ASSOCIATION BETWEEN MAGNESIUM LEVELS AND THE SEVERITY OF ACNE VULGARIS

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ABSTRACT

Introduction: Acne vulgaris is a cosmetic problem that often occurs in 80% of the population, especially reproductive age (12-25 years). Acne vulgaris is a chronic inflammatory disease of pilosebaceous follicles with multifactorial causes and clinical manifestations of blackheads, papules, pustules, nodules, and cysts. Magnesium plays a role in increasing skin hydration, increasing skin permeability, barrier repair, and facilitating skin proliferation and epidermal differentiation to reduce inflammation. Hypomagnesium is thought to increase inflammation and affect androgen hormones, especially testosterone, which plays a role in increasing the hyperactivity of the sebaceous glands in the pathogenesis of Acne Vulgaris.

Purpose: To determine the difference in magnesium levels in each severity degree of acne vulgaris, namely mild, moderate, and severe.

Method: This study is an analytic observational study with a cross-sectional design. The sampling technique is purposive sampling with a total sample of 30 people. Data retrieval in this study was carried out using photo taking of three sides of the face (front, right oblique, left oblique). Then proceed with a three cc venous blood draw to measure magnesium levels in the blood.

Results: This study found a significant difference between magnesium levels and the severity of acne vulgaris with a value of $p = 0.032$ ($p < 0.05$). Magnesium levels in severe acne vulgaris were higher than moderate and mild acne vulgaris. However, magnesium levels in all samples were still within the normal range. There was a moderate positive correlation between the two variables with a p-value = 0.016 ($p < 0.05$).

Conclusion: There was a significant difference between magnesium levels and the severity of acne vulgaris, and there is a moderate positive correlation between magnesium levels and the severity of acne vulgaris, which means that the higher the magnesium level, the more severe the degree of acne vulgaris.

Keywords: Acne Vulgaris, Magnesium levels

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INTRODUCTION

Acne vulgaris is a common skin disease and affects 80-100% of the population (1). Acne vulgaris often occurs in adolescents, young adults, and often progresses to adulthood, and can cause scarring and hyperpigmentation (2). According to the Global Burden of Disease (GBD) study, acne vulgaris affects 85% of young adults aged 12-25 years. Research in India explains that acne vulgaris often affects > 80% of the world's population during some period of life and 85% of adolescents in developed countries. The prevalence of acne vulgaris in Southeast Asia is 40-80% of cases. At the same time, according to records from Indonesian Cosmetics Dermatology, there has been an increase, from 60% of acne vulgaris sufferers in 2006, 80% in 2007 and 90% in 2009 (3).

Magnesium (Mg^{2+}) in the human body acts as a cofactor of more than 300 enzymes in regulating several functions such as muscle contraction, neuromuscular conduction, blood sugar control, heart muscle contraction, and blood pressure. Magnesium in the skin is thought to play a role by penetrating under the stratum corneum, which helps restore the skin. Individuals with magnesium deficiency are also associated with a local inflammatory process in the skin (4).

Low magnesium levels are thought to play a role in the severity of acne vulgaris. Several studies have shown different results for the role of magnesium levels on the severity of acne vulgaris. According to research by Basil O Saleh, there was a decrease in magnesium levels in individuals with severe degrees of acne vulgaris (5). Meanwhile, according to the research of Salma Ahmed et al. (6).

The population and sample in this study are students of the Medical Faculty at Widya Mandala Catholic University Surabaya and several students from other faculties aged 19-21 years. This is due to difficulties both from the school's unavailability and related to the pandemic COVID-19 in data collection and laboratory examinations according to research procedures on the highest prevalence of acne vulgaris at the age of 15-18 years are classified as high school students.

METHOD

This study is an analytical observational study with a cross-sectional design to determine the association between magnesium levels and acne vulgaris in subjects who met the inclusion criteria. Data was collected online via google form and blood collection at each respondent's residence. The research period was from July to September 2020. The total population is 30 people. The samples used in this study were all students of the Medical Faculty at Widya Mandala Catholic University Surabaya, class 2017 to 2020 and several students from other faculties who met the inclusion and exclusion criteria. Samples were taken using a non-probability sampling technique, namely purposive sampling, because samples were needed that met the inclusion and exclusion criteria.

The inclusion criteria in this study were samples suffering from mild, moderate, and severe acne vulgaris diagnosed by dr. Jose Laksamana Anggowarsito, dr., G.Dip. Derm, according to Lehman et al., samples are a student of Medical Faculty at Widya Mandala Catholic University Surabaya with an age range of 17-20 years (class 2017-2020), samples are willing to become a respondent in the research and sign an informed consent. Meanwhile, the exclusion criteria in this study were samples suffering from acne vulgaris as a result of cosmetic use, drugs that were suspected of triggering acne vulgaris such as antibiotics, corticosteroids and antidepressants, undergoing acne vulgaris therapy in the last three months, and samples taking magnesium supplements.

The variables studied were acne vulgaris (independent variable), magnesium levels (dependent variable), and history of atopic (confounding variable). The method of data collection was done by distributing questionnaires and taking blood. The data

were processed and analyzed using the Kruskal-Wallis test and the Spearman test using the SPSS system.

RESULTS

Tabel 1. Sample Distribution Based on Gender

Gender	Frequency (n)	Percentage (%)
Male	12	40,0
Female	18	60,0
Total	30	100,0

The data above shows 12 male respondents (40%) and 18 female respondents (60%).

Table 2. Sample Distribution Based on the Severity of Vulgaris Acne to Gender

The severity of acne vulgaris varies with gender	Frequency (n)	Percentage (%)
Male		
Mild	5	16,67
Moderate	5	16,67
Severe	2	6,66
Female		
Mild	5	16,67
Moderate	5	16,67
Severe	8	26,66
Total	30	100,0

Based on the data obtained, it is found that the male sample with mild severity was five people (16.67%), five people were moderate severity (16.67%), and two people were severe (6,66%). There were five samples of female sex with mild severity (16.67%), five people with moderate severity (16.67%), and eight people with severe severity (26.66%).

Table 3. Normality Test of Magnesium Levels in Blood

Normality Test	Shapiro – Wilk (p)
Magnesium levels	0,017

The normality test is performed using the Shapiro-Wilk normality test on magnesium levels. The normality test found that the p-value of magnesium content is 0.017 ($p < 0.05$), which is an abnormal distribution.

Table 4. Distribution of Average Magnesium Levels and the Severity of Acne Vulgaris

Severity of Acne Vulgaris	Magnesium levels (mg/dL) Mean ± SD	*Kruskal-Wallis Test* p-value
Mild	2,090 ± 0,1663	
Moderate	2,110 ± 0,1287	0,032
Severe	2,250 ± 0,1480	
Total	2,150 ± 0,1480	

There are significant differences in magnesium levels in mild, moderate, and severe acne vulgaris samples with a p-value = 0.032. From the data above, it is found that the average magnesium level in severe acne (2,250 ± 0.1480 mg/dL) is higher than moderate acne (2.110 ± 0.1287 mg/dL) and mild acne (2.090 ± 0.1663 mg/dL). Magnesium levels of all samples at mild, moderate, and severe degrees are still within normal limits.

Table 5. Post Hoc Mann Whitney Test

Severity of Acne Vulgaris	p-value
Moderate and severe severity	0,081
Mild and severe severity	0,038
Mild and moderate severity	1,00

From the table above, significant associations are found between mild acne vulgaris and severe samples of acne vulgaris with a value of $p = 0.038$.

Table 6. Spearman Test Result

Variable	P (0,05)	Correlation Coefficient (r)
Association Between Magnesium Levels and the Severity of Acne Vulgaris	0,016	0,435

In the correlation test using Spearman, a moderate positive correlation was found. The higher the magnesium level, the heavier the degree of acne vulgaris is, with a significant r = 0.435 (p = 0.016).

DISCUSSION

In this study, it is found that there are more females with 18 people (60%) compared to males with a total of 12 people (40%). The difference in the number of male and female samples is because most of the students at the Medical Faculty at Widya Mandala Catholic University Surabaya and some students from other faculties are more female than male.

Another factor that is thought to have an effect is the use of cosmetics in females. The use of cosmetics in females can cause blockage of the pores of the face and blockage of the sebaceous glands. Generally, acne vulgaris in females occurs earlier than in males due to puberty. The use of cosmetics that are not cleaned properly can promote acne vulgaris on the face (7). According to one study, more females developed moderate severity of acne vulgaris significantly even though they had received isotretinoin therapy (8). Gender is also thought to be related to testosterone, which can cause acne vulgaris. The influence of gender on testosterone involves many factors such as neurobiological, sociocultural, and evolutionary factors. Male and females in roles oriented towards power, competition, and masculinity have higher testosterone than others (9). The effect of testosterone and 5α-DHT, which is the result of the conversion of testosterone to the enzyme 5α-reductase type I

in the sebaceous glands, will be mediated by binding to androgen receptors (AR) and also expressed in the sebaceous glands, which cause hyperactivity of the sebaceous glands in the pathogenesis of acne vulgaris (10).

Based on data, magnesium levels through a normality test using the Shapiro-Wilk normality test is obtained with an abnormal distribution. Therefore, the Kruskal-Wallis test is performed to find the ratio of magnesium levels according to the severity of acne vulgaris. The test results showed a significant difference between magnesium levels and the severity of acne vulgaris with $p = 0.032$. Then the Post Hoc Mann Whitney test was carried out, and it was found that there were significant differences in magnesium levels in mild to severe acne vulgaris.

The average magnesium level in samples with moderate acne is higher than samples with mild acne. This study found a significant difference between magnesium levels and the severity of acne vulgaris accompanied by a moderate positive correlation which stated that the higher the severity of acne vulgaris, the higher the magnesium levels. Magnesium levels in all severity degrees of acne vulgaris in this study are still within normal limits. Still, there is a significant difference ($p = 0.032$) and moderate positive correlation (p = 0.016) between magnesium levels and the severity of acne vulgaris.

The results of this study are inconsistent with the research conducted by Basil O. Saleh et al., which stated that magnesium levels had no relationship with the severity of acne vulgaris, and magnesium levels were lower in severe acne vulgaris (unidirectional) (5). Another literature used by the researcher was a study by Salma Ahmed. The study stated no relationship between magnesium levels and the severity of acne vulgaris with $p > 0.05$ (6).

The results of the researchers' study differ from the results of the study, allegedly due to several factors, such as

genetics, facial skin type, stress, dietary factors, trauma, infection, hormonal, and sleep patterns. Another factor that is thought to be influential is the age range of the respondents, wherein in the previous study, the age range of the respondents was much wider (18-30 years). This is related to the aging process, a risk factor for magnesium deficiency (11). Another possibility that is thought to influence the study results is that the methodology used in this study is cross-sectional. The assessment of the two variables is still limited.

CONCLUSION

This study found a significant difference between magnesium levels and the severity of acne vulgaris accompanied by a moderate positive correlation which stated that the higher the severity of acne vulgaris, the higher the magnesium levels.

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