ORIGINAL ARTICLE

Factors Associated with Stunting among Infants and Young Children in the Fourth District of Camarines Sur, Philippines

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ABSTRACT

Objective. This study aimed to investigate the determinants linked to stunting among infants and young children aged 0-23 months in the Fourth District of Camarines Sur.

Methods. An analytical cross-sectional study was conducted among 628 primary caregivers with infants and young children aged 0-23 months in four municipalities of the Fourth District of Camarines Sur, Philippines, using a two-stage stratified random sampling design. Data on sociodemographic and economic factors were collected through face-to-face interviews. Infant and young child feeding (IYCF) indicators were assessed using a list-based approach, while weight and length were evaluated using the World Health Organization Anthro Plus software. Descriptive statistics and multiple logistic regression were done using R statistical software version 4.3.1.

Results. The study revealed that the prevalence of stunting was of significant public health concern, reaching 42.8%. Holding other variables constant, age of the child (OR=0.77; 95% CI: 0.63-0.94), having college undergraduate mothers (OR=0.26; 95% CI: 0.05-1.28), and belonging to a poor income household (OR=0.40; 95% CI: 0.14-0.88) were associated with stunting among infants aged 0.01-6.00 months. Moreover, after controlling for the confounding effects of other variables, age (OR=1.09; 95% CI: 1.05-1.14) and sex of the child (OR=1.55; 95% CI: 1.05-2.28) were associated with stunting among older children aged 6.00-23.99 months.

Conclusion. This study emphasizes the challenge of stunting in the Fourth District of Camarines Sur. None of the IYCF indicators were associated with stunting; however, maternal education, the child's age, sex, and socioeconomic status were identified as significant factors influencing stunting. Addressing these determinants through targeted interventions focusing on improving maternal education and enhancing socio-economic conditions were crucial to reducing stunting in the study areas.

Keywords: growth disorders, risk factors, nutritional status, infant nutrition disorders

INTRODUCTION

Stunting is the most prevalent form of malnutrition globally, affecting 149 million children under the age of 5.[1,2] With approximately one-third of Filipino children affected by stunting, the Philippines ranks among the top 10 countries with the highest stunting prevalence in the world.[3] Characterized by failure to thrive in children under five years due to chronic malnutrition and frequent infections, stunting can lead to growth and development challenges in children, impacting their overall health and well-being.[2,4-6]

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Inappropriate infant and young child feeding (IYCF) practices, influenced by factors such as the availability of nutrient-dense foods, maternal knowledge, and cultural beliefs, are the major causes of stunting in children.[7] Different socio-demographic and economic factors play a crucial role in influencing stunting among children.[8,9] Household income and living conditions significantly impact stunting, with children from lower-income families and poor living environments more susceptible to stunting.[10,11] Maternal education was identified as the most significant predictor of chronic malnutrition, as mothers with higher education levels and better nutrition practices tend to provide better care and feeding for their children.[11-13] Child factors, such as frequency of illnesses, further contribute to the risk of stunting.[14,15]

Aside from socio-demographic and economic factors, caregivers' IYCF practices remain a significant factor affecting the nutritional status of infants and young children. The role of exclusive breastfeeding for the first six months of life was fully documented in several studies.[16-18] However, breast milk alone may not meet the recommended nutritional needs of the child from six months onwards, necessitating the introduction of complementary foods.[19] Promoting continuous breast-feeding and appropriate complementary feeding from six months of age is crucial to prevent stunting.[20] Meeting the daily energy requirements for infants at different ages proves essential to support their growth and development. [6,21]

Adherence to IYCF guidelines and recommendations remains a significant challenge in Camarines Sur, adversely affecting children's growth and nutritional status.[22] The prevalence of stunting is particularly concerning, with three out of ten children affected, and rates are significantly higher among households classified as poor compared to non-poor households.[22] However, there is currently a dearth of research investigating the specific factors contributing to stunting in Camarines Sur.

The identified factors contributing to stunting highlight the significant influence of IYCF practices on the child's health. Despite numerous studies, limited local research was done on using new IYCF indicators in the Philippines.[23] Thus, this study aimed to assess the factors associated with stunting in children aged 0 to 23 months living in the Fourth District of Camarines Sur.

MATERIALS AND METHODS

Study Design

An analytic cross-sectional design was used to determine the factors associated with stunting among infants and young children in the Fourth District of Camarines Sur. This design allows to estimate the prevalence of stunting and describe the IYCF practices of caregivers in the study areas. Also, this design can provide evidence of the different factors related to stunting in the study areas. Given the cross-sectional study design, this study cannot determine causality.

Study Setting

Stunting was classified as a "high" public health concern in the province.[22] The area also faces significant challenges with food insecurity, with seven out of ten households in Camarines Sur experiencing acute food insecurity. Moreover, chronic food insecurity affects four out of ten households, with a higher prevalence among those with lower wealth status.[22] Among the districts in Camarines Sur, the Fourth District stands out as the most economically disadvantaged.[24] Despite its abundance of natural resources, approximately 100,000 households in this district are low-income earners. Food security remains a challenge despite efforts to increase the food supply.[25]

The Fourth District also has a higher number of municipalities situated in rural areas, including Caramoan, Garchitorena, Goa, Lagonoy, Presentacion, Sagñay, San Jose, Siruma, Tigaon, and Tinambac. These municipalities are located near the Pacific Ocean and Maqueda Channel, making them susceptible to the impact of severe tropical cyclones that frequently form in the eastern or southeastern regions of the country. A substantial part of the fourth district is situated along the eastern seaboard (Figure 1).[26]

Sampling Design and Sample Size

A total of 628 primary caregivers were selected using a two-stage stratified random sampling design. Four municipalities, namely Tinambac, Presentacion, Sagnay, and Lagonoy, were drawn from the ten municipalities in the Fourth District. Barangays were stratified into rural and urban categories to ensure equal representation, with 31 barangays selected overall. Using the Master List of the 2023 *Operation Timbang* Plus in each selected barangays, simple random sampling was used to determine the child included in the survey.

Due to the limited information regarding the current population size of infants and young children aged 0–23 months in the Fourth District, the study utilized a sample size calculation formula for estimating the sample size under the assumption of an unknown population size.

$$n = \frac{z_{(\alpha/2)}^2\, p(1-p)}{e^2}$$

Where p = hypothesized population proportion of stunted infants, $z_{(\alpha/2)} = [1 - (\alpha/2)]100^{th}$ percentile from the standard normal distribution, e = margin of error, and $\alpha = 0.05$ is the level of significance. Assuming a margin of error of 4%, the minimum required sample size is given by:

$$n = \frac{1.96^2\,(0.142)(1-0.142)}{0.04^2}$$

$$n = 292.53 \approx 293 \text{ participants}$$

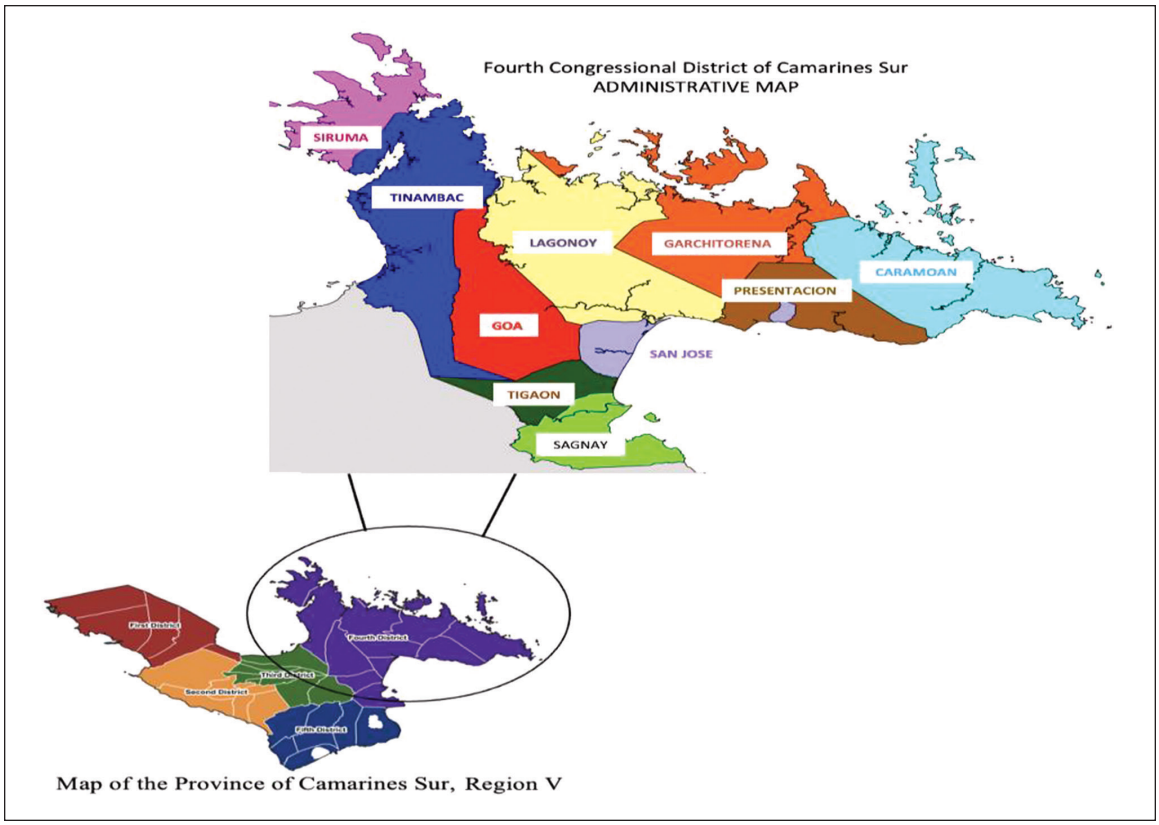

Figure 1. Geographical map of the 4th district of Camarines Sur.

Source: Excerpt from PDA. Annual Report: Partido Development Administration created under R.A. 7820, 2013.[26]

The prevalence of stunted children, hypothesized at 14.2%, was used as the population proportion. The minimum sample size determined for the study was 293 households. However, accounting for the design effect and potential attrition, the final required sample size was 645 primary caregivers with children aged 0-23 months.

Study Participants

The primary respondents were the mothers or caregivers of the children with at least one year of residence in the study areas. In cases when two Infants and Young Children (IYC) aged 0-23 months were in a household, the youngest served as the reference child. The mothers or caregivers voluntarily signed the informed consent form for their participation. Minors and teenage mothers, Persons with Disabilities (PWD), and those who had difficulty answering the questionnaire were also excluded from this research. Lastly, children who were ill and diagnosed with congenital, physical, or mental disabilities during the data collection period were also excluded. If a selected household was unavailable to participate, data collection moved to the next household on the random sampling master list. Data collection took place from January to February 2024.

Research Instruments

Socio-demographic and Economic Variables

The researcher collected data on several socio-demographic and economic variables. Maternal factors investigated included educational attainment and employment status. Child-related variables encompassed date of birth, morbidity status, and living arrangements. Household characteristics examined included the sex of the household head, availability of water supply, and food security status, assessed using the Household Food Insecurity Access Scale (HFIAS).

Anthropometric Assessment

Prior to data collection, the weighing scale was calibrated using standard weights to ensure accurate measurements. Similarly, the height board was calibrated using a standardized metal rod. The study used the protocol of Gibson to evaluate the height/length-for-age.[27] This was calculated and assessed individually using World Health Organization (WHO) Anthroplus Software. To ensure accurate calculations, the weights and lengths must be entered in kilograms with a maximum of two decimal places. The software utilized this inputted data to generate Z-scores, which are scores that indicate how a child's measurement compares to the international standards for their age group.

IYCF Practices

This part evaluates the current IYCF practices of the caregivers following the guidelines based on the technical guide of WHO and United Nations Children's Fund (UNICEF).[23] Among households with 0.01-5.99 months IYC, the following questions were asked:

- Ever breastfed – Infants who suckled at the mother's breast or have drank milk that had been expressed by the mother or received milk from another woman regardless of how long or how frequently they were breastfed.
- Early initiation of breastfeeding – The child was given the opportunity to feed at the mother's breast or "being put to the breast" within one hour after birth.
- Exclusively breastfed for the first two days after birth – Infants who were fed exclusively with breast milk for the first two days after birth.
- Exclusive breastfeeding under six months – Infants who were fed exclusively with breast milk.
- Bottle feeding – Infants who were fed from a bottle with a nipple.

In addition, the following questions were asked among caregivers with IYC aged 6.0-23.99:

- MDD – IYC who consumed foods and beverages from at least five out of eight defined food groups.
- MMF – Children who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more.
- MMFF for non-breastfed children who consumed at least two milk feeds.
- MAD – IYC who consumed a minimum acceptable diet during the previous day.
- Egg and/or flesh food consumption – Children who consumed egg and/or flesh food.
- Sweet beverage consumption – Children who consumed a sweet beverage.
- Unhealthy food consumption – Children who consumed sentinel unhealthy foods.
- Zero vegetable or fruit consumption – Children who did not consume any vegetables or fruits.

Data Collection Procedure

Request letters were sent to the Municipal Mayors of the study areas to seek permission to conduct the study and to coordinate with the Rural Health Units (RHUs) and barangay units. The researcher requested the Municipal Nutrition Action Officer (MNAO) and the midwife in the barangays for the OPT Plus 2023 and information on immunized children. This data was utilized to create a master list of IYC aged 0-23 months. Before the actual data collection, a pretest was conducted on 20 mothers at Sagnay, Camarines Sur.

Once the children were selected and consent was obtained from primary caregivers, all eligible subjects were registered based on household, sex, age, date, and identification number. A trained data collector went to each selected household and interviewed the primary caregivers of IYC 0-23 months using a structured questionnaire collecting information on sociodemographic and economic factors, anthropometric measurements, and IYCF indicators.

Data Analysis

Data analysis was performed using R statistical software version 4.3.1. Frequencies and proportions were reported to describe the demographic and socio-economic characteristics of children and their household, prevalence of stunting among children aged 0-23 months, and IYCF practices of mothers and caregivers. The 95% confidence intervals were also presented. Binary logistic regression was used to determine the crude association of the socio-demographic and economic and feeding practices with stunting.

A full model was developed using backward stepwise regression. The model incorporated significant IYCF practices and identified confounding variables to estimate adjusted ORs while controlling for confounding effects and effect measure modification of other variables. Only variables with a significance level of $p<0.05$ were retained in the final model, ensuring the validity of the associations identified.

Ethical Considerations

Participants in the study were adequately informed about the research through detailed informed consent forms. Ethical clearance was obtained from the University of the Philippines Manila Research Ethics Boards (UPM REB 2023-0663-01).

RESULTS

Characteristics of the Households and Prevalence of Stunting among IYC in the Study Areas

A total of 628 primary caregivers with IYC from the four municipalities in the Fourth District of Camarines Sur participated in this study. Table 1 shows that 71.2% of the participants were aged between 6.00 to 23 months, with girls comprising over half (52.1%). A majority (54.6%) of the IYC reported an illness in the past month. Additionally, 78.7% of the IYC resided with both parents, and predominantly (78.5%) households were headed by men. Among mothers, 57.2% attained at least a high school level education, though the majority (72.0%) were unemployed.

Meanwhile, 60.0% of the households relied on a centralized water system for their water supply. Most households belonged to the poor quintile (83.8%), while only a few belonged to the middle quintile (16.2%). Nearly forty percent of households (38.5%) experienced moderate food insecurity, while less than a quarter (22.8%) were food secure. Assessment of the children's length for their age revealed that 42.8% of IYC were stunted (Table 1).

Table 1. Socio-economic Characteristics and Prevalence of Stunting in the Fourth District of Camarines Sur, 2024

Demographic characteristics of the participants	n=628	%
Sex of the child		
Male	301	48.0
Female	327	52.1
Age group, in months		
0 to 5.99	181	28.8
6.00 to 23	447	71.2
Experienced illness for the past month		
Yes	343	54.6
No	285	45.4
Living status of the children		
Living with both parents	494	78.7
Living with one parent	96	15.3
Living with other caregivers or relatives	38	6.0
Educational attainment of mother		
College Graduate	71	11.3
College undergraduate	62	9.9
Others (Vocational/ALS)	13	2.1
High school level or graduate	359	57.2
Elementary level or graduate	120	19.1
No formal education	3	0.5
Employment status of mother		
Employed	176	28.0
Unemployed	452	72.0
Sex of the household head		
Male	493	78.5
Female	135	21.5
Household monthly income		
Middle class	102	16.2
Poor	526	83.8
Household water supply		
Centralized	377	60.0
Decentralized	251	40.0
Household food insecurity category		
Food secure	143	22.8
Mildly food insecure	141	22.4
Moderately food insecure	242	38.5
Severely food insecure	102	16.2
Length-for-age		
Stunted	269	42.8
Not stunted	359	57.2

Association of Feeding Practices with Stunting among IYC

Two separate analyses were made to determine the factors associated with stunting among infants less than six months and IYC 6 to 23 months old in the study areas. This is because of the difference in the indicators being used for each age group.

Infants aged 0.01-5.99 Months

Age and maternal education attainment were significant factors associated with stunting among infants aged 0.01-5.99. The odds of being stunted decreased by 21% less likely as the child's age increased (OR=0.79; p=0.02). Moreover, mothers who achieved college level had 80% lower odds of having stunted children than those who were college graduates (OR = 0.20; p = 0.04) (Table 2).

IYC aged 6.00-23.99

Bottle feeding emerged as the sole IYCF practice associated with stunting. Children who were bottle-fed were 72% more likely to be stunted than those who were not bottle-fed (OR=1.72; p=0.01). Moreover, mothers with an elementary level or graduate education had 2.06 times higher odds of having stunted children compared to college graduate mothers (OR=2.06; p=0.05). Male infants and young children had a 54% increased odds of being stunted compared to their female counterparts (OR=1.54; p=0.02). Additionally, for every one-month increase in age, there was a 9% increased odds of being stunted (OR=1.09; p=<0.00) (Table 3).

Factors Associated with Stunting among IYC 0-23 Months Old

It was observed that none of the IYCF indicators were associated with stunting among infants aged 0.01-5.99 months. Nevertheless, mothers who were college undergraduates were 74% less likely to have stunted children than mothers who were college graduates (aOR=0.26; p=0.03). Further, for every one-month increase in age, infants had 23% lower odds of being stunted (aOR=0.77; p=0.01). The odds of being stunted was 65% lower among children who belonged to the poor households compared to those from the middle-class quintile (aOR=0.35; p=0.03). Among children aged 6.00-23 months, each month increase in the age of IYC corresponded to a 9% greater likelihood of experiencing stunted growth (aOR=1.09; p=<0.00). Moreover, boys exhibited a 55% higher likelihood of being stunted compared to girls (aOR=1.55; p=0.03) (Table 4).

DISCUSSION

The present study was conducted in the Fourth District of Camarines Sur involving 628 primary caregivers with IYC. Most of the IYC who took part in the study were between 6 to 23 months old, with girls making up more than half of the participants. This stage of development is crucial for children to embrace nutritious foods and drinks, and form lasting dietary habits. It aligns with the peak period of vulnerability to stunted growth and inadequate nutrient intake.[20] The data indicates significant health challenges, where more than half of the IYC reported an illness in the past month. As outlined in the UNICEF theoretical framework, illness stands as one of the immediate causes of malnutrition due to inadequate intake of both macro and micronutrients.[28]

In this study, the majority of the IYC lived with both parents, and were headed by men. Despite a relatively high percentage of mothers having at least a high school

Table 2. Crude Association of IYCF Indicators, Socio-demographic Characteristics, with Stunting among Infants Aged 0.01-5.99 Months

Independent variables	Stunting	
	OR (95% CI)	*p*
Early initiation of breastfeeding		
Immediately (n=152)	1	–
Not immediately (n=29)	1.85 (0.83-4.12)	0.13
Exclusively breastfed for the first two days after birth		
Yes (n=143)	1	–
No (n=38)	1.05 (0.50-2.21)	0.89
Exclusively breastfed during the first 6 months		
Yes (n=104)	1	–
No (n=77)	1.80 (0.11-29.21)	0.68
Use of bottle feeding		
Not bottle fed (n=115)	1	–
Bottle fed (n=66)	1.14 (0.61-2.14)	0.68
Household food insecurity	1.03 (0.96-1.11)	0.36
Area of residence		
Inland Barangay (n=96)	1	–
Coastal barangay (n=85)	0.64 (0.35-1.19)	0.16
Water supply		
Centralized (n=110)	1	–
Decentralized (n=71)	0.86 (0.46-1.60)	0.64
Household monthly income		
Middle class (n=34)	1	–
Poor (n=147)	0.48 (0.23-1.03)	0.06
Sex of the household head		
Male (n=145)	1	–
Female (n=36)	1.17 (0.55-2.49)	0.68
Living status of the children		
Living with both parents (n=154)	1	–
Living with one parent (n=25)	1.01 (0.42-2.44)	0.98
Living with other caregivers or relatives (n=2)	0.56 (0.40-0.77)	0.68
Educational attainment of mother		
College graduate (n=20)	1	–
College undergraduate (n=21)	0.20 (0.05-0.91)	0.04*
Others (Vocational/ALS) (n=6)	1.22 (0.20-7.59)	0.83
High school level or graduate (n=99)	0.67 (0.25-1.77)	0.42
Elementary level or graduate (n=35)	0.92 (0.30-2.77)	0.88
No formal education (n=0)	–	–
Employment status of mother		
Employed (n=41)	1	–
Unemployed (n=140)	0.84 (0.41-1.72)	0.64
Sex of the child		
Female (n=82)	1	–
Male (n=99)	1.15 (0.62-2.12)	0.65
Age, in months	0.79 (0.65-0.96)	0.02*
Experienced illness for the past month		
No (n=108)	1	–
Yes (n=73)	0.65 (0.35-1.23)	0.18

**significant at the 0.05 level of significance*

education, a significant proportion were unemployed. This lack of employment among mothers could limit household income and access to nutritious food, thereby influencing the high rates of stunting observed.[29] Sixty percent of the households relied on a centralized water system, which is essential for reducing waterborne diseases that can exacerbate malnutrition.[11] However, the majority of these households were economically disadvantaged. Food insecurity was closely linked to livelihood security, where income played a crucial role in ensuring regular access to sufficient safe and nutritious food for normal growth development and maintaining an active and healthy lifestyle.[30,31]

The study revealed that stunting affected 42.8% of the IYC in the Fourth District of Camarines Sur, indicating severe chronic malnutrition with long-term impacts. Stunting prevalence in the district far exceeded provincial and national rates of 32.4% and 21.6%, respectively.[32] The prevalence of stunting has declined throughout the years, and, as of 2022, 148.1 million children under the age of five suffer from stunting. However, projections were suggestive that there will be a rise in the coming years. This concern can possibly hinder the goals of SDG 2 by 2030 target for ending hunger and food insecurity.[31]

The only feeding practice that showed significant association with stunting was bottle feeding in IYC aged 6.00-23.99 months. These findings emphasize the importance of breastfeeding, which potentially reduces the risk of stunting. Research studies have provided strong evidence that at least four months of breastfeeding can offer immunological protection against certain diseases that commonly occur during childhood. Previous research that examined the composition of human milk highlighted that human breast milk contains several components that support the immune system of infants, including direct-acting antimicrobial factors, anti-inflammatory factors, and immunomodulating bioactive compounds.[33]

There was no significant relation between the feeding practices and the prevalence of stunting in the final models for both age groups. Nonetheless, the results suggest that stunting was less likely to occur when the infant grows and develops through the months. Similar findings were reported by Rakotomanana et al., in which stunting was not associated with any of the complementary feeding indicators.[34] This suggests that improvement in complementary feeding may not prevent stunting in children less than two (2) years of age. While the WHO IYCF indicators are essential in monitoring the global trends over time, the tool simplifies the complexity of child feeding. Stronger measures of dietary quality will be needed to determine the associations between stunting and infant feeding indicators.[35]

The multivariable analysis showed that as the age of infants less than six months increases, the likelihood of stunting decreases. The finding suggests that older infants are less likely to experience stunting compared to younger infants. The child age group consistently demonstrated correlations

Table 3. Crude Association of IYCF Indicators, Socio-demographic Characteristics, with Stunting among Infants and Young Children Aged 6.00-23.99 Months

IYCF practices and socio-demographic profile	Stunting	
	OR (95% CI)	*p*
Minimum diet diversity		
Achieved (n=103)	1	–
Not Achieved (n=344)	0.90 (0.58-1.40)	0.65
Minimum meal frequency		
Achieved (n=338)	1	–
Not Achieved (n=109)	0.79 (0.51-1.23)	0.30
Minimum milk feeding frequency for non-breastfed children		
Achieved (n=135)	1	–
Not Achieved (n=312)	1.11 (0.74-1.68)	0.59
Minimum acceptable diet		
Achieved (n=94)	1	–
Not Achieved (n=354)	1.00 (1.00-1.01)	0.63
Egg and/or flesh food consumption		
Yes (n=220)	1	–
No (n=227)	0.91 (0.63-1.32)	0.62
Sweet beverage consumption 6.00–23 months		
Yes (n=349)	1	–
No (n=98)	1.32 (0.84-2.07)	0.23
Unhealthy food consumption		
Yes (n=78)	1	–
No (n=369)	1.18 (0.72-1.93)	0.52
Zero vegetable or fruit consumption		
Yes (n=243)	1	–
No (n=204)	1.03 (0.71-1.50)	0.86
Household food insecurity	1.03 (0.99-1.07)	0.11
Area of residence		
Inland Barangay (n=219)	1	–
Coastal barangay (n=228)	1.24 (0.85-1.80)	0.26
Water supply		
Centralized (n=267)	1	–
Decentralized (n=180)	1.07 (0.73-1.57)	0.72
Household monthly income		
Middle class (n=68)	1	–
Poor (n=379)	0.76 (0.45-1.27)	0.30
Sex of the household head		
Male (n=348)	1	–
Female (n=99)	0.94 (0.60-1.47)	0.79
Living status of the children		
Living with both parents (n=340)	1	–
Living with one parent (n=71)	1.27 (0.76-2.14)	0.36
Living with other caregivers or relatives (n=36)	1.10 (0.55-2.19)	0.79
Educational attainment of mother		
College graduate (n=51)	1	–
College undergraduate (n=41)	1.75 (0.75-4.04)	0.19
Others (Vocational/ALS) (n=7)	1.38 (0.28-6.83)	0.70
High school level or graduate (n=260)	1.52 (0.82-2.84)	0.19
Elementary level or graduate (n=85)	2.06 (1.01-4.22)	0.05*
No formal education (n=3)	–	–
Employment status of mother		
Employed (n=135)	1	–
Unemployed (n=312)	0.90 (0.60-1.35)	0.62
Sex of the child		
Female (n=245)	1	–
Male (n=202)	1.54 (1.06-2.24)	0.02*
Age, in months	1.09 (1.04-1.13)	<0.00*
Experienced illness for the past month		
No (n=177)	1	–
Yes (n=270)	0.92 (0.63-1.35)	0.66
Use of bottle feeding		
Not bottle fed (n=221)	1	–
Bottle fed (n=226)	1.72 (1.18- 2.50)	0.01*

**significant at the 0.05 level of significance*

Table 4. Factors Associated with Stunting among IYC Aged 0.01-23.99 Months in the Fourth District of Camarines Sur, 2024

Factors	Stunting			
	0.01-5.99 months		6.00-23.99 months	
	aOR (95% CI)	*p*	aOR (95% CI)	*p*
Educational attainment of mother				
College graduate	1	–	–	–
College undergraduate	0.26 (0.05-1.28)	0.03*	–	–
Others (Vocational/ALS)	1.33 (0.19-9.31)	0.76	–	–
High school level or graduate	1.26 (0.41-3.90)	0.75	–	–
Elementary level or graduate	1.67 (0.46-6.04)	0.47	–	–
No formal education	–	–	–	–
Age in months	0.77 (0.63-0.94)	0.01*	1.09 (1.05-1.14)	<0.00*
Sex of the child			1	–
Female	–	–	1.55 (1.05-2.28)	0.03*
Male	–	–		
Household monthly income				
Middle class	1	–	–	–
Poor	0.40(0.14-0.88)	0.02*	–	–

**significant at the 0.05 level of significance*

with stunting, highlighting the importance of implementing feeding interventions that are suitable for the specific age range of children, such as exclusive breastfeeding among this age group.[36] In addition, the findings of this study indicated a significant correlation between the mother's lower level of education and a lower likelihood of stunting in children less than six months compared to children with mothers who were college graduates. The educational level attained by mothers influences their comprehension of child nutrition and feeding practices, thus impacting the nutritional status of their children positively.[37] Improved maternal knowledge not only enables better feeding practices but also empowers mothers to recognize signs of malnutrition and seek timely medical help. It was also observed that children in the poor-income quintile were less likely to be stunted. Due to the services given to them by health workers, these households were considered in need of basic preventive, promotive, curative, and rehabilitative care.[38] In comparison to rich households (42%) who observed a significant rise in the use of infant/toddler formula (poor: 22%, and rich: 56%, respectively), there is a higher prevalence of breastmilk consumption (69%) among households with children ages 6.00-23.9 months belonging to the poorest households.[8] These findings were consistent with the study of Rohner et al., suggesting that those with poorer socioeconomic status were more likely to breastfeed and were more likely to continue breastfeeding up to two years of age.[9]

Contrary to the results observed in infants aged 0.01-5.99 months, there was a significant positive association between age in months and stunting among children aged 6-23 months. This indicates that as the age of older children increases, the likelihood of stunting also increases. This study reveals a concerning trend that as children grow older, there is an increase in the prevalence of stunting, consistent with findings from other studies.[39] As children age, their energy requirements increase, which can result from prolonged periods of inadequate nutrition, leading to chronic malnutrition, particularly stunting.[40] Studies have indicated age as a predictor for stunting, with age-inappropriate complementary feeding resulting in undernutrition.[41]

In a cohort study in Indonesia, the findings emphasized the significant influence of size at birth (preterm birth and lower birth weight), particularly being small for gestational age (SGA), as a predominant early risk factor for stunting within the first six months of life.[42] SGA has been identified as a risk factor for stunting in the initial year of life among Filipinos, with SGA infants failing to catch up with the linear growth trajectory of non-SGA infants from birth to 12 months. While this specific aspect was not assessed in the present study, it may have potentially contributed to the association between age in months and stunting.[42,43]

In relation to the age of the child, it appeared significantly with stunting that boys exhibited a higher likelihood of being stunted among IYC 6-23 months compared to girls. Boys need more energy and other nutrients for sufficient growth than girls.[44] The results contradicted the study of Ahmed et al., that girls were more likely to be stunted due to inequality since boys were given more food than girls.[29] On the other hand, several studies pointed out a similar observation indicating that a higher risk among boys was found, albeit for wasting.[36,40,45] This was attributed to diarrheal illnesses brought on by the greater likelihood of male children investigating their surroundings when they learn to crawl, totter, and/or walk.[45]

Limitations of the Study

The study included significant socio-economic and demographic factors, maternal and child factors, and anthropometric measurements of IYC. However, the nutritional value of foods taken by the children, such as the volume of breastmilk and weights of food taken by the infants and young children, was not assessed in this study. The assessment of food security relied on obtaining information from primary caregivers of children who may not actively participate in food preparation within their households.

While each primary caregiver was provided adequate time during the interview to respond to every question, the responses relied on memory recall, potentially resulting in day-to-day variability in the diet of IYC, as indicated by the collected data. The accuracy of dietary recall was dependent on an individual's ability to remember, which could lead to the underreporting of specific food items during the recall process.

This cross-sectional study captured data at a single point in time, making it impossible to determine whether certain IYCF practices directly lead to specific nutritional outcomes. Consequently, the results should be interpreted as indicative of potential associations rather than definitive cause-and-effect relationships.

CONCLUSION

The prevalence of stunting in the study areas indicates that stunting remains to be of very high public health significance. In the crude analysis, it was observed that bottle feeding was significantly associated with stunting. However, after holding all other variables constant, none of the new IYCF indicators showed a significant association with stunting. Meanwhile, after controlling for the confounding effect of other variables, stunting was observed to be associated with educational attainment of mothers, age of the child, and wealth quintile among infants less than six months, and with sex and age for older infants and young children 6 to 23 months of age.

The findings emphasize the complexity of factors influencing stunting among children in the study areas. Hence, addressing socio-economic disparities, promoting optimal IYCF practices, and preventing diseases are crucial to alleviating stunting. Efforts should focus on improving socio-economic conditions, generating income, and ensuring food security for vulnerable households.

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Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

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