

Original Article

Women's nutrient intakes and food-related knowledge in rural Kandal province, Cambodia¹

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In Cambodia, both anaemia and vitamin A deficiency are serious health problems. Despite this, few comprehensive nutritional surveys have been completed to date. This study evaluates the adequacy of iron and vitamin A intakes, as well as women's nutritional knowledge in rural Kandal province. Twenty-four hour recalls, pile sort activities, socioeconomic surveys, focus groups, and market surveys were carried out with 67 women from 5 villages in rural Kandal Province. Ninety seven percent of women did not meet their daily-recommended intake of iron, while 70% did not meet their daily-recommended intake of vitamin A. Although many women consume vitamin A-rich and iron rich-foods daily, they do not consume large enough quantities of these foods. Results suggest that both the cost of foods as well as the extent of health knowledge is linked to nutritional practice. Most animal-source iron and vitamin A-rich foods are considered expensive; however, small fish, and several plant-source vitamin A-rich foods are inexpensive and easy to access. Despite health education, food restrictions lead some healthy foods to be considered to be harmful to women. Ultimately, this study demonstrates the importance of developing comprehensive nutritional interventions in Cambodia. Health programming must provide women with not only suggestions to include low-cost nutrient-rich foods, but also advise them about the quantities that are likely to have an impact on nutritional status. Programs should take a community-based, inter-sectoral approach that simultaneously combines culturally informed health education with initiatives that combat poverty and increase access to nutrient rich foods.

Key Words: nutritional deficiency, developing countries, Cambodia, anaemia, vitamin A deficiency

INTRODUCTION

Globally, iron deficiency is the most common micronutrient deficiency and severe iron deficiency is often associated with anaemia. Iron deficiency anaemia (IDA) predominantly affects reproductive-aged women and children and is responsible for numerous adverse health consequences; these include negative effects on the health of the foetus and child, and overall well-being and activity levels.¹⁻³

Diets low in iron or bioavailable iron are one of the major causes of IDA.¹ However, deficiencies in other key micronutrients that influence haemoglobin metabolism can also contribute to anaemia. In particular, vitamin A plays an essential role in haemoglobin synthesis through the mobilization of iron and is required for hematopoiesis.^{4,5} Beyond its role in maintaining iron status, vitamin A is essential for maintaining the immune system and epithelial tissue. Vitamin A deficiency (VAD) can lead to eye damage and increases the severity of infections.^{6,7} The primary dietary causes of both iron and vitamin A

deficiency are a diet that is low in diversity and insufficient intake of animal source foods.⁸

Anaemia is most prevalent in the developing world where poverty is widespread and access to healthcare is limited.⁹ The largest population affected by anaemia (315 million) resides in South-East Asia.¹⁰ In Cambodia, both anaemia and VAD are serious health problems. Estimates from the most recent Cambodian Demographic and Health Survey (CDHS) show that anaemia affects 44% of the total population of Cambodia and approximately 44.9% of women living in Kandal province.¹¹ The incidence of night blindness, a clinical sign of VAD, is

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experienced by twice the number of women living in rural areas compared to urban areas.¹²

Few comprehensive nutritional surveys have been completed in Cambodia, especially among women. Data on the prevalence of anaemia and the types of foods consumed by mothers aged 15-49 were collected through the 2005 CDHS. Among the women surveyed in Kandal province, for example, 98% had consumed iron-rich foods, such as meat, fish, shellfish and poultry the day and night prior to the interview, while 88% had consumed vegetables and fruits rich in vitamin A.¹² However, the CDHS did not collect data on the total daily iron and vitamin A intakes, therefore, it is not clear whether or not women's daily requirements for iron and vitamin A are being met.

Nutrition studies in Cambodia have failed to gain an understanding of both food consumption as well as nutritional knowledge as it relates to anaemia and iron- and vitamin A- rich foods. It is well documented that due to women's childbearing roles, strengthening women through improvements in their own nutritional and health status is one of the most effective ways to improve the survival and development of women and children. However, where the causes of malnutrition among women are poorly understood, it is impossible to design effective nutrition programming.¹³

With this in mind, this study had two main objectives:

1) To evaluate the nutrient adequacy of women in rural Kandal province with reference to iron and vitamin A; 2) To understand how culturally-informed nutritional knowledge constrains and/or facilitates women's access to iron and vitamin A rich foods; and 3) Based on 1) and 2), to discuss the implications of the findings for public health nutrition programs in the region and to make recommendations for future research.

METHODS

Study site and population

The study took place in August 2011, during the wet season, in five villages in rural Kandal province. Kandal province is located in the south of the country and is home to the country's capital city, Phnom Penh. The province has a higher socioeconomic status compared to provinces located further north, such as Kampong Thom.¹² Villages within the study area are peri-urban and rural, experience some degree of flooding during the monsoon season, have limited literacy rates and access to secondary education opportunities and health care. The villages selected are located approximately 25-50 km from Phnom Penh. These villages were chosen using convenience sampling because they were involved in programs organized by Resource Development International Cambodia (RDIC), a local, non-governmental organization, and were therefore accessible and easy to assemble. The sample consisted of 67 women aged 25-75; this included 30 women who participated in a one-on-one interview, which was composed of interactive 24-hour recall and pile sort activities. Ten women were selected from each village. Three focus groups (one in each village) were conducted with 37 different women (11-14 women per group). At the outset of the study, three families from Preak Thom were also involved in a free-listing

activity. Women from these families did not participate in the other activities. Key interlocutors included: farmers, community elders, and women employed as cooks.

Key interlocutors were selected for the free-listing activity with assistance from RDIC on the basis of their knowledge about local food. Recall and pile sort participants were selected using random walk sampling with the intent to include an equal number of women from three socioeconomic (SES) strata. The interviewer followed specific randomly generated directions (for example, take the first road to the right and interview the second house on the left) and interviewed individuals as they were encountered. Women selected were approached at their homes and the purpose of the study was explained and the formal SES assessment applied.¹⁴ Focus group participants consisted of women from pre-existing health groups that were formed by RDIC. No women were pregnant or nursing. Data was collected by the primary author and three research assistants employed by RDIC who are native *Khmer* speakers. Informed verbal consent was obtained from all participants and study procedures were approved by the Research Ethics Board at the University of Guelph and the Ministry of Rural Development, Cambodia.

Data collection

Market surveys

To identify the average prices for commonly consumed foods rich in vitamin A or iron, two market surveys spaced two weeks apart were conducted with randomly selected vendors in two locations (*Phsa Moni* and *Kohras*).

Socioeconomic surveys

An asset-based socioeconomic score was calculated for each woman. The asset-based approach is widely used as a proxy for household wealth and is based on the assumption that wealthier households will own a larger number of consumer items.¹⁴ An index of household socioeconomic status was constructed based on household ownership of 21 possessions such as a working car, livestock, and housing building materials (such as concrete, bricks, and iron sheets).

Free listing

Before commencing the interactive 24-hour recalls and pile sort activity, a free listing activity was completed with key informants in Preak Thom. Free listing assisted with the development of a list of key vitamin A, iron-rich and staple foods that were then used to create picture cards for the pile sort activity. The free listing protocol was adapted from Blum and colleagues' widely cited ethnographic procedure for assessing community sources of vitamin A.¹⁴ Twenty-two key foods were selected according to their iron and vitamin A content, and how commonly they were consumed.

Interactive 24-hour recalls

The interactive 24-hour recall method was used to estimate participants' intakes of iron, energy and vitamin A on the previous day.¹⁶ Approximately 24 hours before the recall interview, women were asked to observe the types

and quantities of food they consumed on the recall day. Descriptions of the specific varieties of foods were taken to ensure documentation of particular locally-specific cultivars. Only women who reported feeling "normal" on the recall day were included in the study. The recalls were conducted according to the interactive four-pass method, described in Gibson and Ferguson's guide.¹⁶

Pile sort activity

Following each recall, pile sorts were conducted with women to understand local concepts of food combinations and attributes associated with iron-rich, vitamin A-rich and staple foods. Pictures of each food and its Khmer word were placed on laminated numbered cards and participants were asked to sort the cards into categories and discuss the meaning behind each pile. Category suggestions such as likes and dislikes, cost, similarities and differences were used to initiate the activity, however, women were not restricted to sorting into these categories.

Focus groups

Focus groups were carried out with participants recruited through previously-formed health education groups. In Preak Thom, women had been exposed to health education sessions conducted by RDIC. In Leuk Dek and Samrong Thom, health education groups had recently been formed through RDIC, but education sessions had not commenced. Between 11 and 14 women participated in each focus group. The objective for each focus group was to understand how health education groups impact women's nutritional knowledge. The focus group guide presented women with two hypothetical scenarios about community members with symptoms of 1) iron deficiency anaemia and 2) *kwak moin* (night blindness), and asked them to identify possible causes and treatment options. The scenario on night blindness was adapted from Blum and colleagues' ethnographic protocol.¹⁵ Questions were posed to explore the relationship between health and nutrition, and community-recommended diets for pregnant women, breastfeeding women, and growing children.

Data analysis

A socioeconomic score was calculated for each woman based on the sum of the values of the assets in her household using a previously validated equation.¹⁴ A value for each asset was created by calculating the proportion of the study households who owned one or more of that asset and then taking the reciprocal of the proportion to create a weighted-score. Each weighted-score was multiplied by the number of units of the item owned by that particular household, and all of the products were summed to produce a final socioeconomic score for each home. Housing materials were assigned a binary score (0 = not used, 1 = used). The distribution of the asset scores (11-101) was divided into three parts representing low (11-41), medium (41-71) and high scores (71-101) and recalls and pile sorts were assigned to the appropriate category. Averages of household asset scores were calculated for participants in each focus group. Prices obtained from the market surveys were averaged and the prices of foods were compared to determine which foods were both inexpensive and rich in either vitamin A or iron.

Intakes of iron and vitamin A were calculated using the NutriSurvey software (Nutrisurvey for Windows, Dr Juergen Erhardt, University of Indonesia, Jakarta, Indonesia). The standard NutriSurvey food database was complemented using USDA and Thai food databases available on the NutriSurvey website (www.nutrisurvey.de). The USDA database was complemented with the Thai database to ensure that nutritional content of species of fruits and vegetables unique to South East Asia were documented accurately. In instances where the iron content of the fish species consumed had been documented, this value was entered with the Nutrisurvey values for the vitamin A and energy content of cooked fish.⁸ In instances where the iron content of the fish species had not been documented, Nutrisurvey values for cooked fish were used.

The iron intake generated by the software was converted into bioavailable iron by taking into account the iron content of foods, as well as the presence of iron enhancers (haeme iron and ascorbic acid) and inhibitors (phytate and tea) using Murphy's algorithm.¹⁷ Vitamin A and iron intakes for each woman were compared to USDA dietary reference intakes (DRIs).¹⁸ In addition, nutrient intakes among women of low, medium and high SES were averaged and compared.

Pile sort data was coded thematically under the following categories: recipes, deserts and snacks, likes and dislikes, expensive, cheap, eaten often, easy to make, easy to find and healthy. Frequencies for each food and theme were recorded and data were entered into SPSS Statistical Package for the Social Sciences (SPSS v.19.0, IBM Corporation, Armonk, USA). Multidimensional proximity scaling (MDS) and hierarchical clustering analysis was used to determine patterns in food consumption and practices. Specifically, dendrograms and the MDS output for each SES group and the total population were examined. Pairs of related foods were reviewed to determine which characteristics were most commonly used to group them. Characteristics listed by five or more women in the pile sorts for both foods were recorded. A conceptual diagram (Figure 1) was then constructed to explain the relationship within and between different theme categories. Focus group data was compiled for each question and the answers given by each focus group were compared and contrasted. Emerging themes for each question were recorded and described.

RESULTS

The results of the 24-hour recalls and market surveys are discussed, followed by the results of some of the most important themes identified from the focus group and pile sorts.

Nutrient intakes

In general, women did not meet daily-recommended nutrient intakes. The average consumption of iron and vitamin A was well below the USDA DRI. The majority of women (97%) did not meet their daily-recommended intake of iron; seventy-seven percent consumed less than one half of the iron they required. The range of participants' iron intakes was 1.62-1.82 mg/day while the median intake of iron was 1.72 mg/day. Low intakes of

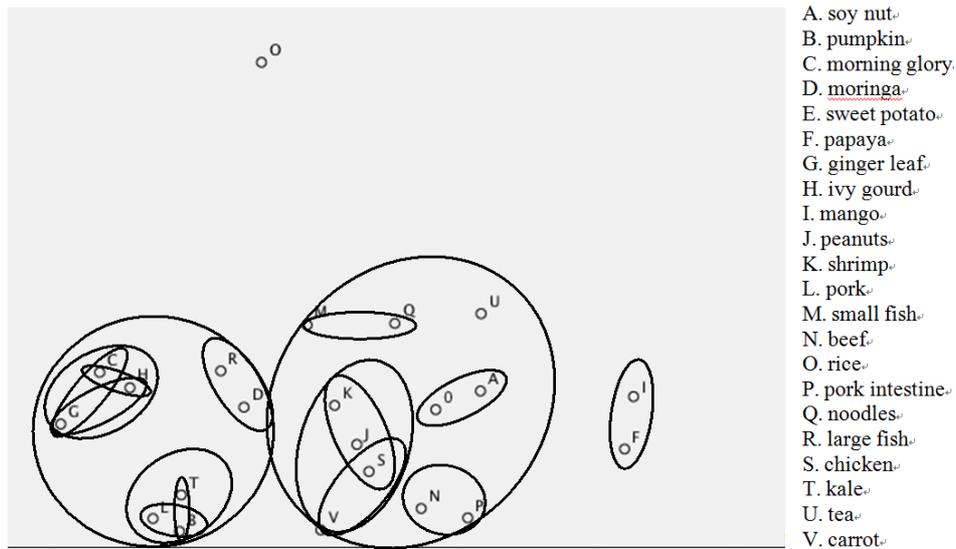


Figure 1. Aggregated multidimensional scale diagram of a pile sort activity completed by 30 Cambodian women, including 22 key iron-rich, vitamin A-rich and staple foods

Table 1. Percent of women who met the DRI for iron and vitamin A and energy in Kandal Province, Cambodia

Age	# Total women	SES score	Iron DRI (mg/d)	# Met iron needs	Vitamin A DRI ($\mu\text{g}/\text{d}$)	# Met vitamin A needs	Energy EAR [†] (kcal/d)	# Met energy needs
19-30	7	40	8.1	0	500	1	2350	0
31-50	10	44	8.1	0	500	5	2250	1
51-70	13	40	5	1	500	3	2100	4

[†] EAR = estimated average requirement, #: number.

iron were recorded despite the fact that participants frequently consumed iron-rich foods, such as fish and pork daily. On average, 30% of the total iron consumed was bioavailable, and only 12% of the non-heme iron was bioavailable. Only 13% of women consumed tea, which contains tannins and is a strong inhibitor of iron absorption.

Most women (70%) did not meet their DRI of vitamin A. The range of participants' intakes of vitamin A was 17.4-2119 $\mu\text{g}/\text{day}$ while the median intake was 249 $\mu\text{g}/\text{day}$. These low intakes were recorded despite the fact that over half of the participants consumed vitamin A-rich plant-based foods such as morning glory, pumpkin or eggs in the 24-hour period prior to the recall. Intakes of energy were also low. Only 17% of participants met their energy intake. On average, 48% of women's energy was obtained from grains such as rice, noodles, and baguette while 26% was obtained from meat such as fish and pork. Fruits and vegetables and other items such as sugar cane juice, and soft drinks comprised 10% and 16% of women's energy intakes, respectively. Vitamin A, iron and energy intakes did not change according to SES status. See Table 1 for a summary of intakes of iron, vitamin A and energy by age and SES score.

Best buys

The results of the market survey are shown in Table 2. Chicken and small fish are inexpensive, rich sources of iron. Morning glory and papaya are inexpensive, vitamin A-rich food sources.

Cost of foods

Women expressed strongly in focus groups that poor nutrition and a lack of food were caused by a lack of money, and that food insecurity was a daily concern for many women. As one participant stated, it is "all about the money". Similarly, in the pile sorts, women often sorted the foods according to costs. Foods that were labeled as "cheap" were often linked with the phrase "easy to find"; foods that are "easy to find" are often grown around the house and are therefore available at little to no cost. Vitamin A-rich plant-based foods such as mango, papaya, morning glory, ivy gourd and ginger leaf are labeled as both cheap and easy to find. A number of iron-rich foods including pork intestine, beef, prawns, and soybeans are labeled expensive, whereas pork meat is considered to be inexpensive. Some vitamin A-rich foods such as carrots and sweet potato are also included in the "expensive category". A conceptual diagram using information from the MDS and cluster analyses is displayed in Figure 1; the descriptors that link foods together are shown in Table 3.

Health education

There are some apparent differences in nutritional knowledge. Focus group data showed that women in Preak Thom, who had previously received health education and were of the highest socioeconomic status, are more nutritionally knowledgeable than those in Somrang Thom, where women received no education and had a moderate socioeconomic status. In turn, women in Somrang Thom were more knowledgeable than participants in

Leuk Dek, who received no health education and were of lower socioeconomic status.

In response to the first scenario, which described a woman with the symptoms of iron deficiency anaemia and asked participants to identify possible causes and treatment options, women from each group linked the symptoms of iron deficiency anaemia to a problem with nutrition, in particular, a deficiency in vitamins. However, a specific deficiency in iron was not mentioned. Participants in Preak Thom and Somrang Thom both suggested that a woman with these symptoms should eat green vegetables. In Somrang Thom, women also suggested beef, fish and meat. In Leuk Dek, participants stated that the individual should eat healthy food and/or use traditional medicine.

When presented with the vitamin A deficiency scenario, participants from each group knew that the problem was vitamin A deficiency (*kwak moin*) and linked the symptoms presented (diarrhoea, frequent infections) with a lack of vegetables. Participants in Preak Thom, for example, suggested the woman eat more foods rich in vitamin A such as pumpkin, sweet potato, carrots, and green vegetables. Women in Somrang Thom stated that the woman should eat more green vegetables and yellow fruits, and participants in Leuk Dek discussed traditional

medicine. For both the scenarios on vitamin A deficiency and iron deficiency, women in Preak Thom, who had previously received health education and were of the highest socioeconomic status, are more nutritionally knowledgeable than those in Somrang Thom, which had a moderate socioeconomic status, and Leuk Dek, where women received no health education and were the poorest.

Harmful foods

Participants agreed that at some stages of life, women should eat differently and avoid certain harmful foods. For example, several foods are considered to be harmful to breastfeeding women. These include certain types of fish including *Kry* fish, *Kahel* fish, *Broma* fish and *Khgoeng* fish, as well as *chek nuon* (a type of banana) and salty foods such as *prahok* (fermented fish paste). Spicy hot foods like ginger and "peppered foods" are considered to be good foods to eat when breastfeeding. On the contrary, women stated that when pregnant, spicy foods like chili should be avoided "because they will make your child hot inside you". Women also stated that salty foods like *prahok* should be avoided during pregnancy.

Table 2. Average year-round cost of vitamin A- and iron-rich foods in Kandal Province, Cambodia

Name of food	Unit	Price (KHR) [†]	Price (USD)
Beef	1 kg	26000	0.65
Carrot	1 kg	5000	1.25
Chicken	1 kg	15000-16000	3.75-4.00
Chicken egg	10 eggs	5000-6000	1.25-1.50
Fish (big)	1 kg	13000-14000	3.25-3.50
Fish (medium-sized)	1 kg	8000-14000	2.00-3.50
Fish (small)	1 kg	8000-10000	2.00-2.50
Mango	1 kg	3000	0.750
Moringa	1 bunch	300	0.080
Morning glory	1 bunch	200-500	0.050-0.125
Mung bean	100 g	1000	0.250
Papaya	1 kg	300-600	0.075-0.150
Pork	1 kg	20000-22000	5.00-5.50
Pumpkin	1 kg	2000-2500	0.50-0.625
Soybean	100 g	100000	2.50
Sweet Potato	1 kg	1500-2000	0.375-0.500

[†]KHR = Khmer Riel; 4000 KHR=\$1 USD.

Table 3. Characteristics associated with groupings of vitamin A-rich, iron-rich and staple foods in Kandal Province, Cambodia

Food Groupings	Recipe	Dessert	Expensive	Healthy	Easy to find	Cheap	Eaten often
Sweet potato, soy nut	X	X	X	X			
Mango, papaya		X		X	X	X	
Pork intestine, beef			X				
Kale, pumpkin, pork	X					X	
Morning glory, ivy gourd, ginger leaf	X				X	X	X
Large fish, moringa	X				X		
Shrimp, peanuts, chicken, carrot	X		X				
Small fish, noodles							X
Tea			X				
Rice							X

DISCUSSION

The current study suggests that it may be a combination of a lack of health education and poverty that leads women in the study area, and likely across rural Cambodia, to have poor dietary intakes. Most animal-source iron and vitamin A-rich foods are considered expensive; however, small fish, and several plant-source vitamin A-rich foods are inexpensive and easy to access. Despite health education, food restrictions lead some healthy foods to be considered to be harmful to women.

Similar to the findings of the CHDS conducted in 2005, our study reveals that women frequently consume iron rich foods, especially fish and pork, at each meal. In contrast to the finding of our study, where less than one half of the women consumed vitamin A-rich foods, the 2005 CDHS observed that 88% of women consumed vegetables and fruits rich in Vitamin A.¹² Unfortunately, the 2005 CDHS provides only a qualitative assessment of dietary intake. By quantifying the dietary intakes through the completion of 24-hour recalls, the current study reveals that although many women consume vitamin A-rich and iron rich-foods daily, they do not consume large enough quantities of these foods. Thus, this study reveals that it is important for health programming to focus on providing not just suggestions to include low-cost nutrient-rich foods, but also the quantities that are likely to have an impact on nutritional status.

Despite the fact that only 13% of participants consumed tea with their meals, the average bioavailability of the non-heme iron consumed by participants is low. As well as encouraging women to avoid taking tea with meals, health education initiatives should instruct women to increase their intake of ascorbic acid, which enhances the absorption of non-heme iron. One of the most important findings with regard to iron is that small fish are considered to be an inexpensive and easily accessible source of iron. Cambodian villagers often raise small fish at the household level, albeit typically in ponds that are not sustainable in the dry season. Future research should explore technical considerations that would make it possible to raise small iron-rich fish, such as *chanwa phlieng* in communities year-round as a cheap, iron rich animal source food for household consumption.⁸

Animal-based sources of Vitamin A such as organ meats, which are the most readily absorbed, were considered to be expensive by those women surveyed. In the past, nutritional programs in Cambodia have tended to promote the consumption of plant-based vitamin A rich foods, but often neglect animal sources (Personal Observation, CVC). Nutrition education campaigns and outreach activities should focus on promoting both low-cost animal and plant sources of vitamin A.

Unfortunately, national nutritional programming in the region is not comprehensive. Current nutritional programming in Cambodia narrowly focuses on the provision of nutritional supplements and limited education. The public health sector is seriously understaffed and overstressed, and is centered on clinic-based approaches rather than on community-based initiatives. Nutritional programming is not well integrated with other sectors, such as agriculture. This is despite the fact that research suggests that malnutrition in Cambodia has several causes

that require a broader inter-sectoral approach. For example, studies show that infections with helminths such as hookworm, whipworm, and roundworm, are common across all age groups in Cambodia. Helminths can cause iron deficiency anaemia through blood loss and can also contribute to anaemia because they have negative effects on vitamin A absorption, and cause chronic inflammation and diarrhea.¹⁹ The concomitantly high prevalence of intestinal worm infection in Cambodia together with poor nutritional intake contributes to rampant malnutrition. An inter-sectoral approach that addresses not only nutrition and agriculture but also sanitation and hygiene is necessary.

Nutritional programming in Cambodia should both be linked with the broader activities of primary healthcare and community development and incorporate community participation in planning and implementation. Participatory programming is likely to be more successful than top-down narrowly-focused nutrient specific programming.²⁰ This is exemplified, for example, by the success of Thailand's community-based nutritional and development program. Thailand used a combined bottom-up and top-down approach that encourages communities to identify their own basic minimum needs (BMN) with regard to nutrition, and larger health, education, agriculture and rural development issues, and to initiate action on community priorities with the assistance of the government. This integrated, participatory approach has shown success, with nutrition problems being addressed more broadly through the promotion of initiatives such as improved antenatal care, formal health and agricultural educational programs in schools and in communities, and household and community food production activities, such as fish-ponds and backyard poultry raising. Between 1980 and 1990 alone in Thailand, the prevalence of anaemia in pregnant women declined from 41% to 25%.²¹ Nutritional programs in Cambodia should adopt a similar inter-sectoral, participatory approach that is both culturally relevant and sensitive to the ever-changing development priorities identified by communities.

Despite the useful results that have been uncovered by the current study, it has some limitations. The diet in Cambodia is typically quite variable from season to season, with some staples, including rice making up a large portion of the diet throughout the year. The results given in this paper are generalizable only to the season in which data collection took place, and this is a limitation of the current study. In addition, due to time and budgetary constraints, it was not possible to obtain a sample representative of the entire province and data was collected from a single sampling period. A representative food consumption study that collects data using multiple recalls in both the wet and dry seasons should be completed to build upon these results and validate the findings. That said, the nutrition situation in Cambodia is not well-understood and this study, which provides an accurate snapshot of participants' regular food intake, will be important for the development of nutrition policy and in setting future research priorities.

Our findings also demonstrate the importance of designing nutrition education in Cambodia in line with the socio-cultural realities and understandings of communi-

ties. Women's avoidance of hot, spicy foods during pregnancy and consumption of these foods during the postpartum state can be explained by the incorporation of humoral theory into the Khmer medical worldview.²² In humoral theory, health is defined by a state of balance described using a hot-cold distinction. For example, during pregnancy, a woman is in a hot state and, therefore, consuming hot foods can make her child too hot.²³ Food restrictions during pregnancy and after delivery are common cross-culturally and it has been suggested that they may affect daily nutrient intakes.^{24,25} If Cambodia is to take action to preserve the health of reproductive-aged women, further ethnographic studies should be completed to investigate Khmer food classifications and the impact of accepted and restricted foods on nutritional status, and this knowledge should be incorporated into community-based nutrition programming.

This study highlights the fact that women in rural Kandal province, and likely across rural Cambodia, do not meet their daily-recommended intakes of iron and vitamin A. Although many women consume vitamin A-rich and iron rich-foods daily, they do not consume large enough quantities of these foods. Thus, the current study reveals that it is important for health programming to focus on providing not just suggestions to include low-cost nutrient-rich foods, but also the quantities that are likely to have an impact on nutritional status. Both the cost of foods as well as the extent of health knowledge are linked to nutritional practice. Most animal-source iron and vitamin A-rich foods are considered expensive; however, small fish, and several plant-source vitamin A-rich foods are inexpensive and easy to access. Despite health education, food restrictions lead some healthy foods to be considered to be harmful to women. In order to ensure that nutrition programs in Cambodia are designed in line with the lived realities and cultural practices of target communities, initiatives should expand beyond clinic-based approaches to adopt an inter-sectoral, participatory approach. Similar studies that collect data using multiple recalls and incorporate ethnographic study should be carried out with Cambodian women and their families in order to gain a better understanding of why low intakes of nutrients result.

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AUTHOR DISCLOSURES

No competing interests are reported.

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Original Article

Women's nutrient intakes and food-related knowledge in rural Kandal province, Cambodia¹

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柬埔寨 Kandal 省农村妇女的营养素摄入和食物相关知识

在柬埔寨，贫血和维生素 A 缺乏都是严重的健康问题。尽管如此，到目前为止已经完成的全面的营养调查还很少。本研究评估了 Kandal 省农村妇女铁和维生素 A 摄入量是否充足，以及她们的营养知识。24 小时膳食回顾，累积活动量，社会经济调查，焦点小组和市场调查在来自 Kandal 省 5 个村庄的 67 名女性中进行。97% 的女性铁的摄入量未达到每日推荐量，而 70% 的女性维生素 A 的摄入量未达到每日推荐量。尽管许多女性每天摄入富含维生素 A 和铁的食物，但是他们摄入这些食物的量并不够。结果表明食物的价格和健康知识的程度与营养实践相关。大多数动物来源铁和维生素 A 含量丰富的食物被认为价格昂贵，然而，小鱼和维生素 A 含量丰富的几种植物性食物价格低廉并且容易获得。尽管健康教育，食物限制导致一些健康食物被认为对妇女有害。最终，本研究证实了在柬埔寨开展综合性营养干预的重要性。卫生规划不仅应为妇女提供营养丰富且价格便宜的食物建议，而且应给出能够影响营养状况的摄入量。规划应以社区为基础、跨部门的方法，同时结合文化健康教育举措以消除贫困和增加可获得营养丰富的食物。

关键词：营养缺乏、发展中国家、柬埔寨、贫血、维生素 A 缺乏