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Factors related to complementary feeding practices during the COVID-19 pandemic in Indonesia

Herwinda Kusuma Rahayu[1*], Yhona Paratmanitya[1], Herni Dwi Herawati[1], Eka Nurhayati[2] & Rindi Nuryani[1]

[1]*Department of Nutrition, Faculty of Health Sciences, Universitas Alma Ata, Yogyakarta, Indonesia*; [2]*Department of Midwifery, Faculty of Health Sciences, Universitas Alma Ata, Yogyakarta, Indonesia*

ABSTRACT

Introduction: Complementary feeding practice is critical for adequate growth and development in children. Appropriate practices should be maintained, especially during the COVID-19 pandemic. **Methods:** This cross-sectional study aimed to analyse complementary feeding practices and their related factors, including the impact of the COVID-19 pandemic on household economic aspects. Data were collected via online questionnaires involving 574 mothers of children aged 6–23 months in Indonesia from April to May 2022. **Results:** In total, 63.6%, 64.6%, 86.6%, and 57.7% of children met the criteria for timely introduction of complementary feeding (INTRO), minimum dietary diversity (MDD), minimum meal frequency (MMF), and minimum acceptable diet (MAD), respectively. Households that had no impact on their ability to provide food during the pandemic had higher odds of meeting MDD and MAD. Having a high household income level, high maternal education, and being a housewife increased the odds of INTRO. The odds of MDD increased in children who lived in Java, had older age, and whose mother had high education level. Older children had higher odds of having appropriate MMF. MAD was associated with mother's high education level and being a housewife. **Conclusion:** Several factors during the pandemic, including economic aspects, influenced complementary feeding practices. To prevent child malnutrition, besides ensuring household food security, other strategies to increase complementary feeding quality are also needed.

Keywords: complementary feeding, COVID-19, minimum acceptable diet, minimum dietary diversity, minimum meal frequency

INTRODUCTION

In 2020, a global outbreak of the coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), impacted countries including Indonesia (Liu, Kuo & Shih, 2020; Nugraha *et al.*, 2020). To prevent transmission of the disease, the government imposed physical restrictions on essential public places, including schools, workplaces, businesses and services, markets, and healthcare providers (WHO, 2020). Physical restrictions impacted the economic sector, which was depicted by the reduced number of working hours, the emergence of a work-from-home system, and layoffs (Nicola *et*

*Corresponding author: Herwinda Kusuma Rahayu
Department of Nutrition, Faculty of Health Sciences, Universitas Alma Ata, Yogyakarta, Indonesia
E-mail: herwinda@almaata.ac.id
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al., 2020). These conditions may lower household economic status and food security. Additionally, several health-related services were halted, which could limit the public's access to health information (Pires *et al.*, 2021). Due to such circumstances, people may be more susceptible to nutrition and health problems.

Children were one of the vulnerable groups affected during the COVID-19 pandemic, especially those in their first 1000 days of life. Currently, many malnutrition-related problems are still occurring in Indonesia, which include stunting, wasting, and underweight. Results of a survey prior to the pandemic in 2019 showed that the prevalence of stunting was 27.7%, which decreased to 24.4% in 2021; wasting decreased from 7.4% to 7.1%. However, the prevalence of underweight increased from 16.3% to 17.0% during the pandemic (National Institute of Health Research & Development, 2019; National Institute of Health Research & Development, 2021).

To ensure healthy growth and development of children aged 6–23 months, complementary feeding is given through a variety of nutritious foods introduced besides breast milk. To guarantee that the nutritional needs of infants and young children are met, complementary foods must be provided timely, adequately, safely, and appropriately (Binns *et al.*, 2020; UNICEF, 2020). To mirror the dietary quantity and quality of infants and young children, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have proposed several infant and young child feeding (IYCF) indicators, including the timely introduction of complementary feeding (INTRO), minimum dietary diversity (MDD), minimum meal frequency (MMF), and minimum acceptable diet (MAD) (WHO & UNICEF, 2021). Nevertheless, in Indonesia, complementary feeding requires optimisation. In the latest Indonesia Demographic and Health Survey, the proportion of MDD was reported to be 60%, MMF 72%, and MAD 40% (National Institute of Health Research & Development, 2018).

However, studies on the factors that influence complementary feeding practices in Indonesia during the COVID-19 pandemic are lacking. Therefore, this study aimed to analyse the indicators of complementary feeding practices and their related factors in Indonesia, which will serve as preparation for another possible outbreak in the future.

MATERIALS AND METHODS

This study was an online cross-sectional survey that involved a convenience sample of participants. A validated, self-administered online questionnaire was utilised to collect the data to be used for this study from April to May 2022, during which the COVID-19 pandemic took place. Data collection was carried out during the implementation of the physical restrictions policy by the government to prevent disease transmission, which included limiting access to essential public places, such as healthcare centres, workplaces, and markets. The following inclusion criteria were applied: living in Indonesia, able to complete the study questionnaire in the Indonesian language, have children aged 6–23 months, and could provide a consent form. In this study, 574 mothers of children aged 6–23 months in Indonesia were enrolled. An online questionnaire was distributed to several target populations in Indonesia via social media platforms, including Instagram, WhatsApp, Line, Facebook, and Twitter, and the Indonesian Breastfeeding Mothers' Association. This research was

ethically approved by the Institutional Review Board (KE/AA/VI/10832/EC/2022), which complied with the Helsinki Declaration. The participants, before giving their informed consent, received written explanations about the study. Before they participated in the study, all participants electronically signed an online informed consent form. The identities of the participants were anonymised.

Outcome measures

Complementary feeding practices were measured using four indicators that reflected the children's nutrition adequacy based on the child's age, including INTRO, MDD, MMF, and MAD (WHO & UNICEF, 2021). A validated, online structured questionnaire was developed to assess complementary feeding consumption in the past 24 hours. To measure dietary diversity, a list-based approach was employed. The definitions of each indicator based on the WHO recommendation of IYCF are as follows:

- INTRO: Children who start receiving solid, semi-solid, or soft foods at six months of age besides breast milk.
- MDD: Children who had at least five out of eight defined food group consumptions during the previous day. The eight food groups include breast milk; grains, roots, and tubers; pulses, nuts, and seeds; dairy products; eggs; flesh foods (meat, fish, poultry, and organ meats); and vitamin A-rich fruits and vegetables.
- MMF: Children who had solid, semi-solid, or soft foods with a minimum number of times during the previous day. The minimum number of times such as two times feeding of breastfed infants aged 6–8 months, three times feeding of breastfed children aged 9–23 months, and four times feeding of non-breastfed children aged 6–23 months.
- MAD: Children who received at least the MDD and MMF during the previous day.

Explanatory variables

The questionnaire was utilised to collect information related to socio-demographic data and the impact of the COVID-19 pandemic on household economic aspects. Socio-demographic variables considered in this study were child, maternal, paternal, and household characteristics. Child characteristics included age (6–11, 12–17, and 18–23 months) and gender (male and female). Maternal characteristics included age (18–25, 26–35, and 36–40 years), level of education (low if junior high school and below, middle if senior high school, and high if college or above), mother's occupation (housewife/unemployed, government employees, and private employees), type of occupation (housewife/unemployed, work from home, and work from office), and source of complementary feeding information (healthcare providers such as paediatrician, nurse, nutritionist, or midwife; mass media including television, print, radio, or social media; and friends or family members such as neighbours or parents). Paternal characteristics included the father's occupation (unemployed, government employees, and private employees). Household characteristics included place of residence (Java Island and outside Java Island), household income level (household income quintiles: poorest, poorer, middle, richer, and richest), and family size (large, 7–10 people; middle, 4–6 people; and small, 2–3 people). Variables that were related to the impact of the COVID-19 pandemic on household economic aspects included impacts on household income, household ability to provide food, mother's employment status, and father's employment status. All variables of household economic

Table 1. The distribution of complementary feeding practices and characteristics of study participants (*n*=574)

Variable	*n*	*%*
Child characteristic		
Age (months)		
6-11	235	40.9
12-17	236	41.1
18-23	103	18.0
Gender		
Female	287	50.0
Male	287	50.0
Maternal characteristic		
Age (years)		
18-25	179	31.2
26-35	351	61.1
36-40	44	7.7
Level of education		
High	12	2.1
Middle	381	62.9
Low	201	35.0
Mother's occupation		
No occupation/ housewife	350	61.0
Government employee	82	14.3
Private employee	142	24.7
Type of occupation		
Housewife/ Unemployed	350	61.0
Work from home	74	12.9
Work from office	150	26.1
Source of complementary feeding information		
Healthcare providers	168	29.3
Mass media	391	68.1
Friends or family members	15	2.6
Paternal characteristic		
Father's occupation		
Unemployed	3	0.6
Government employee	165	28.7
Private employee	406	70.7
Household characteristic		
Place of residence		
Java	403	70.2
Outside Java	171	29.8

Table 1. The distribution of complementary feeding practices and characteristics of study participants (*n*=574) [cont'd]

Variable	*n*	*%*
Household income level†		
Richest (IDR >5000.000)	99	17.3
Richer (IDR >3500.000-5000.000)	130	22.7
Middle (IDR >3000.000-3500.000)	34	5.9
Poorer (IDR >2000.000-3000.000)	169	29.4
Poorest (IDR ≤2000.000)	142	24.7
Family size		
Small (2-3 people)	45	7.8
Medium (4-6 people)	381	66.4
Large (7-10 people)	148	25.8
Complementary feeding indicators		
INTRO	365	63.6
MDD	371	64.6
MMF	497	86.6
MAD	331	57.7

INTRO: Timely introduction of complementary feeding; MDD: Minimum dietary diversity; MMF: Minimum meal frequency; MAD: Minimum acceptable diet
†1 US dollar = IDR 14,340 IDR (as of April 20th, 2022)

aspects were data obtained from the participants in terms of their economic condition during the pandemic.

Statistical analysis

Using Pearson's chi-square test (p<0.05), a bivariate analysis of each complementary feeding indicator and the impact of the COVID-19 pandemic on household economic aspects was conducted. Variables with a 95% confidence interval and a p-value of less than or equal to 0.2 during the bivariate analysis were entered into the multivariate logistic regression analysis in order to determine the relative effect of confounding variables and the interactions of variables. All analyses were carried out using IBM SPSS Statistics for Mac version 26.0 (IBM Corp, Armonk, New York, USA).

RESULTS

The proportions of complementary feeding practices and characteristics of study participants are shown in Table 1. The proportion of infants and young children who received timely introduction of solid, semi-solid, or soft foods was 63.6%. The percentages of infants and young children meeting the MDD, MMF, and MAD were 64.6%, 86.6%, and 57.7%, respectively. Most of the infants and young children were aged below 18 months (82%). More than half of the mothers were aged 26–35 years (61.1%), completed middle education (62.9%), and were housewives (61.0%). Most fathers worked as private employees (70.7%). Complementary feeding information were mostly obtained from mass media (68.1%). Our study participants were

mostly from outside Java Island (70.2%) and of medium-sized families (66.4%).

The results of multiple logistic regression of factors related to complementary feeding indicators are presented in Table 2. Timely INTRO was not associated with any child factor. At the maternal level, compared with those with low education, mothers with high education levels were more likely to have children meeting timely introduction of complementary foods (*AOR*=4.0; 95%*CI*:1.0–15.4). Unemployed mothers had a 2.6 greater chance of feeding their children timely than those who worked outside the house (95%*CI*:1.1–6.0). Children from the richest households were more likely to meet timely INTRO than those from other household income groups (*AOR*=1.6; 95%*CI*:1.2–8.9). There was no association between living residency and economic aspects related to the COVID-19 pandemic in terms of timely INTRO.

Children aged 18–23 months had a 2.8 greater chance of meeting MDD than younger children (95%*CI*:1.0–7.2). There was a dose–response relationship between maternal education level and MDD. Mothers with high and middle education levels had a greater chance of feeding their children with diverse foods, with odds of 6.0 (95%*CI*:1.8–8.2) and 5.1 (95%*CI*:1.2–7.9), respectively. Children who lived on Java Island were more likely to eat a more diversified diet than those who lived outside Java Island (*AOR*=2.2; 95%*CI*:1.2–4.1). Households with increased income during the pandemic tended to meet the MDD (*AOR*=1.3; 95%*CI*:1.1–3.9) compared to households with decreased income. Meanwhile, if the households were not impacted in their ability to provide food, the odds of meeting MDD increased 1.3 times (95%*CI*:1.1–3.8).

There were no associations between household, maternal, and paternal characteristics with MMF. MMF was only associated with a child's age. Children aged 12–17 months old tended to have appropriate meal frequency (*AOR*=2.0; 95%*CI*:1.3–2.9). The odds was 2.9 times higher in children aged 18–23 months (95%*CI*:1.7-4.9). Economic aspects related to the COVID-19 pandemic had no impact on MMF.

Mothers with high and middle education levels had a greater chance of meeting the MAD; the odds were 5.9 (95%*CI*:1.5–8.7) and 6.1 (95%*CI*:1.5–7.9), respectively. Mothers who were housewives were more likely to have appropriate MAD than mothers with informal work outside the home (*AOR*=2.1; 95%*CI*:1.0–4.1). Among all aspects related to the economic impacts of the COVID-19 pandemic, only impact on household ability to provide food had a significant association with MAD (*AOR*=1.6, 95%*CI*:1.4–3.9).

Family size, source of complementary feeding information, child's gender, and father's occupation had no significant associations with complementary feeding indicators. Furthermore, the impact of COVID-19 on mother's and father's employment statuses was also not affected by complementary feeding practices.

DISCUSSION

Based on the results, household income during the COVID-19 pandemic and maternal education level impacted INTRO, MDD, and MAD. Previous studies have also shown that household economic level predicts complementary feeding quality (Mitchodigni *et al.*, 2017; Berbari *et al.*, 2021). There was a decrease in support for proper IYCF practices, especially during the lockdown period, such as the ability to access healthcare service facilities to increase knowledge regarding nutrition and child health. In Indonesia, several health services related to growth monitoring and nutrition

Table 2. Multilevel logistic regression: Factors related to complementary feeding practice indicators

Variables	*INTRO*		*MDD*		*MMF*		*MAD*	
	COR (95% CI)	*AOR (95% CI)*	*COR (95% CI)*	*AOR (95% CI)*	*COR (95% CI)*	*AOR (95% CI)*	*COR (95% CI)*	*AOR (95% CI)*
Household characteristic								
Place of residence								
Java	1.6 (1.0-2.4)*	1.3 (0.80-2.3)	3.2 (2.0-5.3)***	2.2 (1.2-4.1)*	1.1 (0.7-1.5)		1.5 (1.0-2.1)*	1.3 (0.9-2.0)
Outside Java	1	1	1	1	1		1	1
Household income level								
Richest	2.0 (1.0-3.9)*	1.6 (1.2-8.9)*	2.6 (1.3-5.2)**	1.9 (0.9-4.0)	0.6 (0.4-1.1)	0.9 (0.6-1.6)	0.9 (0.5-1.4)	
Richer	1.5 (0.6-4.0)	1.1(0.8-3.0)	1.5 (0.8-2.8)	1.2 (0.4-3.5)	1.0 (0.6-1.7)	0.9 (0.6-1.2)	1.0 (0.6-1.6)	
Middle	1.8 (0.9-3.4)	0.3 (1.2-4.6)	1.1 (0.4-2.9)	1.4 (0.7-3.0)	0.8 (0.4-1.7)	0.7 (0.3-1.1)	0.9 (0.4-1.8)	
Poorer	0.9 (0.5-1.7)	0.9 (0.4-2.0)	1.7 (0.8-3.5)	1.5 (0.6-3.9)	0.9 (0.6-1.6)	0.9 (0.7-2.0)	1.3 (0.8-2.1)	
Poorest	1	1	1	1	1	1	1	
Family size								
Small	0.7 (0.6-1.6)		1.1 (0.4-2.7)		1.2 (0.8-1.8)		1.3 (0.9-3.2)	0.7 (0.3-1.3)
Medium	0.9 (0.3-1.4)		0.8 (0.3-2.2)		1.3 (0.7-2.5)		1.5 (0.8-2.8)	0.9 (0.4-1.8)
Large	1		1		1		1	1
Source of complementary feeding information								
Healthcare providers	2.4 (0.8-7.5)	1.8 (0.5-6.2)	3.0 (0.9-10.5)	3.1 (0.7-12.9)	0.6 (0.2-1.8)		1.1 (0.7-2.8)	
Mass media	2.1 (0.7-6.3)	1.8 (0.5-5.9)	2.2 (0.7-7.2)	3.0 (0.7-12.1)	1.1 (0.4-3.4)		1.8 (0.4-3.2)	
Friends or family members	1	1	1	1	1		1	
Child characteristic								
Age (months)								
18-23	0.4 (0.4-1.4)		3.0 (1.2-7.4)*	2.8 (1.0-7.2)*	3.0 (1.7-5.0)***	2.9 (1.7-5.0)***	3.0 (1.8-4.9)***	1.1 (0.4-3.5)
12-17	1.0 (0.6-1.9)		1.1 (0.7-1.8)	2.2 (0.8-5.8)	1.9 (1.3-2.8)**	2.0 (1.3-2.9)**	1.8 (1.2-2.6)**	1.9 (0.6-6.0)
6-11	1		1	1	1	1	1	1
Gender								
Male	1.2 (0.8-1.8)		0.9 (0.6-1.6)		1.0 (0.7-1.4)		1.0 (0.7-1.4)	
Female	1		1		1		1	

Table 2. Multilevel logistic regression: Factors related to complementary feeding practice indicators (cont'd)

Variables	*INTRO*		*MDD*		*MMF*		*MAD*	
	COR (95% CI)	*AOR (95% CI)*	*COR (95% CI)*	*AOR (95% CI)*	*COR (95% CI)*	*AOR (95% CI)*	*COR (95% CI)*	*AOR (95% CI)*
Maternal characteristic								
Age (years)								
36-40	1.5 (0.8-1.8)		0.7 (0.3-1.6)	0.5 (0.2-1.4)	1.3 (0.7-2.7)		1.2 (0.6-2.2)	
26-35	1.4 (0.81-1.9)		1.8 (1.1-3.1)*	2.6 (0.9-6.7)	1.2 (0.8-1.7)		1.1 (0.4-1.6)	
18-25	1		1	1	1		1	
Level of education								
High	0.3 (0.1-1.1)	4.0 (1.0-15.4)*	6.4 (2.2-23.3)**	6.0 (1.8-8.2)**	1.2 (0.9-1.7)		1.2 (0.9-1.8)	5.9 (1.5-8.7)*
Middle	0.9 (0.6-1.5)	1.5 (0.5-5.4)	7.2 (2.2-23.3)***	5.1 (1.2-7.9)*	1.2 (0.4-4.3)		0.3 (0.1-1.1)	6.1 (1.5-7.9)*
Low	1	1	1	1	1		1	1
Occupation								
Unemployed	1.9 (1.2-3.0)**		1.8 (0.8-4.1)	2.2 (0.8-6.4)	1.2 (0.8-1.8)		1.5 (1.0-2.2)*	1.9 (1.8-3.2)*
Private employee	0.9 (0.5-1.9)	0.9 (0.9-3.6)	1.7 (0.9-2.9)	1.8 (0.9-3.7)	0.8 (0.5-1.4)		0.9 (0.5-1.7)	2.0 (1.2-3.4)
Government employee	1	1	1	1	1		1	1
Type of occupation								
Housewife	2.4 (1.5-3.8)***	2.6 (1.1-6.0)*	1.7 (0.9-2.8)	1.9 (0.7-5.0)	1.5 (0.9-2.2)	1.4 (0.8-2.6)	1.9 (1.3-2.8)**	2.1 (1.0-4.1)*
Work from Home	2.5 (1.2-5.1)*	1.0 (0.3-2.9)	1.6 (0.7-3.6)	2.3 (0.1-3.1)	1.5 (0.8-2.7)	1.3 (0.8-1.9)	1.9 (1.1-3.4)*	1.2 (0.8-4.2)
Work from Office	1	1	1	1	1	1	1	1
Paternal characteristic								
Occupation								
Unemployed	3.6 (0.6-22.5)	1.3 (0.1-16.9)	0.7 (0.1-6.2)	1.6 (0.8-3.2)	2.6 (0.4-15.8)		1.9 (0.3-12.2)	
Private employee	2.6 (0.4-15.9)	2.1 (0.1-11.8)	1.4 (0.8-2.5)	3.4 (0.2-4.4)	2.9 (0.5-12.3)		2.1 (0.3-12.6)	
Government employee	1	1	1	1	1		1	

Table 2. Multilevel logistic regression: Factors related to complementary feeding practice indicators (cont'd)

Variables	*INTRO*		*MDD*		*MMF*		*MAD*	
	COR (95% CI)	*AOR (95% CI)*	*COR (95% CI)*	*AOR (95% CI)*	*COR (95% CI)*	*AOR (95% CI)*	*COR (95% CI)*	*AOR (95% CI)*
Impact of COVID-19 pandemic								
Impact on household income								
Increased income	4.0 (1.5-11.1)**	0.6 (0.3-1.2)	2.7 (1.9-7.9)*	1.3 (1.1-3.9)*	1.0 (0.4-2.8)		0.6 (0.2-1.6)	
No change in income	5.9 (2.2-16.1)***	2.1 (0.1-4.4)	4.6 (1.6-13.0)**	2.2 (0.9-5.5)	1.0 (0.7-1.5)		0.8 (0.6-1.2)	
Decreased income	1	1	1	1			1	
Impact on household ability to provide food								
Not impacted	1.3 (0.8-2.1)	1.1 (0.5-2.3)	2.9 (1.8-4.7)***	1.3 (1.1-3.8)**	1.3 (0.9-1.9)	0.9 (0.6-1.4)	2.0 (1.4-2.9)***	1.6 (1.4-3.9)**
Impacted	1	1	1	1	1	1	1	1
Impact on mother's employment status								
Not impacted	0.8 (0.6-1.3)		2.1 (1.2-3.5)**	1.1 (0.4-1.5)	1.1 (0.8-1.5)		1.2 (0.9-1.7)	
Impacted	1		1	1	1		1	
Impact on father's employment status								
Not impacted	1.4 (0.9-2.2)	1.1 (0.6-2.2)	2.5 (1.5-4.2)***	1.6 (0.3-1.7)	1.2 (0.8-1.8)		1.2 (0.8-1.8)	
Impacted	1	1	1	1	1		1	

INTRO: Timely introduction of complementary feeding; MDD: Minimum dietary diversity; MMF: Minimum meal frequency; MAD: Minimum acceptable diet; COR=Crude Odds Ratio; AOR=Adjusted Odds Ratio; CI=Confidence Interval
*statistically significant at $p<0.05$, **significant at $p<0.01$, *** significant at $p<0.001$

counselling for children were also limited; many respondents from low-income households experienced difficulties in accessing healthcare service facilities. Results further show that household economic levels affect healthcare access (Filha *et al.*, 2022). High-income households can use professional expert guides related to the first INTRO; while low-income households tend to receive knowledge only from their parents, friends, or family (Abate, Hassen, & Temesgen, 2023). Our results indicated that the richest households had 1.6 times greater odds of meeting the INTRO indicator.

Maternal education level was associated with most complementary indicators, including INTRO, MDD, and MAD. High maternal education level has a positive impact on health-seeking behaviours (Khasanah *et al.*, 2023; Yugistyowati & Marza, 2018). Those with high levels of education and household income tend to use webinars/expert recommendations, internet/ applications, professional experts, and other telehealth services to increase their knowledge (Nurhayati *et al.*, 2023; Thomson *et al.*, 2021). High awareness and understanding of the benefits and quality of complementary feeding practices will protect mothers and children against external interference and pressure from the environment or family concerning food taboos (Andualem *et al.*, 2020). Most respondents in this study obtained information regarding complementary feeding during the pandemic via social media.

The Indonesian government has since optimised its social media platforms for health promotion during the pandemic.

Furthermore, the lockdown period during the COVID-19 pandemic has had a negative impact on the food supply chain (Bustos-Arriagada *et al.*, 2022). Due to the high cost of food caused by this condition, dietary preferences changed, especially in households with middle to lower economic status. People tended to choose foods with low prices per calorie and generally non-perishable foods, including starchy food groups (Laborde *et al.*, 2021). Household income level determines food availability and food insecurity. Food insecurity has led people to consume low diversity diets (Nofitasari *et al.*, 2023; Sidebottom *et al.*, 2022; Zhao *et al.*, 2020).

A child's dietary diversity is also significantly increased by a mother's education. High maternal education levels tend to open up more employment opportunities and higher economic status than low maternal education levels. A higher economic level will increase food purchasing power and the ability to provide a variety of foods for children (Tegegne *et al.*, 2017). Meanwhile, of all complementary feeding indicators, MMF had no significant relationship with household income levels during the COVID-19 pandemic. Previous studies also had the same result (Mitchodigni *et al.*, 2017). Household income was an insignificant predictor of MMF, possibly because meeting MMF is less resource-dependent.

The place of residence differed in relation to MDD compliance. The COVID-19 pandemic reduced the amount of food that was distributed in markets, which had a major impact on rural areas. Poor food access in rural areas reduced food diversity. Food groups that were most limited included dairy products and several types of animal-source foods (Sidebottom *et al.,* 2022). Furthermore, numerous foods were imported from the urban area. During the pandemic, numerous areas in Java (urban areas in Indonesia) had a high incidence of COVID-19 and social restrictions or lockdowns had to be implemented. This condition caused interruptions in the food chain. However, the emergence of food ordering and delivery services or online grocery shopping became a viable solution to maintain a stable food supply and access to adequate food during the COVID-19 pandemic because it can maintain dietary diversity and has the potential to reduce the spread of the disease through physical distancing (Zhao *et al.*, 2020). In Java, many online food delivery services were available, which might have increased dietary diversity of complementary feeding compared to outside Java Island, where not all regions had these services.

Mother's occupation has a relationship with INTRO and MAD. To protect their children from COVID-19, more housewives breastfed their infants more frequently during the pandemic, which allowed for timely INTRO (Holand *et al.*, 2022). Housewives have enough time to practise exclusive breastfeeding for 6 months compared to working mothers, whose time is spent mostly outside (Tušl *et al.*, 2021). Women are a vulnerable group to likely experience high levels of depressive symptoms and anxiety related to breastfeeding during the COVID-19 pandemic, especially working mothers (Lauzon-Guillain *et al.*, 2019). Due to work pressure, working mothers may not have enough time to pay attention to their children. As demonstrated in this study, compared with housewives, lower MAD was found among children with working mothers.

In this study, the age of the child was associated with MMF and MDD. Appropriate complementary feeding practices increase as the child gets older. As children get older, the frequency of

eating increases and the types of foods that are introduced to them become more diverse (Tegegne *et al.*, 2017).

Due to physical restrictions during the pandemic, we employed self-administered online questionnaires, which is a limitation of this study. Given the diversity of the Indonesian region, our sample may not have been as representative. The only mothers included in this study were those who had access to the internet and completed the online survey.

CONCLUSION

In conclusion, complementary feeding practice indicators were altered during the pandemic. To prevent child malnutrition, strategies to increase complementary feeding quality are needed. The economic aspect is one of the factors in fulfilling indicators for appropriate complementary feeding practices. During the pandemic, the government must ensure household food security issues, such as a safety net. Furthermore, mothers' knowledge on the importance of appropriate complementary feeding practices must be enhanced.

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Authors' contributions

Rahayu HK, principal investigator, conceptualised and designed the study, data analysis and interpretation, prepared the draft of the manuscript, and reviewed the manuscript; Paratmanitya Y, conceptualised and designed the study, led the data collection, and reviewed the manuscript; Herawati HD, led the data collection and reviewed the manuscript; Nurhayati E, advised on data analysis and interpretation, and reviewed the manuscript; Nuryani R, led the data collection.

Conflict of interest

The authors declare no conflicts of interest.

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