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The Relationship of Sleep Quality with Severity Level Acne Vulgaris in Students Aged 17-21 Years Faculty of Dentistry Prima Indonesia University

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Abstract. *Acne vulgaris is chronic inflammation of the sebaceous glands. Many factors cause acne vulgaris, one of which is sleep quality. Poor sleep quality will cause an increase in androgen hormones which are associated with an increase in the incidence of acne vulgaris. Purpose: This study aims to determine the relationship between sleep quality and the severity of Acne vulgaris in students aged 17-21 years. This research is an analytical observational research with a cross-sectional method and sampling using a purposive sampling method. Research instruments using the Pittsburgh Sleep Quality Index (PSQI) questionnaire and the severity of acne vulgaris using the Lehmann classification. The result showed that of the 70 samples collected, there were 9 men and 61 women. There were 30 people with mild degree acne, 37 people with moderate degree and 3 people with severe degree. Based on sleep quality, there were 24 people with good sleep quality and 46 people with poor sleep quality. The results of Spearman's analytical correlation showed that there was a relationship between sleep quality and the severity of Acne vulgaris (P-value = 0.005). So, it can be concluded that sleep quality is related to the severity of Acne vulgaris in students aged 17-21 years.*

Keywords *: Sleep Quality, Acne vulgaris, Degree of Severity*

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INTRODUCTION

Acne vulgaris (AV) is a chronic inflammation of the sebaceous glands which is characterized by the appearance of pleomorphic lesions in the form of comedones, papules, nodules, cysts, and eventually become scar tissue. AV predilection is on the face and neck (99%), back (60%), chest, and shoulders and upper arms (15%). The part of the face that suffers most from *acne* is the cheek area (Seran et al., 2020). *Acne vulgaris* is a skin disease that occurs globally in almost 80% of the world's population (Ruchiatan et al., 2020). Acne is said to be *a self-limited disease*, namely a disease that can heal itself. Acne is not a life-threatening disease, but it has a major impact on an individual's socioeconomic and quality of life (Pratiwi et al., 2015).

Skin is the largest and outermost organ of the human body, the skin weighs around 5 kg and is around 2 meters long with a body weight of 70 kg. Anatomically, the skin is

divided into three parts, namely the epidermis, dermis, and hypodermis or subcutaneous. Several functions of the skin are protection, immunological protection, excretion, sensing, thermoregulation, vitamin D formation, and cosmetics. Skin is different from other organs in the body, skin is easy to observe both in diseased and normal conditions. Based on the Global Burden of Disease (GBD), the prevalence of AV is 9.38% and is the 8th in the list of skin diseases with the highest prevalence level in the world (Pratiwi et al., 2015). According to PERDOSKI, the prevalence of AV in Indonesia is the 3rd highest number of cases coming to hospitals for treatment (Sitohang & Wasitatmadja, 2015).

Based on gender, the incidence of AV occurs more often in women than in men with a percentage of 69.3% compared to 30.3%. Similar findings among teenagers with AV in Egypt, it is more common in women than in men.[8] This could be caused by hormonal factors. Hormone levels increase during menstruation, increasing the activity of the sebaceous glands. Apart from that, the use of cosmetic products can cause closed comedones and worsen AV lesions (Sibero & Anggraini, 2019).

Based on age, AV is the most common disease at young ages, usually starting at 12-15 years of age, with the highest level of severity at 17-21 years of age. Nearly 85% of the population of individuals aged 12-25 years experience AV. The incidence of AV in young women tends to be around 83-85% in young women aged 14-17 years and in men aged 16-19 years it is around 95-100%. That at a young age AV is more common in women, whereas when entering puberty the prevalence AV is more common in men (Tayel et al., 2020).

There are 4 (four) pathophysiological causes of AV, namely 1. hyperproliferation of epidermal follicles, 2. excessive production of oil glands, 3. inflammation, and the presence of 4. the bacteria *Propionibacterium acnes* which results in hypersensitivity of the sebaceous glands to androgen levels that work normally and is exacerbated by inflammation. Other multifactorial causes include genetics, hormones, drugs, sun exposure, food, personal hygiene, psychology, cosmetics, and extreme weather changes (Wibawa & Winaya, 2019). *Acne vulgaris* can also be caused by an increase in androgen hormones which stimulate sebum production which causes the formation of blackheads. Open and closed, sebum functions as *a subtract* for bacterial growth that leads to the proliferation of acne. *Prop. acnes* releases chemical mediators that increase inflammation, caused by the traumatic rupture of comedones into the surrounding dermis (Koku Aksu et al., 2012).

Manifestations of AV can be non-inflammatory lesions and inflammatory lesions. Non-inflammatory lesions in the form of comedones, namely closed comedones (whiteheads) and open comedones (blackheads). Open comedones are slightly raised or flat lesions with dark colored follicles in the center. Closed comedones are small papules that are slightly raised and pale in color, stretching the skin so that these lesions are very easy to detect. Inflammatory lesions found in the AV such as papules, pustules, and cystic nodules/nodules. Around the papules and pustules there is erythema which indicates inflammation. Nodules are characterized by erythematous and painful papular lesions with a diameter of about 5 mm. Based on the Indonesian Acne Grading according to Lehmann AV, they are categorized into 3 degrees, namely:

Mild degree: Lesions: Blackheads <20, or Inflammatory Lesions <15, or Total Lesions <30. Medium degree: Lesions: Blackheads 20-100, or Inflammatory Lesions 15-50, or Total Lesions 30-125. Severity: Lesions: Cysts>5 or Blackheads <100, or Inflammatory Lesions>50 or Total Lesions>125

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Research in Northern China suggests that there are several factors that cause AV These include stress, menstrual disorders, parental genes, depression, a high-fat diet, pressure when studying, spicy food, and oily skin (Lehmann et al., 2002). In research in Korea, it shows that the main or aggravating trigger factors are psychological stress (82%), lack of sleep (75.2%), menstruation (61.3%), smoking (50.4%), drinking (50.4 %), cosmetic use (50.4%), pregnancy (28.4%), and chocolate consumption (19%). The exact cause of AV is not yet clearly known, but AV is a multifactorial skin disease because many factors have been linked to causing AV. The factors that influence or trigger acne vulgaris can be concluded as sebum, genetics, hormones, diet, stress and cosmetics (Wei et al., 2010).

Research using female respondents aged 18-40 years found that respondents with poor sleep quality had a higher increase in sebum production compared to respondents who had good sleep quality. Sebum is one of the pathological factors for the formation of *acne vulgaris.* Sleep is a physiological process of the body and mind entering a state of rest at a certain time. Sleep is a cyclic, temporary, and functional state that is controlled primarily by neurobiology and is a part of human physiology that is necessary for the maintenance of health. Sleep is related to the activity of closing your eyes for several periods which provides complete rest for mental and physical activities except for vital organs such as the heart, lungs, liver, blood circulation and other organs (Suh et al., 2011).

Sleep quality is an individual's ability to maintain sleep, not only to get sleep duration but also to get the amount of rest needed. Sleep quality is a person's satisfaction with the sleep experience they have starting from sleep initiation, sleep maintenance, sleep quantity and freshness when they wake up from sleep. Sleep quality is different from sleep quantity. Sleep quantity is how long a person needs to sleep. According to the Pittsburgh Sleep Quality Index (PSQI), sleep quality is divided into two, namely good sleep and bad sleep. Good sleep quality is sleep that has a score of less than five, while bad sleep quality or bad sleep has a score of more than or equal to five. Poor sleep quality in a person can result in decreased production of the hormone melatonin. The hormone melatonin is produced by the pineal gland in the hypothalamus. The hormone melatonin is mostly produced at night and conversely during the day the pineal gland is inactive and suppresses the production of the hormone melatonin. When it is dark at night, a person will feel a sleepy reaction which results in the production of the hormone melatonin as a chronobiotic factor that plays a role in regulating the circadian cycle. As another function, the hormone melatonin also plays a role in suppressing the synthesis of androgen hormones. If there is a deficiency of the hormone melatonin, it will result in a reverse reaction resulting in increased production of the androgen hormone (Malahayati et al., 2018).

Acne vulgaris can be influenced by other factors, one of which is poor sleep quality. When sleep quality is disturbed or poor, the HPA (Hypothalamus Ptuitary Axis) will be activated which can cause an increase in ACTH (Adrenocorticotropichormone) which has the effect of increasing androgen hormones which play a role in stimulating an increase in excessive production of sebum and keratinocytes as a sign of a stress response. In this condition, it triggers inflammation and damage to sebaceous follicles, which can cause AV. In addition, when you experience sleep quality disturbances, there is an increase in CD4+ mediators, T cells, and inflammatory mediators such as TNF-α, Interleukin (IL)-1, IL-6 and IL -7 which can cause AV.

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Teenagers have poor sleep quality because they have to face school exams, make assignments pile up, excessive use of electronic devices such as cellphones and computers also causes teenagers to delay sleeping so they experience sleep deprivation and result in poor sleep quality and this also causes stress. Students experience disruptions in their circadian cycles due to the stress of the academic environment, which is increased by habits such as working all day on the internet, watching television, academic backlogs, and medical report assignments. Because a decrease in sleep quality directly affects academic performance and also emotional aspects which will affect hormones indirectly (Pramana & Harahap, 2022). Previously, research was conducted on 70 pre-clinical student respondents from the Faculty of Medicine, Undana, using a *simple random sampling research method*. The results of the bivariate analysis test in this research were ($p>0.05$). The conclusion from this study is that there is no relationship between sleep quality and the severity of acne vulgaris.

Stress is one of the indirect etiological factors of AV and stressful conditions can be one of the causes of disturbed sleep quality. When sleep quality is disturbed, this condition causes an imbalance of the hormones epinephrine, norepinephrine, and cortisol which can affect the structure and function of the central nervous system and an imbalance of hormones which can cause disruption to skin health, namely AV. Insufficient sleep duration causes poor sleep quality. bad. Stress can result in increased secretion of androgen hormones which are pathogenic for the onset of AV, chronic or prolonged stress which causes the severity of *Acne vulgaris*. Similar to medical students, dental students are a group at high risk of experiencing poor sleep quality. This is because academic pressure, busy practicum schedules and stress can change good sleep habits in the age range of 17-21 years.

Research on 630 workers, including 259*day shift workers* and 371*night shift workers*, found that *night shift workers* had more poor sleep quality and suffered from more severe skin diseases compared to *day shift workers* who had better sleep quality. The skin diseases suffered include *acne vulgaris*, seborrheic dermatitis, atopic dermatitis, dry skin and pruritis. Workers who have poor sleep quality suffer more from AV. A study conducted on a French population found that there was no significant relationship between poor sleep quality and acne vulgaris.

The etiology of AV is still not completely clear, however, based on the risk factors that have been identified there are 4 theories related to AV. Increased Sebum Production. Sebum is synthesized by the sebaceous glands continuously and secreted onto the skin surface through the pores of the hair follicles. This sebum secretion is regulated hormonally. The hormones that play a role in triggering increased sebum secretion are androgen hormones, especially testosterone. Androgen hormones cause an increase in the size of the sebaceous glands, increasing the stimulus for sebum production, as well as stimulating the proliferation of keratinocytes in the sebaceous ducts. An imbalance in sebum production and secretion will cause sebum to clog up in the hair follicles.

Keratin Blockage in the Pilosebaceous Canal. Blockage of the pilosebaceous duct occurs due to blockage due to changes in the keratinization pattern of the sebaceous follicles. These changes can cause the inner stratum corneum of the pilosebaceous duct to become thicker and stickier and cause blockage of the follicular duct. If the flow of sebum to the surface of the skin is blocked by keratin masses, micro comedones will form which will be the beginning of the formation of non-inflammatory acne lesions and

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inflammatory lesions. The keratinization process that occurs is stimulated by androgens, sebum, and fatty acids.

Colonization of Microorganisms in Sebaceous Follicles. Microorganisms are considered to have an important role in the development of AV. Microorganisms that are thought to play a role include Cutibacterium acnes, Staphylococus epidermidis, and Pityrosporum Ovale. These microorganisms play a role in chemotactic inflammation in the formation of lipolytic enzymes that change the lipid fraction of sebum. C. Acnes produces active components such as lipase, protease, hyaluronidase, and chemotactic factors that cause inflammation. Lipase plays a role in hydrolyzing sebum triglycerides into free fatty acids which play a role in causing hyperkeratosis, retention and the formation of comedones.

Inflammation: Bacterium acnes has a chemotactile factor that can cause polymorphonuclear discharge into the lumen of comedones. If polymorphonuclear leukocytes phagocyte P. acnes and release hydrolysis enzymes, this will cause damage to the follicular wall and enter the dermis, resulting in an inflammatory reaction.

Several other factors are also thought to play a role in triggering *acne vulgaris,* such as intrinsic factors, namely genetics, race, hormonal and extrinsic factors, namely stress, climate, temperature, humidity, cosmetics, diet and drugs. In literature research, it turns out that the highest prevalence of AV is at the age of 16 - 17 years with the conclusion that poor sleep quality can result in the emergence of AV and is also a contributing factor in the development of *Acne vulgaris.* According to research on the relationship between sleep quality and the severity of AV in students aged 17-21 years using a *purposive sampling* research method, it is stated that there is a significant relationship between sleep quality and the severity of AV. Research on 141 respondents from pre-clinical students at the Faculty of Medicine, Indonesian Muslim University who filled out questionnaires found that most of them were female, namely 106 samples and based on the results of the chi square test, a p-value of 0.732 (>0.005) was obtained, which means there is no significant relationship between sleep quality and the incidence of acne vulgaris. The same thing was seen in research on 57 respondents from the 2017 class of Baiturrahmah Medical Faculty with the result that mild acne was the highest degree of acne in 53 respondents (93.0%) with p = 0.270 (p > 0.05). This means that there is no relationship between the severity of acne vulgaris and quality of life.

The high incidence of acne vulgaris is especially true among medical faculty students who face study loads, lots of assignments, and schedules which create poor sleep patterns for the students themselves. Although the cause is not yet known for certain because it is multifactorial. Poor sleep patterns are thought to be one of the factors in the emergence of *Acne vulgaris.* Based on this background, researchers are interested in conducting further research with the title "The Relationship between Sleep Quality and AV Severity Levels in Students Aged 17-21 Years, Faculty of Dentistry, Prima Indonesia University."

METHODS

Study this is a type analytical observational research with *cross-sectional methods.* Technique sampling by sampling using the purposive *sampling method.* The research instrument used the *Pittsburgh Sleep Quality Index* (PSQI) questionnaire and the severity *of Acne vulgaris* used the Lehmann classification. The research was conducted from February to July 2023. The research population was students who represented a sample aged 17-21 years who suffered from mild, moderate and severe *acne vulgaris*

totaling 70 people. The research was conducted at the Faculty of Dentistry, Prima Indonesia University, Medan. Data analysis consisted of univariate, bivariate analysis with Chi Square test and Multivariate analysis with logistic regression test.

RESULT AND DISCUSSION

Table 1. Frequency Distribution of Respondent Characteristics Students with Acne vulgasis at Age 17-21

Characteristics	F	%
Gender		
Man	9	12.85
Woman	61	87.1
Age		
17 years	4	5.7
18 years	26	37.14
19 years old	16	22.86
20 years	21	30
21 years	3	4.3
Total	70	100

Table 1 shows that the majority of respondents were female, 61 people (87.1 %), and age the majority were 18 years old, 26 people (37.14 %).

Table 2. Frequency Distribution of Sleep Quality Characteristics and Severity Levels of Acne Vularis in Students Aged 17-21

Independent Variable	F	%
Sleep Quality		
Good	24	3 4.3
Bad	4 6	6 5.7
Severity Level		
Light	30	42.9
Currently	3 7	52.9
Heavy	3	4.3
Total	**70**	**100**

Table 2 shows that the majority of respondents' sleep quality was poor, as many as 46 people (65.7 %). The majority of respondents' AV severity level was moderate , 37 people (52.9 %).

Table 3. Relationship between sleep quality and severity of acne vulgaris in students aged 17-21

Variables	Mark *p*
Sleep Quality	
Good	<0.005
Bad	
Severity Level	
Light	30
Currently	37
Heavy	3

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Table 3 in above shows that there is a relationship between sleep quality and *Acne Vulgaris* (*p = <0.00 5).* The majority of severity levels were moderate, as many as 37 people.

Table 4. Logistic Regression Model of Sleep Quality with Severity of Acne Vulgaris

	Median	**Min-Max**	**P-Value**	**Correlation Coefficient**
Sleep Quality	6	2-11		
Acne Vulgaris	2	1-3	0.005	0.310

Table 4 shows that for research subjects the median sleep quality index was 6, while for acne vulgaris the median was 2. The results of the correlation analysis of sleep quality with acne vulgaris obtained a p value of 0.005** with a correlation coefficient value of 0.310. This shows that there is a significant correlation of moderate strength and is positive between sleep quality and the severity of acne vulgaris.

Acne vulgaris and its scars can also have psychosocial effects such as shame, social isolation, low self-esteem, anxiety, frustration, depression, and even the most fatal is the desire to commit suicide. *Acne vulgaris* or Acne is considered a chronic disease due to its prolonged course, recurrence pattern, and acute outbreak-like manifestations or slow onset. In addition, acne impacts the sufferer's quality of life, causing very negative psychological and social effects (Azad et al., 2015).

Based on gender, AV events occur more often in women than men with a percentage of 69.3% compared to 30.3%. In the research results from table 1 regarding the characteristics of respondents based on gender, it was found that there were more female respondents than men with a ratio of 87.1% versus 12.85%.

The largest age group was 18 years old (37.14%) and it was found that the severity of Acne vulgaris was more moderate than mild to severe. In accordance with similar findings from research on Malang Medical Faculty students who suffer from *Acne* vulgaris and it is more common in women with a ratio of 65.3% compared to 34.6% of men and the severity level is moderate.

Women suffer from acne vulgaris more often than men due to hormonal factors where women's hormonal levels increase during menstruation, increasing the activity of the sebaceous glands. In addition, the use of cosmetic products can cause closed comedones and worsen *acne vulgaris lesions.*

Relationship between sleep quality and acne vulgaris

The etiology of acne is still unclear, but there are studies that suggest it is influenced by sleep quality. Sleep is one of the things that can trigger acne vulgaris, especially when it is associated with the stress response (Elagra et al., 2016). Humans spend about a third of their lives sleeping. However, the human need for sleep is currently still unknown. There are several hypotheses that are considered to be the benefits of sleep, namely: improving brain function and increasing memory abilities.

A person's sleep quality can be said to be good if there are no signs of decreased concentration, the body feels unfit when waking up, and no health problems arise. Good sleep quality can be stated if the individual easily starts sleeping at bedtime, does not wake up at night, maintains sleep, wakes up easily in the morning. Sleep quality is not

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determined based on sleep duration alone but how individuals wake up well and get the same quality the next day.

There are three aspects that can be related to sleep quality, namely sleep continuity (continuous and uninterrupted sleep), duration (long time sleep lasts), and sleep depth and satisfaction. Based on the results of research conducted by researchers on students at the Faculty of General Medicine, Prima Indonesia University, it was found that in the group whose sleep quality was poor, 46 (65.7 %) of the respondents had the greatest effect on acne vulgaris. The p value = 0.000 means that the hypothesis is accepted so it can be concluded from the chi-square test that there is a relationship between sleep quality and acne vulgaris. The Odds Ratio value was 33.214 with a 95% confidence interval (CI) of (2.919-18.009), meaning that respondents with poor sleep quality were 33.214 times more likely to experience acne vulgaris than respondents with good sleep quality.

The results of the researcher's statistical test on sleep quality and the severity *of Acne vulgaris* obtained p=0.005, which means the *p* value = <0.001, meaning that there is a relationship between sleep quality and the severity *of Acne vulgaris*. This research is the same as research conducted at the Malahayati Medical Faculty, with the results of the study finding a relationship between sleep quality and acne vulgaris, characterized by a *P-value* = 0.000 (p<0.05). This is also supported by research on students at the Faculty of Medicine at the Indonesian Christian University, there is a correlation between sleep quality and the severity of *acne vulgaris*. After analyzing the data using the Chi-Square test, it showed 0.000 (p<0.05), which means that there is a significant relationship between sleep quality and the severity of acne vulgaris, namely moderate degree.

What this research has in common with comparative research is that there are more respondents aged 21 years with AV and female gender while the majority of research respondents are 18 years old. The similarity is that there is a significant relationship between sleep quality and the severity of acne vulgaris, with poor sleep quality followed by moderate acne vulgaris.

This research is in line with research conducted entitled The relationship between sleep quality and acne vulgaris in students at the Faculty of General Medicine, Malahayati University, Class of 2019, which shows that there is a statistically significant relationship between sleep quality and the incidence of acne vulgaris in 75 student respondents with poor sleep quality. 8% experienced positive acne vulgaris in 105 samples (88.2%). The results of this study are also in line with research conducted with the title The Relationship between Sleep Quality and Students' Acne Vulgaris Severity at Medical Faculty, Indonesian Christian University on 87 respondents with 60 respondents with poor sleep quality and 48 found moderate grade acne vulgaris. Shows that there is a statistically significant relationship between sleep quality and the incidence of moderate acne vulgaris. Another thing explained in this study is that there is a percentage risk of poor sleep quality causing the sample to experience acne vulgaris based on an *odds ratio value* of 33.214 with *a confidence interval* (CI) of 95%, which indicates that the sample in this study has a 33.214 times greater chance of experiencing acne vulgaris. Medical students are more susceptible to experiencing sleep disorders due to high academic loads and lack of sleep. Good sleeping hours are from 08.00 pm to midnight to get a good night's sleep and sweet dreams. If you sleep late after 12 at night, this habit will have a bad impact on your health.

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These results are in accordance with existing theory. Poor sleep quality causes a decrease in the hormone melatonin. Sleeping too late has a significant link to a decrease in the hormone melatonin. The melatonin hormone itself functions to suppress androgen synthesis. Low levels of the hormone melatonin cause increased synthesis of the androgen hormone. Increased synthesis of androgen hormones causes increased secretion of sebum glands which results in acne vulgaris.

Acne prevention can be done by keeping facial skin clean. Facial skin hygiene starts with washing your face twice a day with facial cleanser or cleanser. Apart from that, acne prevention can be done with physical care such as cleaning blackheads using a scrub or porepack. On the other hand, acne will get worse if you clean your face too often with soap or cleanser because it triggers dry or dehydrated skin. Skin dehydration can disrupt the skin layer (stratum corneum) in the natural desquamation process (the process of shedding layers of dead skin cells) so that the risk of acne getting worse.

When someone has poor sleep quality. The body will produce androgen hormones which will cause increased production of sebum secretion and changes in follicular keratinocyte cells resulting in the formation of microcomedones and blackheads resulting in acne vulgaris.

CONCLUSION

Based on the results of the analysis and discussion in this research, it can be concluded that the results of the analysis using chi-square, obtained p-value = 0.000 so pvalue (≤0.005) = 0.000 ≤0.005, which means Ho is rejected. So it can be concluded that there is a significant relationship between sleep quality and acne vulgaris in students at the Faculty of Dentistry, Prima University with an Odds Ratio (OR) = 33.214, which means that respondents with poor sleep quality have a thirty-three times risk of suffering from acne vulgaris.

SUGGESTION

Students at the Faculty of Dentistry, Prima Indonesia University, are expected to always pay attention to the quality of their sleep, especially as they enter a further stage of education which requires a lot of energy in order to always be in good physical condition and reduce factors that trigger acne vulgaris other than sleep quality.

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