Mal J Nutr 32 (Supplement): 093-105, 2026

# Food security as a key determinant of complementary feeding practices during the COVID-19 pandemic: Results from an online survey in Indonesia

**Athiya Fadlina[1*], Cahya Ayu Agustin[2] & Judhiastuty Februhartanty[2,3]**

[1]*Department of Nutrition, Faculty of Food Technology and Health, Sahid University, Jakarta, Indonesia*; [2]*Southeast Asian Ministers of Education Organization - Regional Centre for Food and Nutrition (SEAMEO RECFON)/ Pusat Kajian Gizi Regional (PKGR) Universitas Indonesia, Jakarta, Indonesia*; [3]*Department of Nutrition, Faculty of Medicine, Universitas Indonesia – Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia*

## ABSTRACT

**Introduction:** Optimal complementary feeding practices after six months are crucial for child growth and development. The COVID-19 pandemic may have disrupted factors influencing these practices, including food security and social support. This study aimed to investigate factors affecting the minimum acceptable diet (MAD) among Indonesian infants aged 6–11 months during the pandemic. **Methods:** A cross-sectional online survey was conducted as part of the multinational COVID-19 Mom-Infant Study. Convenience sampling recruited 403 mothers living in Indonesia (aged ≥18 years) with infants aged 6-11 months. The Household Food Insecurity Access Scale (HFIAS), UK COVID-19 New Mums questionnaire, and Demographic and Health Survey were used to assess food security, psychosocial and social support, and MAD. Multivariable logistic regression identified MAD determinants. **Results:** Most mothers were 25-34 years old, had a high level of education, were from middle- to high-income households, were not working, and resided on Java Island. The prevalence of MAD was 74.2%, while 26.6% of households experienced food insecurity. Primary support came from husbands. Bivariate analyses indicated that child's age, maternal education and employment, maternal mood, household income and food security, husband's support, and support group were associated with MAD. However, only household food security remained significantly associated with MAD in multivariate analysis (*aOR*=2.155; 95% *CI* =1.239–3.750; *p*=0.007). **Conclusion:** Household food security was crucial for sustaining infant feeding during the pandemic, particularly in high socioeconomic and urban settings. Targeted interventions should focus on strengthening both the food environment and caregiver's capacity through adaptive food access strategies and community-based support.

**Keywords:** complementary feeding practice, COVID-19 pandemic, food security, minimum acceptable diet

*Corresponding author: Athiya Fadlina
Department of Nutrition, Faculty of Food Technology and Health, Sahid University
Jl. Prof. DR. Soepomo No.84, Menteng Dalam, Tebet, South Jakarta, Jakarta Province, Post Code12870 Jakarta, Indonesia
Tel: +62878-8359-8860; Fax: 021-8354763; E-mail: athiya_fadlina@usahid.ac.id
doi: https://doi.org/10.31246/mjn-2025-0042

## INTRODUCTION

At six months, infants require complementary foods and breast milk to fulfil their energy and dietary requirements. Without the timely introduction of complementary foods or with insufficient quantity and quality of complementary foods, a child's growth may falter (Soliman *et al.*, 2021; WHO, 2023). Stunting is most prevalent during the initial two years of life due to a lack of quantity and quality of complementary foods, as well as a high rate of infectious diseases (Soliman *et al.*, 2021). According to basic health research conducted in Indonesia in 2024, the stunting rate was 19.8%. Indonesia is dedicated to lowering this figure to 14.2% by 2029 (Ministry of Health Republic Indonesia, 2025; Bappenas, 2025). One of the strategies to lower the incidence of malnutrition is by optimising complementary feeding practices.

The minimum acceptable diet (MAD) is an indicator of infant and young child feeding practices that combines breastfeeding practices, minimum meal frequency, and minimum dietary diversity (WHO, 2021). However, only one-third of children aged 6–11 months in Indonesia achieved MAD (Ministry of Health Republic Indonesia, 2025). The COVID-19 pandemic worsened complementary feeding practices, disrupting the food system and support for feeding.

Previous findings found shifts in family food security status, home food environments, and parental feeding practices after the COVID-19 pandemic (Adams *et al.*, 2020). COVID-19 lockdowns disrupted food access, including availability and affordability, and reduced diet quality (Devereux, Béné & Hoddinott, 2020). A previous study indicated a substantial rise in households facing severe food insecurity, accompanied by notable changes in household food environments and feeding behaviours. Specifically, over half of families classified as having very low food security reported reductions in the overall quantity of food in their homes and increased reliance on non-perishable processed foods (Adams *et al.*, 2020).

Professional feeding support was limited during the COVID-19 pandemic, particularly from in-person healthcare providers. In Indonesia, about 86% of Posyandu (community-based Integrated Service Posts) reported suspending child growth monitoring and face-to-face nutrition education, including complementary feeding activities during this time (Ijazah, 2020; Lubbe *et al.*, 2022). Social support thus became a key driver of appropriate complementary feeding and achievement of MAD. A cluster-randomised study in Uganda's post-emergency settlements found that peer-led nutrition education through support groups increased maternal social support, resulting in significant improvements in MAD and dietary diversity (Komakech *et al.*, 2023). Similarly, during the COVID-19 pandemic, mothers lacking in-person or online feeding support were more likely to have infants who did not meet MAD, underscoring the importance of virtual and peer networks for information sharing and emotional support (Vazquez-Vazquez *et al.*, 2020; Yamashita, Isumi, & Fujiwara, 2022). These findings suggest that reduced access to professional and social support may hinder caregivers' ability to maintain optimal feeding practices during crises.

Considering these circumstances, this study aimed to evaluate complementary feeding practices and explore the possible determinants, specifically household food security and social support associated with MAD, among children aged 6–11 months during the COVID-19 pandemic.

## METHODOLOGY

This study employed a quantitative design, utilising a cross-sectional approach as part of the multinational COVID-19 Mom-Baby Study in the United Kingdom (UK) and Malaysia. The study population consisted of mothers aged 18 years and above with infants aged 6–11 months, residing in all provinces of Indonesia. Data was collected online from December 2, 2020, to August 27, 2021, employing non-probability and convenience sampling methods. The survey questionnaire was posted online and distributed through several networks and social media sites. Additionally, invitations to participate were distributed through various maternal and community support groups, as well as through interpersonal connections.

The study utilised an online questionnaire adapted from the UK COVID-19 New Mums Study and the Malaysia COVID-19 Mom-Baby Study (Mohamad Nasri, Gan & Mohd Shukri, 2025; Vazquez-Vazquez *et al.*, 2020). Questions adapted from the COVID-19 Mom-Baby Study in Malaysia and the UK addressed maternal mood, feeding support, the impact of COVID-19 on maternal health, and household economic status. Additional items for infant feeding practices were adapted from the Indonesian Demographic and Health Survey 2017 (BKKBN *et al.*, 2018) and the Household Food Insecurity Access Scale (HFIAS) for assessing household food security and infant feeding. The infant feeding practices section assessed complementary feeding patterns, including the timing of food introduction, feeding frequency, and dietary diversity, which were then used to derive infant feeding indicators: minimum meal frequency (MMF), minimum dietary diversity (MDD), and MAD.

The questionnaire comprised four main components: (1) socio-demographic information, including maternal age, education level, household income, family composition, and geographical location; (2) the impact of COVID-19 on household conditions, employment status, economic well-being, and food security; (3) experiences related to infant feeding practices, support systems, and related behaviours; and (4) the pandemic's effect on maternal mood, assessed using a 17-item measure of mood states experienced during the previous week. This measure included aspects of social contact, leisure engagement, coping, tension relief, appetite, and loneliness.

The original COVID-19 New Mums Study questionnaire was culturally and linguistically adapted for use in Indonesia, with modifications including translation and replacing support group examples with Indonesian infant feeding support groups. The research team translated the original questionnaire from English into Bahasa Indonesia, then backtranslated it through a qualified translator to verify accuracy. The Indonesian version was piloted through a pre-test before deployment. The HFIAS questionnaire demonstrated good reliability and validity, with Cronbach's alpha=0.901 and $r$=0.312. The research used LimeSurvey® as the internet survey platform for data collection.

To ensure data quality, multiple verification measures were implemented: (1) CAPTCHA verification, (2) cross-checking of names, email addresses, phone numbers, and IP addresses, (3) examination of response times, attention-check questions, and answer patterns, and (4) directly confirming with participants through messaging apps or phone calls when discrepancies, omissions, or unlikely data were

detected. Incomplete responses and missing data were excluded from data analysis.

Dietary diversity score was calculated as the total number of food groups consumed in the previous 24 hours, categorised into 8 distinct groups. A child was classified as meeting the MDD criterion when he/she had consumed foods from five or more of the following eight food groups: breast milk; grains, roots, tubers, and plantains; pulses (beans, peas, lentils), nuts, and seeds; dairy products; flesh foods; eggs; vitamin A–rich fruits and vegetables; and other fruits and vegetables. Meal frequency was evaluated by counting the number of times a child was given solid, semi-solid, or soft foods, including milk feeds for those not breastfed. The total feeding frequency was deemed to meet the minimum meal frequency standard if breastfed infants aged 6-8 months had two meals, breastfed infants aged 9-23 months had three meals, and non-breastfed infants had four meals. For non-breastfed children, the minimum acceptable criteria were met if they achieved the required meal frequency, received milk feeds at least two times, and met dietary diversity standards. Additionally, for breastfed children, the definition of a minimum acceptable diet encompassed the required meal frequency and dietary diversity (WHO, 2021).

The HFIAS questionnaire was used to evaluate household food access. There were nine frequency-of-occurrence questions with two possible answers: “yes” and «no». For “yes” answers, a scoring system from 1 to 3 was used, with the highest score given to “often” and the lowest score to “rarely” (Coates, Swindale & Bilinsky, 2007). Food security was assessed based on HFIAS with a four-category scoring system: food secure (scores 0 – 1), mild food insecurity (scores 2 – 7), moderate food insecurity (scores 8 –14), and severe food insecurity (scores 15 – 27), which was adopted from a previous study in Indonesia (Ashari, Khomsan & Baliwati, 2019).

Support groups were defined as communities or social networks offering infant feeding guidance via various modalities—both offline and online—during the COVID-19 pandemic. These included official social group accounts on platforms such as Facebook Groups, WhatsApp Groups, Instagram, and Twitter, as well as webinars or online classes organised by these communities. Additionally, online support encompassed information and assistance accessed through digital applications and web-based platforms, including websites, blogs, or social media managed by individuals, such as maternal health influencers. This also included participation in online classes or webinars offered either as a feature of these platforms or organised by other entities.

Maternal mood score was determined using a four-point Likert scale, with response options ranging from “not at all” to “to a high extent”. For positively worded statements, scores ranged from 1 to 4, while for negatively worded statements, reverse scoring was applied. Mothers were considered at COVID-19 risk if they had experienced symptoms, tested positive, or had a pre-existing condition putting them at high risk. The perceived impact on household finances was assessed by asking mothers to rate the magnitude of COVID-19’s impact on the household’s ability to pay rent or mortgage payments, buy food, and cover other essentials, based on maternal perception. Any reported effects on these three enquiries would classify the household as impacted.

Descriptive statistics explained the distribution of key study indicators, including infant feeding characteristics,

especially MAD. Multivariate logistic regression analysis using the Enter method identified factors significantly associated with MAD ($p$<0.05). Predictor variables were selected based on bivariate relationships ($p$<0.2) and theoretical significance established in prior literature. All data were processed and analysed using the IBM Statistical Package for Social Science (SPSS) Version 20.0 (IBM Corp., Armonk, NY, USA). The study protocol received ethical approval from the ethical committee of the Faculty of Medicine, Universitas Indonesia, with Protocol Number KET 357/UN2.F1/ETIK/PPM.00.02/2020.

## RESULTS

A total of 403 mothers participated in this study. Table 1 describes the maternal, child, and household socioeconomic characteristics. Most mothers were in the 25 – 34 years age group (80.1%), had a bachelor's or diploma degree (43.2%), were housewives (50.1%), married (99.3%), had no COVID-19 risk (78.4%), and resided in Java or Bali (82.1%). The majority of children were aged 9–11 months (58.8%), male (53.8%), firstborn (58.1%), and had a normal birth weight (92.6%). Household income was mainly >Rp 1.990.000,00, equivalent to USD 119.9 (88.1%).

Table 2 presents the distribution of household food security, COVID-19 impacts on household finances, and feeding support characteristics. The majority of households were food-secure (73.4%), with food-insecure households comprising mildly food-secure (17.6%), moderately food-secure (7.2%), and severely food-insecure (1.7%). Most households were financially impacted by COVID-19 (77.4%). Most mothers reported their husbands as a source of feeding support (90.6%), followed by parents (69.7%), healthcare workers (68.7%), and parents-in-law (42.4%). Moreover, around 28.3% and 21.8% of respondents reported receiving feeding support from a support group and an online support group, respectively.

Complementary child feeding practices are presented in Table 3. Most children aged 6 – 8 months had a timely introduction of solid/semi-solid/soft foods (98.3%). A total of 74.2% of children met MAD, which consisted of 94.0% meeting MMF and 76.9% meeting MDD. Food groups that most children consumed were grains, roots, and tubers (97.3%); vitamin A-rich fruits and vegetables (82.6%); and flesh foods (80.4%). Eggs were the lowest food group consumed by the children (35.0%).

Table 4 provides the outcomes of the bivariate and multivariate analyses assessing the determinants of MAD among mother-infant pairs, including maternal and infant characteristics, household food security, COVID-19-related financial impacts, and feeding support systems. Bivariate analysis revealed significant associations between MAD and several factors: child's age, maternal education level, maternal occupation, participation in support groups, access to online support, husband's support, and household food security. However, in the adjusted multivariate analysis, only household food security remained a significant predictor of MAD. Specifically, infants from food-secure households were significantly more likely to meet MAD requirements (a*OR* = 2.155; 95% *CI* =1.239–3.750).

## DISCUSSION

The prevalence of MAD was higher in this study compared to the reported findings in the Indonesian Nutritional Status Survey 2024, where MAD was only 32.7%, comprising 77.0% for MMF and 48.3% for MDD (Ministry of Health Republic Indonesia, 2025). The high

**Table 1.** Maternal, child, household socioeconomic characteristics (*N*=403)

| *Characteristics* | *n (%)* |
|---|---|
| Maternal age (years) | |
| 18 - 24 | 34 (8.4) |
| 25 - 34 | 323 (80.1) |
| 35 - 49 | 46 (11.4) |
| Maternal education level | |
| Junior and senior high school | 54 (13.4) |
| Bachelor or diploma | 299 (43.2) |
| Postgraduate | 50 (12.4) |
| Maternal occupation | |
| Civil servant/Army/Police | 61 (15.1) |
| Non-government employee | 82 (20.3) |
| Entrepreneur | 19 (4.7) |
| Freelancer | 8 (2) |
| Student | 3 (0.7) |
| Housewife | 202 (50.1) |
| Others[†] | 28 (6.9) |
| Maternal marital status | |
| Married | 400 (99.3) |
| Single parent living with family | 3 (0.7) |
| Maternal COVID-19 risk | |
| At risk | 87 (21.6) |
| No risk | 316 (78.4) |
| Mood score[‡] | 47 (21 – 68) |
| Geographical region | |
| Java and Bali | 331 (82.1) |
| Non-Java[§] | 72 (17.9) |
| Child's age | |
| 6 – 8 months | 237 (41.2) |
| 9 – 11 months | 166 (58.8) |
| Child's sex | |
| Male | 217 (53.8) |
| Female | 186 (42.2) |
| Child's birth order | |
| First | 234 (58.1) |
| Second or above | 169 (41.9) |
| Child's birth weight | |
| Low (<2,500 gr) | 26 (6.5) |
| Normal (2,500-4,000gr) | 373 (92.6) |
| Large (>4,000gr) | 4 (1.0) |
| Household income | |
| Low income (≤ Rp 1.990.000,00) | 48 (11.9) |
| Middle-high income (>Rp 1.990.000,00) | 355 (88.1) |

[†]Others: health care workers (doctor, nurse, midwife), teacher, contract employee, honorary employee, non-civil servant government employee, researcher, honorary employee, and finance administrator

[‡]Median (Min-Max)

[§]Non-Java: Sumatra, East and West Nusa Tenggara, Kalimantan, Sulawesi, Maluku

**Table 2.** Distribution of household food security, COVID-19 impacts on household finances, and feeding supports (*N*=403)

| *Characteristics* | *n (%)* |
|---|---|
| Household food security | |
| Food secure | 296 (73.4) |
| Mild food secure | 71 (17.6) |
| Moderate food secure | 29 (7.2) |
| Severe food insecure | 17.6 (1.7) |
| Impacted by COVID-19 | |
| Impacted | 312 (77.4) |
| Not impacted | 91 (22.6) |
| Sources of feeding support[†] | |
| Husband | 385 (90.6) |
| Parents-in-law | 171 (42.4) |
| Parents | 281 (69.7) |
| Healthcare worker | 227 (68.7) |
| Friends/relatives | 174 (43.2) |
| Support group | 114 (28.3) |
| Online support group | 88 (21.8) |
| Nanny | 18 (4.5) |

[†]Multiple response

rate of MAD in this study may be due to selection bias, a common issue in online surveys. The present online survey was completed by respondents who were predominantly from high-income, high-education backgrounds and lived in Java and Bali. The use of an online survey facilitated extensive data collection; however, it may have inadvertently excluded participants with low digital literacy, leading to an overrepresentation of more educated and affluent mothers and those with a higher level of interest in this subject matter (Andrade, 2020).

The stay-at-home order during COVID-19 may have positively impacted infant feeding practices, as one mother reported having more time at home, allowing her to prepare a greater variety of meals. This aligns with research indicating that the pandemic increased interest in preparing meals at home (Ben Hassen, El Bilali & Allahyari, 2020). This positive impact may reflect the higher socioeconomic status (SES) of most respondents, whereas low-income mothers may have experienced income loss and reduced access to food during the pandemic. Another study highlighted that parents paid significant attention to their children's nutrition during the COVID-19 pandemic, as most meals were prepared at home and consisted of unprocessed foods. Fear of illness and death, and restrictions on individual freedom, increased the stress load and resulted in a shift in habitual behaviours, causing parents to prioritise their children's nutrition (Bahatheg, 2021).

In this study, children mainly consumed grains, roots, and tubers, followed by vitamin A–rich fruits and vegetables and flesh foods, while eggs were eaten the least. A previous study during the COVID-19 pandemic also found an increase in the consumption of vitamin A-rich fruits and vegetables among children. This might be due to lockdowns or restrictions, as well as

**Table 3.** Complementary child feeding practices (*N*=403)

| *Feeding practices* | *n (%)* |
|---|---|
| Timely introduction of solid/semi-solid/soft foods† (*n*=237) | 233 (98.3) |
| Meeting Minimum Meal Frequency (MMF)‡ | 379 (94.0) |
| Meeting Minimum Dietary Diversity (MDD)§ | 310 (76.9) |
| Meeting Minimum Acceptable Diet (MAD)¶ | 299 (74.2) |
| Breastfed in the last 24 hours | 380 (94.3) |
| Food groups consumed | |
| Grains, roots and tubers | 392 (97.3) |
| Vitamin A-rich fruits and vegetables | 333 (82.6) |
| Flesh foods | 324 (80.4) |
| Dairy products | 206 (51.1) |
| Other fruits and vegetables | 203 (50.4) |
| Legumes and nuts | 192 (47.6) |
| Eggs | 141 (35.0) |

†children between 6 to 8 months old who had solid, semi-solid, or soft foods in the past day
‡Two feedings of solid, semi-solid or soft foods for breastfed children aged 6–8 months; three feedings of solid, semi-solid or soft foods for breastfed children aged 9–23 months; and four feedings of solid, semi-solid or soft foods or milk feeds for non-breastfed children aged 6–23 months, whereby at least one of the four feeds must be a solid, semi-solid or soft feed.
§Children aged 6-11 months who were given at least five out of eight food groups in the previous day
¶Children aged 6-11 months who met minimum meal frequency and minimum dietary diversity for breastfed children and for non-breastfed children who met minimum meal frequency and dietary diversity, as well as at least 2 milk feeds

decreased exposure to unhealthy food environments (Pradeilles *et al.*, 2022). Meanwhile, low egg consumption is consistent with findings in Malaysia, whereby the primary sources of protein in complementary foods for infants were meat and fish, with an average daily consumption of 9.2 grams and 5 grams, respectively. In comparison, the average daily consumption for eggs was lower at 4.1 grams (Khor & Lee, 2021). Older infants tend to consume a wider variety and larger quantities of animal-source foods (ASF); pandemic-era evidence from Indonesia showed that children from higher-income households had greater access to a wider variety of ASF (Rahayu *et al.*, 2024). Given that most children in our sample were aged 9 – 11 months (58.8%) and predominantly from middle- to high-income families (88.1%), higher meat consumption relative to eggs is consistent with these demographic and socioeconomic patterns.

Child's age, maternal education level and occupation, mother's mood, support group, online support, and husband's support were associated with MAD in bivariate analysis. A higher proportion of children aged 6 – 8 months did not meet MAD. A previous study also found similar results, which may be due to teething, often causing a loss of appetite, thus reducing both the frequency and variety of meals (Leseba, Vermaak & Makatjane, 2025). Maternal education and occupation were associated with MAD because mothers with higher education have greater literacy, and those who work may have higher incomes and a greater role in household decision-making, which can contribute to infant feeding practices (Ashraf *et al.*, 2024).

**Table 4.** Factors associated with MAD

| *Variables* | *Did Not Meet MAD n (%)* | *Met MAD n (%)* | *Total* | *Crude OR* † *(CI 95%)* | *Adjusted OR* § *(CI 95%)* |
|---|---|---|---|---|---|
| Child's age | | | | | |
| 6-8 months | 70 (29.5) | 167 (70.5) | 237 | 1.627 (1.018 – 2.601)* | 1.601 (0.976 – 2.628) |
| 9-11 months | 34 (20.5) | 132 (79.5) | 166 | 1 | 1 |
| Child's sex | | | | | |
| Female | 47 (25.3) | 139 (74.7) | 186 | 0.949 (0.696 – 1.486) | |
| Male | 57 (26.3) | 160 (73.7) | 217 | 1 | |
| Birth order | | | | | |
| 1st | 62 (26.5) | 172 (73.5) | 234 | 1.090 (0.692 – 1.716) | |
| >1 | 42 (24.9) | 127 (75.1) | 169 | 1 | |
| Birth weight | | | | | |
| <2500 g | 97 (25.7) | 280 (74.3) | 377 | 0.940 (0.384 – 2.305) | |
| ≥2500 g | 7 (26.9) | 19 (73.1) | 26 | 1 | |
| Maternal Age | | | | | |
| 18-24 years old | 12 (35.3) | 22 (64.7) | 34 | 1 | |
| 25-34 years old | 81 (25.1) | 242 (74.9) | 323 | 1.630 (0.772 – 3.440) | |
| 35-49 years old | 11 (23.9) | 35 (76.1) | 46 | 1.736 (0.654 – 4.608) | |
| Maternal education level | | | | | |
| Low - Middle | 23 (42.6) | 31 (57.4) | 54 | 2.455 (1.355 – 4.446)* | 1.263 (0.613 – 2.603) |
| High | 81 (23.2) | 268 (76.8) | 349 | 1 | 1 |
| Maternal occupation | | | | | |
| Not working | 41 (20.7) | 157 (79 .3) | 198 | 0.589 (0.374 – 0.927)* | 0.755 (0.459 – 1.242) |
| Working | 63 (30.7) | 142 (69.3) | 205 | 1 | 1 |
| Marital status | | | | | |
| Single parent | 2 (66.7) | 1 (33.3) | 3 | 5.843 (0.524 – 65.120)‡ | 1.666 (0.132 – 21.036) |
| Married | 102 (25.8) | 298 (74.5) | 400 | 1 | 1 |
| Maternal risk of COVID-19 | | | | | |
| At risk | 22 (25.3) | 65 (74.7) | 87 | 0.966 (0.560 – 1.666) | 1.063 (0.593 – 1.906) |
| No risk | 82 (25.9) | 234 (74.1) | 316 | 1 | 1 |

*to be continued...*

**Table 4.** Factors associated with MAD *(continued)*

| *Variables* | *Did Not Meet MAD n (%)* | *Met MAD n (%)* | *Total* | *Crude OR* † | *Adjusted OR* § |
|---|---|---|---|---|---|
| | | | | *(CI 95%)* | *(CI 95%)* |
| Maternal mood score | | | | 1.025 (0.995 – 1.057) | 1.025 (0.995 – 1.057) |
| Support group and online support | | | | | |
| Not supported | 72 (29.3) | 174 (70.7) | 246 | 1.616 (1.005 – 2.6001)* | 1.613 (0.968 – 2.688) |
| Supported | 32 (20.4) | 125 (79.6) | 157 | 1 | 1 |
| Family and friends support | | | | | |
| Not supported | 20 (26.0) | 57 (74) | 77 | 1.001 (0.574 – 1.781) | |
| Supported | 84 (25.8) | 242 (74.2) | 326 | 1 | |
| Health professional support | | | | | |
| Not supported | 38 (30.2) | 88 (69.8) | 126 | 1.381 (0.863 – 2.209) | 1.209 (0.733 – 1.994) |
| Supported | 66 (23.8) | 211 (76.2) | 277 | 1 | 1 |
| Household income | | | | | |
| Low income | 20 (41.7) | 28 (58.3) | 48 | 2.304 (1.235 – 4.300)* | 1.548 (0.768 – 3.118) |
| High-middle income | 84 (23.7) | 271 (76.3) | 355 | 1 | 1 |
| Household food security | | | | | |
| Food insecure | 45 (42.1) | 62 (57.9) | 107 | 2.916 (1.807 – 4.704)* | 2.155 (1.239 – 3.750)* |
| Food secure | 59 (19.9) | 237 (80.1) | 296 | 1 | 1 |
| Household finance impact | | | | | |
| Impacted | 83 (26.8) | 229 (73.4) | 312 | 1.208 (0.698 – 2.091) | |
| Not impacted | 21 (23.1) | 70 (76.9) | 91 | 1 | |
| Husband's support | | | | | |
| Not supported | 15 (39.5) | 23 (60.5) | 38 | 2.022 (1.011 – 4.044)* | 1.749 (0.820 – 3.924) |
| Supported | 89 (24.4) | 276 (75.6) | 365 | 1 | 1 |
| Family and friends' support | | | | | |
| Not supported | 20 (26.0) | 57 (74) | 77 | 1.001 (0.574 – 1.781) | |
| Supported | 84 (25.8) | 242 (74.2) | 326 | 1 | |

†Chi-Square Test
‡Fisher's Exact test
§Logistic Regression

In line with the previous New Mom-Baby Study in Malaysia and the UK, most mothers reported that during the COVID-19 pandemic, their husbands were the most influential source of feeding support (Vazquez-Vazquez *et al.*, 2020; Mohamad Nasri *et al.,* 2025*).* The mood associated with MAD can be explained by maternal psychological distress, which can cause caregiving desire to lower, is linked to less effective feeding behaviours, limited and controlling feeding approaches, and a disengaged style of feeding during early childhood (Almaatani *et al.*, 2022). In this study, the median mood score of 47 indicated a predominance of positive mood, as it was relatively close to the maximum possible mood score of 68. The New Mum Study in Thailand and a study conducted in Malaysia similarly reported that most mothers maintained a positive mood (Sirikul *et al.*, 2022) and were able to cope (Mohamad Nasri *et al.*, 2025) during the COVID-19 lockdown.

This study found an association between support groups and online support with a child's MAD. Mothers who received no feeding support from support and online groups had higher odds of a child not meeting MAD compared with those who did. Mother and baby support groups may be necessary for peer support, especially during COVID-19, when direct social interactions are scarce, as they provide empathetic support and validation. Support groups and online support served as spaces for mothers to exchange information, seek emotional support, and build a supportive community accessible anytime, anywhere (Yamashita *et al.*, 2022). Support groups and online support may indirectly enhance maternal knowledge and emotional support in accessing optimal food. Support groups that facilitate knowledge sharing and provide emotional support can empower mothers to adopt healthier feeding practices, build confidence in infant care, and improve the timing and quality of complementary feeding (Komakech *et al.*, 2023). However, support groups and online support were not determining factors of MAD after adjusting for household food security and other factors. While support groups are theoretically important, in this high-SES sample, household food security appeared to be the overriding constraint or enabler of optimal feeding practices, effectively diminishing the independent statistical role of social support.

Food security was found to be a determinant of MAD (a*OR*=2.155), indicating that children in food-secure households were over twice as likely to achieve MAD compared to those in food-insecure households. The COVID-19 pandemic indirectly affected food security through lockdowns, reducing household incomes and limiting access to food. A rise in food prices due to wages or income can jeopardise access to food (Devereux *et al.*, 2020). Financial fluctuations resulting from the COVID-19 pandemic may have influenced certain infant feeding practices, such as families opting for less expensive foods and increasing the intake of homemade meals (Horvath *et al.*, 2021). A previous study found that households experiencing very low food security indicated a reduction in the total food available in their homes throughout the pandemic (Adams *et al.*, 2020). Food security might affect feeding practices from a psychosocial aspect. Food insecurity-related psychological distress can undermine the quality of feeding interactions between parents and infants, potentially resulting in less responsive feeding behaviours (Marino *et al.*, 2023). Hence, governmental bodies, private sectors, and both local and international NGOs need to extend social assistance to strengthen food security among urban households during the COVID-19 pandemic, particularly for

those experiencing job or income loss (Fatmah, 2024).

The findings of this study are limited by the characteristics of the participants, which may not be representative of all mothers in Indonesia. The use of an online survey may have introduced selection bias, leading to a relatively homogeneous sample. There is a possibility that participants overestimated their compliance with recommended feeding practices.

## CONCLUSION

The study revealed that 74.0% of infants achieved MAD, with a much greater prevalence of MMF at 94.3% compared to MDD at 77.1%. Food security emerged as a key determinant of MAD during the COVID-19 pandemic, as the negative economic impact reduced household food expenditure and limited physical access to nutritious foods. Ensuring that infants continue to receive MAD under such crisis conditions requires strengthening both the food environment and the caregiver's capacity through adaptive food access innovations, such as online grocery platforms, digital food delivery services, and home or community gardening. For vulnerable populations, future crisis planning must prioritise protecting the purchasing power of low-income families through targeted social assistance and ensuring the stable functioning of traditional food markets. Although the social support factor was not statistically significant, sustained caregiver engagement and nutrition counselling can further support these efforts by promoting appropriate feeding practices and ensuring the effective use of available foods. These findings highlight the importance of integrated actions addressing both material and social determinants to build resilient infant feeding systems during emergencies.

**Acknowledgement**

This research received partial funding from the Southeast Asian Ministers of Education Organisation - Regional Centre for Food and Nutrition (SEAMEO RECFON). We also express our gratitude to SEAMEO RECFON for their support during the execution of the study. We thank SEAMEO RECFON for supporting the publication of this paper. The content of this article was partly presented at the 2nd SEAMEO International Conference of Food and Nutrition (ICFN) held on 17–18 October 2024 in Jakarta.

**Authors' contributions**

Fadlina A and Agustin CA, collected data; Februhartanty J, conceptualised and designed the study. All authors contributed to data analysis and interpretation and were involved in drafting the initial manuscript.

**Conflict of interest**

The authors declare no conflict of interest.

**References**

Adams EL, Caccavale LJ, Smith D & Bean MK (2020). Food insecurity, the home food environment, and parent feeding practices in the era of COVID-19. *Obesity* 28(11):2056–2063.

Almaatani D, Zurbau A, Khoshnevisan F, Bandsma RHJ, Khan TA, Sievenpiper JL & Van Den Heuvel M (2022). The association between parents' stress and parental feeding practices and feeding styles: systematic review and meta-analysis of observational studies. *Matern Child Nutr* 19(1):e13448.

Andrade C (2020). The limitations of online surveys. *Indian J Psychol Med* 42(6): 575–576.

Ashari CR, Khomsan A & Baliwati YF (2019). Validasi HFIAS dalam mengukur ketahanan pangan: kasus pada rumah tangga perkotaan dan perdesaan di Sulawesi Selatan. *J Nutr Food Res* 42(1):11–20.

Ashraf I, Bestman PL, Assiri AA, Kamal GM, Uddin J, Luo J, Orayj KM & Ishaqui AA (2024). Status of inappropriate complementary feeding and its associated factors among infants of 9–23 months. *Nutrients* (16):4379.

Bahatheg RO (2021). Young children's nutrition during the COVID-19 pandemic lockdown: a comparative study. *Early Child Educ J* 49(5):915-923.

Bappenas (2025). *National Medium-Term Development Plan (RPJMN) 2025–2029*. Ministry of National Development Planning (Bappenas), Jakarta.

Ben Hassen T, El Bilali H & Allahyari MS (2020). Impact of COVID-19 on food behaviour and consumption in Qatar. *Sustainability* 12(17):6973.

BKKBN, BPS, Kemenkes & ICF (2018). *Indonesia Demographic and Health Survey 2017*. National Population and Family Planning Board (BKKBN); Statistics Indonesia (BPS); Ministry of Health (Kemenkes); ICF, Jakarta.

Coates J, Swindale A & Bilinsky P (2007). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: Indicator guide: Version 3.

Devereux S, Béné C & Hoddinott J (2020). Conceptualising COVID-19's impacts on household food security. *Food Secur* 12(4):769–772.

Fatmah F (2024). Factors associated with food security in Depok City, Indonesia during the COVID-19 pandemic: a cross-sectional study. *Front Sustain Food Syst* 8:1327887.

Horvath A, Stróżyk A, Dziechciarz P & Szajewska H (2021). An online cross-sectional survey of complementary feeding practices during the COVID-19 restrictions in Poland. *Nutrients* 13(9):3196.

Ijazah F (2020). *Report of rapid health assessment: ensuring sustainability of essential health services for children and mothers during the COVID-19 pandemic in Indonesia.* UNICEF.

Khor GL & Lee SS (2021). Complementary foods and milk-based formulas provide excess protein but suboptimal key micronutrients and essential fatty acids in the intakes of infants and toddlers from urban settings in Malaysia. *Nutrients* 13(7):2354.

Komakech JJ, Emerson SR, Cole KL, Walters CN, Rakotomanana H, Kabahenda MK, Hildebrand DA & Stoecker BJ (2023). A peer-led integrated nutrition education intervention through care groups improved complementary feeding of infants in post-emergency settlements in Uganda: a cluster randomised trial. *Curr Dev Nutr* 7(3):100042.

Leseba N, Vermaak K & Makatjane T (2025). A multilevel analysis of the factors associated with minimum acceptable diets among children aged 6–23 months in Lesotho. *BMC Nutr* 11(1):43.

Lubbe W, Niela-Vilén H, Thomson G & Botha E (2022). Impact of the COVID-19 pandemic on breastfeeding support services and women's experiences of breastfeeding: a review. *Int J Womens Health* 14:1447–1457.

Marino JA, Meraz K, Dhaliwal M, Payán DD, Wright T & Hahn-Holbrook J (2023). Impact of the COVID-19 pandemic on infant feeding practices in the United States: food insecurity, supply shortages and deleterious formula-feeding practices. *Matern Child Nutr* 19(3):e13498.

Ministry of Health Republic Indonesia (2025). *Indonesian Nutritional Status Survey 2024*. Ministry of Health, Jakarta.

Mohamad Nasri N, Gan WY & Mohd Shukri NH (2025). Mother-infant postnatal experience and its association with maternal emotion and coping during the COVID-19 pandemic. *J Reprod Infant Psychol* 43(4):980–996.

Pradeilles R, Pareja R, Creed-Kanashiro HM, Griffiths PL, Holdsworth M, Verdezoto N, Eymard-Duvernay S, Landais E, Stanley M & Rousham EK (2022). Diet and food insecurity among mothers, infants and young children in Peru before and during COVID-19: a panel survey. *Matern Child Nutr* 18(3):e13343.

Rahayu HK, Paratmanitya Y, Herawati HD & Nuryani R (2024). Factors related to complementary feeding practices during the COVID-19 pandemic in Indonesia. *IJND* 12 (2):104-144.

Sirikul W, Ongprasert K, Piankusol C & Siviroj P (2022). Maternal mental health under the COVID-19 pandemic in Thailand. *Int J Environ Res Public Health* 19(1):347.

Soliman A, De Sanctis V, Alaaraj N, Ahmed S, Alyafei F, Hamed N & Soliman N (2021). Early and long-term consequences of nutritional stunting: from childhood to adulthood. *Acta Biomed* 92(1):e2021168.

Vazquez-Vazquez A, Dib S, Rougeaux E, Wells JC & Fewtrell M (2020). The impact of the COVID-19 lockdown on the experiences and feeding practices of new mothers in the UK. *Appetite* 156:104985.

WHO (2023). *WHO guideline for complementary feeding of infants and young children 6–23 months of age.* World Health Organization, Geneva.

WHO (2021). *Indicators for assessing infant and young child feeding practices: definitions and measurement methods.* World Health Organization, Geneva.

Yamashita A, Isumi A & Fujiwara T (2022). Online peer support and well-being of mothers and children: systematic scoping review. *J Epidemiol* 32(2):61–68.