

Association of Parental Factors with Overweight and Obesity Among Children Under Five in the Southern Region of Sarawak

Cik Normadiah Bt Said*, Law Leh Shii

Department of Community Medicine and Public Health, Faculty of Medicine and Health Sciences,
University Malaysia Sarawak (UNIMAS), Kota Samarahan, 94300, Sarawak, Malaysia.

*Corresponding Author

DOI: <https://doi.org/10.51584/IJRIAS.2026.11080163>

Received: 03 September 2026; Accepted: 08 September 2026; Published: 21 September 2026

ABSTRACT

Introduction: Childhood obesity is a growing global public health concern, including in Malaysia, with profound implications for the long-term health and development of children. Parental feeding practices are critical in preventing childhood obesity. To better understand these dynamics, this study investigates the association between parental factors and overweight and obesity among children under five in southern Sarawak. **Methodology:** This cross-sectional study involved 213 mother-child pairs recruited from 13 Taska centres (11 in Kuching and 2 in Samarahan) using multistage cluster sampling. Data were collected through self-administered questionnaires that covered socio-demographic characteristics, self-reported parental weight and height, feeding practices, and co-parenting feeding practices. Children's weight and height were extracted from Taska records, and body mass index-for-age (BAZ) z-scores were calculated. Descriptive statistics and binary logistic regression analyses were performed. **Results:** The prevalence of overweight and obesity was 21.6% and 8.5%, respectively. Multiple binary logistic regression revealed that parents who apply pressure to eat (AOR = 0.670, $p = 0.042$) and teach about nutrition (AOR = 0.630, $p = 0.007$) had a lower risk of overweight and obesity among children under five than those who did not. **Conclusion and Recommendation:** This study highlights the importance of parental feeding practices in shaping children's weight outcomes. Interventions that reduce pressure to eat and strengthen parents' skills in teaching nutrition are recommended to raise awareness and support the prevention of childhood overweight and obesity.

Keywords: Parental factors, Children under 5, Overweight/Obesity, Coparenting practices, Sarawak

INTRODUCTION

Childhood obesity is a growing global public health concern, with Malaysia experiencing a similar upward trend. This condition has profound long-term health and developmental implications as mentioned in Institute of Public Health, Malaysia (IPH, 2019). In many low- and middle-income countries (LMICs), such as Malaysia, public health initiatives have historically focused on addressing undernutrition and combating infectious diseases. However, a paradigm shift is emerging as obesity and non-communicable diseases (NCDs) garner increasing attention from the World Health Organization (WHO). Despite the importance of childhood nutrition in ensuring health, the prevalence of childhood obesity has increased dramatically across the world (Caprio et al., 2020). In Malaysia, the situation mirrors global trends, where National Health and Morbidity Survey (NHMS) has shown an alarming increase in childhood obesity rates from 2011 to 2019, where the prevalence of overweight and obesity among children under five in Malaysia has risen from 6.1% in 2011 to 14.8% in 2019 (IPH, 2011, 2019). Additionally, a local study by Mohd Saad et al. (2020) reported an 18% prevalence of overweight and obesity among children under five, while Aslan (2020) found a higher prevalence of 24.9% in selected Selangor kindergartens. This upward trend in childhood obesity is alarming and underscores the potential for this issue to become a significant public health challenge in the 21st century and beyond.

Childhood obesity is defined as abnormal or excessive fat accumulation that presents a risk to health, with diagnosis in children under five typically guided by the World Health Organization (WHO) growth reference

standards (WHO, 2006). This excess accumulation of body fat is not merely a matter of appearance; rather, it significantly increases the likelihood of a range of serious health consequences. Physically, affected children are at heightened risk for hypertension, dyslipidemia, insulin resistance, and early onset of type 2 diabetes, as well as respiratory, orthopedic, and hepatic complications (CDC,2022; Liu et al.,2019). Psychologically, obesity in early childhood is associated with depression, low self-esteem, emotional and behavioral disorders, and a diminished quality of life, often exacerbated by stigma, teasing, and bullying (Baharudin et al.,2021; Caprio et al.,2020). Developmentally, obesity can impair cognitive function, academic performance, and social integration, with many of these adverse effects persisting in adolescence and adulthood (WHO, 2022) which will disturb their school performance thus reducing quality of life.

Despite the growing recognition of childhood obesity as a critical health issue, the factors contributing to its existence remain complex and not fully understood, particularly among children under five years of age in the southern region of Sarawak. Multiple determinants have been implicated, including genetic predisposition, dietary patterns, physical inactivity, socioeconomic status, and environmental influences (Al Yazeedi et al., 2021; Ahmad et al., 2021; Papaioannou et al., 2023). However, the interplay of these factors can vary significantly across different populations and cultural contexts. This uncertainty underscores the urgent need to identify modifiable risk factors, particularly parental influences, to inform effective prevention strategies. In Malaysia, studies have highlighted the role of parental body mass index, birth weight, dietary habits, and household environment, but findings are often inconsistent and sometimes contradictory (Ahmad et al., 2021; Mohamed et al.,2024). In Sarawak, a region characterized by its ethnic diversity and unique socio-cultural landscape, there is a paucity of research exploring the specific drivers of childhood overweight and obesity. This knowledge gap is particularly concerning given the region's higher reported prevalence of overweight and obesity among children, making it essential to investigate the underlying factors in this context to inform tailored and effective public health interventions (Chua et al.,2025).

Parents play a pivotal role in shaping their children's health behaviors, particularly through feeding practices, co-parental dynamics, and their own body mass index (Majid et al.,2023; Webber-Ritchey et al., 2023). Parental feeding practices such as restriction, pressure to eat, and modeling healthy eating have been consistently linked to children's dietary intake and weight status, with both positive and negative effects depending on the approach and context (Shloim et al.,2015). For instance, research involving children aged one to five from families in Puncak Alam, Malaysia, found that restrictive feeding practices were commonly used for weight control, while emotion regulation was less frequent, and these behaviors were associated with children's BMI outcomes (Majid et al.,2023). Furthermore, parental BMI has been shown to have a significant influence on children's risk of overweight and obesity, likely due to a combination of genetic, behavioral, and environmental factors (Ahmad et al.,2021; Webber-Ritchey et al., 2023). Co-parenting practices, including the degree of shared responsibility and consistency in feeding, can also impact children's eating behaviors and weight trajectories, although research in this area remains limited, especially in Malaysia (Shloim et al.,2015).

The persistent uncertainty regarding the determinants of childhood overweight and obesity highlights the imperative to elucidate modifiable risk factors, with particular emphasis on parental influences. Recognizing the crucial role that parents play in shaping early health behaviors, it is essential to systematically investigate parental determinants, including feeding practices, co-parental dynamics, and parental BMI that may contribute to the development of overweight and obesity among children under five years of age in the southern region of Sarawak. A focused examination of these factors will not only enhance the understanding of their relative impact within this specific cultural context but also provide an empirical foundation for the development of targeted, culturally appropriate prevention and intervention strategies. Such research is crucial for informing public health initiatives aimed at mitigating the early onset of childhood obesity and its associated long-term health consequences.

METHODOLOGY

A cross-sectional study was carried out from April 2023 to July 2024 among children aged 24 to 60 months at 13 registered TASKAs located in the southern region of Sarawak. The study sites included 11 TASKAs in

Kuching Division and 2 in Samarahan Division. The study included eligible mother-child pairs with children aged 24 to 60 months who were enrolled in registered TASKAs that were under the monitoring of the Department of Social Welfare Malaysia. This child should live with their parents. Mothers who did not give their consent were not included in the study. Additionally, households led by single mothers were excluded because the questionnaire was designed to examine co-parental feeding practices, which necessitate participation from both parents. Furthermore, children with special needs were also excluded, as their unique health situations may involve specific dietary requirements that could influence the findings of the study. The sample size was calculated using the formula developed by Daniel (Pourhoseingholi et al., 2013). After accounting for a 20% attrition rate, the final desired sample size was determined to be 233. Ultimately, a total of 213 children aged 24 to 60 months were recruited through multistage cluster sampling methods. Verbal and written informed consent were obtained from the mothers of the children before their participation in the study. Ethical approval was granted by the Ethical Committee of the Faculty of Medicine and Health Sciences, University of Malaysia Sarawak (FME/24/77) to conduct this study.

Data collection procedure

This study employed self-administered questionnaires comprising four sections. The first section included 12 questions aimed at gathering socio-demographic information about both parents and their children. For parents, the items addressed the mother's education level, household income, and employment status. For the children, the information collected included date of birth, gender, and ethnicity.

In the second part of the questionnaire, information regarding the children's height and weight was obtained from Taska records. The teachers are responsible for recording these measurements on a monthly basis. The WHO Anthro Plus software, version 1.0.4, was used to evaluate the BMI-for-age Z-score (BAZ) of the children. The BAZ is a statistical measure that indicates how many standard deviations a child's BMI is from the mean BMI of a reference population of the same age and sex (WHO, 2006). It is used to assess and compare a child's growth and nutritional status relative to a standardized population, helping to identify underweight, overweight, or obesity in children and adolescents. In contrast, the body weight and height of parents were obtained through self-report using a structured questionnaire. Parental BMI was then calculated by dividing the self-reported weight in kilograms by the square of height in meters ($BMI = \text{weight (kg)} / [\text{height (m)}]^2$). The resulting BMI values were subsequently categorized according to the WHO Asia-Pacific classification criteria, which define specific cut-off points for underweight, normal weight, overweight, and obesity in Asian populations (CPG, 2023).

The third part of the study utilized the Comprehensive Feeding Practices Questionnaire in its Malay version (CFPQ-M), as developed to evaluate parenting feeding practices. (Shohaimi et al., 2014). The CFPQ-M comprises 12 factors with a total of 39 items. These factors include child control, emotional regulation, encourage balance and variety, environment, food as rewards, involvement, modeling, monitoring, pressure to eat, restriction for health, restriction of weight control, and teaching about nutrition. The instrument measured feeding practices using five response options for items numbered 1 to 12: "never," "rarely," "sometimes," "mostly," and "always." For items numbered 13 to 39, the responses were "disagree," "slightly disagree," "neutral," "slightly agree," and "agree." A higher score in each factor indicated greater utilization of the corresponding feeding practices. However, it is important to note that items 5, 6, 10, and 11 (related to child control) and items 7, 8, and 9 (related to emotional regulation) were reversely scored. The instrument demonstrated good reliability, with a Cronbach's alpha of 0.89.

The last section focused on co-parental feeding practices, as measured by the Co-Parenting Feeding Scale (CFS) developed by Tan et al. (2019). This scale reflects how fathers and mothers mutually support each other, share leadership roles, and collaborate as a team in raising their children. It includes three subscales: sharing positive views and values about child feeding, engaging in child feeding together, and solo parenting in child feeding. Parents are required to respond to all 13 items on the scale using a 5-point Likert scale, where 1 indicates "strongly disagree" and 5 indicates "strongly agree". Higher scores represent more commonly used practices.

The scale has a Cronbach's alpha of 0.78, indicating acceptable reliability.

Quality control

A pilot study involving 30 mother-child pairs was conducted in randomly selected TASKA within Kota Samarahan to assess the feasibility of the study protocol and the suitability of the instruments (Hassan et al., 2006). Each completed questionnaire was double-checked for errors to ensure data accuracy. Respondents completed the questionnaire in 20 to 25 minutes without difficulty, indicating good comprehension.

Content validation was performed by a nutrition expert, who reviewed all items for clarity, comprehensibility, and formatting, including layout and visual elements. No revisions were required based on the expert's feedback, confirming the appropriateness of the questionnaire for the target population.

Statistical analysis

The data collected was analyzed using the Statistical Package for Social Sciences (SPSS) version 29 (IBM Corp, 2022). Descriptive statistical analyses were performed to summarize the data distribution, including calculations of frequency, percentage, mean (with standard deviation), and median scores. The outcome variable, representing overweight and obesity status, was categorized into "non-overweight or obese" and "at-risk, overweight, or obese categories" based on BMI-for-age z-scores.

For inferential statistics, a simple binary logistic regression test was performed in the univariate analysis to assess the association between parental factors and overweight and obesity. Variables with a *p*-value less than 0.20 (Law et al., 2020) from the simple binary logistic regression were subsequently included in a multiple binary logistic regression model. Statistical significance set at *p*-value less than 0.05.

RESULTS

A total of 300 questionnaires were distributed, and 213 were returned fully completed, resulting in a response rate of 71.0%. Of the 213 children studied, 21.6% were at risk of overweight and 8.5% were obese.

Socio-demographic characteristics

The sociodemographic characteristics of the mother and child pairs are shown in Table 1. The gender distribution among children under the age of five was nearly balanced, with boys comprising 59.2% and girls accounting for 40.8% of the sample. The mean age of these children is 37.92 ± 9.15 months. Most responses were from mothers of children aged 24 to 36 months (51.2%), while the fewest were from mothers of children aged 49 to 60 months.

In terms of ethnic composition, Malays make up the largest group at 54% of the sample. This is followed by Bumi-Others, which includes ethnicities such as Iban, Bidayuh, Melanau, Kayan, Kenyah, Murut, Kedayan, and Sekapan, accounting for 26.3%. Other ethnic groups, including Chinese, Indian, Javanese, and Bugis, comprise 19.7% of the respondents.

Analyzing the characteristics of the mothers, a majority (79.3%) have attained tertiary education, while 16.4% completed secondary education. Only 2.8% have completed primary education, and a small fraction (1.4%) have no formal education. Employment status reveals that 94.4% of the mothers are employed. Financially, over half of the families (51.6%) are classified as low-income (B40), with a household income of RM5250 or less. Families in the middle-income (M40) bracket account for 43.7%, while those in the high-income (T20) category make up 4.7%.

Table 1: Distribution of socio-demographic characteristics (N=213)

Characteristics	<i>n</i> (%)	<i>Mean ± SD</i>
Mother's education level^a		
No formal education	3 (1.4)	
Primary education	6 (2.8)	

Secondary education	35 (16.4)	
Tertiary education	169 (79.3)	
Mother's working status		
Yes	201 (94.4)	
No	12 (5.6)	
Total household income		
(B40) < RM 5250	110 (51.6)	
(M40) RM 5251–RM 11819	93 (43.7)	
(T20) > RM 11819	10 (4.7)	
Child's gender		
Male	126 (59.2)	
Female	87 (40.8)	
Child's age (month)		37.92 ± 9.15
24–36	109 (51.2)	
37–48	69 (32.4)	
49–60	35 (16.4)	
Min, Max	24, 60	
Child's ethnicity		
Bumi-Malay	115 (54.0)	
Bumi-others ^b	56 (26.3)	
Non-Bumiputera ^c	42 (19.7)	

^aMother's education level: Primary education: UPSR, Secondary education: PMR, SPM, Tertiary education: STPM, Diploma, Degree, PhD.

^bIban, Bidayuh, Melanau, Kayan, Kenyah, Murut, Kedayan, Sekapan

^cCina, India, Jawa, Bugis

SD= Standard Deviation

Parents body mass index (BMI)

As shown in Table 2, the percentage of parents classified as overweight (BMI between 23.0 kg/m² and 27.4 kg/m²) was notably high, with 36.2% of fathers and 45.1% of mothers in this category. Additionally, a considerable proportion of parents were classified as obese (BMI ≥ 27.5 kg/m²), with 42.7% of fathers and 25.8% of mothers falling into this group. A small percentage of fathers (0.9%) and mothers (3.3%) were classified as underweight (BMI < 18.5 kg/m²). A modest percentage of mothers (25.8%) and fathers (20.2%) fell within the normal BMI range (18.5–22.9 kg/m²). The mean BMI for fathers was 25.64 ± 4.90 kg/m², while the mean BMI for mothers was 26.89 ± 4.77 kg/m².

Table 2: Parents Body Mass Index (BMI) (N=213)

Anthropometric Measurement	Father Mean ± SD	Father Min, Max	Mother Mean ± SD	Mother Min, Max
Weight	76.78 ± 14.59	48, 135	62.23 ± 11.78	39, 110
Height	168.85 ± 6.65	148, 187	155.77 ± 5.50	140, 170
Body Mass Index^a	n (%) / Mean ± SD		n (%) / Mean ± SD	
Mean BMI	25.64 ± 4.90		26.89 ± 4.77	

<18.5 (Underweight)	2 (0.9)		7 (3.3)	
18.5–22.9 (Normal)	43 (20.2)		55 (25.8)	
23.0–27.4 (Overweight)	77 (36.2)		96 (45.1)	
>27.5 (Obese)	91 (42.7)		55 (25.8)	

^aWHO Asia-Pacific BMI classification for adult Asian populations (CPG, 2023).

Body weight status among children under 5

Based on Table 3, most children under the age of 5 have a normal body mass index (BMI), accounting for 54.9% of the group. However, a substantial proportion are facing weight-related issues. Specifically, 15% of the children fall into the wasted category, with a higher prevalence in males (15.9%) compared to females (13.8%). On the other hand, those at risk of being overweight make up 15.5%, while 6.1% are classified as overweight and 8.5% as obese.

Table 3: Body weight status among children under 5 (N=213)

Body Weight Status	Male (n = 126)	Female (n = 87)	Total (n = 213)
Weight (kg)	14.02 ± 0.26	13.10 ± 0.26	13.64 ± 2.75
Height (cm)	93.59 ± 0.84	92.11 ± 1.05	92.98 ± 9.62
BMI (kg/m ²)	16.12 ± 3.20	15.64 ± 2.97	15.93 ± 2.97
BMI-for-age z-score ^a	0.18 ± 0.21	-0.68 ± 0.23	0.08 ± 2.28
Wasted (BAZ < -2 SD)	20 (15.9)	12 (13.8)	32 (15.0)
Normal (BAZ ≥ -2 SD to ≤ +1 SD)	65 (51.6)	52 (59.8)	117 (54.9)
Risk of overweight (BAZ ≥ +1 SD to ≤ +2 SD)	22 (17.5)	11 (12.6)	33 (15.5)
Overweight (HAZ ≥ +2 SD to ≤ +3 SD)	8 (6.3)	5 (5.7)	13 (6.1)
Obese (BAZ ≥ +3 SD)	11 (8.7)	7 (8.0)	18 (8.5)

^aBMI Classification was based on WHO BMI for age and gender(z-score), (de Onis, 2006).

Factors associated with body weight status among children under 5

Table 4 presents the results of the univariate analysis, highlighting six variables with a p-value below 0.20 that were selected for inclusion in the multiple logistic regression analysis. These variables encompass sociodemographic characteristics such as household income ($p=0.195$) and parental feeding practices, specifically: restriction for health ($p=0.050$), teaching about nutrition ($p=0.042$), restriction for weight control ($p=0.068$), and pressure to eat ($p=0.068$), as well as coparenting feeding practices characterized by active engagement ($p=0.144$).

The Hosmer and Lemeshow test indicated that the dataset fits the logistic model well, showing that 70.4% of the cases were correctly classified as either overweight/obese or not. The assumptions of the test were verified, with no outliers identified based on Cook's influential statistics, the highest value being 0.46. Additionally, multicollinearity among the variables was assessed using the Variance Inflation Factor (VIF), and all values were found to be less than ten.

According to the data presented in Table 4, mothers who score higher on the pressure subscale ($AOR\ 0.670$, 95% $CI = 0.455-0.986$, $p = 0.042$) and the teaching about nutrition subscale ($AOR\ 0.630$, 95% $CI = 0.450-0.883$, $p = 0.007$) are less likely to have children under 5 who develop overweight or obesity. Specifically, for each unit increase in pressure, the odds of childhood overweight or obesity decrease by 33%. Similarly, for each unit increase in teaching about nutrition, the odds decrease by 37%.

Table 4: Factors associated with body weight status among children under 5 (n=213)

Variables	B	SE	Wald χ^2	df	p-value	Adjusted OR	95% CI for OR Lower	95% CI for OR Upper
Household income								
B40 (< RM 5251)	Reference							
M40 (RM 5251–11819)	−0.113	0.322	0.124	1	0.725	0.893	0.475	1.679
T20 (> RM 11819)	−1.515	1.102	1.890	1	0.169	0.220	0.025	1.905
Restriction for health	−0.307	0.165	3.473	1	0.062	0.736	0.533	1.016
Teaching about nutrition	−0.461	0.172	7.192	1	0.007*	0.630	0.450	0.883
Restriction for weight control	0.380	0.202	3.519	1	0.061	1.462	0.983	2.173
Pressure to eat	−0.401	0.197	4.116	1	0.042*	0.670	0.455	0.986
Active engagement	0.306	0.238	1.652	1	0.199	1.358	0.851	2.167

Note: $p < 0.05$. Reference category for household income is B40 (< RM 5251).

Adjusted OR= Adjusted Odd ratio; Cox & Snell R square= 0.092; Nagelkerke R square= 0.130

* Significant at the p value <0.05

DISCUSSION

This study found that nearly one-third of children under five in southern Sarawak are overweight or obese, a rate higher than national averages. The prevalence of overweight and obesity among children under five in the southern region of Sarawak remains alarmingly high, with 21.6% classified as overweight and 8.5% as obese, amounting to a combined prevalence of 30.1%. This figure is notably higher than the national prevalence of childhood obesity reported by the National Health and Morbidity Survey (NHMS) 2019, which found that 5.6% of children under five years were obese (IPH, 2019). When compared to similar studies among preschoolers in Putrajaya and Kuala Langat, Selangor, where the prevalence ranged from 7.3% to 24.9% (Aslan et al., 2020; Fauzi et al., 2017), the rates observed in Sarawak are particularly concerning and highlight a growing public health challenge in this region. As clearly reported, the effects of overweight and obesity on both physical and physiological health of children can extend into adulthood if prevention measures are not implemented. This condition raises the likelihood of developing non-communicable diseases such as diabetes, hypertension, and cardiovascular diseases later in life, (Baharudin et al., 2021; CDC, 2022; Liu et al., 2019; Saad, 2021; WHO, 2023) collectively known in Malaysia as “penyakit tiga serangkai”.

These results suggest that behavioral and interactional patterns between parents and children may play a more crucial role than demographic or biological variables alone. The study underscores the critical role that parents, especially mothers as primary caregivers, can play in shaping healthy eating habits and preventing early childhood obesity (Qudat et al, 2025).

The relationship between parental pressure to eat and childhood overweight and obesity reveals complex and sometimes contradictory patterns in literature. As defined by Shohaimi et al. (2014), “pressure to eat” encompasses parental strategies encouraging increased food consumption during meals. While some studies indicate this practice reduces obesity risk (Mohamed et al., 2024; Aslan et al., 2020; Yamborisut et al., 2018), others report contrasting outcomes (Beckers et al., 2021; Abdoli et al., 2023). This inconsistency may reflected from parents who often respond to perceived weight concerns by intensifying pressure tactics in prompting children to eat beyond satiety or finish meals particularly when underestimating their child’s actual weight status

(Hsu et al., 2022). Such behavior aligns with the heightened overweight and obesity prevalence observed among Malaysian preschoolers in our study, suggesting parental concern drives these practices.

Notably, our findings demonstrate an inverse association between pressure to eat and obesity risk, diverging from research linking pressured feeding to disrupted self-regulation and long-term weight gain (Aslan et al., 2020; Abdoli et al., 2023). This discrepancy may reflect contextual moderators in our study; culturally normalized and moderate pressure potentially enhances dietary adherence without triggering counterproductive force-feeding effects. Thus, the protective association observed here likely arises from population-specific feeding practices that balance encouragement with physiological cues.

Similarly, in the present study, teaching nutrition to children emerged as a significant protective factor against overweight and obesity. Here, teaching about nutrition refers to parents actively imparting nutritional knowledge to their children during mealtimes (Shohaimi et al., 2014). This finding reinforces earlier research by Gato-Moreno et al. (2021), which demonstrated strong associations between parental nutrition education during meals and healthier weight outcomes in children. Supporting this, a study from Juanda, Indonesia, revealed that children who were not taught about nutrition by their parents were 26.7 times more likely to experience overnutrition (Hartati et al., 2022). However, these results contrast with findings from Puncak Alam, Selangor, where Majid et al. (2023) reported no significant association between parental nutrition teaching and childhood weight status. Early childhood is widely recognized as a crucial stage for establishing lifelong eating habits. Nutrition education during this period enables children to appreciate the value of healthy foods and fosters a preference for fruits, vegetables, and balanced meals (Gato-Moreno et al., 2021). Additionally, children who receive nutrition education are more likely to make healthier dietary choices both at home and in school (Raut et al., 2019). These make nutrition education an important protective factor against overweight and obesity in children.

These collective findings suggest that culturally tailored health literacy interventions could be highly effective in shaping parental influence on children's weight trajectories. The Centers for Disease Control and Prevention (CDC, 2024) also emphasizes the importance of establishing healthy eating habits early in life to prevent and manage overweight and obesity. Early nutrition education should focus on promoting nutrient-dense foods while limiting added sugars and unhealthy fats.

In Malaysian context, mothers often play a central role not only in meal preparation but also in teaching their children about nutrition during mealtimes (Hashim et al., 2022). This typically involves engaging children in conversations about the foods being served and their health benefits, transforming mealtimes into valuable educational opportunities. To maximize understanding and retention, it is important for parents to use simple, clear nutrition messages. Additionally, as highlighted by Mohamed et al. (2024), parents should model healthy eating behaviors, as children are more likely to adopt habits they observe in their caregivers. This underscores the critical role of parental involvement in early childhood nutrition education in reducing the risk of overweight and obesity among young children. Therefore, integrating nutrition education into family mealtimes should be considered a cornerstone strategy in efforts to combat childhood obesity.

Instead of the significant findings related to parental feeding practices, it is noteworthy that the parental body mass index (BMI) was not associated with the body weight status of children under five in this study. This result diverges from global trends, where a positive correlation between parental and child BMI has been consistently reported. For instance, studies from Taiwan and Bosnia have demonstrated significant associations between parental and child BMI (Heerman et al., 2019; Amira Kurspahić-Mujčić, 2020; Hsu et al., 2022). This association is likely influenced by shared family environments, lifestyle behaviors, and potentially genetics (Bahreyian et al., 2017). In contrast, our data did not reveal any significant relationship between parental BMI and child weight status, suggesting that other factors, such as feeding practices, may play a more prominent role in shaping early childhood weight outcomes within this population.

Surprisingly, in this study, sociodemographic and socioeconomic factors including maternal education level were not significantly associated with child weight status. This result is consistent with some previous findings,

yet the literature remains mixed on this issue. For instance, some studies have reported that higher maternal education may increase the risk of childhood obesity, potentially due to differences in dietary practices, nutrition literacy, and greater access to energy-dense foods (Ayele et al., 2022). Conversely, studies by Hsu et al., 2022 indicate that higher maternal education is generally linked to better nutrition knowledge, healthier feeding practices, and a lower risk of overweight and obesity among children. It has also been suggested that although educated mothers may adopt more appropriate feeding practices, higher household income associated with education may lead to increased consumption of convenience and indulgent foods (Berhane et al., 2020). These varying findings highlight the complex and context-specific relationship between maternal education and child weight status, suggesting that other factors may mediate this association in different populations.

Despite the valuable insights gained, this study is not without limitations, which readers should consider when interpreting the findings. The cross-sectional design precludes any inference of causality, meaning that while associations can be identified, the direction of effect cannot be established. Besides, the reliance on secondary data for children anthropometric measurement may be introduced to observer bias, and self-reported data for parental BMI and some feeding practices may introduce recall or social desirability bias, potentially underestimating or overestimating true associations. The sample was limited to mother-child pairs from registered childcare centers in two districts, which may restrict the generalizability of the results to other regions or to families with different caregiving arrangements.

Finally, the exclusion of fathers and other caregivers from direct participation, as well as the omission of potentially relevant lifestyle variables such as children's physical activity, sleep patterns, and screen time, could mean that important influences on child weight status were not fully captured. Therefore, future studies should address these limitations by employing longitudinal designs, including more diverse family structures, and incorporating a broader range of behavioral and environmental factors to provide a more comprehensive understanding of childhood obesity risk.

CONCLUSION

This study highlighted the concerning prevalence of overweight and obesity among children under five in the southern region of Sarawak, with nearly one-third of these children classified in this category. These findings enhance our understanding of effective feeding practices, specifically the importance of educating children about nutrition and the role of parental pressure to eat as protective factors against overweight and obesity within this vulnerable group. By focusing on a culturally diverse Malaysian context, the research fills a gap in local evidence and underscores the critical role parents play in implementing the right approaches to feeding as a strategy for preventing early obesity. To effectively address this issue, it is crucial to implement targeted strategies that empower parents by strengthening their understanding of effective feeding practices. Prioritizing parental education is key to preventing childhood obesity, as it equips parents with the knowledge and skills needed to foster healthy eating habits in their children. Furthermore, the findings suggest that future research should adopt longitudinal designs to clarify causal relationships, broaden and deeper the scope to include fathers, other caregivers, and additional factors such as physical activity and screen time. This comprehensive approach would lead to more effective interventions and public health policies addressing childhood obesity in similar settings, ultimately promoting better health management and improved outcomes for young children in Malaysia.

ACKNOWLEDGEMENT

The author acknowledges the Ethics Committee of Universiti Malaysia Sarawak (UNIMAS) for approval of this study. Many thanks to UNIMAS and JKM for their support throughout the study. And, to all the subjects for their participation, full cooperation, and patience in completing the study.

Ethical Considerations

Ethical approval was granted by the Ethical Committee of the Faculty of Medicine and Health Sciences, University of Malaysia Sarawak (FME/24/77) to conduct this study.

Funding

This study received no specific grants from any funding agency.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The data generated and analyzed during this study are not publicly available to protect the confidentiality and privacy of the study participants. However, the data may be made available upon reasonable request to the corresponding author. Any request for access to the data will be considered in accordance with applicable ethical approvals, participant confidentiality requirements, and institutional policies.

REFERENCES

1. Abdoli, M., Scotto Rosato, M., Cipriano, A., Napolano, R., Cotrufo, P., Barberis, N., & Cella, S. (2023). Affect, Body, and Eating Habits in Children: A Systematic Review. *Nutrients*, 15(15). <https://doi.org/10.3390/nu15153343>
2. Ahmad Fauzi F, Mohd Zulkefli (2017). *Malaysia J Med Heal Sci*, 13(3):11-20
3. Ahmad, A., Zulaily, N., Shahril, M. R., Wafa, S. W., Mohd Amin, R., Piernas, C., & Ahmed, A. (2021). Obesity determinants among Malaysian 12-year old school adolescents: findings from the HAT study. *BMC pediatrics*, 21(1), 418. <https://doi.org/10.1186/s12887-021-02899-3>
4. Al Yazeedi, B., Berry, D. C., Crandell, J., & Waly, M. (2021). Family Influence on Children's Nutrition and Physical Activity Patterns in Oman. *J Pediatr Nurs*, 56, e42-e48. <https://doi.org/10.1016/j.pedn.2020.07.012>
5. Amira Kurspahić-Mujčić, A. M. (2020). Factors associated with overweight and obesity in preschool children *Medicinski Glasnik*, 17(2). <https://doi.org/doi: 10.17392/1175-20>
6. Aslan, Awalina, A., Sulaiman, & Norhasmah. (2020). Overweight and Obesity Among Children: A Relationship Between Maternal Beliefs and Feeding Practices With Children's Body Mass Index-for-Age in Bandar and Jugra Kuala Langat Selangor. *Malaysian Journal of Medicine and Health Sciences*, 16 (suppl. 6). pp. 11-18. ISSN 1675-8544; ESSN: 2636-9346
7. Ayele, B. A., Tiruneh, S. A., Ayele, A. A., Zemene, M. A., Chanie, E. S., & Hailemeskel, H. S. (2022). Prevalence and determinants of overweight/obesity among under-five children in sub-Saharan Africa: a multilevel analysis. *BMC Pediatric*, 22(1), 585. <https://doi.org/10.1186/s12887-022-03645-z>
8. Baharudin, A., Man, C. S., Sallehuddin, S. M., Radzi, M. R. M., Ahmad, M. H., Aziz, N. S. A., Palanivel, L., Salleh, R., Zainuddin, A. A., & Ahmad, N. A. (2021). Childhood Overweight Among Under Five in Putrajaya, Malaysia: The Contributing Factors. *Journal of Healthcare in Developing Countries*, 1, 72-78. <https://doi.org/10.26480/jhcdc.04.2021.72.78>
9. Bahreynian, M., Qorbani, M., Khaniabadi, B. M., Motlagh, M. E., Safari, O., Asayesh, H., & Kelishadi, R. (2017). Association between Obesity and Parental Weight Status in Children and Adolescents. *J Clin Res Pediatr Endocrinol*, 9(2), 111-117. <https://doi.org/10.4274/jcrpe.3790>
10. Beckers, D., Karssen, L. T., Vink, J. M., Burk, W. J., & Larsen, J. K. (2021). Food parenting practices and children's weight outcomes: A systematic review of prospective studies. *Appetite*, 158, 105010. <https://doi.org/10.1016/j.appet.2020.105010>
11. Berhane, H. Y., Jirström, M., Abdelmenan, S., Berhane, Y., Alsanis, B., Trenholm, J., & Ekström, E.-C. (2020). Social Stratification, Diet Diversity and Malnutrition among Preschoolers: A Survey of Addis Ababa, Ethiopia. *Nutrients*, 12(3), 712. <https://www.mdpi.com/2072-6643/12/3/712>
12. Caprio, S., Santoro, N., & Weiss, R. (2020). Childhood obesity and the associated rise in cardiometabolic complications. *Nature Metabolism*, 2(3), 223-232. <https://doi.org/10.1038/s42255-020-0183-z>

13. CDC. (2024). Preventing Childhood Obesity: 6 Things Families Can Do. Centers for Disease Control and Prevention. <https://www.cdc.gov/obesity/family-action/index.html>
14. Chua, K. Y., Chua, K. Y., Chinna, K., Lim, C. L., & Seneviwickrama, M. (2025). Prevalence of childhood overweight and obesity in Malaysia: a systematic review and meta-analysis. *Clinical and experimental pediatrics*, 68(2), 115–126. <https://doi.org/10.3345/cep.2024.00899>
15. CPG,M.,Malaysia Health Technology Assessment Section (MaHTAS).(2023). Clinical Practice Guidelines Management of Obesity, 2nd ed. [https://www.moh.gov.my/moh/resources/Penerbitan/CPG/Endocrine/CPG_Management_of_Obesity_\(Second_Edition\)_2023.pdf](https://www.moh.gov.my/moh/resources/Penerbitan/CPG/Endocrine/CPG_Management_of_Obesity_(Second_Edition)_2023.pdf)
16. Gato-Moreno, M., Martos-Lirio, M. F., Leiva-Gea, I., Bernal-López, M. R., Vegas-Toro, F., Fernández-Tenreiro, M. C., & López-Siguero, J. P. (2021). Early Nutritional Education in the Prevention of Childhood Obesity. *International Journal of Environmental Research and Public Health*, 18(12), 6569. <https://doi.org/10.3390/ijerph18126569>
17. Hartati, D. I., Noviasy, R., & Susanti, R. (2022). The Effect of Comprehensive Feeding Practices and Physical Activities on the Over-nutritional Status of Preschoolers in the Working Area of Juanda Community Health Center Samarinda.
18. Hassan, Z. A., Schattner, P., & Mazza, D. (2006). Doing A Pilot Study: Why Is It Essential? *Malays Fam Physician*, 1(2-3), 70-73.
19. Hashim, N.F., Yaakob, M.Y., Sahak, A.A.M., & Sharif, M.S., (2022). Parents in preparing meal for children: knowledge, attitude and practice. *Journal of Tourism, Hospitality & Culinary Arts*, 14(2), 35-49
20. Heerman, W. J., Sommer, E. C., Slaughter, J. C., Samuels, L. R., Martin, N. C., & Barkin, S. L. (2019). Predicting Early Emergence of Childhood Obesity in Underserved Preschoolers. *The Journal of Pediatrics*, 213, 115-120. <https://doi.org/https://doi.org/10.1016/j.jpeds.2019.06.031>
21. Hsu, P. C., Hwang, F. M., Chien, M. I., Mui, W. C., & Lai, J. M. (2022). The impact of maternal influences on childhood obesity. *Sci Rep*, 12(1), 6258. <https://doi.org/10.1038/s41598-022-10216-w>
22. IBM Corp. (2022). IBM SPSS Statistics for Windows (Version 29.0) [Software]. IBM Corp. <https://www.ibm.com/products/spss-statistics>
23. Institute for Public Health.IPH. (2011). National Health and Morbidity Survey 2011 (NHMS 2011) Volume I: Non-communicable diseases: Risk factors and other health problems. Ministry of Health Malaysia. <https://iku.gov.my/national-health-and-morbidity-survey-2011>
24. Institute for Public Health.IPH. (2019). Nutritional Status of Children. National Health and Morbidity Survey 2019 (Technical Report),Institute for Public Health, National Institutes of Health, Ministry,https://iku.moh.gov.my/images/IKU/Document/REPORT/NHMS2019/Report_NHMS2019-NCD_v2.pdf
25. Law, L. S., Sulaiman, N., Gan, W. Y., Adznam, S. N., & Mohd Taib, M. N. (2020). Predictors of Overweight and Obesity and Its Consequences among Senoi Orang Asli (Indigenous People) Women in Perak, Malaysia. *Int J Environ Res Public Health*, 17(7). <https://doi.org/10.3390/ijerph17072354>
26. Liu, D., Hao, Y. X., Zhao, T. Z., Song, P. K., Zhai, Y., Pang, S. J., Zhao, Y. F., Zhang, M., Wang, Z. Q., Mi, S. Q., Wang, Y. Y., Zhang, J., & Zhao, W. H. (2019). Childhood BMI and Adult Obesity in a Chinese Sample: A 13-Year Follow-up Study. *Biomedical and Environmental Sciences*, 32(3), 162-168. <https://doi.org/https://doi.org/10.3967/bes2019.023>
27. Majid, N., Ab Hamid, M. R., Wan Ismail, W., & Suryanto, S. (2023). Parental Feeding Practice in Relation to Their Children’s Weight Status among Puncak Alam Residents. *Environment-Behaviour Proceedings Journal*, 8, 231-237. <https://doi.org/10.21834/e-bpj.v8i26.5150>
28. Mohamed, S. F., Vanoh, D., & Soo, K. L. (2024). Socio-demographic factors and parental feeding practices predicted body mass index of Malaysian children with learning disabilities. *Malaysian Journal of Nutrition*, 30(1), 59–72. <https://doi.org/10.31246/mjn-2023-0081>
29. Oudat, Q., Lee, R. C., Miller, E. L., Couch, S. C., & Bakas, T. (2025). The Factors Influencing Feeding Practices of Primary Caregivers of Preschoolers: A Theory-Based Cross-Sectional Study. *Children*, 12(2), 226. <https://doi.org/10.3390/children12020226>

30. Raut, S., Kc, D., Singh, D. R., Dhungana, R. R., Pradhan, P. M. S., & Sunuwar, D. R. (2024). Effect of nutrition education intervention on nutrition knowledge, attitude, and diet quality among school-going adolescents: a quasi-experimental study. *BMC Nutr*, 10(1), 35. <https://doi.org/10.1186/s40795-024-00850-0>
31. Saad, A. S., Suzani & Rahmatullah, Bahbibbi & Che Mustafa, Mazlina. . (2021). The Trend of Body Mass Index (BMI) Changes among Malaysian Children and the Prediction at 48 Months Old. *Asia-Pacific Journal Of Research In Early Childhood Education.*, 15, 187-206. <https://doi.org/10.17206/apjrece.2021.15.2.187>.
32. Shohaimi, S., Wei, W. Y., & Shariff, Z. M. (2014). Confirmatory factor analysis of the Malay version comprehensive feeding practices questionnaire tested among mothers of primary school children in Malaysia. *ScientificWorldJournal*, 2014, 676174. <https://doi.org/10.1155/2014/676174>
33. Shloim, N., Edelson, L. R., Martin, N., & Hetherington, M. M. (2015). Parenting Styles, Feeding Styles, Feeding Practices, and Weight Status in 4–12 Year-Old Children: A Systematic Review of the Literature. *Frontiers in Psychology*, 6, 163321. <https://doi.org/10.3389/fpsyg.2015.01849>
34. Tan, C. C., Lumeng, J. C., & Miller, A. L. (2019). Development and preliminary validation of a feeding coparenting scale (FCS). *Appetite*, 139, 152-158. <https://doi.org/10.1016/j.appet.2019.04.020>
35. Webber-Ritchey, K. J., Habtezi, D., Wu, X., & Samek, A. (2023). Examining the Association Between Parental Factors and Childhood Obesity. *Journal of community health nursing*, 40(2), 94–105. <https://doi.org/10.1080/07370016.2022.2125809>
36. WHO. (2006). WHO Child Growth Standards based on length/ height, weight and age. 76-85. <https://doi.org/10.1080/08035320500495548>
37. WHO. (2023). Malnutrition. https://www.who.int/health-topics/malnutrition#tab=tab_1
38. World Health Organization. (2024). Noncommunicable diseases: Childhood overweight and obesity. <https://www.who.int/news-room/questions-and-answers/item/noncommunicable-diseases-childhood-overweight-and-obesity>
39. Yamborisut, U., Visetchart, P., Thasanasuwan, W., Srichan, W., & Unjana, R. (2018). Parental feeding practice is associated with child's body mass index in Thai school-aged children: A case study in Don Tum district, Nakhon Pathom, Thailand. *Journal of Health Research*, 32(1), 82–94. <https://doi.org/10.1108/JHR-11-2017-010>