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Associated Factors to Prevalence of Childhood under Nutrition in Malaysia: Findings from the National Health and Morbidity Survey (NHMS 2016)

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Abstract

Objectives: This study aimed to assess the prevalence of underweight, wasting and stunting in children less than five years and to determine its associations with socio-economic factors using nationally representative data.

Study Design: Stratified random sampling was used in the study. Structured questionnaire with face-to-face interview was used for data collection.

Method: A total of 11,845 living quarters were selected with eligibility of the mothers aged 15-49 years with last childbirth less than two years prior and their children aged below five years. The WHO growth standards were applied to classify malnutrition (World Health Organization, 2006), as follows: Underweight (weight-for-age < - 2SD); Stunting (height-for-age < - 2SD); Wasting (weight-for-height < 2SD).

Results: Based on the results obtained, the prevalence of underweight, stunting and wasting for infants aged 6 months and below were 9.4%, 13.9% and 10.9%, respectively, while for children aged 12-23 months, they were 13.0%, 17.0% and 11.6%, respectively. Under nutrition was more prevalent in rural areas and it was higher among boys, children whose mother was unemployed, as well as those in low household income.

Conclusion: This study indicates wasting, stunting and underweight are still a problem in this country which requires urgent action. Poor socio-economic status was regarded as significant predictor for malnourished children under the age of five years old. Improving socio-economic status should be the main aspect to consider improving children nutritional status.

Keywords: Nutrition; Children; Childbirth

Introduction

Globally, UNICEF estimated that there are 170 million underweight children and at least 41 million overweight children under 5 years of age [1]. Previous studies have stated that prevalence of malnutrition among children is high due to poor child-feeding practices [2-4]. The presence of over nutrition and under nutrition concurrently in a population is recognized as a "nutrition transition" a term that is used to explain changes in diet, physical activity, health and nutrition in a population [5,6]. The problem of child malnutrition are influenced by three fundamental determinants-food security, adequate care for mothers and children and a proper health environment, including access to health services [4,6,7].

In Malaysia, the rates of under nourished children have been decreased over the past decade [8,9]. Based on the National Health and Morbidity Survey 2015 report, the prevalence of underweight has decreased from 19.6% in 2011 to 12.4% in 2015, prevalence of stunting was decreased from 18.7% in 2011 to 17.7% in 2015, while prevalence of wasting was also found to be decreased from 19.1% in 2011 to 8.0% in 2015. Although they were getting lower, a constant monitoring by health professionals and policy makers need to be done to ensure Malaysian children grow healthily. Other recent studies in developing countries, namely Turkey, India, and China, have shown an increasing trend in malnutrition [10-12]. Stevens et al. [13] postulated that perhaps wrong target approach by the local government in terms of tackling under nutrition which leads to skewed improvement in certain places while other places with under nutrition remained stagnant.

Children who came from household with low income and poor socioeconomic status have high risk of poor nutritional status which leads to poor growth and development [14]. Wong et al. [15] observed that poverty was linked to households with malnourished children which attributed by father's occupation and mother's working status. They discussed that fathers who worked as labour workers, fishermen and technicians, as well as mothers who were housewives and unemployed may related to malnourished

children in the household. They also indicated that poor child care practices were linked to childhood malnutrition. Furthermore, Naser et al. [16] showed that children in households that experienced any kind of food insecurity were more likely to be underweight or stunted compared to food-secure children. They also stated that adults in a family usually surrendered their nutrient need in order for their children to grow. They also compromised by reducing micronutrient intake while maintaining energy intake before reducing it, hence, resulting in malnourished children.

The aim of this study was to assess the prevalence of underweight, wasting and stunting in children under five years, specifically, below 6 months as well as children aged 12-23 months old; and to determine its associations with socio-economic factors using nationally representative data.

Methodology

Data source

Data was obtained from the National Health and Morbidity Survey 2016 (Maternal and Child Health). Data cleaning and sample weights were generated based on the objectives of this study. National Health and Morbidity Survey was a national representative survey covered all districts in 16 states in Malaysia.

Study participants

The target population of the survey was all mothers aged 15-49 years with last childbirth less than two years prior to the survey and their children below five years located within the selected Living Quarters (LQs). Stratified random sampling was used in the study. A sampling frame was obtained from birth registrations from the period of June 2014 to January 2015 which was provided by the National Registration Department. A total of 11,845 eligible LQs for children aged 12 to 23 months while 1550 LQs for infants below six months were selected as eligible respondents.

Outcome variables

Data collection was conducted throughout Malaysia simultaneously between March and May 2016. The survey used a validated questionnaire and measurements of weight and height by trained data collectors. Body weight was measured using a digital weighing scale (Tanita 318, Japan) to the nearest 0.1 kg whereas body height was assessed using a seca bodymeter (Seca 206, Germany) to the nearest 0.1 cm. The average of two measurements taken for each child was used for data entry.

Three nutrition indicators were used to define nutritional status of children through anthropometric measurements (body weight and height), namely, (1) Weight-for-Age (WAZ), (2) Height-for-Age (HAZ) and (3) Weight-for-Height (WHZ). The WHO Growth Standards were applied to classify malnutrition [17], as follows: Underweight-weight-for-age < - 2SD; Stunting-height-for-age < - 2SD; Wasting-weight-for-height < - 2SD.

Wasting reflects a recent and severe process of weight loss due to acute starvation or severe disease. It is the best indicator for assessing acute malnutrition in children [17]. Meanwhile, stunting is a result of inadequate nutrition which lead to hindered growth and development of a child [17]. It is the best indicator for children's well-being and their surrounding that affect their growth [18].

Statistical analysis

Data was analyzed using SPSS version 20.0 for Windows (SPSS Inc., Chicago, IL, USA) with complex sample analysis. Weights were generated for household, infants below 6 months, and children aged 12-23 months to create national prevalence estimates for all indicators. Descriptive analysis was performed to determine the prevalence of malnutrition among children. Logistic regressions were utilized to determine the predictors of malnutrition. Statistical significance was set of p value <0.05.

Results

Table 1 shows the prevalence of under nutrition in Malaysia among infant below 6 months according to socio-demographic characteristics while **Table 2** shows the prevalence of under nutrition among children aged 12-23 months. From 1550 eligible respondents under 6 months, 170 were found to be underweight, 189 were stunted, and 139 were wasted, while from 11,845 eligible respondents aged 12-23 months, 1300 were underweight, 1868 of them were stunted and 1129 respondents were wasted. For infant below 6 months, prevalence of underweight, stunting, and wasting were 9.4% (95% CI: 7.4, 12.1), 13.9% (95% CI: 10.9, 17.7) and 10.9% (95% CI: 8.2, 14.4), respectively. Meanwhile, for children aged 12-23 months, the prevalence of underweight, stunting and wasting were 13.0% (95% CI: 12.0, 14.0), 17.0% (95% CI: 15.7, 18.3) and 11.6% (95% CI: 10.6, 12.8), respectively.

Generally, under nutrition was more prevalent in rural areas compared to urban areas for both infant below 6 months as well as children aged 12-23 months, however, underweight is more prevalent in urban area (10.1%, 95% CI: 7.2, 13.9) compared to rural area (8.7%, 95% CI: 5.9, 12.5) for infant below 6 months. When compared by gender, the prevalence was slightly higher among boys compared to girls in both infant below 6 months as well as children aged 12-23 months though girls below 6 months had higher prevalence (12.7%, 95% CI: 8.6, 18.5) of wasting compared to boys below 6 months (9.2%, 95% CI: 6.1, 13.6).

In terms of mother's level of education, mothers who only had primary educational level had the highest prevalence of under nutrition among infant less than 6 months. Among children aged 12-23 months, the prevalence of underweight is the highest among mothers who only had primary educational level (16.3%, 95% CI: 13.3, 19.8) for stunting, it was the highest among mothers who had no education (21.4%, 95% CI: 15.2, 29.2) and for wasting, the prevalence was the highest among mothers who had secondary educational level (13.0%, 95% CI: 11.5, 14.7).

Mothers without employment had highest prevalence for under nutrition among infant below 6 months as well as children aged 12-23 months. However, mothers who were employed did have highest prevalence of underweight (10.7%, 95% CI: 7.6, 14.9) and stunting (14.5%, 95% CI: 9.8, 20.9) among infant below 6 months.

Table 1 Under nutrition status based on WHO 2006 criteria among infant below 6 months by socio-demographic characteristics.

	Prevalence of Under Nutrition Status		
	Underweight (WAZ <- 2SD) (n=170)	Stunting (HAZ <- 2SD) (n=189)	Wasting (WHZ <- 2SD) (n=139)
Sociodemographic Characteristics	Prevalence % (CI 95%)	Prevalence % (CI 95%)	Prevalence % (CI 95%)
Malaysia	9.4% (7.4, 12.1)	13.9% (10.9, 17.7)	10.9% (8.2, 14.4)
Strata			
Urban	10.1% (7.2, 13.9)	12.9% (9.0, 17.4)	10.0% (7.0, 14.2)
Rural	8.7% (5.9, 12.5)	15.6% (10.7, 22.2)	12.0% (7.6, 18.4)
Sex			
Boys	9.9% (7.2, 13.4)	16.0% (11.9, 21.4)	9.2% (6.1, 13.6)
Girls	9.0% (6.0, 13.2)	11.8% (7.7, 17.7)	12.7% (8.6, 18.5)
Ethnicity of child			
Malay	9.1% (6.5, 12.6)	14.4% (10.6, 19.3)	9.1% (6.1, 13.3)
Chinese	9.1% (4.7, 16.6)	11.7% (5.4, 23.8)	17.0% (7.9, 32.8)
Indians	8.6% (2.8, 23.3)	17.4% (4.8, 46.7)	25.8% (9.7, 53.1)
Other Bumiputera	9.2% (5.5, 14.9)	8.7% (4.9, 14.8)	8.6% (5.2, 14.0)
Others	21.3% (8.9, 42.8)	31.4% (13.1, 58.0)	17.2% (6.2, 39.3)
Education of mother			
None	8.5% (2.4, 26.0)	7.3% (2.2, 22.0)	7.4% (2.3, 21.2)
Primary	13.4% (7.4, 23.0)	21.7% (12.6, 34.7)	16.5% (7.4, 32.8)
Secondary	10.1% (7.0, 14.4)	12.3% (8.5, 17.4)	12.8% (8.8, 18.2)
Higher	7.5% (5.0, 11.1)	15.1% (9.7, 22.6)	7.1% (4.1, 12.0)
Occupation of mother			
Not Employed	8.1% (5.6, 11.7)	13.5% (9.9, 18.1)	11.9% (8.0, 17.5)
Employed	10.7% (7.6, 14.9)	14.5% (9.8, 20.9)	10.0% (6.7, 14.8)
Wealth index quintile			
Poorest	16.8% (9.6, 27.7)	14.7% (8.6, 23.9)	10.8% (5.6, 19.8)
Second	10.4% (6.9, 15.5)	12.5% (7.8, 19.5)	14.7% (8.0, 25.5)
Middle	5.3% (3.1, 8.8)	9.1% (4.3, 18.3)	12.5% (6.4, 23.2)
Fourth	7.9% (4.8, 12.5)	17.2% (10.3, 27.4)	6.8% (4.1, 11.2)
Richest	9.1% (4.8, 16.4)	15.8% (9.0, 26.1)	11.1% (5.8, 20.2)

Table 2 Under nutrition status based on WHO 2006 criteria among children aged 12-23 months by socio-demographic characteristics.

	Prevalence of Under Nutrition Status		
	Underweight (WAZ <- 2SD) (n=1300)	Stunting (HAZ <- 2SD) (n=1868)	Wasting (WHZ <- 2SD) (n=1129)
Sociodemographic characteristics	Prevalence % (CI 95%)	Prevalence % (CI 95%)	Prevalence % (CI 95%)
Malaysia	13.0% (12.0, 14.0)	17.0% (15.7, 18.3)	11.6% (10.6, 12.8)
Strata			
Urban	10.6% (9.3, 12.0)	15.4% (13.8, 17.1)	9.5% (8.3, 10.8)
Rural	15.2% (13.4, 17.1)	18.6% (16.7, 20.6)	13.8% (12.1, 15.7)
Sex			
Boys	15.5% (13.8, 17.3)	20.6% (18.7, 22.6)	13.1% (11.6, 14.8)
Girls	10.1% (8.7, 11.7)	13.1% (11.6, 14.7)	10.0% (8.6, 11.6)
Ethnicity of child			
Malay	14.7% (13.2, 16.4)	18.1% (16.5, 19.9)	13.5% (12.0, 15.1)
Chinese	5.4% (3.8, 7.7)	12.7% (9.9, 16.1)	5.3% (3.9, 7.1)
Indians	9.9% (5.6, 16.8)	11.3% (6.5, 19.0)	11.4% (6.9, 18.3)
Other Bumiputera	12.4% (10.3, 14.8)	17.7% (15.2, 20.5)	9.7% (7.9, 11.9)
Others	11.5% (8.0, 16.3)	16.0% (11.9, 21.3)	8.7% (5.7, 13.1)
Education of mother			
None	13.2% (8.6, 19.9)	21.4% (15.2, 29.2)	8.0% (4.5, 13.9)
Primary	16.3% (13.3, 19.8)	19.2% (16.0, 22.9)	12.7% (10.1, 15.8)
Secondary	14.6% (13.0, 16.4)	18.1% (16.3, 19.9)	13.0% (11.5, 14.7)
Higher	9.4% (7.7, 11.4)	14.5% (12.5, 16.8)	9.4% (7.8, 11.4)
Occupation of mother			
Not Employed	15.5% (13.8, 17.3)	18.2% (16.4, 20.1)	12.5% (11.0, 14.2)
Employed	10.6% (9.1, 12.2)	15.8% (14.2, 17.7)	10.8% (9.3, 12.4)
Wealth index quintile			
Poorest	17.9% (15.5, 20.6)	21.8% (19.2, 24.7)	14.3% (12.2, 16.8)
Second	16.1% (13.4, 19.3)	18.8% (16.1, 21.9)	14.7% (12.0, 17.9)
Middle	11.3% (9.0, 14.2)	14.7% (12.2, 17.7)	11.1% (8.9, 13.9)
Fourth	10.6% (8.4, 13.4)	15.8% (13.0, 19.0)	11.0% (8.8, 13.7)
Richest	9.3% (7.2, 11.9)	14.5% (12.0, 17.4)	7.8% (6.0, 10.3)

Comparing the wealth index quintile, the prevalence of underweight were the highest in households with poorest wealth index quintile with 16.8% (95% CI: 9.6, 27.7) for infant under 6 months and 17.9% (95% CI: 15.5, 20.6) for children aged 12-23 months. For wasting, the prevalence were the highest in households within the second quintile among both infant under 6 months (14.7%, 95% CI: 8.0, 25.5) and children aged 12-23 months. While the prevalence for stunting was the

highest in households within poorest quintile (21.8%, 95% CI: 19.2, 24.7) among children aged 12-23 months, surprisingly, the prevalence among infants under 6 months was the highest in households within fourth quintile (17.2%, 95% CI: 10.3, 27.4).

Table 3 shows the predictors of wasting, stunting and underweight among children below 6 months while **Table 4**

shows the predictors among children aged between 12 months to 23 months in Malaysia analyzed using binary logistic regression analysis. For underweight, being in poorest wealth index was a significant (AOR 1.74, 95% CI: 1.00-3.02) predictor for underweight infants below 6 months compared to richest wealth index. Infants who were born in household of other ethnicities was significantly more likely to be underweight

(AOR 2.64, 95% CI: 1.25-5.58) compared to infants who were in Malay household. Obese mothers were significantly more likely to raise an underweight infants (AOR 1.85, 95% CI: 1.13-3.00) compared to ideal weight mothers. However, overweight mothers were significantly less likely (AOR 0.56, 95% CI: 0.34-0.90) to raise an underweight infants compared to ideal weight mothers.

Table 3 Predictors of under nutrition among children below 6 months in Malaysia after controlling background variables.

	Underweight (WAZ <- 2SD)	Stunting (HAZ <- 2SD)	Wasting (WHZ <- 2SD)
Sociodemographic Characteristics	AOR (95% CI OR)	AOR (95% CI OR)	AOR (95% CI OR)
Strata			
Urban	na	1	1
Rural	na	1.56 (1.12, 2.18)	1.52 (1.07, 2.16)
Sex			
Girls	na	1	1
Boys	na	1.53 (1.10, 2.12)	0.73 (0.52, 1.03)
Ethnicity of child			
Malay	1	1	1
Chinese	1.18 (0.65, 2.12)	0.75 (0.44, 1.28)	1.70 (1.04, 2.77)
Indians	1.09 (0.44, 2.67)	1.13 (0.56, 2.30)	2.76 (1.46, 5.22)
Other Bumiputera	0.77 (0.44, 1.34)	0.41 (0.23, 0.73)	0.81 (0.47, 1.42)
Others	2.64 (1.25, 5.58)	3.21 (1.56, 6.58)	1.87 (0.77, 4.51)
Education of mother			
Primary and lower	na	na	2.12 (1.15, 3.91)
Secondary	na	na	1.83 (1.21, 2.76)
Higher	na	na	1
Maternal nutritional status			
Ideal weight	1	na	na
Underweight	0.70 (0.36, 1.38)	na	na
Overweight	0.56 (0.34, 0.90)	na	na
Obese	1.85 (1.13, 3.00)	na	na
Wealth index quintile			
Poorest	1.74 (1.00, 3.02)	na	na
Second	1.11 (0.65, 1.89)	na	na
Middle	0.49 (0.25, 0.97)	na	na
Fourth	0.64 (0.37, 1.12)	na	na
Richest	1	na	na
*na: not applicable			

For stunting among children below 6 months, those who lived in rural area were more likely to be stunted (AOR 1.56, 95% CI: 1.12-2.18) compared to those who in urban area.

Meanwhile, male infants were significantly more likely to be stunted (AOR 1.53, 95% CI: 1.10-2.12) compared to female infants. Similar to underweight, infants who were born in

other ethnicities were more likely to be stunted (AOR 3.21, 95% CI: 1.56-6.58) compared to Malay household.

Table 4 Predictors of under nutrition among children aged 12 months to 23 months in Malaysia after controlling background variables.

	Underweight (WAZ <- 2SD)	Stunting (HAZ <- 2SD)	Wasting (WHZ <- 2SD)
Sociodemographic Characteristics	AOR (95% CI OR)	AOR (95% CI OR)	AOR (95% CI OR)
Strata			
Urban	1	1	1
Rural	1.21 (1.05, 1.38)	1.13 (0.99, 1.27)	1.34 (1.12, 1.55)
Sex			
Girls	1	1	1
Boys	1.62 (1.42, 1.85)	1.76 (1.56, 1.98)	1.47 (1.28, 1.69)
Ethnicity of child			
Malay	na	1	1
Chinese	na	0.79 (0.66, 0.97)	0.49 (0.36, 0.67)
Indians	na	0.74 (0.63, 0.88)	1.05 (0.75, 1.46)
Other Bumiputera	na	na	0.65 (0.52, 0.82)
Others	na	na	0.43 (0.29, 0.62)
Education of mother			
Primary and lower	na	1.14 (0.92, 1.43)	1.27 (0.95, 1.69)
Secondary	na	1.17 (1.02, 1.34)	1.34 (1.11, 1.60)
Higher	na	1	1
Maternal nutritional status			
Ideal weight	1	na	na
Underweight	1.57 (1.26, 1.95)	na	na
Overweight	0.89 (0.76, 1.05)	na	na
Obese	0.79 (0.65, 0.96)	na	na
Wealth index quintile			
Poorest	1.61 (1.28, 2.01)	na	1.59 (1.20, 2.11)
Second	1.39 (1.11, 1.74)	na	1.74 (1.34, 2.27)
Middle	1.02 (0.81, 1.29)	na	1.38 (1.07, 1.79)
Fourth	1.02 (0.80, 1.29)	na	1.49 (1.16, 1.90)
Richest	1	na	1
*na: not applicable			

For wasting, infants below 6 months old who lived in rural area were more likely to be wasted compared to infants who lived in urban area (AOR 1.52, 95% CI 1.07, 2.16). For maternal influence on wasting, ethnicity of mothers as well as education of mother, were found to be significant predictors for wasting. Indian mothers were more likely to raise wasted infants (AOR 2.76, 95% CI 1.46, 5.22) compared to Malay. Mothers who only had primary education background were significantly more

likely to raise wasted infants (AOR 2.12, 95% CI 1.15, 3.91) compared to mothers who had higher education.

Among children aged 12 months to 23 months, strata, gender, wealth index quintile, and maternal nutrition status were significantly related to underweight problem. Those who live in rural area were more likely to be underweight (AOR 1.21, 95% CI 1.05, 1.38) compared to those who live in urban

area. Male children were more likely to be underweight (AOR 1.62, 95% CI 1.42, 1.85) compared to female children. Poorest wealth index quintile was a predictor for underweight children as they were more likely to be underweight (AOR 1.61, 95% CI 1.28, 2.01) compared to those who were in richest quintile. For maternal nutrition status, underweight mothers were more likely to have underweight children (AOR 1.57, 95% CI 1.26, 1.95) compared to normal weight mothers. Inversely, overweight and obese mothers were less likely to have underweight children.

For stunting among children aged 12 months to 23 months, gender, mother's education and ethnicity of household were shown to have significant association to stunting problem. Male children were significant predictor for stunting as they were more likely to be stunted (AOR 1.76, 95% CI 1.56, 1.98) compared to female children. Mothers who only have secondary education were more likely to have stunted children (AOR 1.17, 95% CI 1.02, 1.34) compared to mothers who have higher education or even those who have only primary education. Children from Indian household were less likely to be stunted (AOR 0.74, 95% CI 0.63, 0.88) compared to Malay or Chinese household.

For wasting among children aged 12 months to 23 months, strata, gender, mother's education and ethnicity of household and household income quintile had shown significant association to wasting problem. Children that live in rural area as well as male children were more likely to be wasted (AOR 1.34, 95% CI 1.12, 1.55; AOR 1.47, 95% CI 1.28, 1.69, respectively) compared to children who live in urban area or female children. Mothers who only have secondary education were more likely to have wasted children (AOR 1.34, 95% CI 1.11, 1.60) compared to mothers who have higher education as well as mothers who have only primary education or below. Children from other ethnicity household were less likely to be wasted compared to the rest of the ethnicities. For household income quintile, those who live in second quintile of the index were more likely to have stunted children compared to the richest household.

Discussion

Result showed that the prevalence of underweight, stunting and wasting among infants below 6 months were 9.4%, 13.9% and 10.9%, respectively, while the prevalence of underweight, stunting and wasting among children aged 12-23 months were 13.0%, 17.0%, and 11.6%, respectively. Generally, boys, coming from rural area, mothers who have low educational level, unemployed, and living in poorest wealth index quintile, have higher prevalence of underweight, stunting and wasting.

The urban-rural differential we found was expected. Since 2011, the urban-rural differential has appeared in underweight, stunting and wasting cases as reported by IPH [8, 9]. A higher prevalence of malnutrition in rural areas agrees with several studies [19-21]. Smith et al. [22] noted that the lower urban malnutrition occurrence was due to more favourable socioeconomic conditions such as women's education and status, presence of water sanitation as well as

household income. Similarly, Khambalia et al. [23], Garraza [24], and Yadav [11] all found that the prevalence of underweight was higher in rural area compared to urban area. Difference in socioeconomic status as well as dietary patterns were attributed as the reason of this disparity [18]. A more detailed study was done by Garraza [24] which found that a better and more favorable socio-environmental living conditions such as good quality housing, accessibility of public services and buying power of families permitted improved food access in living household, thus, reduced the prevalence of malnutrition.

In this study, maternal education played a significant role in nutritional status of children. Mothers who have no education background contributed to high prevalence of underweight and stunted children while mothers who have secondary level of education had high prevalence of wasted children. The association between mother's educational level and children's nutritional status was comparable with the findings from Adnan et al. [25]. They found that mothers who have only secondary schooling had more wasted children compared to mothers who have diploma and above. In this study, we can also see the feeding practices in which the prevalence of exclusive breastfeeding more than 6 months were higher in mothers that only have secondary school level of education whereas the percentage of mothers who gave fast food to their children were higher among those who have diploma and above. A study done by Amsalu et al. [26] also found that mother's illiteracy contributed to higher risk of malnutrition in children under the age of five. Apart from mother's educational level, a study done by Tiwari et al. [27] stated that the prevalence of malnutrition was greater among children whose fathers were not educated. This suggested that paternal as well as maternal educational level is both important in order to assess the risk of malnutrition among children. The lack of education among either mothers alone or mothers as well as fathers, could be crucial in terms of children's development as well as the health awareness among the parents. It is important for mothers to achieve higher educational level for them to raise better nourished and healthier children.

A study done by Sa [28] found that malnutrition was found to be lower among children who have mothers with better educational level and family that have higher monthly income. Masroor et al. [29] found almost similar results in which high prevalence of children from the lowest household income were found to be underweight, stunted, and wasted. In Malaysia, Wong et al. [15] found that mothers who were housewives had higher odds to have malnourished children. However, they also found that the household poverty status was not a good predictor of childhood malnutrition due to the differences of child caring practices and resources as well as household allocation of resources. In this study, it was shown that wealth index could be a predictor of likelihood for underweight and wasting. A study done in Kelantan has shown that there was a significant association between household insecurities and nutritional status of children [16]. A study done by Zalilah et al. [14] shown those children who came from household with low income did not meet the

recommended serving size of most of food group, hence, resulting in not meeting the recommended intake of nutrients. They also discussed about the purchasing power of low income family which results in children consuming lower nutrient dense foods instead of food with richer in nutrient.

These household insecurities characteristics include household size, total monthly income and number of children and education of the mother. However, the study was restricted to subjects who received monthly welfare allowance which may leads to under-representation of samples. Families that are unable to grow food or not enough money to buy food will likely to opt for the most economical cost per calorie from the market [6].

This study used a nationally representative sample to demonstrate findings applicable to the under five children in Malaysia. The finding of this study could add current literature on malnutrition among children under five in Malaysia. Since this study was a cross-sectional survey, it was not without any limitation. The main limitation was the selected sample was not a true indicator of the whole national population. All children below 5 years of age within a household were enrolled without acknowledging the representation of national population.

Conclusion

As a conclusion, wasting, stunting and underweight are still a problem in this country which requires urgent action. Poor socio-economic status was regarded as significant predictor for malnourished children under the age of five years old. Improving socio-economic status should be the main aspect to consider improving children nutritional status.

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Author statements

All authors declare that they have no competing interests.

Ethics approval

This study used the data from National Health and Morbidity Survey 2016: Maternal and Child Health conducted by Institute for Public Health. This study was approved with exempt review by Malaysian Research Ethical Committee (MREC).

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