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Complementary Feeding Practices of Infants and Young Children in Kibawe, Bukidnon: A Community-Based Cross-Sectional Study

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ABSTRACT

Complementary feeding is introduced when breastmilk alone can no longer meet a child's energy and nutrient needs, ensuring the maintenance of good nutritional status. This community-based cross-sectional study assessed complementary feeding practices and associated factors among 32 children aged 6-23 months in Barangays Bukang Liwayway and Kiorao in Kibawe, Bukidnon. Data were collected through interviews using adapted and validated questionnaire and three-day 24-hour food recall to assess the usual dietary intakes and diet diversity. Results showed that 65.5% of children were introduced to complementary foods at six months, and 66.7% continued breastfeeding beyond six months. However, 81.3% did not meet the Minimum Dietary Diversity (MDD), resulting in the same proportion failing to achieve the Minimum Acceptable Diet (MAD), despite 71.9% meeting the Minimum Meal Frequency (MMF). Nutrient inadequacies were most pronounced for niacin (74.5%), vitamin A (67.5%), and calcium (64%) among non-breastfed children. Significant associations were observed between ethnicity, income, age, birth order, and mother/caregiver's education and occupation with feeding indicators such as MMF, MDD, and MAD. These findings highlight the urgent need to improve complementary feeding practices to reduce malnutrition risks in the community. Further research is recommended to explore underlying determinants of inadequate nutrient intake, barriers to meeting feeding standards, and the role of nutrition education and other influences beyond complementary feeding practices.

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1. INTRODUCTION

Malnutrition is a condition resulting from an imbalance between the body's nutrient intake and its requirements, leading to deficiencies, excesses, or imbalances in essential nutrients. It encompasses undernutrition (wasting, stunting, and underweight), micronutrient deficiencies, and overnutrition (overweight and obesity) (World Health Organization [WHO], n.d.). Malnutrition affects millions of individuals across various age groups, genders, and races, with particularly high prevalence in developing countries. Among children, malnutrition remains a significant issue. The most recent Expanded National Nutrition Survey (ENNS) by the Department of Science and Technology reveals that, among children aged 0–59 months, stunting has a public health significance of 23.6%. At the same time, underweight prevalence is 15.1%, and wasting is classified as low to medium (Department of Science and Technology – Food and Nutrition Research Institute [DOST-FNRI], 2024). Factors contributing to malnutrition in children include food insecurity, a decline in breastfeeding practices, and inadequate complementary feeding practices.

The United Nations' Sustainable Development Goals (SDG) aim to end all forms of malnutrition by 2030, and the Philippines is committed to this goal, as evidenced by the implementation of the Philippine Plan of Action for Nutrition (PPAN 2023-2028). In alignment with the SDGs, one of the key outcome targets of the PPAN focuses on improving maternal, infant, and young child nutrition (National Nutrition Council [NNC], 2023). To address food and nutrition issues, the Philippines has developed nutrition-specific, nutrition-sensitive, and nutrition-supportive programs designed to provide long-term solutions.

The first 1,000 days of life, from conception to a child's second birthday, are vital for laying the foundation for lifelong health and development. This period is marked by significant physical, cognitive, and emotional growth, making it a crucial time for intervention and support (Likhar & Patil, 2022). The 6 to 23-month period, being the longest phase, highlights the importance of properly introducing complementary foods to ensure that children receive adequate nutrition and reach their full potential.

Complementary feeding, which involves introducing foods alongside breast milk or formula when they no longer meet a child's nutritional needs, typically begins at six months and continues until 23 months—a critical period for establishing healthy eating habits and preventing growth

faltering and nutrient deficiencies (WHO, 2023). It plays a vital role in bridging the gaps left by exclusive breastfeeding (Abeshu et al., 2016), making it essential to plan and ensure the provision of adequate energy and nutrients for the optimal growth and development of infants and toddlers, particularly in developing countries. However, there's a limited local study on complimentary feeding practices in the Philippines particularly in Geographically Isolated and Disadvantaged (GIDA) areas in Mindanao.

Thus, this research aims to assess and analyze mothers' knowledge and practices regarding complementary feeding for their children aged 6–23 months in Barangays Bukang Liwayway and Kiorao, Kibawe, Bukidnon. Additionally, the energy and nutrient intakes among the non-breastfed children subset were also estimated. By conducting a community-based study, the researchers aim to foster a collaborative process that supports upstream nutrition initiatives and addresses the constraints and limitations of existing public health programs.

2. METHODOLOGY

Research Design and Sampling

This community-based, cross-sectional descriptive study aimed to determine and analyze the complementary feeding practices of mothers or primary caregivers of children aged 6–23 months, along with the associated factors, in two barangays in Kibawe, Bukidnon using a complete enumeration. A total of 32 children were included in the study, with 20 children from Barangay Bukang Liwayway and 12 children from Barangay Kiorao. The participants were identified from the master list obtained during the most recent Operation Timbang (OPT) Plus, facilitated by the Barangay Nutrition Scholar (BNS). For the estimation of energy and nutrient intakes of children, a complete enumeration (N = 11) of all the non-breastfed children was followed.

Ethical Consideration

The researchers obtained ethical clearance from the Institutional Ethics Review Committee of Central Mindanao University (IERC Control Number: 0053 s. 2023), ensuring compliance with both international and national ethical standards. Participation in the study was voluntary, with mothers or caregivers informed of their right to decline answering the questionnaire. The study maintained complete anonymity, and participants were assured of confidentiality and privacy. Clarifications were provided by the researchers to ensure the participants understood the

survey instrument. Data were coded, with identifying information kept separate to ensure that responses could not be linked to specific individuals, and access to the data was restricted to the researchers.

Research Instruments and Data Collection Procedure

Data were collected through a survey interview using a structured questionnaire, conducted via face-to-face interviews from February to May 2023. The researchers, accompanied by the Barangay Nutrition Scholar (BNS), visited participants in their homes during scheduled data collection sessions.

The questionnaire comprised both self-made and pre-existing validated tools. The self-made section gathered socio-economic and demographic information, while the section on complementary feeding practices was adapted from the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) module on Indicators for Assessing Infant and Young Child Feeding Practices: Definitions and Measurement Methods (WHO & UNICEF, 2021), and was content-validated by three (3) Registered Nutritionist-Dietitians with expertise in Public Health Nutrition.

Additionally, a three-day non-consecutive food recall method was used to assess the energy and nutrient intakes of children, following a four-stage, multiple-pass interviewing technique outlined by Gibson and Fergason (1999) in Gibson's book (2005). Various dietary collection techniques were employed such as actual food weighing and the use of household measurement tools such as cups, tablespoons, teaspoons, and food models in estimating intakes. Data from the food recall were used to assess energy and nutrient intake, Minimum Meal Frequency (MMF), Minimum Acceptable Diet (MAD), and Minimum Dietary Diversity (MDD), using a questionnaire adapted from the Food and Agriculture Organization (2012).

Data Processing and Analysis

All food recall data were converted from household measurements to estimated weights in grams and processed using the online tool Menu Eval Plus by DOST-FNRI, based on the Philippine Food Composition Table (FCT). The results were then compared with the Recommended Energy Intake (REI) and Recommended Nutrient Intake (RNI) from the 2018 Philippine Dietary Reference Intakes (PDRI) to assess the adequacy of children's energy and nutrient intake.

Other data collected were analyzed using descriptive statistics, including frequencies, percentages, averages, ranges, and standard deviations. Pearson's product-moment correlation was performed to determine associations between socio-demographic and economic profile and complementary feeding practices, with statistical significance set at $p\text{-value} < 0.05$ and a 95% confidence interval. Statistical significance was considered at $p\text{-value} < 0.05$ and 95% confidence interval.

3. RESULTS AND DISCUSSION

Socio-Demographic Profile

The socio-demographic and economic characteristics of participating children, mothers, and caregivers are presented in Table 1. The mean age of the children was 16.63 months ($SD = 5.75$). Most were either the youngest (81.3%) or the only child (15.6%) in households with an average size of 4.72 members ($SD = 1.35$), suggesting that larger families are uncommon in these barangays. This finding aligns with the Expanded National Nutrition Survey (ENNS), which reported that most households in the Philippines consist of five or fewer members (FNRI-DOST, 2022).

Table 1. Socio – demographic profile of the children and their mothers or primary caregivers, and households in Brgy. Bukang Liwayway and Brgy. Kiorao, Kibawe, Bukidnon.

Socio – Demographic Factor	BRGY. BUKANG LIWAYWAY (N=20)		BRGY. KIORAO (N=12)		TOTAL (N=32)	
	Freq	%	Freq	%	Freq	%
Age of the Child (months)						
6 - 11	9	45.0	6	50.0	15	46.9
12 - 17	5	25.0	3	25.0	8	25.0
18 - 23	6	30.0	3	25.0	9	28.1
Birth Order of the Child						
Eldest	1	5.0	0	0	1	3.1
Youngest	16	80.0	10	83.3	26	81.3
Only Child	3	15.0	2	16.7	5	15.6
Age of the Mother/Primary Caregiver (years)						
< 16	0	0	0	0	0	0
16 - 18	2	10.0	1	8.3	3	9.4
19 - 29	11	55.0	5	41.7	16	50.0
30 - 49	7	35.0	5	41.7	12	37.5
50 - 59	0	0	0	0	0	0
≥ 60	0	0	1	8.3	1	3.1
Civil Status of the Mother/Primary Caregiver						
Married	14	70.0	8	66.7	22	68.8
Common Law/Live-in	6	30.0	4	33.3	10	31.3
Educational Attainment of Mother/Primary Caregiver						
Elem. Level	4	20.0	2	16.7	6	18.8
Elem. Grad.	4	20.0	1	8.3	5	15.6
HS Level	5	25.0	2	16.7	7	21.9
HS Grad.	6	30.0	5	41.7	11	34.4
College Level	0	0	0	0	0	0
College Grad	1	5.0	2	16.7	3	9.4
Present Occupation of Mother/ Primary Caregiver						

No occupation/ housewife	19	95.0	11	91.7	30	93.8
Farm laborer, gardener, livestock or poultry raiser	0	0	1	8.3	1	3.1
Business woman	1	5.0	0	0	1	3.1
Ethnicity						
Cebuano	15	75.0	10	83.3	25	78.1
Member of the Cultural Community (Monobo, Talaandig, and Others)	5	5.0	0	0	5	15.6
Others	0	0	2	16.7	2	6.3
Household Size						
≤ 5 members	15	75.0	10	83.3	25	78.1
> 5 members	5	5.0	2	16.7	7	21.9
Source of Household Income						
Salary	2	10.0	2	16.7	4	12.5
Business	2	10.0	1	8.3	3	9.4
Farm/ Poultry/ Garden	8	40.0	6	50.0	14	43.8
Labor	6	30.0	3	25.0	9	28.1
Fishing	1	5.0	0	0	1	3.1
Others	1	5.0	0	0	1	3.1
Estimated Monthly Income (Peso)						
<5,000	11	55.0	7	58.3	18	56.3
5,000 – 8, 300	8	40.0	4	33.3	12	37.5
8,400 – 18,300	1	5.0	1	8.3	2	6.25
> 18, 300	0	0	0	0	0	0
Pantawid Pamilyang Pilipino Program (4 Ps) Beneficiary Status						
Beneficiary	10	50.0	5	41.7	15	46.9
Non beneficiary	10	50.0	7	58.3	17	53.1

The majority of mothers or caregivers were aged 19 to 29 years, with a mean age of 29.56 years (SD = 10.13). Most were married (68.8%), while a significant portion were in common-law or live-in relationships (31.3%), consistent with the findings of the 2021 Expanded National Nutrition Survey (ENNS) conducted by DOST-FNRI, which reported that most households consist of married couples, followed by those in live-in arrangements. A notable percentage of mothers or caregivers had at least a high school education (56.3%), while a smaller proportion had some college education (9.4%). However, the majority were unemployed or housewives (93.8%), with a few engaged in small-scale businesses such as sari-sari stores (3.1%). Most respondents identified as Cebuano (78.1%), while others belonged to Cultural Communities (15.6%) or other ethnic groups (6.3%).

The primary source of income for most households came from farm, poultry, or garden-related activities (43.8%), reflecting the agricultural nature of these rural communities. However, the estimated average monthly household income of PhP 3,815.63 fell significantly below the Philippine Statistics Authority's (PSA) 2023 average monthly income of PhP 13,873, the minimum required to meet the basic food and non-food needs of a family of five in the Philippines. This reported income already included financial assistance from the Conditional Cash Transfer (CCT) program, locally known as the Pantawid Pamilya Pilipino Program (4Ps). These findings indicate that households in Barangays Bukang Liwayway and Kiorao, Kibawe, are living below the poverty threshold, which likely hampers their ability to purchase adequate food and

access essential health services, potentially exacerbating nutritional and health-related vulnerabilities.

Complementary Feeding Practices

The results of the complementary feeding practices among mothers or primary caregivers of children in Barangays Bukang Liwayway and Kiorao, as presented in Table 2, include various indicators adapted from the 2021 Indicators for Assessing Infant and Young Child Feeding provided by WHO and UNICEF.

Table 2. The complementary feeding practices of the mothers/ primary caregivers in Brgy. Bukang Liwayway and Brgy. Kiorao, Kibawe, Bukidnon.

COMPLEMENTARY FEEDING INDICATORS	BRGY. BUKANG LIWAYWAY (N=20)		BRGY. KIORAO (N=12)		TOTAL (N=32)	
	Freq	%	Freq	%	Freq	%
Continued Breastfeeding						
Yes	13	65.0	8	66.7	21	65.6
No	7	35.0	4	33.3	11	34.4
Given with Complementary Feeding						
Yes	20	100	12	100	32	100
No	0	0	0	0	0	0
Age of the Child First Introduced with Liquids Other than Breastmilk (6.06 ± 1.63; 1 – 10)						
Less than 6 months	4	20.0	1	8.3	5	15.6
At 6 th month	11	55.0	10	83.3	21	65.6
More than 6 months	5	25.0	1	8.3	6	18.8
Type of Liquid First Given						
Water	11	55.0	11	91.7	22	68.8
Alm/ Soup	0	0	0	0	0	0
Milk Formula	8	40.0	1	8.3	9	28.1
Others	1	5.0	0	0	1	3.1
Age of the Child First Introduced with Solid, Semi-Solid or Soft Foods (6.13 ± 1.10; 3 – 10)						
Less than 6 months	2	10.0	1	8.3	3	9.4
At 6 th month	15	75.0	10	83.3	25	78.1
More than 6 months	3	15.0	1	8.3	4	12.5
Type of Solid Food First Given						
Rice Porridge	7	35.0	2	16.7	9	28.1
Mashed/Pureed	0	0	0	0	0	0
Vegetables or Fruits	12	60.0	10	83.3	22	68.8
Commercial Products (Cerelac)	1	5.0	0	0	1	3.1
Others	1	5.0	0	0	1	3.1
^aMin. Dietary Diversity (MDD) (3.48 ± 1.44; 1-6)						
3.48 ± 1.44	1 - 6	20.0	2	16.7	6	18.8
Non-compliant	16	80.0	10	83.3	26	81.3
^bMin. Meal Frequency (MMF) 3.23 ± 0.77; 1 -6						
Compliant with the Recommendation	14	70.0	9	75.0	23	71.9
Non-compliant	6	30.0	3	25.0	9	28.1
^cMin. Milk Feeding Frequency for Non-Breastfeed Children (MMFF) N =11 (2.9 ± 1.3; 3 – 4)						
Compliant with the Recommendation	2	28.6	2	50.0	4	36.4
Non-compliant	5	71.4	2	50.0	7	63.6
^dMin. Acceptable Diet (MAD)						
Compliant with the Recommendation	2	10.0	4	33.3	6	18.8
Non-compliant	18	90.0	8	66.7	26	81.3
Consumed Egg and/or Other Flesh Meat in the past day						
Yes	11	55.0	7	58.3	18	56.3
No	9	45.0	5	41.7	14	43.8
Consumed Sweet Beverages in the Past Day						

Yes	0	0	0	0	0	0
No	20	100	12	100	32	100
Consumed Unhealthy Foods in the Past Day						
Yes	11	55.0	7	58.3	18	56.3
No	9	45.0	5	41.7	14	43.8
Zero Vegetable or Fruit Consumption in the Past Day						
Yes	11	55.0	7	58.3	16	50.0
No	9	45.0	5	41.7	16	50.0
Children Given Milk through Bottle Feeding						
Yes	7	35	1	8.3	8	25.0
No	13	65	11	91.7	24	75.0

Note.

^a Minimum Dietary Diversity (MDD) – an indicator for children aged 6–23 months who consumed foods and beverages from at least five out of eight defined food groups during the previous day.

^b Minimum Meal Frequency (MFF) - an indicator for children aged 6–23 months who received solid, semi-solid, or soft foods (including milk feeds for non-breastfed children) at least the minimum recommended number of times during the previous day to ensure adequate energy and nutrient intake.

^c Minimum Milk Feeding Frequency for Non-Breastfed Children (MMFF) - an indicator for non-breastfed children aged 6–23 months who consumed at least two milk feeds during the previous day.

^d Minimum Acceptable Diet (MAD) - A feeding indicator for children aged 6–23 months, defined as meeting both minimum dietary diversity and meal frequency—plus at least two milk feeds for non-breastfed children—during the previous day.

The majority of children in both barangays were still being breastfed (65.6%), with slightly higher rates in Barangay Kiorao (66.7%). This high percentage of children receiving breast milk alongside complementary foods aligns with the findings of the 2021 Expanded National Nutrition Survey (ENNS) conducted by DOST-FNRI, which reported that 64.2% of children continued breastfeeding until one year of age. Mothers chose to continue breastfeeding due to its perceived health benefits, convenience, and cost-effectiveness (Basbous et al., 2024).

The foods parents choose for children aged 6-23 months are influenced by various factors such as culture, financial resources, and convenience. Families often select culturally accepted foods like rice porridge, a traditional first food in the Philippines. In this study, rice porridge ranked as the second most popular first solid food (28.1%), following commercially available options (68%), likely because busy parents prefer ready-made foods. Although most mothers in the study were housewives, they managed household chores and occasionally assisted with additional work, prompting them to choose easy-to-prepare foods for convenience. This aligns with findings by Sharma et al. (2019) and Hollinrake et al. (2024), indicating that due to time-constrained parents often rely on pre-packaged baby foods and formula. Additionally, caregivers may choose pre-packaged food items due to concerns about food safety, brand influence from packaged purees, and the convenience of commercial snacks that support motor skill development, keep infants occupied, and allow them to participate in family meals (Isaacs et al., 2022).

The 2021 Expanded National Nutrition Survey conducted by DOST-FNRI reported that while 90.9% of children aged 6–23 months met the Minimum Meal Frequency (MMF), only 13.8% achieved the Minimum Dietary Diversity (MDD), resulting in just 13.3% receiving the Minimum Acceptable Diet (MAD). MAD reflects both MMF and MDD, ensuring dietary and nutrient adequacy. Similar patterns were

observed in this study, where most children met MMF but failed to achieve MDD, leading to a low overall MAD rate. Breastfed children (71.9%) were more likely to meet MMF compared to non-breastfed children, of whom only a quarter met the recommendation. Despite adequate MMF, limited MDD raises concerns about current feeding practices. According to Birie et al. (2021), factors such as maternal education, institutional delivery, media exposure, and household wealth significantly influence the likelihood of meeting MAD.

Dietary Diversity (DD) is a crucial indicator of infant and young child feeding (IYCF). However, achieving the minimum standards for DD remains challenging in many developing countries, and information about its determinants is still limited. According to Dafursa and Gebremedhin (2019), factors influencing dietary diversity in children include household wealth, food security status, the husband's literacy and involvement in IYCF, maternal knowledge of IYCF, ownership of a backyard garden, and access to IYCF information through mass media, cooking demonstrations, interpersonal communication, and maternity care services. In this barangay, the low estimated monthly income—less than Php 5,000 for the majority of households—along with employment status and literacy levels, may contribute to the low DD observed among children in this study.

Low-income families may struggle to afford a diverse range of nutrient-rich foods, often relying on staples like rice or cheaper commercial products. Food availability in a region also influences what children are fed; rural areas typically have better access to fresh produce, while urban households may depend on processed foods. However, despite being classified as rural, the study areas have limited availability of fruits, vegetables, pulses, legumes, and nuts due to a focus on cultivating coconut, corn, and cardava bananas. Access to meat, fish, poultry, and eggs is also restricted unless households raise farm animals. These factors likely contributed to 81.3% of the children not meeting the Minimum Dietary Diversity (MDD) of at least five out of eight assessed food groups.

For food groups consumed, the most prevalent food groups in the diet of the 32 children receiving complementary feeding, regardless of age, were cereals, breastmilk, and dairy products including milk formula. This finding is the same with the study of Jacquier et al (2020) that breast milk, infant formula, powdered milk and rice were the most commonly consumed foods and beverages consumed by Filipino children.

Milk and dairy products provide essential nutrients, particularly calcium, which supports healthy growth in young children. According to the WHO guidelines on feeding non-breastfed children aged 6–23 months, the recommended amount of milk varies depending on the child's overall diet. If the child's diet includes other animal-source foods, a daily intake of 200–400 mL of milk is advised, while 300–500 mL is recommended if such foods are absent. Milk feeds encompass various types of animal milk (e.g., cow, goat, evaporated, or reconstituted powdered milk) and milk-based formulas, including infant

formula, follow-on formula, and toddler milk, in both fluid and semi-solid forms.

In this study, more than half of the children consumed eggs and/or flesh meats, with eggs being the most commonly consumed item in this group. These foods are valuable sources of protein, iron, and other essential nutrients. Eggs, in particular, are often preferred due to their affordability (Larson et al., 2024). According to WHO guidelines for feeding children, including meat, poultry, fish, or eggs in their daily diet is recommended for optimal nutrition. Children who consume these foods generally have higher intakes of essential nutrients critical for healthy growth and development.

Furthermore, none of the children consumed sweet beverages the previous day, though over half (56.3%) ate unhealthy foods. Diets in many low- and middle-income countries increasingly include foods high in sugar, salt, and unhealthy fats but low in essential nutrients. Commercially prepared snacks like chips, candies, and cakes can displace healthier options, contributing to nutrient deficiencies and poor growth. Guidelines recommend limiting such foods for infants and young children, keeping free sugar intake below 5% of total calories. Early exposure to sugary and salty foods may shape long-term dietary preferences, increasing the risk of obesity and chronic diseases later in life.

As shown in Table 2, half of the children (50%) had no vegetable or fruit consumption on the previous day. According to the WHO, inadequate intake of fruits and vegetables is linked to a higher risk of noncommunicable diseases (NCDs). In 2017, low fruit and vegetable consumption contributed to 3.9 million deaths, ranking among the top 10 global mortality risk factors. Although these figures primarily reflect adult data, research suggests that limited fruit and vegetable intake in early childhood can persist into later life. The American Academy of Pediatrics advises including at least one vegetable serving with every meal for young children. While specific recommendations for fruit and vegetable servings for children over six months vary, consuming none is considered an unhealthy dietary practice (UNICEF, 2021).

Energy and Nutrient Contents of Complementary Foods Given to Non-Breastfed Children

The average daily energy intake of infants and preschool children aged 6 to 23 months was 662.6 kcal, which is below the recommended intake of 720-1000 kcal for boys and 630-920 kcal for girls, as specified by the Philippine Dietary Reference Intakes (PDRI) for children aged 6-11 months and 1-2 years. Consequently, the mean percent adequacy for energy in this study was only 66.3%, indicating insufficient energy intake among the children. This finding aligns with the results of the 2018-2019 Expanded National Nutrition Survey (ENNS), which reported that only 18.4% of Filipino children aged 6 months to 5 years met the recommended energy intake (DOST-FNRI, 2022). However, the children's percent protein adequacy was 106.2%, suggesting that while protein intake is sufficient, addressing inadequate energy intake remains a critical concern for preventing undernutrition in this population.

Table 3. Energy and nutrient intake of non-breastfeed 6 – 23-months old children of Kibawe, Bukidnon.

ENERGY AND NUTRIENT		BARANGAY BUKANG LIWAYWAY AND BARANGAY KIORAO (N=11)	DESCRIPTION
Energy	Mean Intake (Kcal.)	662.6	Inadequate
	Mean % Dietary Reference Intake (DRI)	66.3	
Protein	Mean Intake (g)	19.1	Adequate
	Mean % Dietary Reference Intake (DRI)	106.2	
Calcium	Mean Intake (mg)	319.8	Inadequate
	Mean % Dietary Reference Intake (DRI)	64.0	
Iron	Mean Intake (mg)	7.3	Adequate
	Mean % Dietary Reference Intake (DRI)	91.6	
Vit. A	Mean Intake (ug)	130.3	Inadequate
	Mean % Dietary Reference Intake (DRI)	67.5	
Vit. C	Mean Intake (ug)	21.0	Excessive
	Mean % Dietary Reference Intake (DRI)	175.0	
Thiamin	Mean Intake (ug)	0.6	Excessive
	Mean % Dietary Reference Intake (DRI)	138.3	
Riboflavin	Mean Intake (ug)	0.6	Excessive
	Mean % Dietary Reference Intake (DRI)	151.1	
Niacin	Mean Intake (ug)	3.7	Inadequate
	Mean % Dietary Reference Intake (DRI)	74.5	
Sodium	Mean Intake (ug)	446.0	Excessive
	Mean % Dietary Reference Intake (DRI)	253.3	

Note. The percent Dietary Reference Intakes (DRIs) for energy, protein, vitamins, and minerals are based on the Recommended Energy and Nutrient Intakes (RENIs) for male and female infants aged 6–11 months and children aged 1–3 years, as specified in the Philippine Dietary Reference Intakes (PDRI).

The mean micronutrient intakes among children in both studied barangays were as follows: calcium (319.8 mg/d), iron (7.3 mg/d), vitamin A (130.3 µg/d), vitamin C (21.0 mg/d), thiamin (0.6 mg/d), riboflavin (0.6 mg/d), niacin (3.7 mg/d), and sodium (446.0 mg/d). Vitamin C, thiamin, and riboflavin exceeded 100% of the Recommended Nutrient Intake (RNI), while iron intake reached 91.6%, likely due to the high consumption of protein-rich foods that are also good sources of iron (British Dietetic Association, n.d.). However, the high sodium intake is concerning and may be linked to commonly consumed foods among this age group, as reported by FNRI-DOST (2022). These include soy sauce (ranked 6th), hotdogs (7th), salted crackers (10th), as well as instant noodles and sardines, which were also within the top 30.

Children in this study had nutrient intakes below 100% adequacy for calcium, vitamin A, and niacin, with calcium showing the lowest adequacy. Milk, the primary source of calcium, is often under-consumed due to its rising cost, disproportionately affecting children and low-income families (Owens, 2024). In the studied barangays, mothers were observed diluting milk with large amounts of water and adding sugar to stretch supplies and reduce costs.

Schendel et al. (2022) found that the highest levels of retinol were present in liver and liver-based foods, while high β -carotene levels were observed in orange and green leafy vegetables and fruit nectars. In contrast, niacin was found in high amounts in foods such as bran, yeast, eggs, peanuts, poultry, red meat, fish, whole grains, legumes, and seeds (Peechakara & Gupta, 2024). Based on the dietary diversity assessment conducted in these barangays, however, these micronutrient-rich foods were not commonly consumed. Instead, the top three food groups

were cereals, breast milk, and other dairy products. It is likely that while micronutrient-dense foods are available locally, they are not consumed in adequate amounts, as indicated by the only 66.3% adequacy for recommended energy intake (REI). According to Angeles-Agdeppa et al. (2019), low mean energy intake in Filipino children correlates with low intake of essential nutrients. However, nutrient-dense, locally available foods such as fruits, vegetables, legumes, and root crops are often affordable and can be grown in backyards. WHO-UNICEF (2021) recommends that children consume at least five out of eight food groups, including breast milk, grains, pulses, dairy, flesh foods, eggs, vitamin-A rich fruits and vegetables, and other fruits and vegetables. Therefore, nutrition education in these barangays is essential to help children meet their nutrient requirements.

The Socio- demographic and Economic Profile and Complementary Feeding Practice of Mothers or Caregivers

The relationship between socio-economic factors and complementary feeding practices, such as Mean Dietary Diversity (MDD), Minimum Meal Frequency (MMF), Minimum Milk Feeding Frequency for Non-breastfed Infants (MMFF), and Minimum Acceptable Diet (MAD), is a critical area of study in child nutrition and public health. Socio-economic status plays a significant role in shaping children's nutritional habits. Research consistently shows that children from higher socio-economic backgrounds tend to have better dietary diversity and more regular meal patterns, which are essential for their overall health and development. The relationship between these variables is presented in Table 4.

Table 4. Association of socio-economic profile and complementary feeding practices of mothers or primary caregivers of children.

Socio-economic Characteristics	Mean Dietary Diversity (MDD)		Minimum Meal Frequency (MMF)		Minimum Milk Feeding Frequency for Non-Breastfeed Children (MMFF)		Minimum Acceptable Diet (MAD)	
	Correlation Coefficient	Sig.	Correlation Coefficient	Sig.	Correlation Coefficient	Sig.	Correlation Coefficient	Sig.
Age of the Child	0.206	0.259	0.391	0.027*	-0.166	0.605	-0.011	0.954
Birth Order of the Child	0.171	0.349	-0.528	0.002**	0.340	0.279	0.220	0.225
Age of the Mother/Caregiver	0.058	0.752	0.143	0.434	0.326	0.301	-0.035	0.849
Civil Status of the Mother/Caregiver	-0.174	0.341	0.164	0.371	0.652	0.022*	-0.022	0.907
Highest Educational Attainment of Mother/Caregiver	-0.019	0.919	0.140	0.446	0.317	0.315	0.383	0.031*
Present Occupation of Mother/Caregiver	0.065	0.722	0.181	0.322	0.340	0.279	0.374	0.035*
Ethnicity	-0.353	0.048*	0.014	0.939	-0.103	0.751	-0.133	0.468
Household Size	0.081	0.661	0.081	0.660	0.115	0.723	0.102	0.580
Source of Household Income	-0.079	0.667	0.018	0.922	0.290	0.360	0.222	0.222
Estimated Monthly Income	0.394	0.026*	0.501	0.004**	0.118	0.714	0.304	0.090
Government Aide Beneficiary Status (4 Ps)	0.099	0.591	-0.001	0.994	-0.121	0.707	0.030	0.870

**Correlation is significant at the 0.01 level (2 – tailed)

* Correlation is significant at the 0.05 level (2 – tailed)

Table 4 reveals a significant relationship between ethnicity and estimated household income concerning Minimum Dietary Diversity (MDD). This indicates that

households belonging to various ethnic groups in the community have lower MDD, which aligns with findings from previous researches conducted. Le et al. (2019)

observed lower household dietary diversity among ethnic minority groups in impoverished rural areas compared to the majority population. Similarly, research in Central-South China by Bi et al., (2019) highlighted poor dietary diversity among preschool children in ethnically diverse regions. Conversely, a positive correlation emerged between income and MDD, indicating that higher income levels are associated with greater dietary diversity, in line with findings from rural Bangladesh (Amugsi et al., 2015).

A positive significant association was also found between the age of the child and Minimum Meal Frequency (MMF), while a negative significant association was noted for birth order. This suggests that as a child's age increases, the likelihood of meeting the required number of feedings per day also increases. On the other hand, children who are born later in the family are less likely to meet the required meal frequency. As children grow older, their nutritional needs evolve, requiring more frequent meals to meet their energy and nutrient requirements (WHO, 2021). The World Health Organization recommends 2-3 meals per day for infants aged 6-8 months and 3-4 meals per day for children aged 9-23 months, along with 1-2 snacks as needed. Additionally, as children age, they develop the ability to recognize hunger cues and ask for food when needed. Johns Hopkins Medicine (n.d.) suggests that children aged 6-12 years can communicate hunger and fullness, but may require guidance on when to start and finish meals.

Lastly, the civil status of mothers or primary caregivers was positively associated with the Minimum Milk Feeding Frequency for Non-Breastfed Children (MMFF), while their highest educational attainment and occupation were linked to the Minimum Acceptable Diet (MAD). This suggests that children of married primary caregivers are more likely to meet the MMFF, likely due to consistent support from both parents—not only financially but also in terms of time and care. This finding is supported by Baek et al. (2014), who reported that children living with both parents had significantly better overall food group intake compared to those living with one or no parent, indicating a positive relationship between two-parent family structures and dietary quality. Additionally, mothers with higher educational attainment and earned income—such as those engaged in small businesses or agricultural work—are more likely to provide a diverse and frequent diet for their children, both key components of MAD. Damen et al. (2019) further support this, noting that higher-educated mothers tend to offer healthier food options, and that mothers of firstborn children are often more health-conscious.

Overall, this study relied on self-reported data, which may be affected by recall or social desirability bias, although home visits were conducted to help validate responses. The small, localized sample also limits the generalizability of the findings, and future studies would benefit from a larger and more diverse population, along with improved assessment tools. Despite these limitations, the study offers novel insights as one of the first to explore the link between caregiver characteristics and child feeding practices in underserved areas in the region. Its findings can inform targeted public health interventions and empower mothers, caregivers, and local stakeholders in

GIDAs like Barangay Bukang Liwayway and Kiorao of Kibawe, Bukidnon, to improve child nutrition through collaboration and support.

4. CONCLUSION AND RECOMMENDATIONS

Based on the findings of this study, several key conclusions can be drawn. First, most children in the study areas come from typical Filipino households with five or fewer members, but their average monthly income is below the PhP 13,873 threshold required for basic food and non-food needs. Second, while many children received complementary foods at the appropriate age and were breastfed, their diets lacked essential diversity, particularly in food groups critical for optimal growth and development, such as pulses, nuts, seeds, fruits, vegetables, meat, fish, and poultry. Third, non-breastfed children exhibited dietary imbalances, with excessive intake of vitamin C, thiamine, riboflavin, and sodium, alongside insufficient intake of total energy, calcium, vitamin A, and niacin. Finally, factors influencing complementary feeding practices included ethnicity, monthly income, child's age and birth order, and the civil status, educational attainment, and occupation of the mother or primary caregiver.

To improve the nutritional status of children in this area, further research should be conducted to identify the underlying factors contributing to low household income, which impacts food and nutrient intake. Additionally, an in-depth investigation into why children are not meeting the Minimum Dietary Diversity (MDD), Minimum Meal Frequency (MMF), Minimum Milk Feeding Frequency for Non-Breastfed Children (MMFF), and Minimum Acceptable Diet (MAD) criteria is essential to identify effective interventions. Furthermore, exploring the reasons why children fail to meet their energy and nutrient requirements, examining potential relationships with nutritional status, and expanding the focus to include other age groups, such as school-aged children, would provide valuable insights. Lastly, nutrition education for mothers and caregivers is highly recommended to help them maximize available resources in preparing appropriate, energy-dense, and nutrient-rich complementary foods while ensuring proper feeding practices. The study also suggests that future research should investigate additional factors beyond complementary feeding practices that may influence children's overall nutritional status.

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