These Impacts: A Systematic Literature Review. Am J Clin Dermatol. 2021;22(2):159–71.

6) Heng AHS, Chew FT. Systematic review of the epidemiology of acne vulgaris. Sci Rep. 2020;10(1):1–29.

7) Yang J, Yang H, Xu A, He L. A Review of Advancement on Influencing Factors of Acne: An Emphasis on Environment Characteristics. Front Public Heal. 2020;8(September):1–16.

8) Meixiong J, Ricco C, Vasavda C, Ho BK. Diet and acne: A systematic review. JAAD Int [Internet]. 2022;7:95–112. Available from: https://doi.org/10.1016/j.jdin.2022.02.012

9) Baldwin H, Tan J. Effects of Diet on Acne and Its Response to Treatment. Am J Clin Dermatol [Internet]. 2021;22(1):55–65. Available from: https://doi.org/10.1007/s40257-020-00542-y

10) Conforti C, Agozzino M, Emendato G, Fai A, Fichera F, Marangi GF, et al. Acne and diet: a review. Int J Dermatol. 2022;61(8):930–4.

11) Lajevardi V, Ghodsi SZ, Daneshpazhooh M, Kazemi H, Aryanian Z, Goodarzi A. The relationship between body mass index and the severity of acne. Iran J Dermatology. 2014;17(67):13–7.

12) Qasim MM, Khan MSG, Agha Q, Sikander M, Agha F, Sultana A. Comparison of dermatosis acne vulgaris in obese and non-obese patients. J Fatima Jinnah Med Univ. 2022;16(3):112–4.

13) Borga M, West J, Bell JD, Harvey NC, Romu T, Heymsfield SB, et al. Advanced body composition assessment: From body mass index to body composition profiling. J Investig Med. 2018;66(5):887–95.

14) Amegovu AK, Chewere T, Mawadri M, Kiri Amegovu A. Mid-Upper Arm Circumference (MUAC) Cut-Offs to Diagnose Overweight and Obesity among Adults. J Clin Community Med. 2020;2(3):184–9.

15) Ross R, Neeland IJ, Yamashita S, Shai I, Seidell J, Magni P, et al. Waist circumference as a vital sign in clinical practice: a Consensus Statement from the IAS and ICCR Working Group on Visceral Obesity. Nat Rev Endocrinol [Internet]. 2020;16(3):177–89. Available from: http://dx.doi.org/10.1038/s41574-019-0310-7

16) Lehmann HP, Robinson KA, Andrews JS, Holloway V, Goodman SN. Acne therapy: A methodologic review. J Am Acad Dermatol. 2002;47(2):231–40.

17) Lusiantari R, Pramaningtyas MD, Widyaningsih N, Khoiriyah U. Psychological Conditions of Undergraduate Students of Faculty of Medicine, Universitas Islam Indonesia During Pandemic Covid-19. Proc Int Conf Med Educ (ICME 2021). 2021;567(Icme):305–9.

18) Lili R, Molodynski A, Farrell SM, Citraningtyas T, Kloping NA. Wellbeing and mental health among medical students in Indonesia: A descriptive study. Int J Soc Psychiatry. 2022;68(6):1277–82.

19) Stephanie M, Surjadi C. the Mental Health of First- and Final-Year Preclinical Medical Students. J Pendidik Kedokt Indones Indones J Med Educ. 2020;9(3):291.

20) Thomas E, M G. Prevalence and Determinants of Overweight and Obesity among Medical Students. Natl J Physiol Pharm Pharmacol. 2019;10(0):1.

21) Goodarzi A, Roohaninasab M, Behrangi E, Ghassemi M, Ghahremani AP, Teymoori N. Serum parameters, diet and body mass index in acne vulgaris: A mini review. Iran J Dermatology. 2020;23(1):32–4.

22) Raditra GZH, Sari MI. SUMEJ Sumatera Medical Journal The Correlation Between Body Mass Index And Acne Vulgaris. Sumatera Med J (SUMEJ. 2020;3(1):13–22.

23) Hasrat NH, Al-Yassen AQ. The relationship between body mass index and acne vulgaris - a comparative study. Med J Basrah Univ. 2022;40(2):143–50.

24) Gündüz BÖ, Ataş H. Relationship between body mass index z-score and acne severity in adolescents: a prospective analysis. Postep Dermatologii i Alergol. 2023;40(6):808–13.

25) Gruszczyńska M, Sadowska-Przytocka A, Szybiak W, Więckowska B, Lacka K. Insulin Resistance in Patients with Acne Vulgaris. Biomedicines. 2023;11(8):1–12.

26) Sadowska-Przytocka A, Gruszczyńska M, Ostałowska A, Antosik P, Czarnecka-Operacz M, Adamski Z, et al. Insulin resistance in the course of acne - Literature review. Postep Dermatologii i Alergol. 2022;39(2):231–8.

27) Gayen R, Podder I, Chakraborty I, Chowdhury SN. Sex Hormones, Metabolic Status, and Obesity in Female Patients with Acne Vulgaris Along with Clinical Correlation: An Observational Cross-Sectional Study. Indian J Dermatol [Internet]. 2021;66:60–6. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85045467996&doi=10.4103%2Fijd.IJD_585_17&partnerID=40&md5=24ac1ecf391acb36c5e83a65633c1c90

28) Zhang H, Zhang Z. Genetic Variants Associated with Acne Vulgaris. Int J Gen Med. 2023;Volume 16:3843–56.