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Association Between Infant and Young Child Feeding Practices and Nutritional Status Among Children Aged 6 to 24 Months in Kuala Nerus and Kuala Terengganu

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Abstract

Infant and young child feeding practices (IYCF) have an important role in defining children's nutritional status and optimizing a child's development rate in the first 2 years of life. This study aimed to determine the association between infant and young child feeding practices and nutritional status of children aged 6 to 24 months in Kuala Nerus and Kuala Terengganu. A total of 293 mothers and children aged between 6 to 24 months were recruited in this cross-sectional study. Anthropometric comprised weight and length, and nutritional status were determined based on WHO child growth reference. Mothers were interviewed on socio-demographic characteristics while children's adherence to infant and young child feeding (IYCF) practices were assessed via validated questionnaire from the FAO. A total of 293 (52.2% boys, 47.8% girls) children enrolled in this study. The prevalence of stunting, wasting, and underweight among children were 26.3%, 6.8%, and 14.7%, respectively. The majority (70.6%) of the children have good adherence to IYCF guidelines. However, there was no significant association between IYCF practices and the nutritional status of the children. Majority of the participants have good practice in IYCF and only 1.7% exhibiting poor adherence. Therefore, by promoting the IYCF practices, it can be served as a great tool to assess the health status of the children.

Keywords

Infant and Young Child Feeding (IYCF) Practice, Nutritional Status, Stunting, Wasting, Underweight

Introduction

Appropriate nutrition is essential to a child's health from birth to adulthood. Due to its role in lowering morbidity and mortality, reducing the risk of severe conditions throughout their life span, and encouraging regular mental and physical development, proper nutrition during the first two years of life is particularly crucial [1]. Therefore, infant and young child feeding practices (IYCF) have an important role in defining children's nutritional status, optimizing a child's development rate in the early years of life, and have considerable potential for lowering under-five malnutrition and hence affecting child mortality rates [2].

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https://journal.unisza.edu.my/ajmb

Specifically, breastfeeding is one of the most effective approaches to protect child health; it might save 13% of fatalities occurring in children aged below five years worldwide, while adequate supplemental feeding practices would reduce under-five mortality by an additional 6% [3]. Around six months, a baby's requirement for energy and nutrients begins to surpass what breast milk can offer, necessitating the use of complementary meals. A baby of this age is also developmentally capable of consuming additional meals. If complementary meals are not offered at the age of six months, or if they are introduced incorrectly, a child's growth may stall [1].

The worldwide prevalence of stunting, wasting, and underweight among children aged below five years old was 21.9%, 7.3%, and 5.9%, respectively [4]. According to UNICEF Malaysia, stunting among children under the age of five increased drastically from 17.7% in 2006 to 20.7% in 2016. Terengganu has been recognized as the second highest state with stunting rates of 26.1% in 2016, which was much higher than the national average of 13.4% [5]. As shown in a survey in other countries including Thailand, their frequency of stunting was 10.5%, wasting was 5.4%, and obesity was 8.2%. However, in China just 4.4% of children were stunted, 3.6% were wasting, and 2.6% were obese [4,6]. For children aged below five years, it reflects the nutritional needs of the foetus beginning from the prenatal stages. Inadequate maternal nutrition may result in adverse birth outcomes. After birth, a child's growth may be negatively impacted by improper nutrition and the environment [5].

Weight-for-age, length-for-age, and weight-for-length are the three anthropometric indices that are employed the most frequently in children. These indices, which enable the comparison of a kid or a group of children with a reference population, can be stated in terms of z-scores, percentiles, or percentages of the median [7]. This prospective study aims to compare the nutritional status of new-borns based on baby feeding habits. The increasing prevalence of stunting in Malaysia, particularly in Terengganu, is the reason for concern since it will have a severe effect on the future health of children who are still in the key growth stage [8]. Given the problems identified, it is crucial to perform this study on infant and young child feeding practices and their association with nutritional status among children aged 6 to 24 months in Terengganu since most of the past studies only highlighted the nutritional status of children under the age of 5.

Materials and Methods

Study design and study population

This cross-sectional study was part of the larger study conducted among children aged 6 to 24 months and their mothers from the Terengganu districts of Kuala Nerus and Kuala Terengganu. Before the commencement of the study, ethical approval was obtained from the UniSZA Human Research Ethics Committee (UHREC) (UniSZA/UHREC/2022/391). Permission to obtain data on mothers with children below two years old was also obtained from *Yayasan Pembangunan Keluarga Terengganu* (YPKT) and from *Jawatankuasa Pembangunan dan Keselamatan Kampung* (JPKK).

Sampling Method

Purposive sampling technique was employed for this study for the selection of the participants. Children and the mothers were considered eligible for this study based on the inclusion criteria of children aged 6 to 24 months, mothers or parents of the children, mothers who can read, write and understand Malay language. Children were excluded if they had the physical disability, cannot be measured due to illness or postoperative immobilization. Sample size was calculated based on the specific objective of the larger study of which the specific objective yielded most sample size were used. Based on the prevalence of stunting of 26.1% of children under five years old in Terengganu [5], the sample size was determined using the single

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proportion formula by Epitools. Thus, the minimum sample size was 296. The final sample size determined with a provision of 10% drop-out rate was 329.

Data collection

After the ethical approval was granted, the list of children who were born in year 2020 to 2022 were obtained from YPKT and JPKK. All the eligible participants were then contacted and participants who met the inclusion criteria were invited to participate in the study. Written inform consent were obtained prior to the data collection. The data collection commenced from August 2022 until March 2023 for a duration of 6 months. Home visit was done every day with at least two houses a day by the trained researchers. Anthropometric measurement was conducted to assess the nutritional status of the children. Mothers were also interviewed on the IYCF practices. Data collected were then transferred into SPSS software.

Socio-demographic characteristics

Section A of the questionnaire consisted of socio-demographic form. This section included age of mother and child, gender of child, race, date of birth, number of children, maternal educational level, and estimated household income.

Anthropometric measurements

Section B of the questionnaire consisted of anthropometric information. This section included all measurements of children that were taken which included weight and length. The SECA 374 baby scale was used to weigh infants and toddlers. Before measuring, the equipment was calibrated according to the standard protocol to ensure high accuracy [9]. For an accurate weight reading, the children were weighed without clothing and footwear. Weight was recorded to the nearest 0.1kg with at least two measurement, and the mean is determined [9]. With the use of SECA 233 equipment, recumbent length was measured with the infant resting on the SECA 374 with arms by the sides and feet flat and held together with feet and head contacting the feet and headboards, respectively. SECA 233 is the measuring rod for SECA 374, completing the system for measuring and weighing.

Nutritional and growth status

Nutritional status is a significant indication of a population's overall health. Growth status is the rate at which children's development is widely acknowledged on a global scale as an essential public health indicator for monitoring the nutritional standing and general health of people. Weight-for-age, length-for-age, and weight-for-length are the three anthropometric indices that are utilized the most frequently in the context of measuring children [7].

Infants and Young Child Feeding (IYCF) practices questionnaire

The infant and young child feeding habits questionnaire were adapted from the FAO Guidelines for measuring nutrition-related knowledge, attitude, and practice [10]. The questionnaire was pilot tested for its validity with the internal consistency of Cronbach's Alpha Coefficient with a score of 0.823 before the commencement of the study. Content and face validation were also conducted prior to the pre-testing of the questionnaire. The questionnaire included 3 domains (C1, C2, and C3) with 42 questions altogether. Section C3 had 8 questions focusing on mothers' practice on mother, infant and young child feeding practice (4 questions) and WASH practice (4 questions). Every single item in section C3 provided three answer choices: "Yes", "No", "Don't know". One point was given to a correct answer, zero to wrong answer and don't know option. There were also additional questions for frequency of intake of specific foods to probe more on infant and young child feeding practice.

https://doi.org/10.37231/ajmb.2023.1.S.658
https://journal.unisza.edu.my/ajmb

Infants and Young Child Feeding (IYCF) practice score

The score for IYCF practice among the study participants was given. For every item they answered "Yes", they got 1 point. If the participants answered "No" or "Don't know", they got 0 point. A total of 7 maximum points were given to the study participants if they answered all "Yes". If the participant got 1-3 score, it indicates that they had "Poor" IYCF practice. Meanwhile, if they got 4-5 or 6-7 score, it indicates that they had "Fair" or "Good" IYCF practice, respectively.

Statistical Analysis

The statistical analysis was carried out by using IBM SPSS for Windows version 26. Data cleaning and normality of the data were performed before the data analysis. For normality test, the variables were considered normal distribution when p-value > 0.05, whereas variables were considered not normally distributed when p-value < 0.05. For descriptive statistics, continuous variables that have normally distributed data were presented as mean (SD). Categorical data were presented as frequency (%). Statistical significance was set at $p < 0.05$ with 95% confidence interval. The association between two numerical data were tested using simple linear regression. All tests were carried out according to the specific objectives stated in this study.

Results

Sociodemographic characteristics

This study consisted of 293 participants whom were mothers and their children aged between 6 to 24 months. Sociodemographic characteristics of the participants were displayed in Table 1. The mothers' age ranged from 20 to 50 years old. Majority of the mothers aged between 31 to 40 years old (58.7%). Majority of the mothers were Malay (98.6%) and the rest were from other ethnics (1.4%). As for their educational levels, majority of them have tertiary educational level (51.5%), followed by secondary school educational level (45.1%), and the rest of the mothers had primary school educational level (1.7%) and no formal educational level (1.7%). Most (67.6%) of the mothers stated that this was not their first pregnancy. As for the children, almost half were male (52.2%) and the rest were female (47.8%). Most of the children were between 13 to 24 months (61.8%) and the rest of the children were between 6 to 12 months (38.2%).

Table 1: Socio-demographic characteristics of the participants (n = 293)

Characteristic of the participants	n	Percentage (%)
Mother's age (years)		
20-30	111	37.9
31-40	172	58.7
41-50	10	3.4
Race		
Malay	289	98.6
Others	4	1.4
Educational level		
No formal	5	1.7
Primary school	5	1.7
Secondary school	132	45.1
Tertiary	151	51.5
First pregnancy		
Yes	95	32.4
No	198	67.6
Child's sex		

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Male	153	52.2
Female	140	47.8
Child's age (months)		
6-12	112	38.2
13-24	181	61.8

*Descriptive analysis was applied

Nutritional status of study participants

Table 2 presents the three nutritional status indicators, which are length-for-age (LAZ), weight-for-age (WAZ), and weight-for-length (WLZ). According to the Kolmogorov-Smirnov test, all three indicators were normally distributed ($p > 0.05$). Based on Table 2, majority of the children were normal for LAZ (73.7%), WAZ (85.3%) and WLZ (93.2%). Nevertheless, there still 26.3% of the children were stunted, 14.7% were underweight and 6.8% were wasted.

Table 2: Nutritional status among children aged 6 to 24 months in Kuala Nerus and Kuala Terengganu (n=293)

Variable	n	Percentage (%)
Length-for-age (LAZ)		
Normal (> -2 SD)	216	73.7
Stunted (≤ -2 SD)	77	26.3
Weight-for-age (WAZ)		
Normal (> -2 SD)	250	85.3
Underweight (≤ -2 SD)	43	14.7
Weight-for-length (WLZ)		
Normal (> -2 SD)	273	93.2
Wasted (≤ -2 SD)	20	6.8

*Descriptive analysis was applied

Infant and young child feeding practices of study participants

Table 3 shows the infant and young child feeding practices of the children. According to Kolmogorov-Smirnov test, the infant and young child feeding practices were not normally distributed ($p < 0.05$). Based on the table below, majority of the mothers (91.5%) can provide healthy meals for themselves. More than half of the children (57.5%) did not consume other fluids than breast milk when they were below six months.

Majority of the mothers (98.6%) treat the water first before drinking. Only a few of them (1.4%) did not treat the water first before drinking. Majority of the mothers (99%) stored the water by covering the water surface and only 1% of them did not store the water properly. Besides, most of the mothers (96.2%) cleaned their kitchen and dirty cooking utensils with hot water or soap after cooking. However, a few of them (3.8%) did not clean their kitchen and dirty cooking utensils with hot water or soap after cooking.

Furthermore, 73% of the mothers did practice seven ways to wash their hands according to the recommendation from the Ministry of Health Malaysia. Lastly, majority of the children (70.3%) ate main meals or snacks other than liquids according to the minimum meal frequency (MMF) (categorized by their age).

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Table 3: Infants and young child's feeding practice among children age 6 to 24 months in Kuala Nerus and Kuala Terengganu (n=293)

Items	Yes		No	
	n	%	n	%
Can you provide yourself with healthy food?	268	91.5	25	8.5
Does your child when under 6 months old breastfeed with other fluids such as formula milk, plain/mineral water, juice, soup and liquid porridge?	124	42.3	169	57.7
Do you treat your water in a safe way to drink such as boiling the water first, using water filters and others?	289	98.6	4	1.4
Do you store the plain water by covering the water surface well?	290	99.0	3	1.0
Do you clean your kitchen or dirty cooking utensils after cooking with hot water/soap?	282	96.2	11	3.8
Do you practice 7 ways to wash your hands properly according to the recommendation of the Ministry of Health Malaysia?	214	73.0	79	27.0
Did your child 6 months of age and older eat main meals or snacks other than liquids yesterday during the day or night as follow: If, 6-8 months: 2-3 times 8-23 months: 3-4 times No breastfeeding: over 4 times	206	70.3	87	29.7

*Descriptive analysis was applied

Infant and young child feeding practices score of study participants

Based on Table 3, infant and child feeding practice scores were then calculated. Table 4 shows the IYCF scores for every participant. Majority of the participants (70.6%) had good infant and young child feeding practice. However, there were some of them (27.6%) had fair infant and young child feeding practice. Lastly, only a few of them (1.7%) had poor infant and young child feeding practice.

Table 4: IYCF scores for study participants (n = 293)

Indicators (scores)	n	Percentage (%)
Poor (1-3)	5	1.7
Fair (4-5)	81	27.6
Good (6-7)	207	70.6

*Descriptive analysis was applied

Association between infant and young child feeding (IYCF) practices and nutritional status of the children

The association between infant and young child feeding (IYCF) practice and nutritional status (stunting, underweight, and wasting) of children was identified by a simple linear regression test. The results are shown in Table 5. However, this study did not find any significant association between IYCF and the nutritional status of the children, which were stunting, underweight, and wasting ($p > 0.05$).

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Table 5: Association between IYCF and nutritional status (n = 293)

Nutritional status	β (95% CI)	t statistics	p-value	R^2
Length-for-age z-scores	0.103 (-0.047, 0.252)	1.354	0.177	0.006
Weight-for-age z-scores	0.068 (-0.066, 0.202)	1.003	0.317	0.003
Weight-for-length z-scores	-0.006 (-0.160, 0.148)	-0.079	0.937	0.000

*Simple linear regression was applied

Discussion

This study found that 26.3% of children aged between 6 to 24 months were stunted. The prevalence of stunted children in this study was quite similar to the prevalence of stunted children below the age of five in Terengganu, Malaysia, which are 26.1% [11]. According to the NHMS report, stunted children contribute to approximately 21.8% of children under the age of five. It significantly increased from 2011 (16.6%) to 2015 (17.7%) [5]. Terengganu is the second highest states that have a high prevalence of stunting (26.1%), and Kelantan shows the highest prevalence of stunting for children below the age of five (34%) [11]. In addition, the current study found that 14.7% of the children aged between 6 to 24 months were underweight. The prevalence of underweight children in this study was higher than the prevalence of underweight children below the age of five in Terengganu (10.8%) [11] but similar to the prevalence of underweight children below the age of five in Malaysia (14.1%) [5]. As for the prevalence of wasting among children aged 6 to 24 months, our present study found that 6.8% of them were wasted, and was higher than the NHMS report of children below five years old in Terengganu (14.1%) [11], but similar to the prevalence of children below five years old in Melaka (6.6%)[11]. There is a significant association between age of children and length-for-age z-scores, weight-for-age z-scores, and weight-for-length z-scores (data not shown). Children aged between 13-24 months has higher percentage of stunting, wasting, and underweight which are 26%, 8.8%, and 16.6%, respectively; compared to children aged between 6-12 months. According to a study in Ahmedabad, the age of the children was found to be substantially related to nutritional status, with older children being more likely to be wasted and underweight [12].

The aim of this study was to determine infant and young child feeding practices in Kuala Nerus and Kuala Terengganu among children aged 6 to 24 months. Since WHO and UNICEF have suggested core infant and young child feeding practices to minimize early-life malnutrition, therefore; safe, appropriate, and acceptable infant and young child feeding practices are necessary [13]. Regardless of the fact that IYCF is multifunctional and hence simple and effective, successful IYCF impacts, particularly when comes to complementary feeding practices, are inadequate over the world, especially in low-income countries [12]. In this study, it was discovered that the majority of the mothers (70.6%) had good practice in infant and young child feeding. Most of the participants scored either 6 or 7 points based on IYCF score indicators (Table 4). The prevalence of good IYCF practice in the current study (70.6%) is greater than in a previous study conducted in Debrelibanos, Ethiopia, where 65.8% of participants practiced acceptable IYCF practice [13]. According to WHO, a few guiding principles for healthy complementary feeding include exclusive breastfeeding, implementing good hygiene and safe food handling, as well as the minimum meal frequency (MMF) [1]. This study also highlights the exclusive breastfeeding, water, sanitation, and hygiene (WASH) practice, and the minimum meal frequency of the children.

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https://journal.unisza.edu.my/ajmb

One of the indicators of this study is exclusive breastfeeding. The mothers were asked about their exclusive breastfeeding status when their children were below six months. The present study found that more than half of the children (57.5%) did not consume other fluids such as formula milk, plain or mineral water, juice, soup and liquid porridge than breast milk when they were below six months (Table 3). This is quite high compared to the total prevalence of exclusive breastfeeding in infants aged between 0 to 6 months in Malaysia (47.1%) [11]. The previous study in Klang, Malaysia, found that 43.1% of the mothers exclusive breastfed their child [14]. However, the prevalence of exclusive breastfeeding in this study is lower than the previous study in Debrelibanos, Ethiopia which was 61.6% [13]. The disparity could be attributable to variations in exclusive breastfeeding measurement, where the previous study examined exclusive breastfeeding based on 24-hour recall while this study measured exclusive breastfeeding by inquiring about it retrospectively.

In addition to exclusive breastfeeding, this study also emphasizes the importance of Water, Sanitation, and Hygiene (WASH) practices among mothers. It is important for the mothers to practice good WASH practice since poor WASH conditions, when combined with poor infants and young child feeding habits, are likely to be the cause of child malnutrition [15]. This study found that majority of the mothers (more than 95%) treated the water first before drink, stored the water by covering the water surface, and cleaned their kitchen and dirty cooking utensils with hot water or soap after cooking. A previous study in Morocco also reported a high prevalence of safe water drinking source which was 94.3% [16]. The previous study in India also found that 71.8% of the study participants stored the water by covering the water surface [17]. Based on the results, 73% of the mothers practiced the 7 ways of washing hands according to the recommendation from the Ministry of Health. This is quite similar to a previous study in India where 76.6% of the participants washed their hands with water and soap before handling food [17].

The last indicator of IYCF practice in this study was the minimum meal frequency (MMF). MMF assesses how often children receive solid foods in addition to breast milk, and it varies depending on the child's age and breastfeeding status [13]. This study found that 70.3% of the children ate main meals or snacks other than liquids according to the minimum meal frequency (MMF) and were categorized by their age. For infants aged 6 to 8 months, the recommended meal frequency is 2 to 3 times per day. Children aged 9 to 24 months are advised to consume solid foods 3 to 4 times per day, and if the children are no longer breastfed, they should eat more than 4 times per day [10]. According to NHMS, the overall frequency of MMF in Malaysia was 80.8%, which is rather high [11]. Nevertheless, the results of the current study (70.3%) reported quite similar prevalence of MMF in Terengganu (74.6%) [11]. Overall, infant and young child feeding practices (IYCF) have an important influence in child's physical and mental development during their first two years of life [18]. The IYCF score can evaluate both the quantity and the quality of various feeding methods [12]. Several studies in China, India, and Bangladesh have documented efforts to evaluate and quantify IYCF behaviours using IYCF scores, as well as to determine their relationship with nutritional status [18].

The primary objective of this study was to investigate whether there is any connection between infant and young child feeding practice and the nutritional status of the children aged between 6 to 24 months in Kuala Nerus and Kuala Terengganu. However, in this study, there was no significant association between IYCF practice and the nutritional status (stunting, wasting, and underweight) of the children. An earlier study reported similar findings that none of the infant and young child feeding indicators exhibited significant correlation with stunting or wasting. This overall absence of a substantial relationship between the predictors of infant and young child feeding and the nutritional status of children could be attributed to the limited variation in child feeding patterns within the research population [19]. In addition to infant and

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young child feeding practices, numerous other factors may contribute to childhood malnutrition [20]. Furthermore, it's important to note that the use of infant and young child feeding indicators may not accurately represent the children's typical dietary intake [21]. These indicators do not account for portion sizes, the quantity of food provided, or the fat consumption of the children [22].

It is important to note that stunting, which leads to growth faltering, has multiple causes that cannot be solely attributed to an examination of complementary feeding practices. Growth stunting in children under the age of two is the result of a combination of factors, including intrauterine growth retardation, inadequate breastfeeding, micronutrient deficiencies, low energy intake, illness, sanitation conditions, and other poverty-related variables [23]. The positive Water, Sanitation, and Hygiene (WASH) practices observed in the study participants may have contributed to the low prevalence of stunting, wasting, and underweight in this study. However, a previous study suggested that even when combining improved water sources and appropriate complementary feeding, only moderate prevention of stunting was achieved [15].

There are several limitations from this study. The absence of specific indicators for infant and young child feeding practices, such as minimum dietary diversity, continued breastfeeding, and a minimum acceptable diet, may be one of the reasons why this study was unable to establish an association between IYCF and the nutritional status of children aged 6 to 24 months. Additionally, other factors like the mothers' nutritional status and the child's birth weight were not examined, and they could potentially impact the results. Nevertheless, the results of the present study still can be used to provide the current nutritional status indicators of children aged 6 to 24 months in Kuala Nerus and Kuala Terengganu since most of the past studies covered the nutritional status for children under the age of 5.

Conclusion

This study could not find significant association between infant feeding practices and nutritional status of the children age between 6 to 24 months in Kuala Nerus and Kuala Terengganu. However, the other results of the present study can be helpful to design strategies for the early identification of stunting, wasting, and underweight, leading to better health promotion and wellbeing in the population of children age 6-24 months. Furthermore, it can lower expenses associated with medical treatment that will result from the decreased number of children who are unwell. Therefore, the IYCF score can be extremely valuable in guiding the collection of essential information in nutritional surveys and can thus be utilised for IYCF research, monitoring, evaluation, and advocacy.

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Conflict of Interest Disclosure

None to declare

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