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Malnutrition and Associated Factors of Aboriginal Preschoolers in Gua Musang, Kelantan, Malaysia

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Abstract: Aboriginal children are known as one of the communities that engaged the highest prevalence of malnutrition in Malaysia for ages. The study was participated by 256 (131 males and 125 females) aboriginal preschooler aged one to six years from Gua Musang, Kelantan. This study attempts to determine the current prevalence of malnutrition and to identify the possible factors that may be associated with malnutrition among the subjects. This cross-sectional study was carried out between September to December 2014 at three aborigines' settlements. Socio-demographic and economic status information, health history and anthropometric measurement of the participants were obtained and all the subjects were screened for presence of soil-transmitted helminths (STH). Current study revealed that the prevalence of underweight and stunted was 45.3 and 76.2%, respectively. From the analysis, there was no significant associated factors between demographic, socioeconomic, health history and personal hygiene with underweight ($p > 0.05$). However, binary logistic regression confirmed that the significant factors contribute to stunting were household monthly income (\leq RM520) ($p < 0.01$), number of siblings (≥ 5) ($p < 0.01$) and gender (male) ($p < 0.01$). The current prevalence of malnutrition is still a major concern for public health with lower family monthly income and is the main factors that contribute to stunting. Hence, government should consider revising health strategies to overcome these issues in order to provide a better future for these children to survive.

Key words: Malnutrition, underweight, stunting, aborigines' preschoolers

INTRODUCTION

Sufficient nutrients intake is vital for the prior of one thousand days children lives as it may reflect the children nutritional status in the future, which may contribute to forever stunting for the millions of children in the world (UNICEF, 2013). A study reports that stunting, severe wasting and intrauterine growth restriction are the major causes that responsible for the 21% of disability-adjusted-life-years (DALYs) and death of 2.2 million children under age of five (Black *et al.*, 2008).

According to the Millennium Development Goals (MDG) Report 2014, the proportion of undernourished people in developing countries has decreased to 14% in 2011-2013. Despite the percentage of chronic undernutrition declining, one out of four children is still infected and one of seven children is identified to be inadequate weight for their age (UN, 2014). The same report in 2012 also revealed that developing countries such as Southern Asia, Sub-Saharan Africa, Oceania and South-Eastern Asia indicates the highest proportion of children under age five suffering from moderate or severe underweight with the prevalence of 30, 21, 19 and 16%,

respectively. As for stunting, all regions demonstrated declining percentage of stunted except for sub-Saharan Africa whereas the number of children who were identified as stunted increased by one third from 44 million to 58 million between 1990 to 2012 (UN, 2014). Malaysia is one of the countries from the region of South-Eastern Asia with an upper middle-income group (UNICEF, 2012). Over the decades, malnutrition among aborigine preschooler has been one of the principal concerns for public health in Malaysia. Majority of aborigine population in Peninsular Malaysia are still lagging behind in educational, health care and socio-economic status (Ahmed *et al.*, 2012). Numerous studies in Malaysia show that the prevalence of underweight and stunting among the aborigine children were in the range of 40 to 65% in the year of 2012 (Ahmed *et al.*, 2012; Chua *et al.*, 2012).

There are three main broad factors influencing the nutritional status of the child: food, health and care (UNICEF, 2013). Availability of the foods and accessibility of health and care is closely related to the socioeconomic and demographic factors (Norhayati *et al.*, 1997; Zamaliah *et al.*, 1998; Phimmasone *et al.*,

1997; Lima *et al.*, 1990), foods distribution in the family (Lima *et al.*, 1990; Brugha and Kevany, 1994), immunization status and childhood illness (Brugha and Kevany, 1994), intestinal parasites (Egger *et al.*, 1990) childhood nutrition and prolonged breastfeeding (Osman and Zaleha, 1995; Fawzi *et al.*, 1998). Therefore, this study attempts to determine the current prevalence of malnutrition among aborigine pre-school children and to identify the factors that may be associated in contributing to malnutrition among the participants.

MATERIALS AND METHODS

Ethical approval: This study follows the guidelines and procedures that involve the ethics on human subjects approved by Medical Research and Ethics Committee Ministry of Health (reference protocol: NMRR14-996-21562 (IIR) and Medical Ethics Committee of the Malaysia National University (reference number ST-2014-011). A written permission for visiting and conducting the study in the aborigines' settlements was obtained from Department of Orang Asli Malaysia (JAKOA) (reference number: JAKOA/PP.30.032Jld29 (25)). As for permission to utilize the pathology lab in Gua Musang District Health Clinic, a letter was issued by Kelantan Health Department via Gua Musang District Health Office (reference number Bil.(38) dlm.PKGM.3/2010/PZM.07). Before commencement of the study, a discussion with the villagers' head (Tok Batin) was held in order to obtain their co-operation and consent for this study.

Subjects and study location: This cross-sectional study was carried out between September to December 2014 at three Temiar subs-tribes aborigines' settlement in Gua Musang district of Kelantan states in Malaysia. Locations selected were based on the accessibility by land transport, availability of water and electrical solar supply. A total of 277 children aged one to six years from Temiar subs-tribes who were voluntarily and apparently healthy was chosen in this study.

Data collection: Children were weighed on a digital weighing scale SECA 813 (Seca, Hamburg, Germany) to the nearest 0.1 kg with light clothes. The recumbent length was measured for children aged below two years by using SECA infantometer (Seca, Hamburg, Germany) and children aged two years above were measured using a portable height measuring rod HM 200P (Charder, Taiwan) (CDC, 2011). Weight-for-age and height-for-age of the subjects were computed to Z-score by using World Health Organization (WHO) Anthro software version 3.2.2, 2011 (WHO, 2010) and AnthroPlus software (WHO, 2009). Subjects were given wide mouth bottle with screw cap for their guardian to collect their stool samples as instructed. The returning 256 stool samples were kept in a tightly closed icebox

containing ice pad and were rapidly transferred to pathology lab in Gua Musang District Health Clinic for simple direct wet smear screening and was confirmed based on Atlas of Medical Helminthology and Protozoology 4th Edition (Chiodini *et al.*, 2001). The socio-demographic, health history and personal hygienic practice information was obtained through face-to-face interview with their guardians by using a pre-tested questionnaire.

Data analysis: Statistical Package Social Science (SPSS) version 20.0 (SPSS Incorporation, Chicago, IL, USA) was used to perform the data analyses. The quantitative data was normally distributed based on Kolmogorov-Smirnov test. Descriptive analyses were used to generate all the variables in frequencies and percentages. Chi-square test was employed to assess variables of demographic, socioeconomic, health history, STH infestation and personal hygiene as possible association that may contribute to malnutrition and confirmed as predictors by logistic regression analyses. The significant value for chi-square test and logistic regression analysis was defined at p-value less than 0.05.

RESULTS

Profile of subjects: Malnutrition assessment was conducted on 256 (131 males and 125 females) preschoolers' aged one to six years from 19 villages at three Temiar subs-tribes settlements in Kelantan states. The general demographic, socio-economic status, health history, personal hygiene and current health status of the subjects are presented in Table 1. The mean age of the subjects involved was 3.2 ± 1.3 years. About 59.8 and 50.4% of the subject's parents did attend formal education for at least six years. More than half (66.8%) of the subjects belonged to extended family of seven, whereas 56.3% of them had at least five siblings. Only 17.6% of the subjects' fathers had permanent job such as school security guards, school canteen helpers and supervisor in private palm Estate Company. Majority of them were self-employed and engaged in agriculture based economic such as farmer and rubber tapper. Only 6.3% of the mothers were working whereas the others were housewives or actively helping their family in farming.

The mean monthly family income of the subjects was RM411 \pm 433 with the wide range income of RM100 to RM5000 per month. 73.4% of them belonged to families' whose income was RM520 or less per month. This indicates that a majority of them were categorized as poor hardcore based on the Malaysia Economic Planning Unit, 2012. It also revealed the imbalance of economic distribution within the population (Unit Perancang Ekonomi, 2012). Their water sources was mainly from untreated gravity feeds which provided by

Table 1: General characteristic of the study subjects (n = 256)

Characteristics	Number	Frequency (%)
Demographic		
≤3 years	119	46.5
>3 years	137	53.5
Male	131	51.2
Family size (≥7 members)	171	66.8
Number of siblings (≥5 members)	144	56.3
Socioeconomic		
Father's educational level (Formal education)	153	59.8
Mother's educational level (Formal education)	129	50.4
Working father's	45	17.6
Working mother's	16	6.3
Household monthly income (≤RM520.00)	188	73.4
Availability of toilets	167	64.7
Health history		
Early weaning <6 months	33	12.9
Incomplete vaccination	24	9.4
Personal hygiene		
Cutting nail as scheduled	124	48.4
Wearing slipper when on the ground	21	8.2
Utilizing toilets	111	43.4
Habit of eating soil (Geophagy)	62	24.2
Current health status		
Worm infestation	161	62.9
Underweight	116	45.3
Stunted	195	76.2

the government to each of the household. Despite 64.7% of the subjects having toilets in their house, only 43.4% of them utilized the toilets for their daily defecations. Only 12.9% of the mother early weaned their child before they reached six months of age, which means the majority of the children was given exclusive breastfeeding as recommended. Almost half of the children (48.4%) had their nails checked and trimmed by their family members periodically. A small percentage (8.2%) of the subjects wore slipper when they were outside their house whereas the others prefer barefooted. From the total number of children, almost a quarter (24.2%) of them had the habit of eating soil (geophagy) when the parents were not around.

Prevalence of underweight and stunting based on selected factors: Table 2 displays the prevalence of underweight and stunting of the subjects based on the selected characteristic factors. The relevant indicators for malnutrition were categorized into five categories; demographic, socioeconomic, health history, STH infection and personal hygiene. The association between underweight and stunting with selected variables was generated through chi-square test.

Potential risk factors with stunted: The overall prevalence of underweight and stunting among the subjects was 45.3 and 76.2%, respectively. Referring to Table 2, we found that there was no significant association of underweight with all the selected variables ($p > 0.05$). However, the analysis revealed that gender (male) ($\chi^2 = 8.987$; $p = 0.003$), number of siblings (≥ 5 members) ($\chi^2 = 9.300$; $p = 0.002$), mothers'

educational level (informal education) ($\chi^2 = 10.92$; $p = 0.001$), household monthly income (\leq RM520.00) ($\chi^2 = 12.861$; $p = <0.001$), cutting nail as scheduled ($\chi^2 = 0.155$; $p = 0.009$) and utilizing of toilets (not utilized) ($\chi^2 = 4.996$; $p = 0.025$) were significantly associated with stunting. Logistic regression confirmed that only three out of the six factors are the significant predictors for stunting (Table 3). Factors that was indicated as significant was analysed with logistic regression test again to identify the main factor that contribute to stunting which then revealed that household monthly income (OR: 2.80 CI 95%: 1.48, 5.29) ($p < 0.01$) was the main predictors that contribute to stunting among the subjects (Table 4).

DISCUSSION

Universally, based on a 2012 report, it is estimated that 15% of children of less than five years of age are underweight and 25% stunted (UN, 2014). Compared to the present study, it is revealed that the current prevalence of underweight and stunting among the preschooler aborigine was higher with 45.3% and 76.2%, respectively. However, our finding indicate a lower prevalence of underweight but a higher prevalence of stunting compared to previous reports among aborigines children in Malaysia (Chua *et al.*, 2012; Zulkifli *et al.*, 1999). The high prevalence of stunting among the subjects in our finding reflects the slow progress of nutritional and the high-infected disease among the children due to geographical settlements, poverty, health status and food taboos that still linger in the aborigines' community (Chua *et al.*, 2012).

From our results, gender was one of the factors associated with stunting especially among male (56.4%). This is in tandem with the previous findings in Raub, Pahang (Ahmed *et al.*, 2012). However, a contradictory finding was reported in Krau Wild Life, Pahang, Selangor and Ludhiana, India where gender was not a predictor for stunting (Chua *et al.*, 2012; Al-Mekhlafi *et al.*, 2005; Sengupta *et al.*, 2010). Sex plays a major role in the outcome of infectious disease since the beginning of life. Biologically, a majority of the immune response is ruled by X chromosomes. Therefore, male infants reported a higher mortality as they are susceptible to infection due to their weaker immune system (IOM, 2001). However, as they grow older, both genders have the same level of immunization yet the nutrients intake and degree of exposure of infectious disease will be different. Males have greater freedom as they began to mobile, which may contribute to higher energy expenditure (WHO, 2007).

The present study also indicates number of siblings is significantly associated with stunting. Numbers of studies demonstrate the number of children in the family was significant predictors for malnutrition (Hui *et al.*, 2014; Islam *et al.*, 2013; Hien and Kam, 2008; Vitolo *et*

Table 2: Prevalence of underweight and stunting according to selected factors

Variables	----- Underweight (n = 116) -----		----- Stunting (n = 195) -----	
	Yes n (%)	p value	Yes n (%)	p-value
Demographic				
Gender				
Male	65 (49.6)	0.157	110 (84.0)	0.003**
Female	51 (40.8)		85 (68.0)	
Age group				
≤3 years	54 (44.4)	0.984	93 (78.2)	0.488
>3 years	62 (45.3)		102 (74.5)	
Number of siblings				
<5 members	46 (41.1)	0.229	75 (67.0)	0.002**
≥5 members	70 (48.6)		120 (83.3)	
Family size				
<7 members	39 (45.9)	0.897	65 (76.5)	0.937
≥7 members	77 (45.0)		130 (76.0)	
Socioeconomic				
Father's educational level				
Formal education	68 (44.4)	0.734	112 (73.2)	0.174
Informal education	48 (46.6)		83 (80.6)	
Mother's educational level				
Formal education	59 (45.7)	0.891	87 (67.4)	0.001**
Informal education	57 (44.9)		108 (85.0)	
Father's employment status				
Not working	98 (46.4)	0.430	163 (77.3)	0.380
Working	18 (40.0)		32 (71.1)	
Mother's employment status				
Not working	109 (45.4)	0.897	184 (76.7)	0.472
Working	7 (43.8)		11 (68.8)	
Household monthly income				
≤RM520	90 (47.9)	0.171	154 (81.9)	<0.001**
>RM520	26 (38.2)		41 (60.3)	
Health history				
Breastfeeding				
Early weaning	16 (48.5)	0.695	26 (78.8)	0.705
Exclusive	100 (44.8)		169 (75.8)	
Vaccination status				
Complete	103 (44.4)	0.360	176 (75.9)	0.718
Incomplete	13 (54.2)		19 (79.2)	
STH infection				
Worm infestation				
Yes	71 (44.1)	0.612	128 (79.5)	0.103
No	45 (47.4)		67 (70.5)	
Personal hygiene				
Cutting nail				
Yes	53 (42.7)	0.566	84 (68.9)	0.009**
No	63 (47.7)		111 (82.8)	
Wearing slipper when on the ground				
Yes	11 (52.4)	0.497	16 (76.2)	0.998
No	105 (44.7)		179 (76.2)	
Utilizing of toilets				
Yes	44 (39.6)	0.111	77 (69.4)	0.025*
No	72 (49.7)		118 (81.4)	
Eating soil (Geophagy)				
Yes	32 (51.6)	0.252	49 (79.0)	0.544
No	84 (43.3)		146 (75.3)	

Chi-square *p<0.05, **p<0.01

al., 2008). Fertility rates were reflecting the economic status of the country. In 2005-2010, 28 out of 31 countries with fertility rates at five or above per woman were from the world least developed countries (UN, 2013). Thus, it shows that the larger size of siblings, the higher the economic constraint as the food consumption needs in the family increase. Furthermore, parents

would easily neglect their child when in a large family (Islam *et al.*, 2013; Hien *et al.*, 2008).

The mothers' educational level plays an important role in the nutritional status of their child as mother's who is educated will efficiently utilized household available food sources, availability of the healthcare facilities and helping the family in earning more income (Islam *et al.*,

Table 3: Odd ratio for potential risk factors with stunted among aborigines pre-school children

Variables	N	Prevalence of stunted	
		OR (95% CI)	p-value
Gender			
Male	110	2.71 (1.42, 5.18)	0.003 ^{a,b}
Female	85	1	
Number of siblings			
≥5	120	2.20 (1.13, 4.29)	0.021 ^{a,b}
<5	75	1	
Mother's educational level			
Informal	108	1.46 (0.72, 2.95)	0.297 ^a
Formal	87	1	
Household monthly income			
≤RM520	154	2.23 (1.14, 4.39)	0.020 ^{a,b}
>RM520	41	1	
Utilizing of toilet			
No	118	1.49 (0.77, 2.89)	0.240 ^a
Yes	77	1	
Cutting nail schedulable			
No	109	1.78 (0.91, 3.47)	0.920 ^a
Yes	86	1	

^aSignificant (p<0.05), ^bConfirm as significant predictors by logistic regression analysis

Table 4: Odd ratio as potential predictors risk factors with stunted among aborigines pre-school children

Variables	N	Prevalence of stunted	
		OR (95% CI)	p-value
Gender			
Male	110	2.56 (1.36, 4.79)	0.003 ^{**}
Female	85	1	
Number of siblings			
≥5	120	2.54 (1.37, 4.70)	0.003 ^{**}
<5	75	1	
Household monthly income			
≤RM520	154	2.80 (1.48, 5.29)	0.002 ^{**}
>RM520	41	1	

^{**}p<0.01

2013). However, in our study, we found that mother's educational level was not a significant factor that contributes to stunting among the subjects. Our finding is consistent with various other studies which also reported the same result (Ahmed *et al.*, 2012; Chua *et al.*, 2012; Norhayati *et al.*, 1997; Al-Mekhlafi *et al.*, 2005; Sengupta *et al.*, 2010; Hui *et al.*, 2014). Women's perception on healthy and unhealthy foods for their children is influenced by their food knowledge and beliefs (Contento *et al.*, 1993; Guldán *et al.*, 2000). Thus, as for aborigines' woman in this study location, majority of them still practice the food taboos in their children diet. They prone to believe and follow advice from the shaman compare to the healthcare advisor as they still believes that certain foods may cause illness to the child. For examples, the women believed that the intake of the instant noodles is the cause to worm infestation among the children.

Broad studies have been conducted regarding the association of poverty with malnutrition status. In Bangladesh, poverty has been indicated as one of the factors that contribute to child malnutrition (Black *et al.*, 2008). Several studies were reporting that household economic status was strongly associated with

underweight but did not affecting stunting (Ahmed *et al.*, 2012; Chua *et al.*, 2012; Zamaliah *et al.*, 1998; Al-Mekhlafi *et al.*, 2005; Hui *et al.*, 2014). However, our study is reporting opposite finding as we do not find the significant association of economic status with underweight (p>0.05). Instead of that, we found that economic status was significantly associated with stunting (p<0.01) and this finding is in tandem with studies conducted by Norhayati *et al.* (1997) and Vitolo *et al.* (2008). The economic status of the family reflects the purchasing power on nutritious foods for their children. As the price of foods increase gradually, it reduce the capability of food variety in the family. Therefore, the parents can only provide low nutritious foods for their children. This imbalance pattern of feeding can contribute to stunting to their children in a long period.

In this study, utilizing the toilets is not associated with stunting. Our study is reported conversely with previous studies in India, Brazil and Bangladesh that indicated that utilizing of toilets was significant factor to stunting among the children (Jee *et al.*, 2015; Correia *et al.*, 2014; Islam *et al.*, 2013). In aborigines settlements, not utilizing of the toilets is one of the children's habit. They

prefer to choose bushes, drain or by the river as the place for their daily defecation. However, the children diet was not affected by the practice, as their parents will immediately clean them once the defecation before they was allowed to eat. Thus, it may had reduce the direct contamination of foods which may cause diarrhea or parasites infection that may influenced their nutritional status.

Eating with fingers is one of the culture of the aborigine society, thus, not cutting nail was reported as one of the risk factors that associated to polyparasitism among aboriginal children in Kuala Lipis, Pahang, whereas, the ingestion of cyst or eggs of the parasite can be transferred to humans through the nails (Al-Delaimy *et al.*, 2014). However, our study reveals that the habit of not trimming or cutting nails periodically was not associated to stunting. This is maybe due to most of the children was fed by their parents by using the spoon. Majority of the subjects in this study are young children who was still unable to feed themselves, thus even though their fingernails was seldom trim, it may still not affecting their nutritional health.

The limitation of our study is that we do not obtain the further information that related to caregivers' practice such as bearing child age, the nutritional status of the mother, mothers' hygiene practice and family planning, which may be associated factors that contributed to malnutrition among their children. Besides that, we only conducted the research among the Temiar subs-tribes. Therefore, the study population may not represent the whole aborigines' preschooler in Kelantan.

Conclusion: In nutshell, the prevalence of malnutrition among the subjects is still on the peak with the high prevalence of underweight (45.3%) and stunting (76.2%). This study may not indicate associated factors with underweight, but household income report to be the main factor that contributed to stunting, follow by gender and number of siblings. In overcoming malnutrition, collaborating between governments, private's sector and education institution is necessary as it involves a continuous intervention and ongoing planning. These interventions may include upgrading of their society status, providing continuous health education, enforcement of family planning program and active involvements of health professional within the community and food evolution in their norms.

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