ORIGINAL ARTICLE

The relationship between menstrual cycle and psychological stress on acne vulgaris incidence

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ABSTRACT

Acne vulgaris (AV) is a chronic inflammation of the pilosebaceous unit and presents with a polymorphic clinical picture such as comedones, papules, pustules, nodules, and scars. AV is often experienced by both women and men, affecting 85% of young adults aged 12-25 years, with women more commonly affected than men. There are several triggers that contribute to the onset of AV, including the menstrual cycle and psychological stress. This study aims to determine the relationship between the menstrual cycle, psychological stress, and the occurrence of acne vulgaris in female medical students at Universitas Jenderal Achmad Yani. The research design uses a cross-sectional study approach. There were 48 people who met the inclusion criteria. Respondents in this study were asked to fill out informed consent forms, questionnaires, and indicate their availability for standardized facial photos. The results of this study obtained a p-value of 1.000 and 0.529 (p-value > 0.05). It was found that there is no statistically significant association observed between either regular menstrual cycles or severe psychological stress and the presence of acne vulgaris in this sample. The odds ratios for both variables (1.052 and 1.303) suggest minor increases in the odds of acne vulgaris presence, but they do not reach statistical significance. This relates to the occurrence of acne vulgaris, which is not only caused by factors such as the menstrual cycle and psychological stress but also by various triggering factors including diet, use of cosmetics, facial hygiene, and unhealthy sleep patterns.

INTRODUCTION

Acne vulgaris (AV), commonly referred to as acne, predominantly affects adolescents and young adults, making it a significant concern for this demographic. AV affects both females and males, with a prevalence of 85% among young adults aged 12-25 years, and is more frequently observed in females.[1,2] The peak incidence of AV occurs between the ages of 16-19 in males and 14-17 in females.[3] According to the Global Burden of Disease (GBD) study in 2016, the prevalence of AV among individuals aged 10-24 years ranges from 28-41% globally.[4] However, AV is not limited to this age group and can affect individuals of various ages. The severity of AV can vary, from mild symptoms with a few comedones to severe inflammatory lesions that can result in hyperpigmentation, scarring, and adverse psychological effects. During adolescence, AV is more prevalent in males, but post-adolescence, it is more common in females.[5] It has been reported that 81% of AV patients have a family history of the condition, with a 3.5 times higher risk if their relatives also have AV.[6] Studies have indicated that the prevalence of AV ranges from 8.1% to 85.1%. In Southeast Asia, AV cases range from 40-80%. Although epidemiological data on AV in Indonesia is scarce, records from Indonesian Cosmetic Dermatology show a consistent increase in AV cases, with 60% in 2006, 80% in 2007, and 90% in 2009.[6,7] A 2019 study in Lampung Province revealed that AV was more common in females (69.7%) than in males (30.3%) among individuals aged 16-25 years.[8] While the pathogenesis of acne vulgaris is multifactorial, involving factors such as sebum production, follicular hyperkeratinization, and bacterial colonization, recent research suggests that other systemic and psychological factors may also play pivotal roles. The triggers of AV includes genetic factors, psychological stress, hormonal activity during the menstrual cycle, hygiene, diet, environmental factors, trauma, medications, and cosmetic use.[6,9]

Generally, AV develops earlier in females, often before or at the onset of menstruation, compared to males. This is linked to hormonal changes during puberty, with females entering puberty earlier than males.[6] Menstruation is women's monthly bleeding due to the shedding of the uterine endometrium. The menstrual cycle, a complex physiological process regulated by hormonal fluctuations, has been implicated in various dermatological conditions, including acne. Hormonal changes during different phases of the menstrual cycle, such as fluctuations in estrogen, progesterone, and androgens, are believed to influence sebum production and follicular epithelial cell proliferation, thereby impacting acne development. The menstrual cycle involves changes in ovarian and endometrial activity, both of which are crucial for reproduction. The menstrual cycle is often linked to the onset of AV due to the high androgen levels and low estrogen and progesterone levels.[10] According to the Indonesian Ministry of Health in 2010, 68% of Indonesian women aged 10-59 years had regular menstrual cycles, while 13.7% experienced irregular menstruation in the past year.[11] In addition to the menstrual cycle, psychological stress is another significant factor in the pathogenesis of AV.[12] Stress affects an individual's emotions, cognitive processes, and overall state, leading to resistance, tension, or frustration, which can disrupt physical and mental balance.[13] Psychological stress has emerged as another significant factor potentially influencing acne vulgaris. Stress triggers the release of cortisol and other stress-related hormones, which may exacerbate inflammation, alter immune responses, and increase sebum production, all of which are implicated in acne pathogenesis. Moreover, stress can modulate behaviors such as skincare routines and dietary habits, which further influence acne severity.

Stress can affect various age groups, from adolescents to adults.[6] Generally, Indonesian university students are aged 18-24 years, a critical developmental stage for young adults. During this period, students seek self-identity, form various relationships, and assume personal responsibilities. They also face academic burdens that can trigger stress.[14] Factors such as living environment, physical and emotional status, lifestyle, and financial situation are sources of stress that can influence attitudes, behaviors, and interpersonal relationships.[12] Stress-related conditions are increasing, and medical students may experience higher stress levels due to heavy study loads, demanding coursework, poor schedule management, and inadequate sleep patterns.[12] Consequently, stress can lead to distress.[14] A 2016 study at the Faculty of Medicine, Universitas Jenderal Achmad Yani, found that 85.8% of first-year medical students experienced severe stress, 9.9% experienced moderate stress, and 4.2% experienced mild stress.[15] Despite the individual associations between menstrual cycle phases, psychological stress, and acne vulgaris, their interplay and potential synergistic effects of these factors remain underexplored. Understanding how menstrual cycle phases and psychological stress collectively contribute to acne vulgaris incidence could provide valuable insights for more targeted therapeutic approaches and preventative strategies. Therefore, this study aims to investigate the relationship between menstrual cycle phases, psychological stress levels, and the incidence of acne vulgaris among female medical students at University Jenderal Achmad Yani. By elucidating these relationships, this research seeks to contribute to a better understanding of acne vulgaris pathogenesis and potentially inform personalized treatment strategies that consider hormonal and psychological factors.

METHODS AND SUBJECT

This study is observational analytic research utilizing a cross-sectional approach to examine the relationship between menstrual cycle phases, psychological stress levels, and acne vulgaris incidence among participants.

Participants were recruited from medical students at University Jenderal Achmad Yani who were being premenstrual or menstrual with either regular or irregular cycles, and experiencing psychological stress during the period leading up to examinations. Participants were required to provide informed consent. Exclusion criteria included individuals currently undergoing hormonal therapy or treatments affecting menstrual cycle regularity.

After obtaining ethical approval, the researchers proceeded with distributing questionnaires and taking standardized facial photos of the respondents. Once the data collection phase was completed, the researchers analyzed the facial photos for a diagnosis, which was subsequently confirmed by a dermatologist specialist. Following this confirmation, data processing was conducted based on both the diagnosis results and questionnaire responses. The menstrual cycle and psychological stress were the independent variable the, while and the occurrence of acne vulgaris was the dependent variable the.

Sample collection and data processing were conducted at the Faculty of Medicine, Universitas Jenderal Achmad Yani, from September 2023 to January 2024. The collected data were analyzed using statistical software and processed with the Chi-Square test. The results are presented using univariate and bivariate analyses to assess the relationship between menstrual cycles and psychological stress on the acne vulgaris incidence. This study was conducted following the approval of the Ethics Committee of the Faculty of Medicine, Universitas Jenderal Achmad Yani, No. 066/UMI.10/2023, established on October 30, 2023.

RESULT AND DISCUSSION

This study involved subjects from the female student population of 2022 at the Faculty of Medicine, Universitas Jenderal Achmad Yani. There were forty-eight students who met the inclusion criteria and consented to participate until the end of the study, with a minimum sample size requirement of 38. Univariate analysis was used to describe each variable, while bivariate analysis was employed to examine the relationship between menstrual cycles and psychological stress on the incidence of AV.

Table 1. Incidence of Acne Vulgaris

Acne Vulgaris	Number (N)	Percentage (%)
No	10	20.8
Yes	38	79.2
Total	48	100.0

Based on Table 1, out of 48 respondents, the majority (79.2%) experienced acne vulgaris, while 20.8% did not. These findings are consistent with a 2021 study, which reported that 116 medical students (95.9%) at Universitas Jambi experienced acne vulgaris, while 19 students (14.1%) did not.[16] Furthermore, a 2022 study found that 44 female students (59.5%) experienced acne vulgaris compared to 30 female students (40.5%) who did not.[17] Previous research indicates that, while 85% of adolescents suffer from AV, it also affects 20-40% of adults, predominantly women. In young adults, acne vulgaris (AV) can be influenced by genetic and hormonal factors, which are known triggers for the condition. Genetic predisposition may make individuals more susceptible to developing acne, while hormonal changes, such as increased androgen activity, can stimulate excess sebum production in the skin's oil glands, contributing to acne formation.

Despite these known factors, the precise underlying causes of acne vulgaris in adults are still not fully understood. This lack of clarity regarding the etiology in adults underscores the complexity of acne as a multifactorial condition influenced by various genetic, hormonal, environmental, and possibly lifestyle-related factors.

The primary causes of AV include excessive keratinocyte proliferation forming comedones, increased sebum production triggered by androgens, heightened inflammatory response, and the proliferation of *P. acnes*.[18,19] Acne begins with the overgrowth of skin cells (keratinocytes) within hair follicles. This overgrowth can lead to the formation of comedones (blackheads and whiteheads). Androgens, which are hormones more prevalent in males but also present in females, stimulate the sebaceous glands to produce more sebum (skin oil). Excessive sebum can clog hair follicles and contribute to acne formation. Inflammation plays a significant role in the progression of acne. The presence of bacteria, particularly *Propionibacterium acnes (P. acnes)*, within clogged follicles triggers an immune response. This response includes the activation of inflammatory mediators, leading to redness, swelling, and the formation of inflammatory acne lesions. *Propionibacterium acnes*, a bacterium normally found on the skin, proliferates in the blocked follicles of individuals prone to acne. This bacterium contributes to inflammation and the development of inflammatory acne lesions.

Table 2. Menstrual Cycle Characteristics

Menstrual Cycle	Number (N)	Percentage (%)
Regular	34	70.8
Irregular	14	29.2
Total	48	100.0

According to Table 2, 70.8% of respondents had regular menstrual cycles, while 29.2% had irregular cycles. These results align with a 2022 study, where 74.3% of female students had regular menstrual cycles.[17] Similarly, a 2023 study at Universitas Muhammadiyah Sumatera Utara found that 76.8% of female students had regular menstrual cycles, while 23.2% had irregular cycles.[20] The participants in this study were aged 19-20, falling within the reproductive age range of 15-49 years.[21] Generally, women of reproductive age have relatively regular menstrual cycles with minimal changes.[20] This regularity refers to the predictable timing of menstruation, typically occurring every 21 to 35 days, with bleeding lasting about 2 to 7 days.

Throughout their reproductive years, most women experience stable hormonal fluctuations governed by the hypothalamic-pituitary-ovarian axis. This system regulates the release of hormones like estrogen and progesterone, which orchestrate the menstrual cycle's phases: follicular, ovulatory, and luteal. Each month, these cycles ensure the preparation of the uterus for potential pregnancy.

While variations in cycle length can occur due to factors such as stress, illness, travel, or changes in weight or exercise, these deviations are generally minor and do not disrupt the overall regularity of the menstrual cycle. Women often track their cycles to monitor fertility, anticipate menstruation, and identify any irregularities that might warrant medical attention.

Several factors such as body weight, physical activity, stress, diet, endocrine disorders, bleeding disorders, environmental exposure, and work conditions can all influence irregular cycle.[22] Significant fluctuations in body weight, whether due to rapid weight loss or gain, can disrupt hormone levels, particularly estrogen and progesterone, which are crucial for regulating the menstrual cycle. Intense physical training or excessive exercise can impact menstrual regularity by affecting hormone production and altering the body's energy balance. High levels of stress can disrupt the hypothalamic-pituitary-adrenal (HPA) axis and the hypothalamic-pituitary-gonadal (HPG) axis, which regulate the menstrual cycle. Chronic stress can lead to irregularities in menstrual cycles. Poor nutrition or extreme dietary habits can impact hormone production and affect the menstrual cycle. Inadequate intake of essential nutrients can disrupt reproductive hormone balance. Exposure to environmental toxins, pollutants, or chemicals can interfere with hormone production and disrupt menstrual cycles.

Table 3. Psychological Stress Levels

Psychological Stress	Number (N)	Percentage (%)
Severe	5	10.4
Moderate	43	89.6
Total	48	100.0

Table 3 shows that 89.6% of respondents experienced moderate stress, and 10.4% experienced severe stress. This finding supports the research conducted by Siti Hediaty et al. in 2022, which found that 52.6% of medical students experienced moderate stress, compared to 9.9% with mild stress, 35.1% with severe stress, and 2.4% with very severe stress.[23] Various studies have shown that stressors for medical students primarily involve academic pressures such as exams, time constraints, extensive study materials, and delays in completing assignments.[24] Medical education involves rigorous academic demands, including extensive coursework, exams, and clinical rotations. The pressure to excel academically can be intense and contribute significantly to students' stress levels.

Clinical training, which includes interacting with patients, making clinical decisions, and managing responsibilities under supervision, can be demanding and stressful. The transition to clinical settings and the responsibility associated with patient care can add to stress levels. Balancing academic requirements with personal life, relationships, and self-care can be challenging for medical students. The demanding nature of medical education often leaves limited time for relaxation and leisure activities, contributing to stress. Medical students often face high expectations from themselves, faculty, and peers. The pressure to perform well, achieve academic milestones, and meet professional standards can create stress. The emotional and psychological challenges of dealing with illness, suffering, and patient care can impact medical students. Witnessing and managing the emotional aspects of patient care can be emotionally draining and contribute to stress.

Under certain conditions, the body will respond physiologically when a stressor emerges. There are three bodily responses to stress: hormonal, neurotransmitter, and immune system responses. When the brain cortex detects stress, the hypothalamus secretes CRH into the portal system of the pituitary gland. Subsequently, the anterior pituitary is stimulated to release ACTH into the systemic circulation, allowing the adrenal cortex to release glucocorticoids and epinephrine. Prolonged elevation of glucocorticoid levels can affect the sebaceous glands, increasing sebum production and keratinocyte proliferation in the sebaceous ducts and acroinfundibulum. Increased sebum production leads to an increase in comedogenic and inflammatory elements, which are causes of acne.

Table 4. Relationship Between Menstrual Cycle and Psychological Stress on the Incidence of Acne Vulgaris

Variable	Acne vulgaris				Total	P-Value	OR
	No		Yes				
	N=10	%	N=38	%			
Menstrual Cycle							
Regular	7	20.6	27	79.4	34	1.000	1.052
Irregular	3	21.4	11	78.6	14		
Psychological Stress							
Severe	0	0.0	5	100.0	5	0.529	1.303
Mild-Moderat	10	23.3	33	76.7	43		

From Table 4, among those with a regular menstrual cycle (N=34), 27 individuals (79.4%) have acne vulgaris compared to 7 (20.6%) who did not. The chi-square test shows no significant association between regular menstrual cycles and acne vulgaris (p = 1.000, OR = 1.052). For individuals with an irregular menstrual cycle (N=14), 11 (78.6%) have acne vulgaris, while 3 (21.4%) do not.

The odds ratio (OR) for regular menstrual cycles suggests a slight increase in the odds of having acne vulgaris, although this is not statistically significant (OR = 1.052).

None of the individuals experiencing severe psychological stress (N=5) have acne vulgaris, whereas all 5 (100.0%) without severe stress do. The chi-square test indicates no significant association between severe psychological stress and acne vulgaris (p = 0.529, OR = 1.303). Among those with mild to moderate psychological stress (N=43), 33 (76.7%) have acne vulgaris compared to 10 (23.3%) who do not. The odds ratio (OR) for severe psychological stress suggests a slight increase in the odds of having acne vulgaris, although this is not statistically significant (OR = 1.303).

Hormonal changes during the menstrual cycle can contribute to AV, particularly the increase in progesterone on the 21st day of a normal menstrual cycle, which can trigger sebaceous gland hyperplasia and increased sebum production, ultimately leading to AV.[18] However, this study aligns with a 2022 study at Universitas Batam, which found no significant relationship between menstrual cycles and AV (p-value = 0.143). The lack of a significant relationship may be due to the absence of hyperandrogenemia screening, as androgens play a role in controlling sebaceous gland growth. Additionally, the study did not observe respondents before and after menstruation, a period during which acne might occur. Furthermore, AV is influenced by a variety of factors, including diet, cosmetic use, facial hygiene, and unhealthy sleep patterns.[17]

Another significant factor triggering AV is the stress level among medical students. Various studies have indicated that medical students experience higher stress levels compared to students from other faculties.[18] This study contrasts with previous research showing a significant relationship between stress and the severity of AV among medical students at UISU, Class of 2017 (p-value = 0.005).[25] However, it supports a 2023 study that found no significant relationship between stress and acne severity, likely due to the relatively small sample size.[7]

CONCLUSION

Based on the findings of the study conducted among medical students from the 2022 cohort of Universitas Jenderal Achmad Yani, it is concluded that there is no statistically significant relationship between the menstrual cycle and psychological stress in relation to the occurrence of acne vulgaris among these students (p-value > 0.05). Both menstrual cycles and psychological stress suggest a slight increase in the odds of having acne vulgaris, although this is not statistically significant (OR = 1.052 and 1.303).

ACKNOWLEDGEMENTS

DECLARATION OF INTERESTS

The researcher affirms the absence of any conflicts of interest in the execution and composition of this academic work.

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