

# Adherence to age-appropriate feeding practices among Filipino children under two: An analysis of the 2018-2019 Expanded National Nutrition Survey

Eva Abille Goyena & Ma. Lynell Valdeabella Maniego

*Food and Nutrition Research Institute, Department of Science and Technology, Taguig City, Metro Manila, Philippines*

## Abstract

**Introduction:** Age-appropriate feeding in the first two years of life is essential to a child's growth and development, with health implications that persist throughout life. This study examined the adherence to age-appropriate feeding practices among children 0-23.9 months old based on a constructed index, its association with anthropometric growth, and factors affecting adherence. **Methods:** A total of 9,138 children aged 0-23.9 months with complete information on infant and young child feeding practices (IYCF), anthropometric measurements, maternal information, and household characteristics were included in the study. Data were extracted from a nationwide survey conducted in 2018-2019. **Results:** Among children aged 0-23.9 months, 20.7% adhered to age-appropriate feeding criteria. More than half (57.7%) of children below six months adhered to age-appropriate exclusive breastfeeding practices, while 1.4% of children aged 6-8.9 months old started complementary feeding. Continued breastfeeding at 12 months of age while receiving complementary feeding was uncommon (11%). Significantly higher z-scores for weight-for-age ( $-0.6 \pm 0.04$ ), height-for-age ( $-0.8 \pm 0.05$ ), and weight-for-height ( $-0.2 \pm 0.05$ ) were noted among children who adhered to age-appropriate feeding practices compared to those who did not. Child's age and birth weight, as well as mother's age, education, and working status, were found to significantly influence the likelihood of adhering to age-appropriate feeding index. **Conclusion:** Filipino infants and young children under two years of age have low adherence to age-appropriate feeding practices, putting them at a higher risk of repeated occurrence of infection that could lead to stunting in early life.

**Keywords:** childhood growth, feeding practices, nutritional status, stunting, wasting

## INTRODUCTION

To ensure optimum health, growth and development, and ultimately make headway towards ending all forms of malnutrition among Filipino children under five as part of the 2030 Sustainable Development Goals (SDGs),

breastfeeding and complementary feeding practices during the first two years of life need to be improved. Accordingly, the Department of Health (DOH) on May 23, 2005 issued the Administrative Order 2005-0014, titled "National Policies on Infant and Young

---

\*Corresponding author: Eva Abille Goyena, PhD  
Food and Nutrition Research Institute, Department of Science and Technology  
Bicutan, Taguig City, Metro Manila  
Telefax: (+62)839-1843; E-mail: evabille2@gmail.com  
doi: <https://doi.org/10.31246/mjn-2022-0037>

Child (IYCF)", to guide efforts by the department and its partners in creating a supportive environment for appropriate IYCF practices (DOH, 2005). Since 2005, the promotion of IYCF has been one of the major nutrition programmes of the DOH and other government agencies, including local government units (LGUs), to address childhood undernutrition. Additionally, IYCF in the context of the first 1,000 days period has served as one of the strategic thrusts of the Philippine Plan of Action for Nutrition 2017-2022 to improve the nutritional status of infants and young children (NNC, 2017). Over the years, the National IYCF Plan of Action has been improved to adapt to current global strategies. This was marked by a more rigorous policy development, which included the revision of the implementing rules and regulations of Executive Order 51 (Milk Code), promotion of the Essential Newborn Care Program (known locally as *Unang Yakap*), advocacy on the availability of mother-baby friendly workplaces and public places, and the launch of the Accelerated Hunger Mitigation Program with intensive IYCF (DOH, 2005).

Breastfeeding has been widely promoted in the Philippines, with increasing rates of breastfeeding initiation and exclusive breastfeeding in the period of 2015-2018 (DOST-FNRI, 2020). However, exclusive breastfeeding practices were not sustained, as evidenced by the continuing decrease in the rate of exclusive breastfeeding until six months of age, from 77.6% for newborn infants to only 35.1% among infants under six months. This indicates that exclusive breastfeeding practice was shorter than the recommended six-month duration. Meanwhile, the prevalence of prelacteal feeding among newborns was 16.2% in 2018 (DOST-FNRI, 2020). Prelacteal feeding delays the child's first consumption of breast milk,

depriving the infant of the many benefits of colostrum and breastfeeding (Som *et al.*, 2018). The IYCF programme was also challenged by the steady increase in the proportion of bottle-fed Filipino children under two years, from 44.7% in 2011 to 53.1% in 2018, with the highest rate (61.6%) noted among young children 12-15 months old (DOST-FNRI, 2020).

Despite the positive trajectories recorded in the rates of early breastfeeding initiation and exclusive breastfeeding in the Philippines, poor complementary feeding practices among young children 6-23.9 months old remains a significant challenge. A declining trend was seen in the timely introduction of complementary foods among infants aged 6-8 months, from 80.3% in 2015 to 78.8% in 2018 (DOST-FNRI, 2020). A sharp decline was also noted in the proportion of children 6-23 months old meeting the minimum acceptable diet (MAD), from 18.6% in 2015 to 13.4% in 2018 (DOST-FNRI, 2020). Poor complementary feeding during 6-23.9 months of age can directly affect children's micronutrient status and growth, given their high nutrient requirements (Dewey & Adu-Afarwuah, 2008).

Owing to sub-optimal practices on exclusive breastfeeding and complementary feeding, a marked increase in stunting during the first two years of life was reflected in recent Philippine survey estimates (DOST-FNRI, 2020). Thus, interventions focusing on preventing malnutrition, such as scaling up of nutrition-specific interventions to improve micronutrient intake of infants and young children, could help lower the high stunting and wasting prevalences in the country. This study examined the adherence to age-appropriate feeding practices among children 0-23.9 months of age based on a constructed index and its association with anthropometric growth. It also

assessed factors affecting adherence to these practices. Study findings may guide IYCF programme planners and implementers in revisiting and/or developing a comprehensive national infant and young child feeding strategy to address micronutrient deficiency and growth faltering.

## **METHODS AND MATERIALS**

### **Study design, sampling, and participants**

This study analysed the 2018 and 2019 data obtained from the Expanded National Nutrition Survey (ENNS) conducted by the DOST-FNRI. The ENNS 2018-2019 was a household-based rolling survey that utilised the 2013 Master Sample (MS) of the Philippine Statistics Authority as its sampling design. It aimed to generate yearly nutrition and health data for LGUs, particularly in provinces and highly urbanised cities (HUCs), for a span of three years. It employed a two-stage cluster sampling design that involved the following stages: first, the selection of enumeration areas, which were barangays or a group of adjacent small barangays, as primary sampling units; second, the selection of secondary sampling units composed of housing units/households, with at least 12-16 households in a barangay. The MS had 117 sampling domains (81 provinces, 33 HUCs, and three other areas).

Replicated sampling was employed in selecting the provinces and HUCs to provide an unbiased national estimate. The ENNS 2018-2019 covered 40 and 39 provinces and HUCs, respectively. A total of 9,138 (ENNS 2018: 4,730; ENNS 2019: 4,408) children aged 0-23.9 months with complete information on IYCF, anthropometric measurements, and other relevant data were included in this study. Further details on the survey and sampling design are published elsewhere (DOST-FNRI, 2020).

### **Variables measured**

Anthropometric measurements were conducted using standard procedures. Weight was measured using a SECA (Model 874) double digital window scale (seca GmbH, Germany) with a 150–200 kilogram capacity, while recumbent length was measured using a medical plastic infantometer. For both weight and length, repeated measurements were done and the averages of the two measurements were computed and recorded. Child's weight and height/length were assessed using the 2006 WHO Child Growth Standard to classify the nutritional status of children. Stunting (low height-for-age) and wasting (low weight-for-height) were determined using the z-score cut-off points of  $<-2SD$ .

The criteria for age-appropriate feeding practices were classified based on the WHO-IYCF guidelines (WHO, 2021). Indicators were separated into indicators of breastfeeding (exclusively below six months of age) and indicators of complementary feeding practices (6-24 months of age) as shown in Table 1. Indicators were based on 24-hr recall information on breastfeeding practices, complementary feeding practices, and frequency and intake of other liquid or other semi-liquid foods. Exclusive breastfeeding was defined as the provision of breast milk solely among infants 0-5.9 months of age, although they may also receive oral dehydration solution, vitamins, minerals, and medicine in drops or syrup, and nothing else, not even water. Predominant breastfeeding, on the other hand, referred to feeding the child with breast milk as the main source of nourishment along with other liquid foods, such as water, fruit juices, and other liquid-based foods (WHO, 2008). Complementary feeding practices were evaluated using the indicators of minimum dietary diversity (MDD)

and minimum meal frequency (MMF) based on practices of the previous day (WHO, 2021). The MDD indicator was evaluated based on the consumption of at least five of the following eight food groups: 1) grains, roots and tubers; 2) legumes and nuts; 3) dairy products; 4) flesh foods; 5) eggs; 6) vitamin A-rich fruits and vegetables; 7) other fruits and vegetables; and 8) breast milk. Breastfed infants aged 6-8 and 9-23 months must receive solid, semi-solid, or soft foods at least two and three times, respectively, in the previous day to achieve MMF. Age-appropriate feeding practices were constructed to have a binary structure, i.e., whether the child adhered to the criteria or not.

An electronic data collection system containing a questionnaire was used to gather information on household, maternal, and child characteristics. Other variables considered in the assessment of potential factors included household variables, such as place of residence (rural or urban), wealth quintile (poorest, poor, middle, rich, and richest), food security status (food insecure or food secure) based on the household food insecurity access scale (HFIAS), and water and sanitation; maternal characteristics, such as age, education, civil status, working status, and place of work; and infant characteristics, including age in months, sex, birth weight, and feeding practices. For more details regarding the questionnaires

used, please see earlier articles (DOST-FNRI, 2020).

### Statistical analysis

Presumed variables that may influence child feeding practices, including child (age, sex, feeding practices, anthropometric growth, and birth weight), maternal (age, education, and work status), and household characteristics (type of residence, wealth status, food security status, water and sanitation, and hygiene indicators) were included in the analyses. Descriptive statistics included estimation of proportions and weighted means. Bivariate analysis was conducted and chi-square test was used to test the significance of the association between the age-appropriate feeding practices index and selected independent variables. Mean z-scores and simple linear regression analyses were done between anthropometric growth indicators and age-appropriate feeding practices index. Significant predictors of adherence to age-appropriate feeding practices, which were grouped into child, maternal, and household characteristics, were determined using univariate and multivariate logistic regression analyses. All variables with significant associations with child, maternal, and household characteristics were entered into the multivariate logistic regression analysis. The level of significance was set at  $p < 0.05$  for all tests performed. Analyses were performed using the Stata

**Table 1.** Indicators used to construct the age-appropriate feeding practices<sup>†</sup> criteria based on breastfeeding and complementary feeding practices

Age Group	Breastfeeding	Complementary feeding	
		Frequency	Diversity
0-5.9 months	Exclusive breastfeeding	No complementary feeding	
6-8.9 months	Breastfeeding	At least 2 feedings per day	Consumed at least 5 of the 8 food groups (MDD $\geq$ 5)
9-11.9 months	Breastfeeding	At least 3 feedings per day	
12-23.9 months	Breastfeeding	At least 3 feedings per day	

MDD, minimum dietary diversity

<sup>†</sup>Based on 2021 WHO-IYCF Guidelines

version 15 (Corp LLC, Texas, USA 2017) statistical software package.

### **Ethical consideration**

The ENNS 2018 and 2019 were approved by the FNRI Institutional Ethics Review Committee on July 31, 2017, with protocol code FIERC-2017-017. Information regarding the survey's purpose, objectives, and procedures were discussed with respondents before obtaining their oral and written informed consent to participate in the survey.

### **RESULTS**

The ratio of boys to girls in the 2018 and 2019 surveys were both close to one (Table 1). Mean age of the children was 12.0 months, with the highest proportion being older children 12-23.9 months of age. Majority (87.3%) of the children had normal birth weight ( $\geq 2500$  g).

The current feeding practices of infants under six months, six to 11 months, and young children 12 to 23 months are shown in Table 2. Exclusive breastfeeding was observed among more than half (57.7%) of infants under six months, while predominant breastfeeding was uncommon among them at only 6.3% (Table 2). More than one-fifth (13.3%) of infants under six months were already introduced to early complementary feeding while currently breastfeeding, while 16.5% received breastmilk substitute or were on a regular diet without breastfeeding. Among the six to 11 months, one-third (33.8%) of infants received breast milk substitute along with regular food. Complementary feeding in addition to breastfeeding (0.7%) was not commonly practised among infants 6-11 months, as compared to complementary feeding in addition to breast milk and breastmilk substitute feeding (8.5%). On the other hand, feeding with breastmilk substitute in addition to breast milk

(sometimes referred to as mixed feeding) was commonly observed among infants 6-11 months (49.9%) and 12-23 months (39.2%), but not among infants under six months (5.5%), as shown in Table 2.

Overall, children aged 6-23 months registered a low dietary diversity score (DDS) of 3.1; both infants 6-12 months (2.5) and 12-23 months (3.4) had DDS below the recommended five food groups (Table 2). Only 4.6% infants aged 6-11 months were receiving the daily MDD of five of the eight food groups, while a higher percentage of young children 12-23 months (16.2%) met the recommended MDD. Children 6-23 months old received about six feedings per day on average, with majority of the 6-11 months (84.5%) and 12-23 months (93.7%) meeting the minimum number of feedings per day. However, most infants 6-11 months (95.4%) and 12-23 months (85.1%) failed to receive the minimum acceptable diet. Moreover, consumption of nutrient-dense foods was particularly low. Only 21.6% of infants aged 6-11 months, and 14.0% of children aged 12-23 months were fed eggs and flesh meat. Most (71.5%) children also lacked fruits and vegetables in their diet. It was also noted that consumption of sweetened beverages increased with age, from 0.9% consumption among infants 6-11 months old to 7.1% among young children 12-23 months old.

Across all ages, one-fifth (20.7%) of the children adhered to age-appropriate feeding criteria in 2018 and 2019. Meanwhile, more than half (57.7%) of the children below six months of age adhered to age-appropriate exclusive breastfeeding, while a very small proportion (1.4%) of children 6-8.9 months old started complementary feeding at an appropriate age. Continued breastfeeding at 12 months of age while receiving complementary feeding was uncommon at 11.0% (Table 2).



**Table 2.** Descriptive characteristics of the children, Philippines, 2018-2019

Characteristics	2018 (n=4,730)	2019 (n=4,408)	All (n=9,138)
<b>Child characteristics</b>			
Sex (%)			
Boys	51.7	50.7	51.2
Girls	48.3	49.3	48.8
Age (months)			
Mean age	12.1	11.8	12.0
0-5.9 (%)	23.9	26.0	24.9
6-8.9 (%)	12.3	13.2	12.7
9-11.9 (%)	13.6	12.4	13.0
12-23.9 (%)	50.2	48.4	49.3
Birth weight (grams) (%)			
<2500	12.9	12.5	12.7
≥2500	87.1	87.5	87.3
Current feeding practices (0-5 months) (%)			
Exclusive breastfeeding	55.4	59.9	57.7
Predominant breastfeeding	7.9	4.6	6.3
Breastfeeding + BMS <sup>†</sup>	3.7	7.3	5.5
Breastfeeding + CF <sup>‡</sup>	14.1	12.3	13.2
Breastfeeding + BMS + CF	0.8	1.0	0.9
No breastfeeding- only BMS and/or regular diet	18.1	14.9	16.5
Current feeding practices (6-11 months) (%)			
Exclusive breastfeeding	5.2	4.2	4.7
Predominant breastfeeding	3.3	1.4	2.4
Breastfeeding + BMS <sup>†</sup>	45.6	54.5	49.9
Breastfeeding + CF <sup>‡</sup>	0.7	0.7	0.7
Breastfeeding + BMS + CF	8.9	8.1	8.5
No breastfeeding- only BMS and/or regular diet	36.3	31.1	33.8
Current feeding practices (12-23 months) (%)			
Exclusive breastfeeding	0.0	0.2	0.1
Predominant breastfeeding	0.2	0.2	0.2
Breastfeeding + BMS <sup>†</sup>	36.3	42.4	39.2
Breastfeeding + CF <sup>‡</sup>	0.2	0.0	0.1
Breastfeeding + BMS + CF	8.5	7.5	8.0
No breastfeeding- only BMS and/or regular diet	54.7	49.6	52.3
Complementary feeding practices (6-23 months)			
Mean Dietary Diversity Score <sup>§</sup>			
6-11 months	3.1	3.0	3.1
12-23 months	2.5	2.5	2.5
12-23 months	3.4	3.3	3.4
Met MDD (%)	13.8	10.4	12.2
6-11 months	4.5	4.6	4.6
12-23 months	18.6	13.4	16.2
Mean Meal Frequency	5.9	5.4	5.7
6-11 months	5.2	5.0	5.1
12-23 months	6.2	5.7	5.9

**Table 2.** Descriptive characteristics of the children, Philippines, 2018-2019 (continued)

Characteristics	2018 (n=4,730)	2019 (n=4,408)	All (n=9,138)
Met MMF (%)	89.3	91.9	90.6
6-11 months	80.6	88.7	84.5
12-23 months	93.8	93.7	93.7
Met MAD (%)	12.9	9.6	11.3
6-11 months	4.5	4.6	4.6
12-23 months	17.3	12.2	14.9
Children who consumed eggs and meat (%)	48.8	47.2	48.0
6-11 months	19.7	23.7	21.6
12-23 months	63.9	59.6	61.8
Children who consumed sweet beverages (%)	4.7	5.2	5.0
6-11 months	0.9	0.9	0.9
12-23 months	6.7	7.5	7.1
Children with no intake of fruit/vegetable (%)	70.6	72.6	71.5
6-11 months	82.3	83.7	83.0
12-23 months	64.5	66.7	65.5
Meeting age-appropriate feeding practices (%)	20.3	21.1	20.7
Age (in months, %)			
0-5.9	55.4	59.9	57.7
6-8.9	1.8	1.0	1.4
9-11.9	5.2	6.7	5.9
12-23.9	12.3	9.5	11.0
Nutritional status			
Underweight (%)	14.3	13.0	13.7
Stunted (%)	24.1	15.3	19.8
Wasted (%)	7.5	4.2	5.9
Overweight/Obese (%)	3.4	2.6	3.0
<b>Maternal characteristics</b>			
Age (years)			
Mean age	29.1	29.3	29.2
<20 (%)	6.3	7.1	6.7
20-29 (%)	51.2	49.8	50.5
≥30 (%)	42.5	43.2	42.8
Education (%)			
No education/informal education	0.8	2.0	1.3
Elementary	13.2	16.3	14.7
At least high school	58.3	59.6	58.9
At least college	27.7	22.2	25.0
Currently working (%)			
Working	26.7	18.9	22.9
Not working	73.3	81.1	77.1
<b>Household characteristics</b>			
Residence (%)			
Rural	50.5	58.0	54.1
Urban	49.5	42.0	45.9

**Table 2.** Descriptive characteristics of the children, Philippines, 2018-2019 (continued)

Characteristics	2018 (n=4,730)	2019 (n=4,408)	All (n=9,138)
Wealth status (%)			
Poorest	24.1	22.1	23.1
Poor	22.4	23.7	23.1
Middle	21.2	21.9	21.6
Rich	17.7	18.8	18.2
Richest	14.5	13.5	14.0
Food security <sup>†</sup> (%)			
Food secure	34.0	26.4	31.8
Food insecure	66.0	73.6	68.2
Source of drinking water (%)			
Improved	96.8	96.2	96.5
Not improved	3.2	3.8	3.5
Type of latrine (%)			
Water sealed	94.3	93.7	94.0
Not water sealed	2.8	2.7	2.7
No toilet	3.0	3.6	3.3

<sup>†</sup>BMS=breastmilk substitute

<sup>‡</sup>CF= complementary feeding

<sup>§</sup>Mean dietary diversity score was determined based on the eight (8) food groups in the 2021 WHO-IYCF guidelines: breastmilk, grains, roots and tubers and plantains, dairy products, legumes and nuts, flesh foods, eggs, vitamin-A rich fruits and vegetables, and other fruits and vegetables

<sup>¶</sup>Food security was assessed using the HFIAS

The stunting prevalence among children in 2018 and 2019 was about 20%, while 13.7% of children were underweight and 6.0% were wasted. Mothers of the children were predominantly 20 years old and above (93.3%), with a mean age of 29.2 years old; most had a minimum of high school education (58.9%) and were not working (77.1%) at the time of survey. A higher proportion of children were from rural (54.1%) than urban areas (45.9%). Households were almost equally represented across the poorest, poor, and middle-income groups, while a lower proportion of households belonged to the rich (18.2%) and richest (14.0%) income groups. The majority of households were food insecure (68.2%), although almost all households had improved water sources (96.5%) and latrine (94.0%) (Table 2).

Table 3 presents child characteristics according to the constructed age-appropriate feeding practices based on the 2021 WHO-IYCF indicators. Using the index for nutritional status, the mean weight-for-age (WAZ), height-for-age (HAZ), and weight-for-height z-scores (WHZ) were significantly higher among children who adhered to age-appropriate feeding practices (-0.6, -0.7, and -0.2, respectively) compared to those who did not adhere to the recommendations. Significantly, a higher prevalence of stunting (83.1%;  $p<0.001$ ), underweight (84.8%;  $p<0.001$ ), and overweight (67.2%;  $p=0.002$ ) was recorded among children who did not adhere to age-appropriate feeding practices than those who followed the recommendations. Moreover, non-adherence to age-appropriate breastfeeding practices was significantly higher among low-



**Table 3.** Child characteristics by age-appropriate feeding practices index, Philippines 2018-2019

Variables	Adherence to age-appropriate feeding criteria		p-value
	No	Yes	
<b>Child characteristics</b>			
Sex (%)			0.691
Boys	79.0	21.0	
Girls	79.6	20.4	
Nutritional status			
Mean WAZ	-0.8	-0.6	<0.001
Mean HAZ	-1.1	-0.7	<0.001
Mean WHZ	-0.4	-0.2	<0.001
Underweight (%)	84.8	15.2	0.001
Stunted (%)	83.1	16.9	<0.001
Wasted (%)	79.9	20.1	0.823
Overweight/Obese (%)	67.2	32.8	0.002
Birth weight (grams) (%)			0.015
<2500	82.7	17.3	
≥2500	78.8	21.2	
<b>Maternal characteristics</b>			
Age (years) (%)			0.057
<20	76.5	23.5	
20-29	78.5	21.5	
>29	80.6	19.4	
Education (%)			0.001
No education/formal education	90.8	9.2	
Elementary	80.6	19.4	
At least high school	77.7	22.3	
At least college	81.9	18.1	
Others	79.8	20.2	
Currently working (%)			<0.001
Working	86.6	13.4	
Not-working	77.1	22.9	
<b>Household characteristics</b>			
Residence (%)			0.391
Rural	78.8	21.2	
Urban	79.8	20.2	
Wealth status (%)			0.281
Poorest	77.0	23.0	
Poor	78.8	21.2	
Middle	79.3	20.7	
Rich	81.1	18.9	
Richest	81.3	18.7	
Food security <sup>†</sup> (%)			0.411
Food secure	79.7	20.3	
Mildly FI	76.6	23.4	
Moderately FI	78.0	22.0	
Severely FI	80.0	20.0	
Source of drinking water (%)			0.138
Improved	79.4	20.6	
Not improved	76.3	23.7	
Type of latrine (%)			0.123
Water sealed	79.2	20.8	
Not water sealed	84.2	15.8	
No toilet	76.0	24.0	

WAZ, weight-for-age z-score; HAZ, height-for-age z-score; WHZ, weight-for-height z-score; FI, food insecure

<sup>†</sup>Food security was assessed using the HFIAS.

**Table 4.** Association between adherence to age-appropriate feeding practice and mean anthropometric z-scores of children 0-23 months old, Philippines 2018-2019

Status of adherence to age-appropriate feeding practices by z-score	Mean z-score				Bivariate linear regression			
	Mean	SE	95%CI		Coeff	p-value	95%CI	
			LL	UL			LL	UL
WAZ								
No	-0.84	0.03	-0.89	-0.78	reference			
Yes	-0.59	0.04	-0.68	-0.50	0.25***	<0.001	0.15	0.34
HAZ								
No	-1.08	0.04	-1.17	-1.00	reference			
Yes	-0.75	0.05	-0.85	-0.64	0.34***	<0.001	0.25	0.42
WHZ								
No	-0.36	0.02	-0.40	-0.31	reference			
Yes	-0.17	0.05	-0.27	-0.07	0.18**	0.004	0.07	0.30

WAZ, weight-for-age z-score; HAZ, height-for-age z-score; WHZ, weight-for-height z-score

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

birth weight infants (82.7%;  $p=0.015$ ) than among infants with normal birth weight. On the other hand, a higher percentage of adherence was noted among children whose mothers were less than 20 years old, although this was statistically insignificant. Children born from mothers with no formal schooling and were working (9.2%, and 22.9%, respectively;  $p < 0.001$ ) were less likely to adhere to age-appropriate feeding practices. No significant difference was noted between sex and across socio-economic and demographics characteristics in terms of adherence to age-appropriate feeding practices (Table 3).

Table 4 shows the association between adherence to age-appropriate feeding practices and mean z-scores of children 0-23 months old. Children who followed age-appropriate feeding practices had significantly higher mean WAZ at -0.59 (95% CI: -0.68; -0.50), mean HAZ at -0.75 (95% CI: -0.85; -0.65), and mean WHZ at -0.17 (95% CI: -0.27; -0.07) compared to children who failed to meet feeding guidelines. Correspondingly, adherence to age-appropriate feeding practices had a positive effect on mean

WAZ ( $\beta=0.25$ ,  $p < 0.001$ ), HAZ ( $\beta=0.34$ ,  $p < 0.001$ ), and WHZ ( $\beta=0.18$ ,  $p=0.004$ ) of children under two years based on the results of the bivariate analysis.

Regression analysis revealed the predictors of adherence to age-appropriate feeding practices among children 0-23 months old, as shown in Table 5. The likelihood of meeting age-appropriate feeding practices increased as the child grows older, from 6-8.9 months to 12-23.0 months, at OR=0.01 (95% CI=0.01-0.02) to OR=0.09 (95% CI=0.07-0.11), respectively (Table 5). Children with normal birth weight (OR=1.44; 95% CI=1.11-1.86) were more likely to meet age-appropriate feeding practices compared to children with low birth weight. Children born from mothers with an educational attainment of high school level or better (OR=2.45; 95% CI=1.01-5.65) were more likely to meet age-appropriate feeding practices than their counterparts. Children whose mothers were not working (OR=1.97; 95% CI=1.53-2.54) were also more likely to exhibit adherence compared to children whose mothers were working at the time of survey.

**Table 5.** Multivariate regression analysis for predictors of adherence to age-appropriate feeding practices among children 0-23 months old, Philippines, 2018-2019

Variables	Bivariate logistic regression				Multivariate logistic regression			
	Crude OR	p-value	95%CI		Adjusted OR	p-value	95%CI	
			LL	UL			LL	UL
Age (months)								
0-5.9	reference				reference			
6-8.9	0.01***	<0.001	0.01	0.02	0.01***	<0.001	0.01	0.02
9-11.9	0.05***	<0.001	0.03	0.06	0.04***	<0.001	0.03	0.06
12-23.9	0.09***	<0.001	0.07	0.11	0.09***	<0.001	0.07	0.12
Birth weight (grams)								
<2500	reference				reference			
>=2500	1.29*	0.016	1.06	1.57	1.44**	0.009	1.11	1.86
Maternal characteristics								
Education								
No education	reference				reference			
Elementary	2.37	0.084	0.88	6.41	2.09	0.116	0.81	5.38
At least high school	2.83*	0.031	1.11	7.21	2.39*	0.047	1.01	5.65
At least college	2.18	0.108	0.82	5.74	1.96	0.111	0.84	4.55
Others	2.50	0.121	0.76	8.20	2.47	0.173	0.64	9.46
Currently working (%)								
Working	reference				reference			
Not working	1.92***	<0.001	1.53	2.40	1.97***	<0.001	1.53	2.54

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ 

## DISCUSSION

Malnutrition, particularly stunting, underweight, and wasting, was identified as a significant public health concern among young Filipino children under two in the Philippines in 2018-2019. Employing a constructed age-appropriate feeding practices index, this study assessed the impacts of age-appropriate feeding on children at the age recommended for exclusive breastfeeding through the complementary feeding period to a family diet, while also exploring their association with malnutrition prevalence. This represents an initial attempt to consider child feeding practices in terms of appropriateness for

age, including the quality and quantity of complementary meals, as part of the criteria set in the new IYCF guidelines released in 2021 (WHO, 2021).

Study results indicated that more than half of the children below six months of age adhered to age-appropriate exclusive breastfeeding practices, while only a very small proportion of children (1.4%) started complementary feeding following age-appropriate criteria (i.e., breastfeeding with at least two feedings per day and consumption of at least five of eight food groups). Also, continued breastfeeding at 12 months of age while receiving complementary feeding was not common among Filipino children. Thus,

it is important to refocus and reinforce the message to health practitioners to promote appropriate breastfeeding practices in the Philippines. The first two years of an infant's life is the most rapid growth period when breast milk is no longer enough to meet the nutritional requirements of infants; they need to be fed with various types of complementary foods in addition to breast milk. Thus, poor diets and feeding practices play a major role. In fact, research has shown that children in South Asia were more likely to become stunted and wasted if they began their complementary foods too late, consumed too few meals, and lacked dietary diversity (Torlesse & Aguayo, 2018). The findings of a meta-analysis conducted in Bangladesh (Islam *et al.*, 2020) reported that initiation of complementary feeding at or after seven months of age increased the risk of stunting by 1.23 times. This is also consistent with findings in the Philippines where untimely introduction of complementary foods (either too early or too late) increased the child's odds of being stunted by almost twice and of being severely stunted by more than four times (Guirindola, *et al.*, 2021).

Unfortunately, there was a high prevalence of bottle feeding among infants 6-11 months and 12-23 months, ranging from 33.8% to 52.3%, respectively; while less than 60% were exclusively breastfed during the first 6 months. The proportion of infants 6-11 months old receiving complementary feeding along with breast milk was low, as most of them were given a mixed feeding of breast milk and breastmilk substitute, including feeding solely on breastmilk substitute. It is therefore essential to promote breastfeeding practices in the Philippines. The weak enforcement of the Executive Order 51 or the Philippine Milk Code on Marketing of Products related to Infant and Young Child

Feeding, and the growing advertising and physician's recommendations of breastmilk substitute products, were identified as major factors that influenced mother's decision to feed infant formula (Sobel *et al.*, 2011). Moreover, ingestion of unsafe drinking water with bacterial contamination is one of the major causes of diarrhoea (Rodriguez *et al.*, 2011) and this increases the risk of stunting and malnutrition. Bottle feeding with infant formula using unsafe water is therefore an important concern in preventing the risk of undernutrition among infants and young children in the Philippines.

Furthermore, results of the study also underscored the decreasing adherence to the criteria for appropriate daily feeding practices during the transition period from breastfeeding to a regular diet. Adherence to age-appropriate feeding practices was especially affected by the quality of complementary foods, emphasising the lack of diversity in children's diet as shown by a mean DDS of only 3.1, which was below the recommended consumption of at least five of eight food groups. In addition to lack of dietary diversity, more than 80% of the infants and young children did not receive MAD, highlighting that the quality of their diet is still a major concern in the Philippines. Consumption of nutrient-dense foods, such as meat, poultry, fish, egg, and fruits and vegetables, was also low among infants. Indeed, the lack of diversity in complementary foods given to infants and young children, rather than the number of meals consumed, was the main bottleneck of not meeting the international recommendation for MAD.

The limited capacity to provide quality complementary foods to young children as measured by MAD can have irreversible impacts on the mental and physical growth of children, which can lead to poor cognitive development and

limited opportunities for work throughout life. This corroborates with the finding of this study where adherence to the recommended age-appropriate feeding practices was positively associated with child growth. In particular, Filipino children who adhered to the recommended practices had significantly higher mean z-scores (WAZ, HAZ, and WHZ) as opposed to those who did not. Correspondingly, a higher prevalence of stunting, underweight, and overweight was noted among children who failed to adhere to age-appropriate feeding practices relative to those who observed the recommended practices. Several studies have documented the positive association between dietary diversity indicator and child anthropometry (Jones *et al.*, 2014; Mallard *et al.*, 2014; Ruel, Harris & Cunningham, 2013), particularly on linear growth (HAZ), and in some cases, for WHZ and WAZ (Mallard *et al.*, 2014; Ruel *et al.*, 2013). In addition, a pooled analysis of 14 demographic and health survey data sets (2003–2006) from Africa and South Asia showed that among infants 6–8 months of age, consumption of solid foods was associated with a lower risk of both stunting and underweight (Marriot *et al.*, 2012). In their model for children 6–23 months of age, Marriot *et al.* (2012) found that meeting MDD, consuming iron-rich foods, and achieving MAD were also associated with a lower risk of both stunting and underweight. Meanwhile, consuming the recommended minimum number of meals was associated only with underweight prevalence.

A final aim of the study was to identify factors affecting adherence to age-appropriate feeding practices in children under two. The positive association between a child's age and adherence to age-appropriate feeding showed the poorer quality of feeding practices among youngest infants (0–

5.9 months), who were supposed to be receiving exclusive breastfeeding, compared to older infants six months and above. This could be explained in the context of complementary feeding; wherein older children were more likely to increase their intake of semi-solid and solid foods than younger children 6–8.9 months old. This is not surprising since semi-solid and solid foods are usually introduced gradually and stomach capacity at six months is relatively limited. This result is consistent with studies in Benin Africa (Mitchodigni *et al.*, 2017), West Africa (Isaaka *et al.*, 2014), and Ethiopia (Melkam *et al.*, 2013). In addition, children with perceived normal birth weight were more likely to adhere to appropriate feeding practices. Specifically, a higher likelihood of meeting DDS, MMF, and MAD was related to children having average or above-average birth weight. This could be influenced by the belief that children with below-average birth size may have lesser capacity for digestion.

The mother's education level was identified as a very important predictor of adherence, suggesting that mother's literacy and household living standards are the main drivers of a child's adherence to appropriate feeding practices. A study in Cambodia (Hondru *et al.*, 2020) noted that while household living standards could be improved, higher educational attainment among mothers was associated with better feeding practices and growth outcomes, owing to educated mothers having better access to information, services, and materials promoting appropriate feeding practices. The same trend has been reported in Poland (Kostecka, Jackowska & Kostecka, 2020) where older and better educated mothers were more likely to exclusively breastfeed their children for a longer period than younger mothers. A significant association

was also found between the education status of mothers and appropriate complementary feeding practices in a study conducted in Ethiopia (Demilew, Tafere & Abitew, 2017; Mekonnen *et al.*, 2021), which the authors assumed was attributable to better comprehension of nutrition education among educated mothers as opposed to those who had less educational opportunities or had no formal schooling. The authors also highlighted that educated mothers were more likely to read books, flyers, and other forms of educational materials about IYCF. Evidence from literature and the results of this study support the need for interventions among mothers to improve feeding practices with a holistic view on health and nutrition to address malnutrition among young children.

Similar to the Bangladesh study (AffifaTanny *et al.*, 2019), our results revealed that non-working mothers or housewives were more likely to adhere to appropriate feeding practices than working mothers. For instance, although exclusive breastfeeding was more prevalent among the group of working mothers with infants up to 3 months old compared to the group of housewives; housewives with infants up to six months old, however, practised exclusive breastfeeding more than working mothers. This was attributed to working mothers' inability to sustain exclusive breastfeeding due to insufficient knowledge regarding expressed breast milk feeding and unfavourable working environment that discourages breastfeeding. Indeed, developing better awareness on the importance of exclusive breastfeeding practices, nutritious and diverse complementary foods, and putting efforts in communicating the age-appropriate feeding practices to meet their nutritional needs are key.

### **Strengths and limitations of the study**

The main strength of this study relates to the large number of study participants covered in the ENNS 2018 and 2019, which described population trends and produced valuable evidence. Data collection methods, including anthropometric and dietary assessments from which IYCF indicators were derived, followed international standard protocols to ensure measurement accuracy.

Several limitations were noted in this study. Dietary intake estimates using the 24-hour recall for infants and young children were based on reports by parents and may have included inaccuracies, leading to over- or under-estimation of food intakes. Another limitation of the 24-hour food recall is the possibility that the entire dimension of feeding practices, as well as the presence of other risk factors, cannot be fully captured. Additionally, the risk of misclassification and social desirability biases during interviews must be considered.

### **CONCLUSION**

High prevalences of stunting, underweight, and wasting were revealed as significant public health concerns among young Filipino children under two in 2018 and 2019. Meanwhile, low adherence to age-appropriate feeding practices based on feeding guidelines remains a major concern among children 0-23 months of age. Children's adherence to age-appropriate feeding practices index was significantly associated with anthropometric growth, wherein mean z-scores (WAZ, HAZ, and WHZ) were found to be higher among children who adhered to age-appropriate feeding practices than those who did not. Indicators, such as child's age and birth weight, as well as the mother's



educational attainment and working status, were found to significantly influence the likelihood of adherence.

These findings can provide guidance to IYCF programme planners and implementers in revisiting and developing a comprehensive national infant and young child feeding strategic plan to address micronutrient deficiency and growth faltering during the first 1,000 days. Firstly, awareness campaigns on the importance of adherence to age-appropriate breastfeeding and complementary feeding should be intensified as a potential intervention to reduce the risk of undernutrition. Secondly, activities to improve education level, as well as the health knowledge and practices of women across the country is crucial. Lastly, optimal breastfeeding practices should be promoted while the quality of complementary feeding practices should be enhanced by increasing diversity, meal frequency, and overall acceptability to ensure optimum child growth and development among Filipino infants and young children 0-23 months of age.

#### Acknowledgment

The authors thank the DOST regional and provincial offices for their support during the pre-survey coordination meetings and field data collection, as well as the provincial, city, and municipal governments, including barangay officials and local survey aides, for their direct assistance during field data collection in their respective localities. Gratitude is also extended to all DOST-FNRI technical, non-technical, and field-level staffs for their contribution and untiring efforts towards bringing the 2018-2019 ENNS into fruition.

#### Authors' contributions

EAG, conceived, carried out the study, reviewed and edited the manuscript; MLVM, analysed and interpreted the data. All authors read and approved the manuscript.

#### Competing interest

The authors declare that they have no competing interests.

#### References

- AffifaTanny S, Mamun ASMA, Sabiruzzaman Md & Hossain MdG (2019). Factors influencing exclusive breastfeeding practice in Bangladesh: Multiple logistic regression analysis, *Proceedings of the 7th International Conference on Data Science and SDGs; Bangladesh, India. 18–19 December 2019*. From [http://www.ru.ac.bd/stat/wp-content/uploads/sites/25/2020/03/ICDSSDG\\_COR-2019\\_paper\\_34F.pdf](http://www.ru.ac.bd/stat/wp-content/uploads/sites/25/2020/03/ICDSSDG_COR-2019_paper_34F.pdf) [Retrieved October 28 2021].
- Demilew YM, Tafere TE & Abitew DB (2017). Infant and young child feeding practice among mothers with 0–24 months old children in slum areas of Bahir Dar City, Ethiopia. *Int Breastfeed J* 12:26. From <https://doi.org/10.1186/s13006-017-0117-x> [Retrieved October 28 2021].
- Dewey KG & Adu-Afarwuah S (2008). Systematic review of the efficacy and effectiveness of complementary feeding interventions in developing countries. *Matern Child Nutr* 4(s1):24-85. From <https://doi.org/10.1111/j.1740-8709.2007.00124.x> [Retrieved August 20 2021].
- DOH (2005). *Infant and young child feeding*. Department of Health Philippines. From <https://doh.gov.ph/infant-and-young-child-feeding>. [Retrieved November 5 2021].
- DOST-FNRI (2020). *Philippine Nutrition Facts and Figures: 2018 Expanded National Nutrition Survey (ENNS)*. Department of Science and Technology-Food and Nutrition Research Institute, FNRI Bldg., DOST Compound, Gen. Santos Ave., Taguig City, Philippines.
- Guirindola MO, Goyena EA & Valdeabella MLV (2021). Risk factors of stunting during the complementary feeding period 6-23 months in the Philippines. *Mal J Nutr* 27(1):123-140. From <https://nutriweb.org.my/mjn/2021.php> [Retrieved July 19 2022].
- Hondru LA, Wieringa FT, Poirot E, Berger J, Christensen DL & Roos N (2020). Age-appropriate feeding practices in Cambodia and the possible influence on the growth of the children: A longitudinal study. *Nutrients* 12(1):12. From <https://doi.org/10.3390/nu12010012> [Retrieved October 1 2021].
- Islam MS, Zafar Ullah AN, Mainali S, Imam MA & Hasan MI (2020). Determinants of stunting during the first 1,000 days of life in Bangladesh: A review. *Food Sci Nutr* 8(9):4685-4695. From doi: 10.1002/fsn3.1795. PMID: 32994930; PMCID: PMC7500796 [Retrieved July 1 2022].

- Issaka AI, Agho KE, Burns P, Andrew P & Dibley MJ (2014). Determinants of inadequate complementary feeding practices among children aged 6-23 months in Ghana. *Public Health Nutr* 18(4):669-678. From <https://doi.org/10.1017/s1368980014000834> [Retrieved October 16 2021].
- Jones AD, Ickes SB, Smith LE, Mbuya MNN, Chasekwa B, Heidkamp RA, Menon P, Zongrone AA & Stoltzfus RJ (2014). World Health Organization infant and young child feeding indicators and their associations with child anthropometry: A synthesis of recent findings. *Matern Child Nutr* 10(1):1-17. From <https://doi.org/10.1111/mcn.12070> [Retrieved October 1 2021].
- Kostecka M, Jackowska I & Kostecka J (2020). Factors affecting complementary feeding of infants. A pilot study conducted after the introduction of new infant feeding guidelines in Poland. *Nutrients* 13(1):61. From <https://doi.org/10.3390/nu13010061> [Retrieved October 1 2021].
- Mallard SR, Houghton LA, Filteau S, Mullen A, Nieuwelink J, Chisenga M, Siame J & Gibson RS (2014). Dietary diversity at 6 months of age is associated with subsequent growth and mediates the effect of maternal education on infant growth in urban Zambia. *J Nutr* 144(11):1818-1825. From <https://doi.org/10.3945/jn.114.199547> [Retrieved October 1 2021].
- Marriott BP, White A, Hadden L, Davies JC & Wallingford JC (2012). World Health Organization (WHO) infant and young child feeding indicators: associations with growth measures in 14 low-income countries. *Maternal and Child Nutrition* 8(3):354-370. From <https://doi.org/10.1111/j.1740-8709.2011.00380.x> [Retrieved October 1 2021].
- Mekonnen M, Kinati T, Bekele K, Tesfa B, Hailu D & Jemal K (2021). Infant and young child feeding practice among mothers of children age 6 to 23 months in Debrelibanos district, North Showa zone, Oromia region, Ethiopia. *PLoS ONE* 16(9):e0257758. From <https://doi.org/10.1371/journal.pone.0257758> [Retrieved October 15 2021].
- Melkam A, Molla M, Zelalem B & Azeb A (2013). Dietary diversity and meal frequency practices among infant and young children aged 6-23 months in Ethiopia: A secondary analysis of Ethiopian demographic and health survey 2011. *J Nutr Metab* 2013:1-8. <https://doi.org/10.1155/2013/782931> [Retrieved October 10 2021].
- Mitochondigni IM, Hounkpatin AW, Ntandou-Bouzitou G, Avohou A, Termote C, Kennedy G & Hounhouigan J (2017). Complementary feeding practices: determinants of dietary diversity and meal frequency among children aged 6-23 months in Southern Benin. *Food Sec* 9:1117-1130. From <https://doi.org/10.1007/s12571-017-0722-y> [Retrieved April 18 2021].
- NNC (2017). *Philippine Plan of Action for Nutrition 2017-2022: An urgent call to action for Filipinos and its leadership*. National Nutrition Council. From [https://www.nnc.gov.ph/phocadownloadpap/PPAN/18Sept\\_PPAN2017\\_2022Executive%20Summary.pdf](https://www.nnc.gov.ph/phocadownloadpap/PPAN/18Sept_PPAN2017_2022Executive%20Summary.pdf) [Retrieved April 18 2021].
- Rodríguez L, Cervantes E & Ortiz R (2011). Malnutrition and gastrointestinal and respiratory infections in children: a public health problem. *Int J Environ Res Public Health* 8(4):1174-205. doi: 10.3390/ijerph8041174 [Retrieved July 19 2022].
- Ruel MT, Harris J & Cunningham K (2013). Diet quality in developing countries. In VR. Preedy, L. Hunter, & V. Patel (Eds.). *Diet Quality. An Evidence-Based Approach, Volume 2, Nutrition and Health* (pp. 239-261). New York, NY: Springer.
- Sobel HL, Iellamo A, Raya RR, Padilla AA, Olivé JM & Nyunt-U S (2011). Is unimpeded marketing for breast milk substitutes responsible for the decline in breastfeeding in the Philippines? An exploratory survey and focus group analysis. *Soc Sci Med* 73(10):1445-1448. From <https://doi.org/10.1016/j.socscimed.2011.08.029> [Retrieved July 19 2022].
- Som SV, Prak S, Laillou A, Gauthier G, Berger J, Poirot E & Wieringa FT (2018). Diets and feeding practices during the First 1000 Days window in the Phnom Penh and North Eastern Districts of Cambodia. *Nutrients* 10(4):500. From <https://doi.org/10.3390/nu10040500> [Retrieved October 10 2021].
- StataCorp (2017). *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LLC.
- Torlesse H & Aguayo VM (2018). Aiming higher for maternal and child nutrition in South Asia. *Matern Child Nutr Suppl* 4(Suppl 4):e12739. doi: 10.1111/mcn.12739 [Retrieved July 19 2022].

WHO (2021). *Assessing infant and young child feeding*. World Health Organization, Washington, DC. From <https://www.who.int/publications-detail-redirect/9789240018389> [Retrieved June 5 2021].

WHO (2008). *Indicators for Assessing Infant and Young Child Feeding Practices Part I: Definition*. World Health Organization, Geneva, Switzerland. ISBN 978-9-24-159666-4. From [https://apps.who.int/iris/bitstream/handle/10665/43895/9789241596664\\_eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/43895/9789241596664_eng.pdf) [Retrieved April 18 2021].

WHO (2006). *The WHO Child Growth Standards*. Retrieved from <http://www.who.int/childgrowth/en> [Retrieved April 16 2021].