



# The Relationship between the History of Exclusive Breastfeeding and Complementary Feeding (MP-ASI) with Stunting among Children Under Five in the Working Area of Penana'e Public Health Center, Bima City: A Cross-Sectional Study

Agnis Setiawati<sup>1\*</sup>, M. Noris<sup>1</sup>, Darmin<sup>1</sup>, Juraidin<sup>1</sup>

1. Muhammadiyah University of  
Bima, West Nusa Tenggara,  
Indonesia

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## Abstract

**Background:** Stunting is a chronic nutritional problem that remains a public health challenge in Indonesia, including in the working area of the Penana'e Health Center in Bima City. Inappropriate practices of exclusive breastfeeding and complementary feeding can affect toddler growth and increase the risk of stunting. **Objective:** This study aims to determine the prevalence of stunting and to analyze the relationship between the history of exclusive breastfeeding and complementary feeding and stunting in the working area of the Penana'e Health Center in Bima City. **Methods:** A cross-sectional study was conducted in the working area of Penana'e Primary Health Center, Bima City, Indonesia. A total of 80 mothers with children aged 6–59 months were included. The sample size was determined using the Slovin formula, and participants were selected using purposive sampling based on predetermined inclusion and exclusion criteria. Data were collected through structured interviews using a validated questionnaire. Data were analyzed using descriptive statistics and Pearson's Chi-square test. Effect sizes were expressed as Odds Ratios (ORs) with 95% Confidence Intervals (95% CIs). **Results:** Exclusive breastfeeding was significantly associated with stunting ( $p < 0.001$ ). Children who were not exclusively breastfed had 4.96 times higher odds of being stunted than those who received exclusive breastfeeding (OR=4.96; 95% CI=1.86–13.23). In addition, the timing of complementary feeding was significantly associated with stunting ( $p < 0.001$ ). Children who received complementary feeding either before or after six months of age had 5.32 times higher odds of stunting than those who received complementary feeding at six months (OR=5.32; 95% CI=1.97–14.32). **Conclusion:** The history of exclusive breastfeeding and MP-ASI is related to the incidence of stunting in toddlers in the working area of the Penana'e Health Center, Bima City, so it is necessary to increase education to mothers about the importance of providing exclusive breastfeeding and appropriate MP-ASI to prevent stunting.

## Keywords

Exclusive breastfeeding, Toddlers, Complementary feeding, Stunting.

## Correspondence

Agnis Setiawati,

Nutrition Study Program, Faculty of Health, Muhammadiyah University of Bima,  
Bima City, West Nusa Tenggara, 84119, Indonesia.

Email: [agnissetiawati@cloud.com](mailto:agnissetiawati@cloud.com)

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## 1. BACKGROUND

Stunting is a chronic nutritional problem that remains a major public health concern, particularly in developing countries such as Indonesia. Stunting is a condition of growth failure in children due to long-term malnutrition, characterized by a child's height being lower than the standard for their age, as measured by the height-for-age (H/U) indicator, with a z-score value of  $<-2$  standard deviations according to World Health Organization standards. (WHO, 2024) Stunting not only impacts a child's physical growth but also affects cognitive development, learning ability, productivity, and increases the risk of degenerative diseases in adulthood. (UNICEF, 2024).

Globally, the prevalence of stunting remains a significant public health problem. WHO data indicates that in 2022, approximately 148 million toddlers worldwide were stunted, representing 22.3% of the world's children. (WHO, 2023) In Indonesia, the prevalence of stunting, as measured by the Indonesian Nutritional Status Survey (SSGI), decreased from 24.4% in 2021 to 21.5% in 2023. Still, this figure remains above the WHO standard of 20% or less. (Ministry of Health of the Republic of Indonesia, 2024) In West Nusa Tenggara Province, stunting remains a concern, with

prevalence still quite high despite a downward trend in recent years.

Various factors, both direct and indirect, influence stunting. According to the WHO (2021), the main causes of stunting include prolonged nutritional deficiencies, recurrent infectious diseases, poor quality health services, and suboptimal child feeding practices. One important factor influencing child growth is the practice of exclusive breastfeeding and complementary feeding (MP-ASI). Inappropriate feeding practices during the first 1,000 days of life (HPK) can increase the risk of growth disorders in children.

Exclusive breastfeeding is the provision of only breast milk to infants from birth to 6 months of age without any additional food or drink except medication, vitamins, and minerals. Breast milk contains complete nutrients, antibodies, and immunological factors that play a vital role in supporting growth and boosting the baby's immune system. Infants who are not exclusively breastfed are more susceptible to infectious diseases such as diarrhea and respiratory infections, which can inhibit growth and increase the risk of stunting (WHO, 2021).

A study by Laksmi et al. (2025) shows that toddlers who do not receive exclusive breastfeeding have a 5.29 times greater risk of experiencing stunting

compared to toddlers who receive exclusive breastfeeding. Erwani (2023) also stated that there is a significant relationship between exclusive breastfeeding and the incidence of stunting in toddlers. In addition, the study by Sudirman et al. (2024) shows that less than optimal exclusive breastfeeding practices can increase the risk of growth disorders in children.

In addition to exclusive breastfeeding, complementary feeding (MP-ASI) also plays a crucial role in toddler growth. Complementary feeding is introduced at 6 months of age because a baby's energy and nutrient needs cannot be met solely by breast milk. Providing complementary feeding too early or too late can lead to nutritional imbalances and increase the risk of growth disorders (WHO, 2021). According to the Indonesian Ministry of Health (2024), complementary feeding must be provided in a timely, adequate, safe, and age-appropriate manner to support optimal growth.

A study by Yulianti, & Fatimah (2025) shows that children who receive complementary foods too early are more likely to experience stunting than those who receive them at the right age. Wulandari et al. (2023) also stated that the inappropriate provision of complementary feeding is associated with an increased risk

of stunting in toddlers. In addition, research by Triana and Haniyah (2020) shows a significant relationship between the provision of complementary foods and the incidence of stunting in toddlers.

Despite numerous studies investigating exclusive breastfeeding and complementary feeding separately, evidence examining both feeding practices simultaneously in relation to stunting at the community health center level in eastern Indonesia, particularly in Bima City, remains limited. Furthermore, local surveillance data from the Penana'e Community Health Center indicate that stunting remains a public health concern, with 496 cases in 2023, 436 in 2024, and 361 in 2025. Preliminary observations also revealed that several mothers did not exclusively breastfeed because they perceived their breast milk as insufficient, were employed outside the home, feared their infants would remain hungry, or had limited knowledge of exclusive breastfeeding. In addition, complementary feeding was still introduced either before or after the recommended age of six months.

Therefore, this study aimed to determine the prevalence of stunting and to analyze the relationship between exclusive breastfeeding history and complementary

feeding practices with the incidence of stunting among children under five years of age in the working area of Penana'e Community Health Center, Bima City.

## 2. METHODS

This study employed a quantitative, observational, analytical design using a cross-sectional approach. The study was conducted from February to March 2026 in the working area of Penana'e Community Health Center, Bima City, West Nusa Tenggara Province, Indonesia.

The study population consisted of all mothers with children aged 6–59 months registered in the working area of Penana'e Community Health Center. The sample size was determined using the Slovin formula, resulting in 80 respondents. Participants were selected using purposive sampling based on predetermined inclusion and exclusion criteria. The inclusion criteria were mothers with children aged 6–59 months who resided in the study area, possessed a Maternal and Child Health (MCH) handbook or child growth record, and were willing to participate by signing informed consent. Children with congenital abnormalities or chronic diseases affecting growth were excluded from the study.

The independent variables were exclusive breastfeeding history and

complementary feeding (MP-ASI), while the dependent variable was stunting. Exclusive breastfeeding was defined as providing only breast milk for the first 6 months of life, without additional foods or beverages except for medicines, vitamins, and minerals. Complementary feeding was classified according to the timing of its introduction: before or after 6 months of age. Stunting status was determined using the Height-for-Age Z-score (HAZ) based on the WHO Child Growth Standards, with  $HAZ < -2$  standard deviations categorized as stunting.

Data were collected through face-to-face interviews using a structured questionnaire and anthropometric measurements. Body length was measured using a length board for children aged less than 24 months, while standing height was measured using a microtoise for children aged 24 months or older, following standardized anthropometric measurement procedures.

Before data collection, the questionnaire was pre-tested with 30 respondents with characteristics similar to those of the study population but who were not included in the final sample. Item validity was assessed using the Pearson Product–Moment correlation test, and all questionnaire items were declared valid with correlation coefficients ranging from

0.421 to 0.873, exceeding the critical value ( $r_{table} = 0.361$ ). Instrument reliability was evaluated using Cronbach's Alpha, yielding a coefficient of 0.841, indicating good internal consistency.

Data processing included editing, coding, data entry, and data cleaning. Descriptive (univariate) analysis was conducted to describe respondents' characteristics and study variables. The relationships between exclusive breastfeeding, complementary feeding, and stunting were analyzed using the Pearson Chi-Square test. The strength of the associations was expressed as Odds Ratios (ORs) with 95% Confidence Intervals (95% CIs). Statistical significance was determined at  $p < 0.05$ . Statistical analyses were performed using IBM SPSS Statistics version 26.

This research obtained research permits, and all respondents provided informed consent before the research was conducted.

### 3. RESULTS

This study was conducted on 80 toddlers aged 6–59 months in the Penana'e Community Health Center (Puskesmas) area of Bima City. The results included univariate and bivariate analyses of respondent characteristics, the distribution of exclusive breastfeeding and complementary feeding, stunting incidence, and the relationships among the study variables. Data were obtained through interviews using questionnaires and anthropometric measurements of the toddlers.

Table 1. Respondent Characteristics

| Characteristics    | Category           | n  | %    |
|--------------------|--------------------|----|------|
| Mother's Age       | 20–25 years        | 26 | 32.5 |
|                    | 26–30 years        | 19 | 23.8 |
|                    | 31–35 years        | 16 | 20.0 |
|                    | 36–42 years        | 19 | 23.8 |
| Mother's Education | Elementary School  | 14 | 17.5 |
|                    | Junior High School | 29 | 36.3 |
|                    | Senior High School | 28 | 35.0 |
|                    | College            | 9  | 11.3 |
| Toddler Gender     | Man                | 34 | 42.5 |
|                    | Woman              | 46 | 57.5 |

Table 1 shows the respondent characteristics. A total of 80 mothers with children aged 6–59 months participated in this study. Most mothers were aged 20–25

years (32.5%), had completed junior high school (36.3%), and the majority of children were female (57.5%).

**Table 2.** Distribution of Exclusive Breastfeeding, Complementary Breastfeeding, and Stunting Incidence

| Variables               | Category               | n  | (%)  |
|-------------------------|------------------------|----|------|
| Exclusive Breastfeeding | Yes                    | 43 | 53.8 |
|                         | No                     | 37 | 46.3 |
| complementary feeding   | Exactly 6 months       | 51 | 63.7 |
|                         | <6 months or >6 months | 29 | 36.3 |
| Stunting Incident       | Stunting               | 30 | 37.5 |
|                         | No stunting            | 50 | 62.5 |

Table 2 shows the distribution of Exclusive Breastfeeding, Complementary Feeding, and Stunting Incidence. More than half of the children (53.8%) received exclusive breastfeeding, while 63.7%

received complementary feeding at the recommended age of six months. The prevalence of stunting among children under five was 37.5%.

**Table 3.** Results of the Analysis of the Relationship between Exclusive Breastfeeding and the Incidence of Stunting

| Exclusive Breastfeeding | Stunting Incident |      |             |      | Total |      | OR (95% CI)       | p-value |
|-------------------------|-------------------|------|-------------|------|-------|------|-------------------|---------|
|                         | Stunting          |      | No Stunting |      |       |      |                   |         |
|                         | n                 | %    | n           | %    | n     | %    |                   |         |
| No                      | 21                | 56.8 | 16          | 43.2 | 37    | 46.3 | 4,96 (1,86-13.23) | <0.001  |
| Yes                     | 9                 | 20.9 | 34          | 79.1 | 43    | 53.8 |                   |         |
| Total                   | 30                | 37.5 | 50          | 62.5 | 80    | 100  |                   |         |

The proportion of stunting was higher among children who did not receive exclusive breastfeeding (56.8%) than among those who received exclusive breastfeeding (20.9%). Pearson's Chi-square test demonstrated a statistically significant association between exclusive

breastfeeding and stunting ( $p < 0.001$ ). Children who were not exclusively breastfed had 4.96 times higher odds of being stunted than those who received exclusive breastfeeding (OR = 4.96; 95% CI = 1.86–13.23).

**Table 4.** Results of the Analysis of the Relationship between Complementary Feeding and the Incidence of Stunting

| Time to Give<br>Complementary Foods | Stunting Incident |      |             |      | Total |      | OR<br>(95% CI)       | p-<br>value |
|-------------------------------------|-------------------|------|-------------|------|-------|------|----------------------|-------------|
|                                     | Stunting          |      | No Stunting |      |       |      |                      |             |
|                                     | n                 | %    | n           | %    | n     | %    |                      |             |
| <6 Months or >6 Months              | 18                | 62.1 | 11          | 37.9 | 29    | 36.3 | 5.32<br>(1.97-14.32) | <0.001      |
| Exactly 6 Months                    | 12                | 23.5 | 39          | 76.5 | 51    | 63.7 |                      |             |
| Total                               | 30                | 37.5 | 50          | 62.5 | 80    | 100  |                      |             |

Table 4 shows that children who received complementary feeding before or after the recommended age of six months had a higher proportion of stunting (62.1%) than those who received complementary feeding at six months (23.5%). Pearson's Chi-square test showed a significant association between complementary feeding practices and stunting ( $p < 0.001$ ). Inappropriate timing of complementary feeding increased the odds of stunting by 5.32 times compared with timely complementary feeding (OR = 5.32; 95% CI = 1.97–14.32)

#### 4. DISCUSSION

##### Prevalence of Stunting in the Penana'e Community Health Center Work Area, Bima City

The study results showed that of the 80 toddlers who responded, 30 (37.5%) experienced stunting and 50 (62.5%) did not. These figures indicate that the incidence of stunting in the Penana'e Community Health Center's work area remains relatively high and remains a public health problem that requires serious attention.

The high prevalence of stunting in this study aligns with background data indicating that stunting cases in the Penana'e Community Health Center area have continued to increase in recent years.

This suggests that biological factors do not solely influence stunting but are also closely related to parenting patterns, feeding practices, family socioeconomic conditions, environmental sanitation, and mothers' knowledge of child nutrition.

According to WHO (2024), stunting is a condition of growth failure due to chronic malnutrition that occurs over a long period, particularly during the first 1,000 days of life (HPK). Lack of essential nutrients and recurrent infections can inhibit linear growth, resulting in a shorter height than is typical for their age. This condition is chronic and has long-term impacts on a child's cognitive development, learning ability, and future productivity.

This study also showed that most of the respondent mothers had a junior high or high school education. A mother's education level can influence her ability to understand information about nutrition, exclusive breastfeeding, and appropriate complementary feeding. Nirmalasari (2025) found that low maternal knowledge regarding child feeding practices is an indirect factor contributing to the high incidence of stunting.

Furthermore, a family's socioeconomic status can influence the quality of a toddler's nutrition. Most people in the Penana'e Community Health Center work

as traders, laborers, and farmers, with varying income levels, so families' ability to meet their nutritional needs varies accordingly. According to UNICEF (2024), stunting is influenced not only by health factors but also by family economic conditions, household food security, and the quality of childcare.

The results of this study are consistent with those of Yuliawati et al. (2025), who found that stunting remains common among toddlers with suboptimal feeding practices. Paramashanti and Benita (2020) also stated that stunting occurs more frequently in children with inappropriate feeding patterns and family environmental conditions that do not support optimal child growth.

Thus, the high prevalence of stunting in this study indicates that stunting prevention efforts in the Penana'e Community Health Center work area still need improvement, especially through nutritional education for mothers of toddlers, strengthening the practice of providing exclusive breastfeeding and appropriate complementary feeding, and strengthening routine toddler growth monitoring programs.

### **The Relationship Between Exclusive Breastfeeding and the Incidence of Stunting**

The study found that toddlers who did not receive exclusive breastfeeding had a higher stunting rate (21 toddlers, 56.8%), whereas those who received exclusive breastfeeding mostly did not experience stunting (34 toddlers, 79.1%). The results of the Chi-Square test showed a p-value  $<0.001$  ( $\alpha <0.05$ ), so it can be concluded that there is a significant relationship between exclusive breastfeeding and the incidence of stunting in the working area of the Penana'e Health Center, Bima City.

The results of this study indicate that exclusive breastfeeding plays a crucial role in supporting optimal toddler growth and preventing stunting. Toddlers who are not exclusively breastfed are more susceptible to growth disorders due to inadequate nutritional and immunological support early in life.

According to the WHO (2023), exclusive breastfeeding is the provision of only breast milk from birth to 6 months of age without any additional food or drink except for medication, vitamins, and minerals. Breast milk contains complete nutrients, antibodies, growth hormones, and immunological factors that help increase the baby's resistance to infection. Babies who are not exclusively breastfed

are more susceptible to infectious diseases such as diarrhea and acute respiratory infections, which can inhibit nutrient absorption and increase the risk of stunting.

This study still found that mothers did not exclusively breastfeed their toddlers. Interviews during the study revealed that some mothers reported introducing supplementary foods or formula before 6 months of age due to perceived insufficient breast milk, work commitments, and a lack of knowledge about the importance of exclusive breastfeeding. Furthermore, family habits persisted, leading to early introduction of supplementary foods to infants. This situation resulted in infants' nutritional needs not being optimally met and increased the risk of growth disorders.

Study by Laksmi et al. (2025) also showed that children who did not receive exclusive breastfeeding had a 5.29 times greater risk of stunting than children who received exclusive breastfeeding. In addition, the study by Sudirman et al. (2024) showed a significant relationship between exclusive breastfeeding and stunting incidence (p-value = 0.0001). Wulandari et al. (2023) also stated that stunting occurs more frequently in toddlers who do not receive exclusive breastfeeding compared to

toddlers who receive optimal exclusive breastfeeding.

Breast milk not only serves as a source of nutrition but also supports the development of a child's organs and brain. Maemunah & Sari (2021) explain that the mineral and protein content in breast milk plays a role in supporting bone growth and height in children, so that babies who receive exclusive breastfeeding tend to have better growth than babies who do not receive exclusive breastfeeding.

Thus, the results of this study indicate that exclusive breastfeeding practices are crucial for stunting prevention. Therefore, increased education for pregnant and breastfeeding mothers regarding the benefits of exclusive breastfeeding, family support for breastfeeding mothers, and strengthening of exclusive breastfeeding promotion programs by health workers in the Penana'e Community Health Center area are needed.

The findings of this study have important public health implications. Strengthening exclusive breastfeeding promotion through antenatal education, postnatal counseling, and continuous support from healthcare professionals is essential to improve breastfeeding practices. Community-based interventions involving families and community health

volunteers may also help increase mothers' awareness and confidence in maintaining exclusive breastfeeding during the first six months of life. These efforts are expected to help reduce the burden of stunting in the study area.

### **The Relationship between Providing Complementary Foods and the Incidence of Stunting**

The results of the study showed that toddlers who were given complementary feeding (MP-ASI) less than or more than 6 months of age experienced more stunting, namely 18 toddlers (62.1%), while toddlers who were given complementary feeding at the age of 6 months mostly did not experience stunting, namely 39 toddlers (76.5%). The results of the Chi-Square test showed a p-value  $<0.001$  ( $\alpha <0.05$ ), so it can be concluded that there is a significant relationship between the provision of complementary feeding and the incidence of stunting in the working area of the Penana'e Health Center, Bima City.

The results of this study indicate that the timing of complementary feeding significantly impacts toddler growth. Providing complementary feeding too early or too late can result in children's energy and nutrient needs not being met optimally, increasing the risk of stunting.

According to the WHO (2024), complementary feeding should be introduced at 6 months of age because, at that age, a baby's energy and nutrient needs increase and cannot be met solely through breast milk. Complementary feeding introduced too early can disrupt a baby's digestive system and increase the risk of infection, while introducing it too late can lead to deficiencies in the energy and protein needed for growth.

Based on interviews during the study, some mothers introduced complementary foods before 6 months of age because they believed their babies would still be hungry even after breastfeeding. Furthermore, some mothers introduced complementary foods too late due to a lack of understanding of the appropriate timing. Some mothers also provided only certain types of food, with limited variety, resulting in suboptimal nutritional intake for their children.

According to Sarida et al. (2024), Complementary feeding (MP-ASI) must be provided in a timely, adequate, safe, and responsive manner appropriate to the child's age to ensure nutritional needs are met. Complementary feeding that lacks variety and does not meet nutritional needs can lead to impaired linear growth in toddlers.

The results of this study are consistent with those of Amalia et al. (2021), who found a significant association between the timing of complementary feeding and stunting incidence (p-value = 0.008). Triana & Haniyah (2020), also showed a relationship between the provision of complementary feeding and the incidence of stunting, with a p-value of 0.039.

Paramashanti and Benita's (2020) research found that the timely introduction of complementary foods is a protective factor against stunting. Children who receive age-appropriate complementary foods have a lower risk of stunting than those who receive complementary foods too early or too late.

In addition to the timing of feeding, the quality and variety of complementary foods also significantly impact a child's nutritional status. Complementary foods that consist of only one type of food without animal protein, vegetables, and fruit can lead to deficiencies in essential nutrients such as protein, iron, and zinc, which are essential for a child's growth.

Thus, the results of this study indicate that proper complementary feeding practices are crucial for supporting optimal toddler growth and preventing stunting. Therefore, increased education for mothers is needed regarding the

appropriate timing of complementary feeding, the types of nutritionally balanced foods, and the importance of dietary diversity for child growth.

Appropriate complementary feeding should not only be introduced at the recommended age but should also meet the principles of dietary diversity, meal frequency, and nutritional adequacy. Continuous nutrition education for mothers through community health centers and integrated health service posts (Posyandu) is therefore necessary to improve complementary feeding practices. Strengthening maternal knowledge of appropriate infant and young child feeding may improve children's nutritional status and prevent stunting.

### **Public Health Implications**

The findings of this study have important implications for public health, particularly in strengthening stunting prevention programs at the primary healthcare level. Improving mothers' knowledge and awareness regarding exclusive breastfeeding and appropriate complementary feeding practices should become a priority through continuous nutrition education, breastfeeding counseling, and growth monitoring programs implemented by community health centers and integrated health

service posts (Posyandu). Family involvement, especially support from husbands and other family members, should also be encouraged to create a supportive environment for optimal infant and young child feeding practices. Strengthening these interventions is expected to improve children's nutritional status and reduce stunting prevalence in the community.

This study provides local evidence regarding the association between exclusive breastfeeding, complementary feeding practices, and stunting among children under five in the working area of Penana'e Community Health Center, Bima City. The findings provide scientific evidence to support the development of context-specific nutrition interventions and to strengthen maternal and child health programs aimed at preventing stunting at the primary healthcare level.

### **Strengths and Limitations of the Study**

This study has several strengths. First, it simultaneously examined the relationships between exclusive breastfeeding history, complementary feeding practices, and stunting among children under five, providing a more comprehensive understanding of infant feeding practices associated with child growth. Second, anthropometric

measurements were conducted using standardized procedures based on the WHO Child Growth Standards, thereby improving the accuracy of stunting classification. Furthermore, the study employed a structured questionnaire that had undergone validity and reliability testing before data collection, ensuring the quality and consistency of the collected data.

Despite these strengths, several limitations should be acknowledged. The cross-sectional design limits the ability to establish causal relationships between exclusive breastfeeding, complementary feeding, and stunting. Information regarding breastfeeding history and complementary feeding practices was obtained through maternal recall, which may have introduced recall bias. In addition, this study was conducted in a single primary healthcare center, which may limit the generalizability of the findings to other populations with different demographic and socioeconomic characteristics.

### **5. CONCLUSION**

This study demonstrated that exclusive breastfeeding history and complementary feeding practices were significantly associated with stunting among children aged 6–59 months in the

working area of Penana'e Community Health Center, Bima City. Children who were not exclusively breastfed and those who received complementary feeding before or after the recommended age of six months had higher odds of experiencing stunting. These findings highlight the importance of promoting optimal infant and young child feeding practices during the first 1,000 days of life as part of comprehensive stunting prevention strategies. Strengthening nutrition education, breastfeeding counseling, and appropriate complementary feeding programs at primary healthcare facilities is recommended to improve child nutritional status and reduce the burden of stunting.

#### **AUTHOR CONTRIBUTIONS**

AS, contributed to the development of research concepts, data collection, data processing and analysis, interpretation of research results, and preparation of the article manuscript. MN, contributed to research supervision, preparation of research methodology, validation of data analysis, as well as revision and refinement of the article manuscript. D, contributed to academic guidance, evaluation of research results, data interpretation, and revision of the substance of the article manuscript. J, contributed to scientific review, providing input on research results and discussions,

and final revision of the article manuscript before publication.

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#### **CONFLICT OF INTEREST**

The authors declare that there are no conflicts of interest in this research.

#### **DATA AVAILABILITY STATEMENT**

The data supporting the findings of this research are available from the corresponding author upon reasonable request.

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