



Nutritional Status, Nutrient and Energy Intakes from Complementary Food among Children Aged 6- 23 Months in Two Provinces of Cambodia

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ABSTRACT

Introduction

Complementary feeding is the period of transition from exclusive breastfeeding to diverse family foods among children aged 6-23 months. This period may put children at high risk of stunting, wasting, and underweight due to inadequate nutrient intakes from complementary food. This paper aimed to assess the nutritional status and to describe energy and selected micronutrient intakes from complementary food among children aged 6-23 months.

Methods

A cross-sectional study was conducted among 200 children aged 6-23 months in Kampong Chhnang and Kampong Speu provinces. Household, socio-demographic information, and anthropometric data as well as 24-hour dietary recall were collected using tablets with Kobo database toolbox, a free software toolkit. Children's nutritional status was calculated using WHO Anthro software. Micronutrient analysis was performed using FIDR nutrition calculation software 2013. Then, all data were transferred to Stata 14.2 for descriptive analysis.

Results

Of the study samples, 16% of children were stunted, 7% were wasted, and 16% were underweight. Less than half (47%) of children aged 6-8 months meet the energy's recommendation, while 29% of children aged 9-11 months and 38% of children aged 12-23 months met the standard recommendation respectively. 70% of children aged 12-23 received sufficient protein from complementary food, while about 64% of children aged 6-11 months were at risk of protein inadequacy. Iron, calcium and zinc inadequacy was found in most children 6-23 months. Similarly, about 87%, 92%, 83% of children were at risk of insufficiency for vitamin A, vitamin C, and vitamin B3 respectively.

Conclusions

There are relatively lower prevalent of stunting, wasting and underweight among children aged 6-23 months in these two provinces. However, the proportion of children receiving energy intake, and main nutrients: protein, calcium, iron, zinc, vitamin A, vitamin C, and vitamin B3 from complementary food were far below the WHO/FAO recommendation that need public health attention.

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Introduction

Complementary feeding which is defined as the process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants; therefore, other supplementary foods and liquids are needed. Complementary feeding along with breast milk, is the period of transition from exclusive breastfeeding to diverse family foods among children age 6-23 months old [1, 2]. It is a vulnerable period for children. Many infants may start having different forms of malnutrition, that contribute to the high prevalence and micronutrient deficiencies in this age group [1, 3, 4]. Inappropriate intakes of vitamin A, iron, and zinc are most prevalent among micronutrient deficiencies [5]. Many studies indicated that deficiencies of iron, zinc, vitamin A, iodine, and folic acid can lead to delayed physical, birth defects, blindness, impaired emotional, and intellectual growth which prevent children from reaching their full potentials in physical and mental development (6). Consequently, this could result in the reduction in productivity and intellectual adulthood due to various adverse health consequences [4, 5, 7].

Globally, there were only 28.9% of children age 6-23 months met the WHO requirement for a minimum acceptable diet [8]. Furthermore, in the developing countries, most children aged 6-23 months received low quality of low micronutrient from complementary food [3]. According to Cambodia Demographic and Health Survey (CDHS) 2014, about 30% of children age 6-23 months met the required minimum acceptable diet [9]. This could contribute to different forms of malnutrition among children in a short term and a long term.

Furthermore, malnutrition is a public health concern nationwide; in which one in three children was stunted (32%), one in four children was underweight (24%), and one in ten children was wasted (10%) [9]. However, this malnutrition is disproportionately distributed from province to province and urban versus rural areas. Micronutrient deficiencies are also common and become the main problem. For instance, the prevalence of iron deficiency was 3%, the prevalence of folic acid (vitamin B9), vitamin A, and vitamin D deficiency was 8%, 9%, and 15% respectively. The prevalence of vitamin B12 and calcium was low (2% and 1%, respectively) [10]. Overall, in Cambodia, malnutrition and micronutrient deficiencies contributed to the financial lost between US\$ 250 - 260 million a year [9, 11].

In the past, data on children's nutritional status are not updated (CDHS 2014) and in particular, information or data on energy and micronutrient intakes from complementary food have been lacking among children aged 6-23 months in Cambodia. Therefore, this paper aimed to assess the nutritional status in children aged 6-23 months and to assess energy and selected micronutrient intakes from complementary food.

Methods

1. Study settings

This cross-sectional study was conducted from May to June 2020 in Boribo district, Kampong Chhnang province and in Phnom Srouch district, Kampong Speu province among children aged 6-23 months. Kampong Chhnang is characterized by lowland area, while Kampong Speu is characterized by highland area. Both provinces were among the most vulnerable provinces to malnutrition with high prevalence of stunting, (41%, 43%), wasting (12%, 11%), and underweight (29.4%, 36%) among children under five [9].

2. Sample size and sampling

In each province, 100 children aged 6-23 months were randomly chosen from households using systematic random sampling. It was then subsequently allocated 50 children aged 6-11 months and another 50 children aged 12-23 months. Firstly, 5 health centers (HC) were randomly selected from the 10 HCs in Boribo district, Kampong Chhnang, and another 5 HCs were selected from the list of 7 HCs in Phnom Srouch district, Kampong Speu province. Secondly, under each HC catchment area, we subsequently selected 5 villages using systematic random sampling approach. Finally, 4 children were selected in each village in which 2 children aged 6-11 months, and another two aged 12-23 months. Be noted that only one child was selected in each household and a refusal was not observed.

3. Data collection and anthropometric measurement

Eight fieldworkers experienced data collections were recruited and trained. We collected household (HH) and socio-demographic information from mothers or caregivers of eligible children. Also, 24-hour dietary recall from Monday to Sunday (i.e., meal intake by using the multiple-pass technique) were collected. Picture book showing nine food groups was used to estimate the intake amount [12]. Moreover, local utensils, such as spoon, plate, bowl, measured

water bottle were also used to estimate the intake amount. Anthropometric data including children weight and height were measured twice based on the WHO child growth standard.

Household, socio-demographic information, and anthropometric data were collected using tablets with Kobo Toolbox database, a free software toolkit, most widely used, developed for data collection.

4. Data management and analysis

The anthropometric data such as children age in month, weight and height were transferred to WHO Anthro software for calculating Z-scores for height-for-age (stunting), weight-for-age (wasting), and weight-for-height (underweight). Nutrient analysis was performed using FIDR nutrition calculation software 2013 [13]. Then, energy and nutrient intakes from complementary food were compared with WHO/FAO recommendation 2003 [3]. All data were transferred to STATA 14.2 for descriptive analysis.

Results

Socio-demographic characteristics

The majority of respondents (82.5%) were biological mothers. Most mothers were married (92.5%). Housewives represented 38.0%, followed by farmers (27.0%) and petty cash sellers (25.0%) and others (2.0%). Nearly half of mothers (48.5%) had primary education while 10.5% of them never attended school. Only 2.0% of mothers were at the university level. The mean age of children was 13.1 months (SD = 4.9), and slightly more than half of children (53.0%) were girls (Table 1).

Nutritional status

Of the 200 children surveyed, 16% of children were stunted, 7% were wasted, and 16% were underweight. When stratified by province, the prevalence of stunted children was higher in Kampong Chhnang (18%) than in Kampong Speu (14%). However, the prevalence of wasting (4%) and underweight (14%) in Kampong Chhnang were lower than in Kampong Speu province with 10% and 18% respectively (Table 2).

Table 2: Nutritional status among children aged 6-23 months in the two provinces (N = 200)

Province	Stunted	Wasted	Underweight
Kampong Chhnang	18%	4%	14%
Kampong Speu	14%	10%	18%
Total	16%	7%	16%

Table 1: Socio-demographic characteristics (N = 200)

Characteristics	Freq.	Percent
Child age group		
6-8 months	49	24.5
9-11 months	49	24.5
12-23 months	102	51.0
Child sex		
Boy	94	47.0
Girl	106	53.0
Relationship with children		
Mother	165	82.5
Father	3	1.5
Grandparent	18	9.0
Care taker	10	5.0
Aunt	4	2.0
Marital status		
Married	185	92.5
Divorced	12	6.0
Single	3	1.5
Level of education		
Never schooling	21	10.5
Primary school (grade 1-6)	97	48.5
Secondary school (grade 7-9)	57	28.5
High school (grade 10-12)	21	10.5
University level	4	2.0
Occupation		
Housewife	76	38.0
Farmer	55	27.0
Petty cash seller	50	25.0
Garment worker	8	4.0
Government officer	7	4.0
Others	4	2.0

Energy and nutrient from complementary food

Overall, energy intakes, and micronutrient including protein, calcium, iron, zinc, vitamin A, vitamin C, and vitamin B3 from complementary food were far below the WHO/FAO recommendation. The data shows that less than half (47%) of children aged 6-8 months meet the energy's recommendation, while 29% of children aged 9-11 months and 38% of children aged 12-23 months met the standard recommendation respectively. Around 64% of children aged 6-11 months were at risk of inadequacy for protein from complementary food, while this protein insufficiency was 30% among children aged 12-23 months.

Nearly 100% of children aged 6-23 months were at risk of iron, calcium and zinc inadequacy. Similarly, about 87%, 92%, 83% of children were at risk of shortages of vitamin A, vitamin C, and vitamin B3, respectively (Table 3).

Discussion

The present study found that 16% of children aged 6-23 months were stunted and underweight, while 7% of the children were wasted. The three main indicators of malnutrition were relatively lower than the findings from the previous assessment among children

Table 3: Adequate energy and micronutrient intake from complementary food (N = 200)

Nutrients	6-8 months (49)		9-11 months (49)		12-23 months (102)	
	Freq.	%	Freq.	%	Freq.	%
Energy	23	46.9	14	28.6	39	38.2
Lipid	12	24.5	8	16.3	20	19.6
Protein	19	38.8	16	32.7	71	69.6
Calcium	1	2.1	5	10.2	18	17.7
Iron	2	4.1	0	0.0	11	10.8
Zinc	0	0.0	0	0.0	4	3.9
Sodium	30	61.2	23	46.9	59	57.8
Vitamin A	6	12.2	6	12.2	15	14.7
Vitamin C	9	18.4	4	8.2	25	24.5
Vitamin B3	8	16.3	1	2.1	7	6.8

at the same aged group in Prey Veng, Svay Rieng, Kampot, and Kampong Speu provinces [14]. The decline of these indicators may suggest that over the past 7-8 years, socio-economic development in Cambodia and progressive improvement in national health care services and children and maternal health care have contributed to decline of malnutrition and children's growth as a whole. However, an assessment with larger household samples should be conducted to confirm the decline such as future round of CDHS.

The energy and micronutrient intakes, including iron, zinc, calcium, vitamin A, vitamin C, and vitamin B3 from complementary food were far below the recommendation [3]. A similar study in Northern Ethiopia found that intakes of energy, calcium, zinc, vitamin A, and vitamin C from complementary food were below the WHO recommendations among children aged 12-23 months [5]. This study also found most children received inadequate iron and zinc intakes from complementary food. This was a disturbing concern since iron and zinc, calcium deficiencies during infancy and childhood could lead to impaired cognitive development, growth retardation, and increased risk of mortality [15]. A similar finding in Southern Ethiopia and from Bangladeshi background living in East London [16, 17]. Good food sources of iron and zinc were meat [3, 6, 18]. However, our finding showed that about 64% of children aged 6-11 months were at risk of protein inadequacy, and 30% of children aged 12-23 months was at risk of protein inadequacy.

Moreover, majority of children aged 6-23 months did not meet the estimated average requirement for energy suggesting that these children might have had experience of energy shortage resulting in negative energy balance on body weight. Consequently, it could

result in growth retardation and attribute to weight loss and tissue damage in adulthood [19].

Limitation

This study faced a number of limitations. First, this study was conducted only in two communes of Kampong Chhnang and Kampong Speu provinces with smaller sample size. Larger sample size should be conducted for a better representativeness and to confirm the children's nutritional status and accuracy of the data on micronutrient and energy intakes among this age between 6-23 months since some data from complementary food was subtracted all types of milk. However, this study is the first description of energy and micronutrient intake among children aged 6-23 months. Given the limited data in the past, this study provides the preliminary results that could be useful for designing a larger and a better study to further confirm the results particularly on micronutrient and energy intakes and to provide supportive guidance to the National Nutrition Program.

Conclusions

Sixteen percent of children aged 6-23 months were stunted, 7% were wasted, and 16% were underweight. The prevalence of stunted children was higher in Kampong Chhnang province than Kampong Speu province. However, in Kampong Speu, the prevalence of wasted and underweight children was higher than in Kampong Chhnang.

There is a high prevalence of low intakes of energy, and insufficient micronutrient including protein, calcium, iron, zinc, vitamin A, vitamin C, and vitamin B3 from complementary food. This could put those children at risk of nutrient inadequacy, and chronically result in different forms of malnutrition. Therefore, children aged 6-23 months should be given and taught to eat a variety of food that could be affordable locally such as meat, poultry, egg (protein), fruits, vegetables, and milk, the main sources of protein, energy and micronutrients. Also, children's body weight and height should be measured regularly at least twice yearly so that early sign of malnutrition could be detected and prevented.

Ethical approval

This study was approved by the National Ethics Committee for Health Research (NECHR) in Cambodia on 15 May 2020 (Ref. #114 NECHR).

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