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High prevalence of undernutrition among preschool children in Pattani Province, southern Thailand

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ABSTRACT

Introduction: Malnutrition is one of the leading causes of childhood death. In the southern provinces of Thailand that are encountering a civil conflict, the extent of malnutrition among young children has not been adequately reported. **Methods:** A cross-sectional study was undertaken to assess the nutritional status of children aged 2-5 years enrolled in early childhood development centres (ECDC) in Pattani Province. A total of 112 ECDCs were randomly selected and 871 children who met the inclusion criteria were recruited. Anthropometric measurements were taken and nutritional status determined according to World Health Organization (2006) growth standards. Statistical analyses of nutritional indicators, namely wasting, stunting, underweight and Composite Index of Anthropometric Failure (CIAF) across socio-demographic variables were carried out. Binary logistic regression models, based on the different nutritional indicators, were used to determine the relationships between undernutrition status and associated factors. **Results:** Prevalence of wasting (7.7%), stunting (19.6%) and underweight (16.8%) were determined. Based on CIAF, 27.4% of the children were undernourished. Logistic regression odds showed that prevalence of all forms of undernutrition was statistically independent of sex and place of residence. Religion was associated with all four indicators of undernutrition. Stunting was associated with child's age and religion, while underweight and CIAF were associated with the child's age, religion and mother's occupation. **Conclusion:** Prevalence of undernutrition was estimated to be high in comparison with the national average figure. The study findings highlighted the need for more effective nutrition promotion activities to alleviate undernutrition problems among young children in Pattani Province.

Keywords: Nutrition status, preschool children, southern Thailand

INTRODUCTION

People who are well nourished and cared for from early childhood enjoy optimal growth, health, and wellbeing (Wang & Stewart, 2013). Undernutrition is one of the leading underlying causes of childhood illness and death (Rice *et al.*, 2000). Food choices and eating patterns developed during early childhood can help evade undernutrition, restrained growth, short-term nutrition problems, along with preventing non-communicable diseases (Wang & Stewart, 2013).

The burden of malnutrition (undernutrition or overnutrition) are of public health concern in Thailand

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(Winichagoon, 2013). In the southern border provinces, the population is predominantly Muslim, in a largely Buddhist dominated nation. Since 2004, low-level separatist violence had occurred in the region (UNICEF, 2006). As a result, socio-economic, health services and education have been adversely affected. Maternal and child health status lags behind the national average, contributing to higher maternal and infant mortality rates (UNICEF, 2006). About 74.3% of the children in Pattani province attend early childhood development centres (ECDC) (NSO & UNICEF, 2017). However, there is a lack of data on the nutritional status of children aged 2 to 5 years.

For the measurement of the overall prevalence of undernutrition, Svedberg (2000) suggested an aggregate indicator, namely the Composite Index of Anthropometric Failure (CIAF). The CIAF is made up of typical anthropometric indicators, including wasting, stunting, underweight, and their combinations into seven categories. The CIAF provides an additional measure for assessing malnutrition and serves as an alternative to assessing wasting, stunting and underweight as separate measures (Nandy *et al.*, 2005; Svedberg, 2000). Savanur & Ghugre (2015) found that CIAF could identify more undernourished children in the slums of Mumbai city than the conventional indices.

The aim of this study was to assess the nutrition status of children aged 2-5 years in Pattani Province. Both conventional anthropometric indices as well as the CIAF were used.

MATERIALS AND METHODS

Study design

The study design was cross-sectional with random cluster sampling. Each of the early childhood development centres (ECDCs) under the local administrative office was a cluster unit.

Study population

The study area was Pattani Province, Thailand, which is one of the southern provinces adjacent to the Thai-Malaysian border. The study population was children attending ECDC in Pattani Province. A total of 165 ECDCs with 9,520 children was enrolled in the 2017-2018 academic year. Children with physical disability and children below 2 years or above 5 years of age were excluded.

Sample

The sample size of the study was calculated using 16.7% prevalence of stunting (NSO, 2012) with relative desired precision of 0.03 and 1.3 design effect. Adding a 15.0% non-response rate, the sample size (n) was calculated to be 889. Cluster sampling was used to determine an equal number of children from each ECDC, serving as a cluster. The lowest number of children in the ECDC of Pattani province was eight. The number of clusters, was determined by dividing the total sample size (889) by the lowest number of children in one ECDC (8). In this way, a total of 112 ECDCs was computed and they were randomly selected without replacement. Eight children in each selected centre were selected randomly using a random number table.

Ethics approval

The ethical committee of Prince of Songkla University, Pattani campus, approved the study. Certificate of approval letter was received on 8th June 2017 with record number psu. pn 1-020/60. Prior to the field visit, the heads of the ECDCs were informed about the purpose of the study and procedures of data collection. Written consent was obtained from the head of each ECDC for the measurement of the selected children.

Data collection

Anthropometric measurements were taken by trained enumerators using calibrated instruments. Standardisation of measurements among the enumerators was conducted for accurate and precise measurements. Tools used for the measurements were weighing scale (Seca weighing scale, capacity: 2.0-150.0 kg, precision: 0.1 kg), child height-length measurement board (one-side tape, precision: 0.1 cm). Measurements were made to the nearest 0.1 cm and 0.1 kg for height and weight, respectively. Working in a group, two enumerators followed standard procedures in taking height and weight measurements. Due to socio-religious reasons, all the children were measured wearing similar light clothing. In order to account for the clothing, 0.1 kg was subtracted from all the weight measurements during data analysis. Date of birth was obtained from the ECDC register.

Outcome measures

The World Health Organization (WHO) child growth standard 2006 was used for the classification of anthropometric indices. Wasting reflects acute undernutrition with weight-for-height *z*-score value < -2 standard deviations (SD) (< -3SD as severe wasting). Overweight is weight-for-height > 2SD. Stunting reflects chronic undernutrition with height-for-age *z*-score < -2SD (< -3SD as severe stunting). Underweight reflects weight-for-age < -2SD (de Onis, 2006; WHO, 2006). CIAF excludes those children without any forms of undernutrition (Table 1, Group A) and includes all wasted, stunted, or underweight cases, and their combinations (Table 1, Group names B-F and Y) (Nandy *et al.,* 2005).

Data analysis

Anthropometric data were converted to *z*-scores using WHO Anthro 3.2.2 software and statistical analyses were undertaken using R program 3.4.0. Statistical analyses of four nutritional indicators (wasting, stunting, underweight and CIAF) across age, sex, religion, residence and mother's occupation were carried out. Cross tabulations with Pearson's chi-square test were performed. Logistic regression was used to assess the effects of candidate factors on the wasting, stunting, underweight and CIAF separately.

RESULTS

Out of a total of 889 children initially included, 2.2% were excluded. The WHO flagged these cases as outliers with > ±5SD for wasting, ±6SD for stunting and < -6SD, and > +5SD for underweight. Among the remaining 871 children, 417 (47.9%) were males and 454 (52.1%) females, giving a sex ratio of 0.92. The mean age of the children was 38.8±7.2 months (ranging from 24.0-59.9

Table 1. Classification of children based on Composite Index of Anthropometric Failure (CIAF)

Category	*Description*	*Wasting*	*Stunting*	*Underweight*
A	No failure	No	No	No
B	Wasting only	Yes	No	No
C	Wasting and underweight	Yes	No	Yes
D	Wasting, stunting and underweight	Yes	Yes	Yes
E	Stunting and underweight	No	Yes	Yes
F	Stunting only	No	Yes	No
Y	Underweight only	No	No	Yes

Table 2. Nutrition status of children according to socio-economic factors

Factors	*N (%)*	*Wasting (%)*†		*Stunting (%)*†		*Underweight (%)*†		*CIAF (%) Failures*
		<-3SD	*<-2SD*	*<-3SD*	*<-2SD*	*<-3SD*	*<-2SD*	
Overall	871 (100.0)	1.4	7.7	4.1	19.6	3.0	16.8	27.4
Sex								
Male	417 (47.9)	1.9	8.2	4.6	19.4	2.9	15.6	26.4
Female	454 (52.1)	0.9	7.3	3.7	19.8	3.1	17.8	28.4
		p=0.717, df=1		p=0.95, df=1		p=0.424, df=1		p=0.551, df=1
Age of child‡								
2-3 Years	347 (39.8)	0.9	7.2	3.5	15.9	1.4	14.1	24.8
3-4 Years	420 (48.2)	1.4	6.9	2.6	18.8	2.4	16.2	26.4
4-5 Years	104 (11.9)	2.9	12.5	12.5	35.6	10.6	27.9	40.4
		p=0.145, df=2		p<0.001*, df=2		p=0.004*, df=2		p=0.006*, df=2
Religion								
Buddhist	73 (8.4)	0.0	0.0	0.0	8.2	0.0	4.1	11.0
Muslim	798 (91.6)	1.5	8.4	4.5	20.7	3.3	17.9	28.9
		p<0.019*, df=1		p=0.016*, df=1		p=0.004*, df=1		p=0.002*, df=1
Residence								
Urban	94 (10.8)	1.1	7.4	5.3	14.9	1.1	13.8	24.5
Rural	777 (89.2)	1.4	7.7	4.0	20.2	3.2	17.1	27.8
		p=1.000, df=1		p=0.277, df=1		p=0.509, df=1		p=0.575, df=1
Mother's occupation								
Government	88 (10.1)	2.3	4.5	2.3	11.4	1.1	5.7	14.8
Agriculture	76 (8.7)	3.9	11.8	3.9	28.9	5.3	23.7	38.2
Business	157 (18.4)	1.2	5.0	2.5	19.4	1.9	15.6	25.6
Private	321 (36.7)	0.6	7.2	5.0	19.7	3.1	17.2	27.2
Others	229 (26.1)	1.3	10.1	4.8	19.8	3.5	18.9	30.4
		p=0.151, df=4		p=0.091, df=4		p=0.023*, df=4		p=0.013*, df=4

*statistically significant difference at p<0.05; p-values are calculated using Chi-square test
†Children <–2SD include those with <–3SD
‡Mean age of children 38.8 months with SD 7.2

months). Almost all the children (91.6%) were Muslim. Most of the children (89.2%) were from rural areas. Table 2 summarises the distribution of the study subjects.

It was observed that 7.7% of the children were wasted, out of which 1.4% were severe cases. Stunting was observed in 19.6%, among whom 4.1% were severely stunted. Prevalence of underweight children was 16.8%, among them 3.0% were severely underweight. Based on CIAF, the total prevalence of undernutrition was 27.4%. Within this category, 13.5% children had a single anthropometric failure and 13.9% had multiple anthropometric failures. Overweight was observed in 2.5% children. Similarly, 2.9% children had weight-for-height and/or weight-for-age greater than +2 z-scores. Hence, the total prevalence of any form of malnutrition (both undernutrition and overnutrition) among the pre-school children was 30.3%.

Prevalence of all forms of malnutrition was statistically independent of sex or place of residence. The age group of children was associated with stunting (p<0.001), underweight (p=0.004) and

Table 3. Logistic regression for predicting nutrition status: undernourished vs. normal

Factors	*Wasting OR†(95% CI)*	*Stunting OR†(95% CI)*	*Underweight OR†(95% CI)*	*CIAF OR†(95% CI)*
Years				
2-3 Years (ref)	1.00	1.00	1.00	1.00
3-4 Years	0.95 (0.54, 1.67)	1.24 (0.85, 1.83)	1.17 (0.78, 1.75)	1.08 (0.78, 1.51)
4-5 Years	1.89 (0.92, 3.90)	3.09 (1.86, 5.12)*	2.42 (1.41, 4.14)*	2.13 (1.33, 3.43)*
Religion				
Buddhist (ref)	1.00	1.00	1.00	1.00
Muslim	-	3.38 (1.42, 8.03)*	5.79 (1.78, 18.8)*	3.69 (1.73, 7.89)*
Occupation				
Government (ref)	1.00	1.00	1.00	1.00
Agriculture	2.75 (0.80, 9.42)	3.04 (1.32, 7.01)*	5.00 (1.74, 14.35)*	3.53 (1.62, 7.53)*
Business	1.07 (0.31, 3.68)	1.78 (0.82, 3.86)	2.95 (1.08, 8.05)*	1.94 (0.97, 3.88)
Private	1.62 (0.54, 4.84)	1.83 (0.89, 3.75)	3.38 (1.30, 8.75)*	2.13 (1.12, 4.05)*
Others	2.32 (0.77, 6.97)	1.77 (0.84, 3.73)	3.68 (1.40, 9.69)*	2.44 (1.26, 4.73)*

†OR represents adjusted odds ratio
*Statistically significant difference at $p<0.05$; p-values are calculated using Wald's test

CIAF (p=0.006). Religion was associated with all four indicators of undernutrition. Mother's occupation was associated with underweight (p=0.023) and CIAF (p=0.013) only. Table 2 shows the details of the nutritional status of the study children.

Based on CIAF, a binary logistic analysis showed that the Muslim children was more vulnerable to undernutrition (OR: 3.69, 95% CI: 1.73, 7.88) than Buddhist children. Compared to 2-3 years old children, children aged 3-4 years (OR: 1.08, 95% CI: 0.78, 1.51) and 4-5 years (OR: 2.13, 95% CI: 1.33, 3.43) were more likely to be undernourished based on the CIAF. The possibility of undernutrition was low among children having their mother working in the government service, as opposed to being involved in agricultural occupations (OR: 3.53, 95% CI: 1.62, 7.53). Table 3 shows the details of logistic regression results of socio-economic factors on wasting, stunting, underweight and CIAF separately.

DISCUSSION

Prevalence of malnutrition

Prevalence of wasting, stunting and underweight was estimated to be 7.7%, 19.6% and 16.8%, respectively. Wasting is often due to insufficient feeding or illness during a recent period, while stunting is generally associated with inadequate feeding and/or frequent illnesses over a prolonged period of time. Underweight reflects both acute and/or chronic undernutrition (Nandy *et al.,* 2005).

The prevalence of wasting, stunting and underweight were higher in the studied area than the national average of 5.4%, 10.5% and 6.7% respectively (MICS, 2017). This finding may be attributed to the fact that almost all the health and developmental indicators in the southern provinces were worse than the national average figures (UNICEF, 2006).

Based on CIAF, the total prevalence of undernutrition was 27.4%, which is relatively higher than the individual

malnutrition indicators. Similar findings for relatively higher CIAF results were reported in surveys undertaken in different parts of low middle income and low income countries like India (Goswami, 2016; Gupta, Sharma & Choudhary, 2017), Bangladesh (Khan & Raza, 2016) and Ethiopia (Endris, Asefa & Dube, 2017).

In our study, no significant difference in prevalence of any form of undernutrition was related to the sex of the children. In a civil conflict environment, such as in the southern Thai provinces, male children have been reported to be more vulnerable, at higher risk of morbidity and more likely to exhibit effects of prolonged undernourishment (Asfaw *et al.*, 2015; Pei, Ren & Yan, 2014). In contrast, in some places where patriarchal cultural practices are prevalent, female children might be more vulnerable (Gangadharan, 2011). However, the young children of both sexes in this study suffer from poor nutritional status.

Significant positive associations were found between age and prevalence of stunting, underweight and CIAF. These children face increased likelihood of undernutrition as they grow older. Similar results were reported in west China (Pei *et al.*, 2014), Bangladesh (Khan & Raza, 2014) and Ethiopia (Endris *et al.*, 2017). These findings suggest poorer care and provision of adequate food among older children.

The majority of people in the southern Thai provinces are Muslim. Our study observed that religion was significantly associated with all four indices of undernutrition. Muslim children were found to be more vulnerable to undernutrition than those of the Buddhist faith. A similar finding was reported by a study in Bangladesh (Chowdhury *et al.*, 2016). Socio-economic, educational and cultural factors may influence feeding practices of young children in affecting their nutritional status.

In our study, place of residence was not found to be associated with any form of undernutrition. This might be because most of the children were from rural areas. Also, there are no significant differences in the infrastructure, family income, socio-culture, and the lifestyle of the population in the urban and rural areas in Pattani Province. In contrast, a study in Iran reported a higher prevalence of undernutrition in urban areas than in rural areas, because of the rapid pace of urbanisation, high poverty and hunger rates (Kavosi *et al.,* 2014).

While no significant association was found between prevalence of undernutrition (wasting and stunting) and mother's occupation, the CIAF showed significant association with mother's occupation. Children from an agricultural background were found to be more vulnerable to undernutrition. This may be attributed to generally low earnings associated with agricultural occupations.

Limitations of study

The study offers a snapshot of the study population and therefore does not provide sufficient data for an understanding of underlying causes and mechanisms of undernutrition. The study focussed on pre-school children in the ECDC facilities. Information on variables which might affect the nutritional status of the children, like eating patterns in households, care, socio-economic conditions and water sanitation and hygiene conditions were not assessed. The strength of this study is that the findings from this effort could contribute to a better understanding of the magnitude of undernutrition in the unrest provinces in southern Thailand.

CONCLUSION

The estimated prevalence of undernutrition (especially stunting and underweight) was high among ages 2-5 years in Pattani Province in

comparison with the national average figures. It is recommended that the local administration, health institutions and school authorities of the province include routine monitoring of the nutritional status of young children. Nutrition promotion should be implemented with greater focus on vulnerable Muslim children.

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Authors' contributions

SS, principal investigator, conceptualised and designed the study, led the overall data collection, prepared the draft of the manuscript and reviewed the manuscript; LC, conceptualised and planned the study, advised on the study design, data collection, analysis and interpretation, and reviewed the manuscript; AL, advised on the data analysis and interpretation and reviewed the manuscript.

Conflict of interest

Authors have no conflict of interest.

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