



RESEARCH ARTICLE

# Triglycerides and Acne: Assessing the Impact of Blood Lipid Levels on Acne Severity in Young Adults

Erika Martining Wardani <sup>1\*</sup>, Riezky Faisal Nugroho<sup>2</sup>

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## Abstract

Acne vulgaris is a common chronic inflammatory skin condition that predominantly affects adolescents and young adults. This study aimed to examine the relationship between elevated blood triglyceride levels and the incidence and severity of acne vulgaris in young adults. A cross-sectional design was utilized, involving 85 patients aged 17-25 years from a cosmetic clinic in Surabaya, Indonesia. Triglyceride levels were measured and classified into two categories: normal (<150 mg/dL) and high (>150 mg/dL). The severity of acne vulgaris was assessed using the Global Acne Grading System (GAGS). Statistical analysis using the chi-square test revealed a significant association between elevated triglyceride levels and the incidence of acne vulgaris ( $p = 0.03$ ). However, no significant correlation was found between triglyceride levels and acne severity ( $p = 0.09$ ). These findings suggest that while elevated triglyceride levels may increase the risk of developing acne vulgaris, other factors such as hormonal, genetic, and lifestyle elements may play a more prominent role in determining acne severity. Clinically, reducing triglyceride levels through dietary interventions or pharmacological therapies may serve as a preventive measure for acne vulgaris. Further research is required to explore the mechanisms underlying this relationship and the potential role of lipid management in acne treatment.

Keywords: Acne vulgaris, triglycerides, young adults, sebum production, skin inflammation.

**Abstrak:** Acne vulgaris adalah kondisi kulit inflamasi kronis yang umum terjadi, terutama pada remaja dan dewasa muda. Penelitian ini bertujuan untuk mengkaji hubungan antara kadar trigliserida dalam darah yang tinggi dengan kejadian dan tingkat keparahan acne vulgaris pada dewasa muda. Desain penelitian cross-sectional digunakan, melibatkan 85 pasien berusia 17-25 tahun dari sebuah klinik kecantikan di Surabaya, Indonesia. Kadar trigliserida diukur dan diklasifikasikan menjadi dua kategori: normal (<150 mg/dL) dan tinggi (>150 mg/dL). Keparahan acne vulgaris dinilai menggunakan Global Acne Grading System (GAGS). Analisis statistik dengan uji chi-square menunjukkan adanya hubungan signifikan antara kadar trigliserida yang tinggi dengan kejadian acne vulgaris ( $p = 0,03$ ). Namun, tidak ditemukan korelasi yang signifikan antara kadar trigliserida dengan tingkat keparahan acne ( $p = 0,09$ ). Temuan ini menyarankan bahwa meskipun kadar trigliserida yang tinggi dapat meningkatkan risiko terjadinya acne vulgaris, faktor lain seperti hormon, genetik, dan gaya hidup mungkin lebih berperan dalam menentukan tingkat keparahan acne. Dari sudut pandang klinis, menurunkan kadar trigliserida melalui intervensi diet atau terapi farmakologis dapat menjadi langkah pencegahan untuk acne vulgaris. Penelitian lebih lanjut diperlukan untuk mengeksplorasi mekanisme yang mendasari hubungan ini dan potensi peran manajemen lipid dalam pengobatan acne.

Kata Kunci: Acne vulgaris, trigliserida, dewasa muda, produksi sebum, inflamasi kulit.

## INTRODUCTION

Acne vulgaris is a chronic inflammatory condition of the pilosebaceous follicles, primarily affecting adolescents and young adults. Globally, the prevalence of acne vulgaris ranges between 40-80%, with higher rates observed in developing countries, including Southeast Asia and Indonesia (Lynn et al., 2016; Du et al., 2022). According to recent data, approximately 85% of individuals aged 12-25 suffer from acne vulgaris, making it one of the most common skin problems among young adults (Morshed et al., 2023). In Indonesia, the prevalence of acne vulgaris has been reported to increase annually, especially among young adult females, who tend to experience hormonal changes earlier than males (Lynn et al., 2016).

<sup>1\*)</sup> Departement of Nursing, Faculty of Nursing and Midwifery, Universitas Nahdlatul Ulama Surabaya  
<sup>2</sup> Departement of Nutrition, Politeknik Kesehatan Kemenkes Surabaya

*\*) corresponding author*

Erika Martining Wardani  
Departement of Nursing, Faculty of Nursing and Midwifery,  
Universitas Nahdlatul Ulama Surabaya, 60237 Surabaya,  
East Java, Indonesia

Email: erika@unusa.ac.id

Hormonally, females are more likely to develop acne vulgaris at an earlier age due to the hormonal fluctuations that occur during pre-menstruation and puberty. The rise in androgen and estrogen levels during puberty plays a significant role in triggering excessive sebum production, which is one of the primary contributors to the development of acne vulgaris (Szöllösi et al., 2018). Androgen hormones, particularly testosterone, stimulate sebaceous gland activity, which increases sebum production and facilitates the colonization of *Propionibacterium acnes*, exacerbating skin inflammation (Sutaria et al., 2023).

The prevalence of acne vulgaris in Southeast Asia, including Indonesia, has been reported to increase significantly. Data from the Global Burden of Disease (GBD) indicate that 40-80% of acne vulgaris cases occur in this region, with the rising prevalence largely attributed to lifestyle changes, pollution, and improper cosmetic use (Du et al., 2022). In Indonesia, dermatological data show that the incidence of acne vulgaris has been increasing annually, particularly among young adult females who are more susceptible to the hormonal changes that trigger this condition (Sobhan et al., 2020).

Several factors contribute to acne vulgaris, including genetic, dietary, environmental, hormonal, and improper cosmetic use (Almoughrabie et al., 2023). However, it is crucial to understand how these factors specifically relate to lipid profiles, particularly triglycerides, which are a major component of sebum. Sebum contains approximately 40-60% triglycerides, along with wax esters, squalene, and cholesterol (Szöllösi et al., 2018). Metabolic dysfunction or a high-fat diet can increase triglyceride levels in the blood, which in turn elevates sebum production and exacerbates inflammation in acne vulgaris (Vasam et al., 2023).

Sebaceous glands, responsible for sebum production, express low-density lipoprotein (LDL) receptors, which assist in the uptake of lipoproteins from the bloodstream. Elevated LDL levels in the blood can enhance lipid production by the sebaceous glands, contributing to excessive sebum excretion (Sobhan et al., 2020). Moreover, increased blood triglyceride levels have been linked to heightened skin inflammation, which triggers the formation of comedones and worsens the inflammatory condition associated with acne vulgaris (Vasam et al., 2023).

This study focuses on the relationship between blood triglyceride levels and the incidence of acne vulgaris in young adults. Although some previous studies have found a relationship between lipid profiles and acne vulgaris, the results have been mixed (Sobhan et al., 2020; Okoro et al., 2021). Some research has reported a significant association between cholesterol and LDL levels with the severity of acne vulgaris, but data on the relationship between triglycerides and acne vulgaris remain limited. Therefore, this study aims to analyze whether elevated triglyceride levels are associated with an increased incidence of acne vulgaris, particularly among young adults who have additional risk factors such as hormonal changes and lifestyle habits (Lynn et al., 2016).

In addition to hormonal factors, lipid profiles have also been identified as key contributors to the pathogenesis of acne vulgaris. Triglycerides, which are a major component of sebum, are hydrolyzed by *P. acnes* bacteria into free fatty acids, which worsen inflammation and exacerbate the condition (Almoughrabie et al., 2023). Moreover, elevated blood triglyceride levels are associated with increased activity of the enzyme diacylglycerol acyltransferase, which enhances triacylglycerol (TAG) synthesis and

worsens skin conditions by increasing hyperkeratinization (Vasam et al., 2023).

This study is important for gaining a better understanding of how triglycerides affect the incidence of acne vulgaris in young adults. In this study, the relationship between blood triglyceride levels and acne vulgaris was analyzed using a cross-sectional approach. The data obtained show a positive correlation between elevated triglyceride levels and an increased incidence of acne vulgaris in individuals with triglyceride levels >150 mg/dL compared to those with normal triglyceride levels (<150 mg/dL). This relationship supports the hypothesis that elevated triglyceride levels play a role in exacerbating skin inflammation through increased sebum production and altered lipid composition (Sobhan et al., 2020).

Further research is needed to gain a deeper understanding of the biological mechanisms through which elevated triglyceride levels affect the skin's microbiota, inflammatory processes, and sebum excretion. This study is expected to contribute to a better understanding of the risk factors associated with acne vulgaris, particularly among young adults who are at risk of increased triglyceride levels due to lifestyle and dietary changes.

## METHOD

### Study Design

The research employed a cross-sectional study design, in which data were collected at a single point in time to measure the independent variable (triglyceride levels) and the dependent variable (incidence of acne vulgaris) simultaneously. The cross-sectional design was chosen because it is suitable for identifying the relationship between blood triglyceride levels and acne vulgaris occurrence at a specific time. This design allows researchers to observe associations between variables without experimental intervention, although its primary limitation is the inability to establish direct causal relationships (Setia, 2016). Nevertheless, this design is effective for explaining correlations and prevalence within a population, particularly in epidemiological studies (Levin, 2006).

### Study Population and Sample

The study population consisted of all patients attending a cosmetic clinic in Surabaya who met the inclusion and exclusion criteria. The clinic is located in the central urban area, with the majority of patients being young adult females aged 17-25 years. The sampling technique used was accidental sampling, where the sample was selected based on the availability of patients during the study period. This technique allowed for rapid and efficient data collection; however, it has limitations in terms of generalizing the results. Potential biases associated with this technique should be considered, particularly in the context of sample representation relative to the broader population (Sugiyono, 2019).

### Inclusion and Exclusion Criteria

Inclusion criteria consisted of patients undergoing acne vulgaris treatment at the cosmetic clinic, aged 17 to 25 years, and willing to participate as respondents in the study. This age range was chosen because this group is

physiologically prone to hormonal changes associated with acne vulgaris (Purvis et al., 2018). Exclusion criteria included patients without acne vulgaris or those with other conditions that affect triglyceride levels, such as diabetes or severe dyslipidemia. These factors could influence the study's results, and thus, excluding patients with such conditions is expected to enhance the internal validity of the research.

### Data Collection Process

Data were collected using a structured questionnaire and facial observations of the patients. The questionnaire had been previously validated to ensure the reliability and validity of the variable measurements. Additionally, clinical observations were conducted to assess the severity of acne vulgaris based on the standardized classification established by the Global Acne Grading System (GAGS) (Doshi et al., 1997). The questionnaire also measured other factors such as lifestyle, medical history, and cosmetic product use, all of which could influence the incidence of acne vulgaris.

### Measurement Techniques

Triglyceride levels were measured using capillary lipid profile checkers operated by trained medical personnel. Measurements were taken after patients had fasted for a minimum of 8 hours to avoid variability in triglyceride levels caused by food intake. The reliability of this instrument was tested in accordance with standards set by the World Health Organization (WHO) for measuring capillary lipid profiles (WHO, 2018). Blood samples were aseptically collected using a lancet, and triglyceride results were immediately displayed by the device. Triglyceride data were then classified into two categories: normal triglycerides (<150 mg/dL) and high triglycerides (>150 mg/dL), according to thresholds established by the American Heart Association (AHA, 2019).

### Data Analysis

Data were analyzed using a chi-square test to examine the relationship between triglyceride levels and the incidence of acne vulgaris. The chi-square test was chosen because the variables analyzed were categorical, and this method is effective for identifying the presence or absence of an association between independent and dependent variables (McHugh, 2013). Additionally, the authors need to ensure that the assumptions of the chi-square test, such as adequate sample size and minimum expected frequency

in each category, are met to guarantee the validity of the results (Agresti, 2007). If the authors wish to explore the relationships between variables further, logistic regression analysis can be used to predict the dependent variable based on one or more independent variables, and to determine the strength of the relationship between triglyceride levels and acne vulgaris incidence (Peng et al., 2002).

### Ethical Approval

This study received ethical approval from the Ethics Committee of Nahdlatul Ulama University Surabaya with approval number No. 0519/EC/KEPK/UNUSA/2023. All respondents who participated in the study provided written informed consent after being briefed on the study's objectives and procedures. The research was conducted in accordance with ethical research principles, prioritizing patient confidentiality and the right of patients to withdraw from the study at any time.

## RESULTS OF STUDY

Characteristic data of acne vulgaris patients:

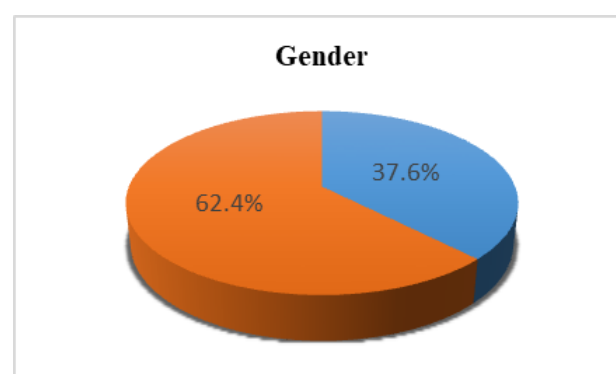


Figure 1. Gender of acne vulgaris patients

This study involved 85 patients, consisting of 32 (37.6%) males and 53 (62.4%) females. Of the total 85 patients involved in the study, 38 patients (44.8%) had normal acne vulgaris and 47 patients (55.2%) had a positive increase in acne vulgaris. Based on the triglyceride level, the research sample can be divided into a group with normal triglyceride levels of 26 patients (30.6%) and a group with increased triglyceride levels of 59 patients (69.4%).

Table 1  
Relationship between triglyceride levels and acne vulgaris

triglyceride level	Acne Vulgaris		f	P value
	Normal	Positive		
Normal (<150 mg/dL)	17 (20.0%)	9 (10.6%)	26 (30.6%)	0.03
High (>150 mg/dL)	21 (24.7%)	38 (44.7%)	59 (69.4%)	
Total	38 (44.8%)	47 (55.2%)	85 (100%)	

Table 1 illustrates that based on the triglyceride level, there are 26 patients (30.6%) with normal triglyceride levels, namely <150 mg/dL. Meanwhile, there were 59 patients (69.4%) with high triglyceride levels, namely >150 mg/dL. From the data, it is known that in the group with normal blood triglyceride levels, there are 17 people (20%) without acne vulgaris, and 9 people (10.6%) positive for acne vulgaris. Furthermore, in the group with high

triglyceride levels, there were 21 patients (24.7%) patients without acne vulgaris, and 38 patients (44.7%) with acne vulgaris. The results of the Chi-Square test for the relationship between triglyceride levels and the incidence of acne vulgaris obtained a p value of 0.03 which is smaller than 0.05 and means that the null hypothesis is rejected, and there is a statistically significant relationship between triglyceride levels and the incidence of acne vulgaris.

**Table 2**  
**Relationship between triglyceride levels and the severity of acne vulgaris**

Triglyceride levels	Acne Vulgaris			f	P value
	Mild	Moderate	Severe		
Normal (<150 mg/dL)	17 (20%)	6 (7.1%)	5 (5.9%)	28 (32.9%)	0.09
Tinggi (>150 mg/dL)	21 (24.7%)	21 (24.7%)	15 (17.7%)	57 (67.1%)	
Total	38 (44.7%)	27 (31.8%)	20 (23.5%)	85 (100%)	

Based on Table 2, in the group with normal triglyceride levels, 17 patients (20%) had mild acne vulgaris, 6 patients (7.1%) had moderate acne, and 5 patients (5.9%) had severe acne. In contrast, in the group with elevated triglyceride levels, there was a more even distribution of acne vulgaris severity: 21 patients (24.7%) had mild acne, 21 patients (24.7%) had moderate acne, and 15 patients (17.7%) had severe acne. Statistical analysis yielded a p-value of 0.09, indicating no significant relationship between triglyceride levels and acne vulgaris severity. Although no significant association was found between triglyceride levels and acne severity, the data distribution suggests that high triglyceride levels may contribute to greater severity. This finding can be attributed to other factors such as skin type and hormonal differences, which can influence the skin's response to elevated triglyceride levels.

These results indicate that while elevated triglyceride levels are associated with an increased risk of developing acne vulgaris, they do not significantly influence the severity of the condition. Clinically, these findings suggest that reducing triglyceride levels through dietary interventions or pharmacological therapies may be beneficial as a preventive or management strategy for acne vulgaris. Further research is needed to explore the effectiveness of such interventions in reducing the incidence of acne vulgaris in individuals with elevated triglyceride levels.

## DISCUSSION

This study found a significant association between elevated triglyceride levels and the increased incidence of acne vulgaris in young adults, which aligns with previous studies on the role of lipids in the pathogenesis of acne vulgaris (Sobhan et al., 2020; Almoughrabie et al., 2023). Triglycerides serve as a major component of sebum, and these findings indicate that elevated blood triglyceride levels may exacerbate skin inflammation by increasing sebum production, which fosters the proliferation of *Cutibacterium acnes* (Vasam et al., 2023).

A study by Skroza et al. (2018) further supports these findings, showing that elevated lipid levels, including triglycerides, contribute to increased sebum production and inflammation within hair follicles. The pathophysiological mechanism underlying the relationship between triglycerides and acne vulgaris is driven by an inflammatory process induced by the interaction between sebum and skin bacteria. Excess sebum provides a substrate for *P. acnes* to break down triglycerides into free fatty acids, leading to localized inflammation and worsening skin lesions (Vasam et al., 2023).

The physiological mechanism supporting these findings is based on the role of triglycerides as a primary substrate in sebum production. Sebum produced by sebaceous glands consists of various lipids, including triglycerides, squalene, and wax esters, which contribute to the skin's protective function. However, in cases of acne vulgaris, excessive sebum production promotes the growth of *P.*

*acnes*, which breaks down triglycerides into free fatty acids through bacterial lipase (Almoughrabie et al., 2023). This process triggers an inflammatory response in the skin, exacerbating acne vulgaris.

Furthermore, elevated blood triglyceride levels are often associated with metabolic conditions that can also worsen the body's inflammatory response, including that of the skin. For instance, patients with dyslipidemia or metabolic syndrome frequently exhibit more severe symptoms of acne vulgaris, supporting the hypothesis that triglycerides play a central role in exacerbating skin inflammation (Capitanio et al., 2017). The relationship between lipid metabolism and androgen hormones may further explain how triglycerides influence the severity of acne vulgaris, as androgens enhance sebaceous gland activity and sebum production (Skroza et al., 2018).

This study demonstrates that while elevated triglyceride levels are correlated with the incidence of acne vulgaris, no significant relationship was found between triglyceride levels and acne severity. This suggests that other factors, such as hormonal, genetic, or lifestyle factors, may play a more prominent role in determining acne severity. Research by Layton (2009) emphasizes the importance of hormonal factors, particularly the role of androgens, in the pathogenesis of acne vulgaris. Androgen hormones are known to stimulate sebaceous gland activity, increasing sebum production and exacerbating inflammation in pilosebaceous follicles. However, individual sensitivity to androgens may vary, leading to differences in skin lesion severity among individuals with elevated triglyceride levels (Bagatin et al., 2021).

In addition, research indicates that genetic variations also play a role in the development of acne vulgaris. Genetic factors can influence how an individual's body responds to hormones and environmental factors, which may result in differences in the severity of acne lesions (Melnik, 2023). Factors such as variations in androgen receptor genes and genetic differences in sebum production may be more relevant in determining the severity of acne vulgaris than triglyceride levels alone. For example, Bagatin et al. (2021) showed that sensitivity to androgens is not uniform, and individuals with greater sensitivity tend to develop more severe acne lesions.

Lifestyle factors also play an important role in acne vulgaris severity. Diets rich in fats, sugars, and refined carbohydrates have been shown to influence triglyceride levels and sebum production (Bowe et al., 2010). A high-fat diet can lead to elevated triglyceride levels, which in turn increases sebum production, although evidence also suggests that the skin's response to dietary factors can vary depending on other factors such as skin microbiota and immune function (Fabbrocini et al., 2010). Furthermore, environmental pollution has been linked to increased oxidative stress in the skin, which can exacerbate acne lesions (Dréno et al., 2018). Pollution is also known to increase sebaceous gland activity and disrupt the skin barrier, contributing to more severe inflammation in patients with acne vulgaris.

This study reinforces previous findings showing a significant relationship between elevated triglyceride

levels and the incidence of acne vulgaris. For example, research by Okoro et al. (2021) found that patients with acne tend to have higher triglyceride levels compared to control groups without acne. However, while there is a relationship between elevated triglycerides and the incidence of acne, this study did not find a significant association between triglycerides and the severity of acne vulgaris. These differences may be attributed to variations in the methodologies used, including study design, sample size, and the populations studied. Population variability in genetic and hormonal factors may also explain why some studies find a strong relationship between lipid profiles and acne vulgaris severity, while this study did not (Capitanio et al., 2017).

In addition to methodology, external factors such as cosmetic use, stress, and sleep patterns may also affect study outcomes. For instance, research by Yang et al. (2020) showed that psychological stress can worsen acne by increasing cortisol production, which in turn affects sebaceous gland activity and skin inflammation. This suggests that not only triglyceride levels play a role in the pathogenesis of acne vulgaris, but also the interaction between various environmental and lifestyle factors can aggravate this skin condition.

Overall, while elevated triglycerides contribute to the incidence of acne vulgaris, the severity of the condition is likely influenced by a combination of hormonal, genetic, and environmental factors. Therefore, further research is needed to understand how these factors interact to exacerbate acne vulgaris. Larger longitudinal studies exploring the causal relationships between triglyceride levels, hormonal factors, and acne severity are highly recommended to deepen our understanding of the pathophysiological mechanisms underlying this condition.

The main limitations of this study relate to the small sample size and the use of accidental sampling, which may introduce selection bias. The small sample size limits the generalizability of these findings to a broader population. Additionally, the lack of strict control over confounding variables such as genetic history, diet, or cosmetic product use may also influence the results. Future research should employ a longitudinal study design with larger and more diverse populations to explore the causal relationships between triglycerides and acne vulgaris (Setia, 2016).

From a clinical perspective, the findings of this study suggest that triglyceride levels could be a potential indicator in the management of acne vulgaris. This research supports the idea that patients with elevated triglyceride levels may benefit from lipid-lowering interventions, such as dietary or pharmacological therapies, to prevent or reduce the incidence of acne vulgaris (Bagatin et al., 2021). Furthermore, future studies should consider other factors such as insulin resistance, hormone metabolism, and skin microbiota to provide a more comprehensive understanding of the lipid-related pathogenesis of acne vulgaris.

## CONCLUSIONS AND RECOMMENDATION

This study demonstrates a significant relationship between elevated triglyceride levels and the incidence of acne vulgaris in young adults. This finding confirms that triglycerides, as a major component of sebum, play a critical role in the pathophysiological processes underlying the development of acne vulgaris. However, this study did not find a significant association between triglyceride levels and the severity of acne vulgaris, indicating that

other factors, such as hormones, genetics, and lifestyle, may play a more dominant role in influencing the severity of the condition.

From a clinical perspective, the findings of this study suggest that patients with elevated triglyceride levels could benefit from interventions aimed at lowering triglycerides, such as dietary modifications or pharmacological therapies, as part of a preventive and management strategy for acne vulgaris. Furthermore, additional research is needed to include variables such as hormonal profiles and genetic factors to provide a more comprehensive understanding of how these elements interact to affect the occurrence and severity of acne vulgaris.

Future studies should also consider using a longitudinal design to uncover causal relationships between triglyceride levels and acne vulgaris, as well as explore potential interventions that could reduce the risk of acne vulgaris through lipid management. A larger and more heterogeneous population would provide a more representative view of the impact of triglycerides on acne vulgaris across various demographic groups.

It is recommended that patients with acne vulgaris regularly monitor their triglyceride levels as part of an overall health evaluation, especially for those with a history of dyslipidemia or a lifestyle that puts them at risk for elevated lipid levels. In this regard, healthcare providers should consider integrating triglyceride control into acne vulgaris management strategies, particularly for patients exhibiting high triglyceride levels, to minimize the risk of acne occurrence and recurrence. Further research is also strongly encouraged to investigate the role of hormonal and genetic factors in influencing the severity of acne vulgaris, which could offer deeper insights into more personalized treatment approaches. Additionally, more exploration is needed into lipid management interventions, such as dietary changes and pharmacological treatments, which could significantly reduce the incidence of acne vulgaris. Longitudinal study designs and larger populations are expected to provide stronger evidence regarding the causal relationship between triglyceride levels and acne vulgaris, as well as the effectiveness of lipid management-based interventions.

## DECLARATIONS

### Ethics approval and consent to participate

The study was approved by the Universitas Nahdlatul Ulama Surabaya No. 0519/EC/KEPK/UNUSA/2023. All respondents have agreed to be research subjects and filled out informed consent

### Consent for publication

I agree that this article can be published and I am ready to provide support and additional information needed to expedite the publication process.

### Availability of Data and Material (ADM)

The data and materials used in this research have been collected adequately and can be accessed by anyone who needs them, either for academic or future research purposes.

## Competing/Conflict of interests Statement

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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## Authors' contributions

All authors contributed to this research.

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