Dual Dietary Intake Problems among Under-Five Years Old Children Living in an Armed Conflict Area of Southern Thailand

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This survey examined nutritional intake and the effects of armed conflict on energy-protein inadequacy among children aged one to less than five years. Fifty health centers were randomly selected. Three children were randomly selected from each 12-month old interval age groups in each health center. Four hundred seventy eight children and their primary caregivers were recruited. Food intake was collected from a single 24-hour food recall and was computed to percentage of the Thai Dietary Reference Intake (DRI). Violent event rates were classified by quartiles. Dietary intake stratified by age groups was examined. Logistic regression was used to examine association between armed conflict and inadequacy of food intake. Average of DRI was above 100% for both energy and protein intake. Snacks contributed to one-fourth of energy intake. Inadequacy of energy and protein intake was 27% and 7%, respectively. There was no association between armed conflict and inadequacy of energy and protein consumption.

Keywords: *Nutrient inadequacy, Preschool children, Armed conflict*

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Malnutrition could result in neuro-developmental outcome and growth retardation among affected children especially in the first five years of life[1,2]. High prevalence of malnutrition was commonly reported in low socio-economic rural, refugee camps[3-5] and in postwar areas[5-8]. Malnutrition in postwar areas was related to destruction of infrastructure and food shortage that led to inadequate nutritional intake especially energy and protein[9,10].

In the four provinces of southern Thailand close to the Malaysian border, child malnutrition has long been an important health problem but has never been reported. An armed conflict has been surged since 2004 with 9,446 incidents resulting in 4,100 deaths and 6,509 injuries between January 2004 and 2010[11]. The prevalence of malnutrition including underweight (23%), stunting (28%) and wasting (11%) among children aged less than five years were reported in 2006 during armed violence[12]. Since this on-going armed conflict is unique that the intensity is not as severe as war and the infrastructure has remained intact, it is still unclear whether the malnutrition is due to inadequate food intake during armed violence. The present study aimed to examine macro-nutritional intake and association between an armed conflict and inadequacy of energy-protein intake among children aged between 12 and 59 months living in communities affected by armed conflicts in lower southern Thailand. The findings will benefit policy making and improving child nutrition in an armed conflict area.

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Material and Method

Sampling method

Out of 405 health centers, 50 were randomly selected as the primary sampling unit. A list of children aged between 12 to 59 months living in the village where the health center was located was obtained. Children with disabilities, chronic illnesses, injuries related to an armed conflict, and whose parents were directly affected by the violence were excluded. The remaining eligible children were classified into four 12-month age groups. Three children were randomly selected from

each age group. Thus, 12 children were drawn from each health center.

Data collection

The primary caregivers of the selected children were verbally invited by a local health officer to be interviewed at a health center. An explanation about the study was given and a written informed consent was obtained before conducting an interview.

Survey instruments

Face-to-face interview using a structured questionnaire was carried out by a trained research assistant to collect data on socio-demographic status and child rearing practices. The Household Food Insecurity Scale (HFIAS)[13] was applied in order to assess household food accessibility. Information of a single 24-hour recall of dietary consumption was taken by a qualified nutritionist using the standard procedure and equipments[14].

Data on armed conflict events

The number of violent events in each month due to armed conflict in each sub-district where selected health center are located were obtained from the Deep South Coordination Centre (DSCC) database[15]. The database includes the information pertaining to violence and victims in the deep south of Thailand since 2004.

Statistical analysis

Socio-demographic data were computerized using EpiData version 3.1 (Epidata Association, Odense, Denmark). Statistical analysis was done using R statistical software version 2.12.1 (The R Development Core Team, Austria). Prevalence of each nutrient inadequacy was estimated using descriptive statistics. Data on 24-hour food recall were computerized and converted to nutrient intake per day using the INMUCAL-Nutrient software fourth edition (Mahidol University, Thailand). The software can convert Thai raw food intake to crude 15 types of nutrient and percentage of Thai Dietary Reference Intake (DRI)[16]. The software has been commonly used in previous studies for dietary assessment of Thai food[17,18].

Intake of energy (kcal/d), protein (g/d), carbohydrate (g/d), fat (g/d) per day of the study children were converted into a percentage of Thai DRI[19]. Inadequacy of each nutrient intake was identified if it was below 100% Thai DRI. Energy-protein inadequacy was defined as inadequate intake of either energy or protein. To identify the intensity of violence exposure, the average yearly event rate per 100,000 population of each sub-district was estimated and categorized into quartiles. Multiple logistic regressions were used to assess the association of armed conflict on protein-energy inadequacy adjusted for potential confounders.

Results

Five hundred seven children out of 589 in 50 sub-districts were recruited, giving a response rate of 86%. Twenty children were excluded because their ages were greater than 59 months due to lag time between sampling and interview. A further nine were excluded due to unreliable food intake data, leaving 478 children for data analysis.

One thousand nine hundred two events of armed violence (93.8 event rate per 100,000 population per year) had occurred in 50 study communities with an annual death and injury rate was 37.3 and 131.1 per 100,000 population per year between January 2004 and May 2010.

Almost half of the families had incomes below the national poverty line (48 $US/person/month). Most caregivers were middle-aged mothers and Malay ethnicity. More than half had completed primary school only. Table 1 shows 64.7% reported no food insecurity problem and more than 61.1% were concerned about the increased cost of food rather than food insecurity.

Mean energy and protein intake was greater than 100% DRI. One-fourth of energy and protein was

Table 1. Food insecurity and perception of violence on foods (n = 478)

Characteristics	No. (%)
Household Food Insecurity (HFI)*	
None	292 (64.7)
Mild	56 (12.4)
Moderate	77 (17.1)
Severe	26 (5.8)
Perception of effects of armed conflict on foods**	
Cost of food rose	272 (61.1)
Need to hoard foods	72 (16.0)
Quality of food worsened	71 (15.8)
Availability of food decreased	24 (5.3)
Cultivation became more difficult	9 (3.5)
Food supply became inadequate	3 (1.2)

* HFI: Household Food Insecurity Scale by Food and Nutrition Technical Assistance

** Data were not mutually exclusive

Table 2. Mean, SD and % DRI of energy and macro-nutrient intake and amount of energy contributed by snack

Age group (n = 478)	Mean	SD	% DRI*	Snack proportion**
Age of 12 to 23 months				
Energy (kcal/d)	1,336.0	530.4	133.6	19.3
Protein (g/d)	41.1	22.6	221.4	8.5
Carbohydrate (g/d)	42.2	35.7	-	24.5
Fat (g/d)	7.8	6.7	-	16.2
Age of 24 to 35 months				
Energy (kcal/d)	1,587.0	605.6	158.7	23.6
Protein (g/d)	50.6	21.3	271.6	11.2
Carbohydrate (g/d)	67.4	62.8	-	29.1
Fat (g/d)	13.1	12.6	-	20.9
Age of 36 to 47 months				
Energy (kcal/d)	1,673.0	707.1	128.7	30.6
Protein (g/d)	60.9	26.0	221.3	14.1
Carbohydrate (g/d)	83.2	59.0	-	37.1
Fat (g/d)	16.5	14.2	-	28.3
Age of 48 to 59 months				
Energy (kcal/d)	1,618.0	602.3	124.5	27.6
Protein (g/d)	60.1	23.8	216.1	12.8
Carbohydrate (g/d)	72.6	47.8	-	33.3
Fat (g/d)	14.3	10.5	-	25.8

* DRI: Thai Dietary Reference Intake
** Percentage of energy intake contributed by snack

Table 3. Association between violence event rate and inadequacy of protein-energy intake

Factors	Adj. OR*	95% CI**	p-value***
Violence event rate (ref = 1st quartile)			0.61
2nd quartile	1.02	0.56-1.84	
3rd quartile	0.74	0.39-1.40	
4st quartile	0.73	0.38-1.42	

Adjusted for sex, age, socio-economic status, household food security, eating problem and health status
* Adj. OR: Adjusted odds ratio
** CI: Confidence interval
*** p-value from likelihood ratio test

contributed by snacks as shown in Table 2. Overall prevalence of energy and protein inadequacy was 27% and 7%. However, the energy-protein inadequacy was not associated with intensity of armed conflict, as demonstrated in Table 3.

Discussion

Against conventional expectation that an armed conflict could lead to inadequacy of protein and calorie consumption[5,6] the results from the present study showed both under- and over-consumption of protein and calorie. Mean macro-nutrient intake was generally higher than the Thai DRI recommendation. Excessive intake of energy was partly due to the high consumption of snacks, which are rich in carbohydrates[20]. High protein intake came from a high consumption of animal food from regular meals, such as fish and chicken, which are abundant in this region[21,22]. The average intake of energy and protein per day of the presented subjects was higher than those in other non-conflict rural areas in Thailand, where poverty is the main problem as well as among Burmese living in the refugee camps in Thailand[17]. Previous studies reported that over intake of food could be observed in war areas after reconstruction of infrastructure and availability of fast food and snacks[6,23].

Despite the high food consumption and no evidence of food shortage, inadequate intake of energy and protein is still a problem. However, inadequacy of food intake is associated with personal food eating habits and caregiver's education. While the association between armed conflict and protein-energy inadequacy was not observed in the present

study, it is possible that the intensity of armed conflict did not collapse the social and agricultural infrastructure to cause inadequacy of food intake as it may have in other war areas[5,6,9]. The survey findings could not be compared to the others since it is the only study examining dietary intake among children 1-5 years old during an on-going armed conflict.

Both over- and under- consumption of energy and protein found in the present study could lead to delayed growth and development[2]. Education and other intervention to promote healthy food intake should be provided to parents and primary care givers. The intervention should be well designed to be cultural and language appropriate.

Strength and limitation

Most investigations of the effect of armed conflicts came from data collected at refugee camps or post war survey. The present study was conducted in the communities during an on-going armed conflict. Food intake obtained from a single time compared to multiple 24-hour food recall may be overestimated. Due to safety reasons, only a single 24-hour recall could be conducted. The single measurement, however, should not be biased by regression dilution effect as food intake in the present study was a study outcome instead of an exposure.

Conclusion

Over- and under-consumption of energy and protein were reported in the present study, however, inadequacy of energy and protein was not associated with an on-going armed conflict in the study area.

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Potential conflicts of interest

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ปัญหาร่วมของการได้รับโภชนาหารของเด็กอายุน้อยกว่า 5 ปี ผู้อาศัยในพื้นที่การต่อสู้ด้วยอาวุธในภาคใต้ของประเทศไทย

รอฮานิ เจะอาแซ, รัศมี สังข์ทอง. วีระศักดิ์ จงสู่วิวัฒน์วงศ์

การศึกษานี้เป็นการสำรวจการได้รับโภชนาหาร และผลกระทบของการต่อสู้ด้วยอาวุธต่อความไม่เพียงพอของพลังงาน และโปรตีนในเด็กอายุ 1 ถึงน้อยกว่า 5 ปี โดยสุ่มเลือกศูนย์สุขภาพ 50 แห่ง สุ่มเลือกเด็ก 3 คน แต่ละกลุ่มอายุได้จำนวนกลุ่มตัวอย่าง 478 คน ปริมาณอาหารที่ได้รับได้มาจากการสัมภาษณ์การบริโภคอาหารย้อนหลัง 24 ชั่วโมง (24-hour recall) จากผู้ดูแลหลัก และประมวลผลเป็นร้อยละ การบริโภคอาหารตามปริมาณสารอาหารอ้างอิงที่ควรได้รับประจำวัน (Thai Dietary Intake) ความรุนแรงของการประสบเหตุแบ่งตามอัตราการเกิดเหตุการณ์ต่อเดือนใช้สถิติคลอไทล์ วิเคราะห์สารอาหารที่ได้รับจำแนกตามกลุ่มอายุ หาความสัมพันธ์ของความรุนแรงของเหตุการณ์และการบริโภคพลังงานและโปรตีนไม่เพียงพอด้วยสถิติถดถอยโลจิสติก ค่าเฉลี่ยของการบริโภคพลังงานและโปรตีนมากกว่าร้อยละ 100 ทั้งสองชนิด 1 ใน 4 ของพลังงานได้มาจากการบริโภคอาหารกรุบกรอบ ร้อยละ 27 และ 7 ได้รับพลังงานและโปรตีนไม่เพียงพอตามลำดับ ไม่พบความสัมพันธ์ระหว่างความรุนแรงของเหตุการณ์และการได้รับพลังงานและโปรตีนไม่เพียงพอ