PREVALENCE AND ASSOCIATIONS OF MALNUTRITION, ANAEMIA AND MICRONUTRIENT DEFICIENCIES AMONG UNDERPRIVILEGED RURAL PRIMARY SCHOOL CHILDREN IN MALAYSIA

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INTRODUCTION

Malnutrition leads to **impaired growth**, **increased risk of infection**, **impaired cognitive function**, and **premature death** among children (Guerrant *et al*., 2008).

Though the poverty rate in **Malaysia** has been drastically reduced, **malnutrition** is still a **major issue** among Malaysian children, especially in **rural areas** (Redmond *et al*., 2017).

Objective: To determine the **prevalence and associations of malnutrition, anaemia, vitamin A deficiency (VAD), iron deficiency and iron-deficiency anaemia** among underprivileged rural primary school children in Malaysia

METHODOLOGY

STUDY DESIGN

Cross-sectional study (Baseline assessment of a randomised clinical trial)

STUDY LOCATIONS AND RESPONDENTS

Primary school children (n= 766) from 10 primary schools in **rural areas** of Malaysia

Figure 1: Study locations according to regions.

APPROVALS → **SELECTION OF PRIMARY SCHOOLS** → **CONSENT** → **DATA COLLECTION** → **DATA ANALYSIS**

- **Ethical approval** was obtained from MREC (**NMRR-16-1905-32547**)
- Approvals were obtained from **MOE, MOH & JAKOA**

10 primary schools from 5 different states located in rural areas of Malaysia were randomly selected based on suggestions and lists from **MOE** and **JAKOA**

Parental written informed consents were obtained before commencement of the study

- **Fasting blood samples** were collected for biochemical analyses
- **Anthropometric measurements** were measured using SECA Clara 803 and SECA 213 mobile stadiometer

- **Anthropometric indices** were computed using ***anthro*** **R-package** (WHO)
- **Associations** of malnutrition, anaemia and micronutrient deficiencies were analysed using **logistic regression test** (SPSS, Version 23)

Figure 2: Study flow diagram.

RESULTS & DISCUSSION

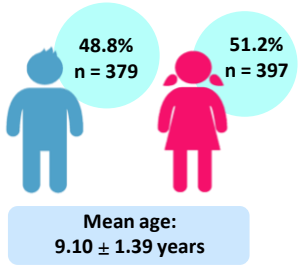

Figure 3: Gender distribution and mean age of children (n =766).

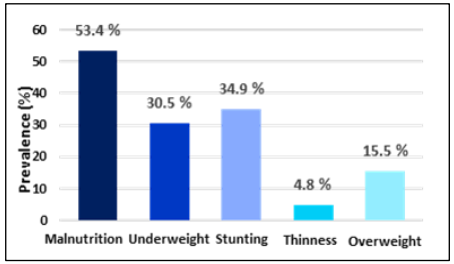

Figure 4: Prevalence of malnutrition, underweight, stunting, thinness and overweight among children (n =776).

Figure 5: Stunting problems among children aged 10 years old.

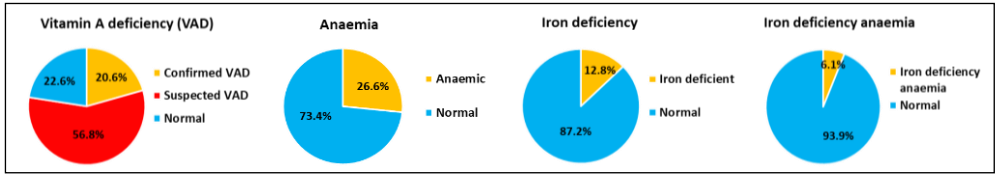

Figure 6: Prevalence of vitamin A deficiency (VAD), anaemia, iron deficiency and iron deficiency anaemia among children (n = 776).

Table 1: Associations of malnutrition status with gender, age group, vitamin A deficiency, anaemia, iron deficiency and iron deficiency anaemia.

	Underweight*		Stunted*		Thinness*		Overweight*	
	n (%)	OR (95% CI)	n (%)	OR (95% CI)	n (%)	OR (95% CI)	n (%)	OR (95% CI)
Gender								
Boys	91 (33.6)	1.3 (0.9 - 1.9)	136 (35.9)	1.1 (0.8 - 1.5)	22 (5.8)	1.6 (0.8 - 3.2)	65 (17.2)	1.3 (0.9 - 2.0)
Girls	77 (27.5)	1	135 (34.0)	1	15 (3.8)	1	55 (13.9)	1
P value	0.122		0.583		0.150		0.161	
Age group (years)								
< 10	135 (29.5)	0.8 (0.5 - 1.2)	152 (33.2)	0.8 (0.6 - 1.1)	19 (4.1)	0.7 (0.4 - 1.4)	67 (14.6)	0.8 (0.6 - 1.2)
≥ 10	33 (35.5)	1	119 (37.4)	1	18 (5.7)	1	53 (16.7)	1
P value	0.252		0.224		0.294		0.384	
Vitamin A deficiency (VAD)								
Retinol (< 0.7 µmol/L)	53 (41.4)	1.9 (1.3 - 2.9)	73 (45.6)	1.8 (1.2 - 2.5)	11 (6.9)	1.6 (0.8 - 3.2)	17 (10.6)	0.6 (0.4 - 1.1)
Retinol (≥ 0.7 µmol/L)	115 (27.2)	1	198 (32.1)	1	26 (4.2)	1	103 (16.7)	1
P value	**0.002**		**0.002**		0.232		0.076	
Anaemia								
Anaemic	44 (44.9)	2.2 (1.4 - 3.4)	59 (50.9)	2.2 (1.5 - 3.3)	7 (6.0)	1.3 (0.5 - 2.9)	12 (10.3)	0.6 (0.3 - 1.1)
Non-anaemic	124 (27.4)	1	212 (32.1)	1	30 (4.5)	1	108 (16.4)	1
P value	**0.001**		**0.000**		0.600		0.112	
Iron deficiency								
Iron deficient	33 (44.6)	2.0 (1.2 - 3.4)	53 (53.5)	2.4 (1.6 - 3.7)	8 (8.1)	1.8 (0.8 - 4.0)	8 (8.1)	0.5 (0.2 - 1.0)
Normal	135 (28.3)	1	218 (32.2)	1	29 (4.3)	1	112 (16.5)	1
P value	**0.005**		**0.000**		0.166		**0.044**	
Iron deficiency Anaemia								
Iron deficiency anaemia	20 (55.6)	3.1 (1.6 - 6.1)	30 (63.8)	3.6 (1.9 - 6.6)	5 (10.6)	2.3 (0.9 - 6.3)	3 (6.4)	0.4 (0.1 - 1.3)
Normal	148 (28.7)	1	241 (33.1)	1	32 (4.4)	1	117 (16.0)	1
P value	**0.001**		**0.000**		0.097		0.113	

* Bivariate logistic regression (reference group is normal
# Multinomial logistic regression (reference group is normal)
OR = odd ratio, CI = confidence interval

- **More than 50%** of the children suffered from **malnutrition** problems and nearly 40% of them were underweight and stunted, which are higher than the findings by Poh *et al*. 2013. (Figure 4)
- **High prevalence** of **confirmed VAD (20.6%)** among the underprivileged rural school children, indicating a severe public health issue (>20 %) (WHO, 2009). (Figure 6)
- **VAD, anaemia, iron deficiency and iron deficiency-anaemia** are **positively associated** with **underweight and stunting** status. (Table 1)

CONCLUSION

- **Malnutrition, anaemia and micronutrient deficiencies** are **still public health concerns** among **underprivileged rural primary school children** in **Malaysia**.
- These data highlight the **urgency** for **multi-agencies involvement** in various **nutritional intervention programs** to **improve health status** among children especially those from rural communities.

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