

## Research Article

## Primary Dysmenorrhea and Risk Factors among Female Students in Yogyakarta: A Cross-Sectional Survey

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### Abstract

**Objective:** To investigate the prevalence of primary dysmenorrhea and its associated factors among female students in Yogyakarta Province, Indonesia.

**Methods:** A cross-sectional study was conducted among female university students in Yogyakarta Province, Indonesia, in 2021. A total of 385 participants were recruited using a purposive sampling method. Data were collected through an online structured questionnaire administered via Google Forms. The questionnaire incorporated the International Physical Activity Questionnaire (IPAQ) along with researcher-developed items that had been validated and tested for reliability before use. Data were analyzed using univariate and bivariate analyses, with the chi-square test applied at a significance level of 5% ( $p < 0.05$ ). Variables with significant associations were subsequently included in a multivariable logistic regression analysis.

**Results:** Severe primary dysmenorrhea was the most prevalent category, affecting 44.2% of respondents. A maternal history of dysmenorrhea was significantly associated with both mild (AOR = 0.450; 95% CI: 0.249–0.813;  $p = 0.008$ ) and severe primary dysmenorrhea (AOR = 2.425; 95% CI: 0.774–2.292;  $p < 0.001$ ).<sup>\*</sup> Among treatment-related factors, healthy food consumption showed the strongest association with mild primary dysmenorrhea (AOR = 0.570; 95% CI: 0.392–0.830;  $p = 0.003$ ), whereas medication use was most strongly associated with severe primary dysmenorrhea (AOR = 2.645; 95% CI: 1.624–4.308;  $p < 0.001$ ).

**Conclusion:** Severe primary dysmenorrhea was the most common presentation among female students. A maternal history of dysmenorrhea was significantly associated with both mild and severe primary dysmenorrhea. Healthy food consumption and medication use were the treatment-related factors most strongly associated with mild and severe dysmenorrhea, respectively. Strengthening collaboration among mothers, adolescents, and healthcare providers may improve the management of primary dysmenorrhea.

**Keywords:** associated factors, female students, primary dysmenorrhea, reproductive health.

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## INTRODUCTION

Dysmenorrhea, commonly referred to as menstrual pain, is characterized by cramping pain in the lower abdomen that occurs before or during menstruation.<sup>1</sup> More than half of menstruating women experience menstrual pain for 1–2 days each month.<sup>1,2</sup> Some women also report accompanying symptoms such as nausea, vomiting, headache, and general discomfort.<sup>2</sup> A study conducted in Malaysia reported that 73.2% of female adolescents experienced dysmenorrhea during menstruation.<sup>3</sup> Similarly, a study in Yogyakarta Province, Indonesia, found that 89.2% of adolescent girls experienced dysmenorrhea.<sup>4</sup> According to the Yogyakarta Provincial Central Statistics Agency, there were 257,533 adolescents aged 15–19 years and 262,181 young adults aged 20–24 years in 2020. These figures are higher than those reported in many other provinces in Indonesia. Yogyakarta has the highest proportion of adolescents and young adults because it is widely recognized as Indonesia's student city.<sup>5</sup>

Dysmenorrhea is classified into primary and secondary types. Primary dysmenorrhea is defined as lower abdominal cramping that occurs before or during menstruation in the absence of pelvic pathology.<sup>6</sup> In contrast, secondary dysmenorrhea is caused by underlying gynecological conditions such as pelvic infections, ovarian cysts, and endometriosis.<sup>7,8</sup> The pathophysiology of primary dysmenorrhea is associated with excessive prostaglandin production, which increases abnormal uterine contractions and results in menstrual pain.<sup>6</sup> Adolescents with primary dysmenorrhea commonly experience lower abdominal pain that may radiate to the lower back or thighs.<sup>6,9</sup>

Several factors have been reported to be associated with dysmenorrhea, including nutritional status, physical activity, allergy history, magnesium intake, age at menarche, duration of menstruation, Body Mass Index (BMI), irregular menstrual cycles, and a maternal history of dysmenorrhea.<sup>10–13</sup> Among these, physical activity has been identified as one of the strongest associated factors.<sup>10</sup> Women with low levels of physical activity have been reported to have an 8.8-fold higher likelihood of experiencing dysmenorrhea than those with moderate or high levels of physical activity.<sup>10</sup> The severity of dysmenorrhea is commonly assessed using the Numeric Rating Scale (NRS), which scores pain

from 1 to 10. Based on the NRS, pain is categorized as mild (scores 1–3), moderate (scores 4–6), or severe (scores 7–10).<sup>14</sup>

Several pharmacological and non-pharmacological interventions have been recommended to reduce menstrual pain. Pharmacological treatments include non-steroidal anti-inflammatory drugs (NSAIDs), oral contraceptive pills, and calcium channel blockers.<sup>1,15</sup> NSAIDs are considered the first-line treatment because they inhibit prostaglandin synthesis, thereby reducing uterine contractions and menstrual pain.<sup>15</sup> Non-pharmacological approaches include regular exercise, local heat therapy, acupuncture, warm compresses, reducing caffeine intake, maintaining a healthy diet, and consuming herbal remedies.<sup>16,17</sup>

Although numerous studies have investigated dysmenorrhea and its associated factors, evidence among female university students in Yogyakarta remains limited despite the province having one of the largest student populations in Indonesia. Understanding the factors associated with primary dysmenorrhea in this population may provide valuable evidence for developing appropriate preventive and management strategies. Therefore, this study aimed to investigate the prevalence of primary dysmenorrhea and its associated factors among female university students in Yogyakarta Province, Indonesia.

## METHODS

A cross-sectional study was conducted among female university students in Yogyakarta Province, Indonesia, from May to July 2021. Yogyakarta is widely recognized as Indonesia's student city because it hosts numerous public and private universities and has one of the largest student populations in the country. Located in the southern part of Java Island, Yogyakarta Province borders Central Java Province and the Indian Ocean and covers an area of 3,185.80 km<sup>2</sup>, comprising one municipality and four districts. The study population included female undergraduate students enrolled at universities throughout Yogyakarta Province. The source population consisted of female undergraduate students studying at universities in Yogyakarta Province. The study population included eligible female undergraduate students who were available during the study period.

The inclusion criteria were female

undergraduate students aged 15–24 years who experienced primary dysmenorrhea without a history of pelvic pathology, were unmarried, were enrolled at a university in Yogyakarta Province, and provided informed consent to participate. The exclusion criteria included students who did not experience dysmenorrhea, had secondary dysmenorrhea caused by conditions such as pelvic infections, ovarian cysts, or endometriosis, or declined to participate. To minimize selection bias, the eligibility criteria were established based on an extensive literature review, and random selection was performed among participants who met all inclusion and exclusion criteria.

### Sample Size and Sampling Procedures

The minimum sample size was calculated using the Lemeshow formula for an unknown population with a 95% confidence level ( $Z = 1.96$ ), a maximum estimated proportion of 0.5, and a margin of error of 10%, resulting in a minimum sample size of 96 participants per group. Therefore, the minimum required sample size for this study was 283 participants. The sample size was calculated using the following formula;

$$n = \frac{Z^2 P (1-P)}{d^2}$$

where  $n$  is the required sample size,  $Z$  is the Z-score corresponding to a 95% confidence level (1.96),  $P$  is the maximum estimated proportion (0.5), and  $d$  is the margin of error (0.10).

$$\frac{1.96^2 \times 0.5 \times (1-0.5)}{0.1^2} = 96.04 \sim 96$$

Participants were recruited using a purposive sampling technique based on predefined eligibility criteria established by the researchers. The dependent variable was primary dysmenorrhea, whereas the independent variables included age, menstrual cycle, duration of dysmenorrhea, activity limitations, Body Mass Index (BMI), maternal history of dysmenorrhea, age at menarche, physical activity, junk food consumption, healthy food consumption, and treatment practices.

Data were collected using the International Physical Activity Questionnaire (IPAQ) together with researcher-developed questionnaires that had undergone validity and reliability testing. The validity test showed a significance value of

$<0.05$ , while the reliability test demonstrated a Cronbach's alpha coefficient of 0.789, indicating acceptable internal consistency. The IPAQ is an internationally standardized instrument for assessing health-related physical activity and is available in both long and short versions for self-administered or interviewer-administered data collection.<sup>18</sup>

Participants received information regarding the study objectives and procedures and were given the opportunity to ask questions before providing written informed consent. Data were subsequently collected online using Google Forms.

Throughout the data collection period, researchers routinely monitored submitted questionnaires to ensure data security, completeness, and consistency. Respondents were re-contacted whenever necessary to complete missing information before the final dataset was analyzed.

Data were coded, verified, and analyzed using IBM SPSS Statistics version 25.0 for Windows. Descriptive statistics were used to summarize participants' characteristics, dysmenorrhea severity, BMI, age at menarche, physical activity, junk food consumption, healthy food consumption, and treatment practices. Associations between categorical variables were analyzed using the chi-square test with a significance level of  $p < 0.05$ . Variables showing significant associations in the bivariate analysis were subsequently included in the multivariable logistic regression model to identify factors independently associated with each severity level of primary dysmenorrhea.

Primary dysmenorrhea was defined as lower abdominal cramping occurring before or during menstruation in the absence of pelvic pathology. Dysmenorrhea severity was assessed using the Numeric Rating Scale (NRS) and categorized as mild (scores 1–3), moderate (scores 4–6), or severe (scores 7–10).<sup>14</sup> Physical activity was classified as low, moderate, or high according to metabolic equivalent (MET)-minutes/week based on the official IPAQ scoring protocol.<sup>18</sup> Body mass index was calculated from self-reported height and weight and categorized as normal ( $18.5\text{--}22.9 \text{ kg/m}^2$ ) or abnormal ( $<18.5$  or  $\geq 23 \text{ kg/m}^2$ ). Other variables, including menstrual cycle characteristics, duration of dysmenorrhea, activity limitations, maternal history of dysmenorrhea, age at menarche, junk food consumption, healthy food consumption, and treatment practices, were

defined based on previous literature regarding factors associated with primary dysmenorrhea.

### ETHICAL CONSIDERATION

Studies involving human respondents have been reviewed and approved by Universitas Muhammadiyah Yogyakarta No. 004/EC-KEPK FKIK UMY/IX/2021.

### RESULTS

#### Sociodemographic and Reproductive Characteristics

A total of 385 female university students participated in this study. The largest proportion of participants was 21 years old (34.5%). Approximately one-third of the respondents (31.4%) experienced dysmenorrhea during every menstrual cycle, while 46.2% reported that the pain lasted for one day. Nearly half of the participants (48.3%) reported activity limitations due to dysmenorrhea. In addition, 28.3% experienced fainting and 12.2% reported nausea and vomiting during episodes of dysmenorrhea (Table 1).

**Table 1.** Sociodemographic and Reproductive Characteristics of Female Students in Yogyakarta

| Variables                             | N   | %    |
|---------------------------------------|-----|------|
| <b>Age (years)</b>                    |     |      |
| 17                                    | 27  | 7.0  |
| 18                                    | 29  | 7.5  |
| 19                                    | 37  | 9.6  |
| 20                                    | 69  | 17.9 |
| 21                                    | 133 | 34.5 |
| 22                                    | 49  | 12.7 |
| 23                                    | 26  | 6.8  |
| 24                                    | 15  | 3.9  |
| <b>Dysmenorrhea frequency</b>         |     |      |
| Sometimes                             | 196 | 50.9 |
| Often                                 | 68  | 17.7 |
| Always                                | 121 | 31.4 |
| <b>Duration of dysmenorrhea (day)</b> |     |      |
| <1                                    | 74  | 19.2 |
| 1                                     | 178 | 46.2 |
| >1                                    | 133 | 34.5 |
| <b>Activity limitations</b>           |     |      |
| Yes                                   | 186 | 48.3 |
| No                                    | 199 | 51.7 |
| <b>Symptom</b>                        |     |      |
| Fainting                              | 109 | 28.3 |
| No fainting                           | 276 | 71.7 |
| Nausea and vomiting                   | 47  | 12.2 |
| No nausea and vomiting                | 338 | 87.8 |

#### Factors Associated with Primary Dysmenorrhea

Most participants experienced menarche between 12 and 14 years of age (67.5%), had a normal BMI (51.4%), engaged in low physical activity (59.5%), and consumed junk food two to three times per month (34.3%). Maternal history of dysmenorrhea was significantly associated with both mild ( $p = 0.011$ ) and severe ( $p = 0.001$ ) dysmenorrhea, whereas other variables showed no significant associations (Table 2).

**Table 2.** Factors Associated with Primary Dysmenorrhoea among Female Students in Yogyakarta

| Risk Factors                   | Total sample<br>(n=385) | Degree of dysmenorrhea |         |                   |         |                 |         |
|--------------------------------|-------------------------|------------------------|---------|-------------------|---------|-----------------|---------|
|                                |                         | Mild<br>n=67           |         | Moderate<br>n=148 |         | Severe<br>n=170 |         |
|                                |                         |                        | P-value |                   | P-value |                 | P-value |
| <b>Age of menarche (years)</b> |                         |                        |         |                   |         |                 |         |
| <12                            | 96                      | 16                     | 0.826   | 31                | 0.153   | 49              | 0.117   |
| 12-14                          | 260                     | 46                     |         | 106               |         | 108             |         |
| >14                            | 29                      | 5                      |         | 11                |         | 13              |         |
| <b>Body mass index</b>         |                         |                        |         |                   |         |                 |         |
| Normal                         | 198                     | 37                     | 0.494   | 75                | 0.815   | 86              | 0.769   |
| Abnormal                       | 187                     | 30                     |         | 73                |         | 84              |         |
| <b>Mother history</b>          |                         |                        |         |                   |         |                 |         |
| Yes                            | 157                     | 18                     | 0.011   | 54                | 0.176   | 85              | 0.001   |
| No                             | 228                     | 49                     |         | 94                |         | 85              |         |

|                                                    |     |    |       |    |       |    |       |
|----------------------------------------------------|-----|----|-------|----|-------|----|-------|
| <b>Physical activity</b>                           |     |    |       |    |       |    |       |
| Mild                                               | 229 | 42 | 0.776 | 95 | 0.331 | 92 | 0.153 |
| Moderate                                           | 147 | 24 |       | 50 |       | 73 |       |
| Severe                                             | 9   | 1  |       | 3  |       | 5  |       |
| <b>Junk food consumption (every month) - times</b> |     |    |       |    |       |    |       |
| 1                                                  | 76  | 17 |       | 31 |       | 28 |       |
| 2-3                                                | 132 | 19 | 0.375 | 51 | 0.889 | 62 | 0.268 |
| 4                                                  | 53  | 7  |       | 18 |       | 28 |       |
| >4                                                 | 124 | 24 |       | 48 |       | 52 |       |

### Association between Treatment Efforts and Primary Dysmenorrhea

Healthy food consumption was significantly associated with mild dysmenorrhea ( $p = 0.006$ ). Warm compresses were associated with moderate

( $p = 0.016$ ) and severe ( $p = 0.009$ ) dysmenorrhea. Medication use and lying down or sleeping were significantly associated with both mild and severe dysmenorrhea, whereas herbal medicine use and resting were not (Table 3).

**Table 3.** Association between treatment efforts and primary dysmenorrhoea among female students in Yogyakarta

| Treatment efforts                  | Total Sample<br>(n=385) | Degree of dysmenorrhea |         |          |         |        |         |
|------------------------------------|-------------------------|------------------------|---------|----------|---------|--------|---------|
|                                    |                         | Mild                   |         | Moderate |         | Severe |         |
|                                    |                         | n=67                   | P-value | n=148    | P-value | n=170  | P-value |
| <b>Consumption of healthy food</b> |                         |                        |         |          |         |        |         |
| Always                             | 40                      | 14                     | 0.006   | 11       | 0.257   | 15     | 0.285   |
| Often                              | 131                     | 23                     |         | 55       |         | 53     |         |
| Sometime                           | 214                     | 30                     |         | 82       |         | 102    |         |
| <b>Warm compress</b>               |                         |                        |         |          |         |        |         |
| Yes                                | 127                     | 21                     | 0.753   | 38       | 0.016   | 68     | 0.009   |
| No                                 | 258                     | 46                     |         | 110      |         | 102    |         |
| <b>Consume herbal medicine</b>     |                         |                        |         |          |         |        |         |
| Yes                                | 94                      | 15                     | 0.671   | 40       | 0.346   | 39     | 0.549   |
| No                                 | 291                     | 52                     |         | 108      |         | 131    |         |
| <b>Consumption of medication</b>   |                         |                        |         |          |         |        |         |
| Yes                                | 102                     | 10                     | 0.018   | 32       | 0.087   | 60     | 0.001   |
| No                                 | 283                     | 57                     |         | 116      |         | 110    |         |
| <b>Lie down or sleep</b>           |                         |                        |         |          |         |        |         |
| Yes                                | 213                     | 25                     | 0.001   | 76       | 0.199   | 112    | 0.000   |
| No                                 | 171                     | 42                     |         | 72       |         | 58     |         |
| <b>Rest</b>                        |                         |                        |         |          |         |        |         |
| Yes                                | 225                     | 37                     | 0.538   | 85       | 0.809   | 103    | 0.479   |
| No                                 | 160                     | 30                     |         | 63       |         | 67     |         |

### Multivariable Analysis of Factors Associated with Primary Dysmenorrhea

Multivariable logistic regression identified healthy food consumption as the factor most strongly associated with mild dysmenorrhea, whereas medication use showed the strongest association with severe dysmenorrhea. Maternal history of dysmenorrhea and lying down or sleeping also remained independently associated with dysmenorrhea severity after adjustment (Table 4).

**Table 4.** Multivariate Analysis of Factors Associated with Primary Dysmenorrhea among Female Students in Yogyakarta

| Variables                   | Degree of dysmenorrhea |                     |        |                     |
|-----------------------------|------------------------|---------------------|--------|---------------------|
|                             | Mild                   |                     | Severe |                     |
|                             | Sig                    | OR; 95% CI          | Sig    | OR; 95% CI          |
| Consumption of healthy food | 0.003                  | 0.570 (0.392-0.830) |        |                     |
| Lie down or sleep           | 0.000                  | 0.368 (0.212-0.641) | 0.000  | 2.372 (1.526-3.687) |
| Consumption of medication   | 0.007                  | 0.366 (0.177-0.760) | 0.000  | 2.645 (1.624-4.308) |
| Warm compress               |                        |                     | 0.066  | 1.525 (0.973-2.392) |
| Mothers history             | 0.008                  | 0.450 (0.249-0.813) | 0.000  | 2.425 (0.774-2.292) |

## DISCUSSION

This study found that severe dysmenorrhea was the most prevalent severity category, in contrast to a study from Brazil in which moderate dysmenorrhea was the most common.<sup>19</sup> This discrepancy may be attributable to differences in participant characteristics, study settings, and sample composition. Yogyakarta Province was selected as the study setting because it has a large and diverse student population, with students from various regions of Indonesia studying in the province.<sup>5</sup> A study conducted in Japan among females aged 16–30 years also reported that moderate dysmenorrhea was the predominant severity category (60%), which was consistent with the findings from Brazil.<sup>20</sup> Differences in the severity of dysmenorrhea across populations may be influenced by a combination of genetic, dietary, environmental, and sociocultural factors.

Maternal history of dysmenorrhea was significantly associated with both mild and severe dysmenorrhea in this study. This finding is consistent with a study conducted in Northwest Ethiopia, which identified a positive family history of dysmenorrhea and irregular menstrual cycles as factors associated with primary dysmenorrhea. Similar findings have also been reported in studies from Sub-Saharan Africa and China.<sup>13,21</sup> The association between maternal history and dysmenorrhea may reflect a familial or genetic predisposition. Heritability estimates for primary dysmenorrhea have been reported to be higher among younger females than among older women, in whom multiple acquired factors may contribute to the condition.<sup>22</sup>

In addition to menstrual pain, participants in this study reported associated symptoms such as fainting (28.3%) and nausea and vomiting (12.2%), particularly among those with severe dysmenorrhea. These findings are consistent with previous studies reporting that primary dysmenorrhea may be accompanied by lower

abdominal pain, back pain, headache, and fatigue, and may interfere with school attendance and daily activities.<sup>23,24</sup> Systemic symptoms associated with dysmenorrhea may include headache, lethargy, fatigue, drowsiness, difficulty sleeping, breast pain, back pain, myalgia, and arthralgia. Gastrointestinal manifestations may include bloating, nausea, vomiting, and changes in appetite, while other symptoms may include diarrhea, constipation, frequent urination, and sweating.<sup>9,24,25</sup> These symptoms are thought to be related to increased prostaglandin production during menstruation. The shedding of the endometrial lining leads to the release of prostaglandins, which stimulate uterine contractions and contribute to menstrual pain. The severity of pain is generally associated with the amount of prostaglandin released.<sup>1</sup>

Several treatment practices were reported by participants, including healthy food consumption, lying down or sleeping, medication use, and warm compresses. Among these practices, healthy food consumption showed the strongest association with mild dysmenorrhea (AOR = 0.570; 95% CI: 0.392–0.830;  $p = 0.003$ ). This finding is consistent with previous research showing a significant association between fast-food consumption and dysmenorrhea intensity ( $p = 0.017$ ).<sup>26</sup> Conversely, increased consumption of fruits and vegetables, which are sources of vitamins and minerals, as well as fish, milk, and dairy products, has been associated with less menstrual pain.<sup>27,28</sup> Adequate intake of nutrients such as magnesium and calcium may contribute to the regulation of neuromuscular function and may reduce uterine muscle spasticity and prostaglandin synthesis.<sup>29</sup> Studies from India and Japan have also reported an association between dietary patterns and dysmenorrhea.<sup>30,31</sup>

Medication use demonstrated the strongest association with severe dysmenorrhea (AOR = 2.645; 95% CI: 1.624–4.308;  $p < 0.001$ ). Pharmacological treatment, particularly non-

steroidal anti-inflammatory drugs (NSAIDs), is widely recommended for the management of primary dysmenorrhea. NSAIDs inhibit cyclooxygenase (COX) enzymes and subsequently reduce prostaglandin synthesis, thereby alleviating menstrual pain. Commonly used NSAIDs include naproxen, ketoprofen, ibuprofen, and mefenamic acid.<sup>24,32</sup> Previous research has also identified pharmacological treatment as a common first-line approach among women experiencing dysmenorrhea.<sup>33</sup>

Although previous studies have reported associations between dysmenorrhea and factors such as age, activity limitations, age at menarche, BMI, physical activity, and junk food consumption,<sup>1,10,34,35</sup> these factors were not significantly associated with dysmenorrhea severity in the present study. Differences between studies may be related to variations in population characteristics, study settings, sample size, measurement instruments, and definitions of the variables assessed.

### Strengths and Limitations of the Study

This study has several strengths. It included a relatively large sample of 385 female university students and used validated instruments, including the International Physical Activity Questionnaire (IPAQ) and the Numeric Rating Scale (NRS), to assess physical activity and dysmenorrhea severity, respectively. The study also examined a broad range of demographic, reproductive, lifestyle, and treatment-related factors associated with dysmenorrhea.

Several limitations should also be acknowledged. First, the cross-sectional design precludes establishing a temporal relationship between the investigated factors and primary dysmenorrhea and therefore limits causal inference. Second, the data were based on self-reported information, and no clinical examination was performed, which may have introduced recall and reporting bias. Third, potentially relevant factors, such as psychological status, were not assessed. Finally, because the study was conducted in Yogyakarta Province, the findings may not be fully generalizable to other regions of Indonesia with different demographic, cultural, and socioeconomic characteristics.

### CONCLUSION

Severe dysmenorrhea was the most prevalent severity level of primary dysmenorrhea among female university students. Among the factors assessed, maternal history of dysmenorrhea was significantly associated with mild and severe dysmenorrhea. Among the treatment practices assessed, healthy food consumption showed the strongest association with mild dysmenorrhea, whereas medication use showed the strongest association with severe dysmenorrhea. Participants also reported associated symptoms such as fainting and nausea and vomiting, although these symptoms were less prevalent.

Further studies using mixed-methods approaches are recommended to explore the experiences and factors associated with primary dysmenorrhea in greater depth. Clinical assessment should also be considered to improve the accuracy of dysmenorrhea diagnosis. Longitudinal or prospective studies are warranted to better establish the temporal relationships between potential risk factors and the development and severity of primary dysmenorrhea among female university students.

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### AUTHORS' CONTRIBUTION

SW: Concept, Data Provision, Data Analysis, Result Interpretation, Writing and Discussion. LF: Data and Result in Interpretation, Writing and Discussion. OR: Data Collection, Data and Result Interpretation. FB: Concept, Discussion. All authors contributed to the article and approved the submitted version.

### CONFLICT of INTEREST

There was no conflict of interest in this study.

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